SCO® XENIX® System V Operating System Reference

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Preface

The complete set of XENIX manual pages are distributed as individual reference sections in the various volumes of the XENIX Operating, Text Processing, and Development Systems. The following table lists the name, content, and location of each reference section.

Section	Description	XENIX Volume
ADM	Administrative Commands - used for system administration.	XENIX Reference
C	Commands - used with the XENIX Operating System.	XENIX Reference
CP	Programming Commands - used with the Development System.	Programmer's Reference
CT	Text Processing Commands - used with the Text Processing System.	Text Processing Guide
DOS	Routines - used with the Development System	Programmer's Reference
F	File Formats - description of various system files not defined in section M.	XENIX Reference
HW	Hardware specific manual pages - information about XENIX procedures specific to your computer.	XENIX Reference
M	Miscellaneous - information used for access to devices, system maintenance, and communications.	XENIX Reference
S	System Calls and Library Routines - available for C and assembly language programming.	Programmer's Reference

In the manual pages, a given command, routine, or file is referred to by name and section. For example, the programming command "cc", which is described in the Programming Commands (CP) section, is listed as *cc*(CP).

The alphabetized table of contents given on the following pages is a complete listing of all XENIX commands, system calls, library routines, and file formats. The permuted index, found at the end of the *XENIX Reference* and the the end of the XENIX *Programmer's Reference*, is useful in matching a desired task with the manual page that describes it.

Alphabetized List

Commands, Systems Calls, Library Routines and File Formats

Contents

System Administration **(ADM)**

lpadmin	Configures the lineprinter spooling system.
lpinit	Adds, reconfigures and maintains lineprinters.
lpsched, lpshut,	
lpmove	Starts/stops the lineprinter.
makekey	Generates an encryption key.
mkdev	Calls scripts to add peripheral devices.
mkfs	Constructs a file system.
mkuser	Adds a login ID to the system.
mount	Mounts a file structure.
mvdir	Moves a directory.
ncheck	Generates names from inode numbers.
netutil	Administers the Micnet network.
pwadmin	Performs password aging administration.
restore, restor	Invokes incremental file system restorer.
rmuser	Removes a user account from the system.
runbig	Runs a command that may require more memory than normal.
schedule	Database for automated system backups.
scopatch	Applies kernel patches.
sddate	Prints and sets backup dates.
setclock	Sets system real time clock.
setmnt	Establishes /etc/mnttab table.
settime	Changes the access and modification dates of files.
sfmt	Performs special formatting.
shutdown	Terminates all processing.
sync	Updates the super-block.
sysadmin	Performs file system backups and restores files.
sysadmsh	Menu driven system administration utility.
telinit, mkinittab	Alternative method of turning terminals on and off.
umount	Dismounts a file structure.
uucheck	Checks the uucp directories and permissions file.
uucico	File transport program for the uucp system.
uuclean	UUCP spool directory clean-up.
uudemon:	
uudemon.admin,	
uudemon.clean,	
uudemon.hour,	
uudemon.poll,	
uudemon.poll2	UUCP administrative scripts.
uuinstall	Administers UUCP control files.
uusched	The scheduler for the uucp file transport program.
uutry	Tries to contact remote system with debugging on.
uuxqt	Executes remote command requests.
wall	Writes to all users.

Name

intro - Introduction to system administration commands.

Description

This section contains the commands that are used to administrate and maintain the XENIX operating system. These commands are largely root-only, meaning that they can only be executed by the super-user (root).

Name

acctcom - Searches for and prints process accounting files.

Syntax

acctcom [[options][file]] . . .

Description

acctcom reads *file*, the standard input, or **/usr/adm/pacct**, in the form described by *acct*(F) and writes selected records to the standard output. Each record represents the execution of one process. The output shows the COMMAND NAME, USER, TTYNAME, START TIME, END TIME, REAL (SEC), CPU (SEC), MEAN SIZE (K), and optionally, F (the *fork/exec* flag: **1** for *fork* without *exec*) and STAT (the system exit status).

The command name is prepended with a # if it was executed with super-user privileges. If a process is not associated with a known terminal, a **?** is printed in the TTYNAME field.

If no *files* are specified, and if the standard input is associated with a terminal or **/dev/null** (as is the case when using **&** in the shell), **/usr/adm/pacct** is read, otherwise the standard input is read.

If any *file* arguments are given, they are read in their respective order. Each file is normally read forward, i.e., in chronological order by process completion time. The file **/usr/adm/pacct** is usually the current file to be examined; a busy system may need several files, in which case all but the current file will be found in **/usr/adm/pacct***?*. The *options* are:

-b Reads backwards, showing latest commands first.

-f Prints the *fork/exec* flag and system exit status columns in the output.

-h Instead of showing mean memory size, it shows the fraction of total available CPU time consumed by the process during its execution. This "hog factor" is computed as:

(total CPU time)/(elapsed time).

-i Prints columns containing the I/O counts in the output.

-k Instead of memory size, shows total kcore-minutes.

-m Shows mean core size (the default).

-r Shows CPU factor (user time/(system-time + user-time).)

-t Shows separate system and user CPU times.

-v Excludes column headings from the output.

-l *line* Shows only processes belonging to terminal **/dev/***line*.

-u *user* Shows only processes belonging to *user* that may be specified by a user ID, a login name that is then converted to a user ID, a **#** which designates only those processes executed with super-user privileges, or **?** which designates only those processes associated with unknown user IDs.

-g *group* Shows only processes belonging to *group*. The *group* may be designated by either the group ID or group name.

-d *mm/dd* Any *time* arguments following this flag are assumed to occur on the given month and day, rather than during the last 24 hours. This is needed for looking at old files.

-s *time* Shows only those processes that existed on or after *time*, given in the form *hr*:*min*:*sec*. The :*sec* or :*min*:*sec* may be omitted.

-e *time* Shows only those processes that existed on or before *time*. Using the same *time* for both **-s** and **-e** shows the processes that existed at *time*.

-n *pattern* Shows only commands matching *pattern* that may be a regular expression as in *ed* (C) except that + means one or more occurrences.

-H *factor* Shows only processes that exceed *factor*, where factor is the "hog factor" as explained in option **-h** above.

-I *number* Shows driver processes transferring more characters than the cutoff *number*.

-O *time* Shows only those processes with operating system CPU time that exceeds *time*.

-C *time* Shows only those processes that exceed *time* (the total CPU time).

Multiple options have the effect of a logical AND.

Files

/etc/passwd

/usr/adm/pacct

/etc/group

See Also

accton(ADM), ps(C), su(C), acct(S), acct(F), utmp(F)

Notes

acctcom only reports on processes that have terminated; use *ps* (C) for active processes.

Name

accton - Turns on accounting.

Syntax

accton [file]

Description

accton turns on and off process accounting. If no *file* is given then accounting is turned off. If *file* is given, the kernel appends process accounting records. (See *acct* (S) and *acct* (F)).

Files

/etc/passwd	Used for login name to user ID conversions
/usr/adm/pacct	Current process accounting file
/usr/adm/sulogin	Super-user login history file
/etc/wtmp	Login/logout history file

See Also

acctcom(ADM), acct(S), acct(F), su(C), utmp(F)

Name

adfmt - Formats SCSI hard disks.

Syntax

/etc/adfmt device_name

Description

The **adfmt** command issues a **format** command to the SCSI disk *device_name*. *device_name* should be the character-special device representing the whole SCSI disk, for example, */dev/rhd10*.

Notes

This utility is only applies to XENIX-386 distributions.

SCSI disks with embedded controllers are formatted as part of the manufacturing test procedure. Using **adfmt** on these disks is unnecessary.

Files

/dev/rhd?0

See Also

scsi(HW)
hd(HW)

Name

aliashash - Micnet alias hash table generator.

Syntax

aliashash [**-v**] [**-o** output-file] [input-file]

Description

The *aliashash* command reads the *input-file* and generates an *output-file* containing a hash table of alias definitions for a Micnet network. The *input-file* must name a file containing alias definitions in the form described for the **aliases** file (see *aliases*(M)). If the **-o** option is not used to specify an *output-file*, the command creates a file with the same name as the *input-file* but with **.hash** appended to it. If no *input-file* is given, the command reads the file named **/usr/lib/mail/aliases** and creates the file named **/usr/lib/mail/aliases.hash**.

If invoked with the **-v** option, the command lists information about the hash table.

The *output-file* will contain both the alias definitions given in the *input-file* and the new hash table. The hash table appears at the beginning of the file and is separated from the alias definitions by a blank line. The hash table has three or more lines. The first line is:

#<hash>

The second line has 4 entries: the bytes per table entry, the maximum number of items per hash value, the number of entries in the table, and the offset (in bytes) from the beginning of the file to the beginning of the alias definitions.

The next lines (up to the end of the hash table) contain the hash table entries. Each line has 8 entries (separated by spaces) and each entry has 2 fields. The first field (1 byte) is a checksum (represented as a printable character); the second field is a pointer (in bytes) to the alias definition. The pointer is represented as a hexadecimal number with leading blanks if necessary and is always relative to the start of the definitions.

The *aliashash* command is normally invoked by the **install** option of the *netutil* command. If the alias definitions of a network must be changed, the definitions in the **aliases** file should be changed and a new **aliases.hash** file created using the *aliashash* command. The new **aliases.hash** file must then be copied to all other computers in the network.

Files

/usr/lib/mail/aliashash
/usr/lib/mail/aliases
/usr/lib/mail/aliases.hash
/usr/lib/mail/maliases.hash
/usr/lib/mail/maliases

See Also

aliases(M), netutil(ADM)

Warning

Do not use the *aliashash* command to create the **aliases.hash** file while the network is running. If necessary, create a temporary output file, **aliases.hash+** , using the **-o** option, then enter:

mv aliases.hash+ aliases.hash

This will prevent disruption of the network.

Name

asktime - Prompts for the correct time of day.

Syntax

/etc/asktime

Description

This command prompts for the time of day. You must enter a legal time according to the proper format as defined below:

[[*yy*]*mmdd*]*hhmm*

Here 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 2 digits of the year number and is optional. The month and day are also optional, as a group with with the year. The current year is the default if no year is mentioned.

Examples

This example sets the new time, date, and year to "11:29 Aug 31, 1992".

```
Current system time is Mon Aug 24 14:36:23 PST 1992
Enter time ([yymmdd]hhmm): 9208311129
```

Diagnostics

If you enter an illegal time, *asktime* prompts with:

Try again:

Notes

asktime is normally performed automatically by the system startup file **/etc/rc** immediately after the system is booted; however, it may be executed at any time. The command is privileged, and can only be executed by the super-user.

Systems which autoboot will invoke *asktime* automatically on reboot. On these systems, if you don't enter a new time or press return within 1 minute of invoking *asktime*, the system will use the time value it has. If RETURN alone is entered, the time is unchanged.

Name

autoboot - Automatically boots the system.

Description

The system can be set up to go through the boot stages automatically (as defined in **/etc/default/boot**) when the computer is turned on (booted), provided no key is pressed at the *boot*(HW) prompt.

If *boot* times out and LOADXENIX=YES, then XENIX is passed the word "auto" in its boot string and *init*(M) *fsck*(ADM), and *asktime*(ADM) are passed a **-a** flag.

In addition, the TIMEOUT entry can be set to specify the number of seconds to wait before timing out.

The *autoboot* procedure checks the file **/etc/default/boot** for the following instructions on autobooting:

LOADXENIX=YES or NO	Whether or not *boot*(HW) times out and loads XENIX. *boot* looks for this variable in the **/etc/default/boot** file on its default device.
FSCKFIX=YES or NO	Whether or not *fsck*(ADM) fixes any root system problems by itself. If the variable is set to YES, then *fsck*(ADM) is run on the root filesystem with the **-rr** flag.
MULTIUSER=YES or NO	Whether or not *init*(M) invokes *sulogin* or proceeds to multiuser mode.
PANICBOOT=YES or NO	Whether or not the system reboots after a panic(). This variable is read from **/etc/default/boot** by *init*.
RONLYROOT=YES or NO	Whether or not the root filesystem is mounted *readonly*. This must be used only during installation, and not for a normal boot. It will effectively prevent writing to the filesystem.
DEFBOOTSTR=*bootstring*	Set default bootstring to *bootstring*. This is the string used by boot when the user presses <RETURN> only to the "Boot:" prompt, or when boot times out.

SYSTTY=*x* — If *x* is **1**, the system console device is set to the serial adapter at COM1. If *x* is **0**, the system console is set to the main display adapter.

TIMEOUT=*n* — where *n* is the number of seconds to timeout at the "Boot:" prompt before booting the kernel (if LOADXENIX=YES). If TIMEOUT is unspecified, defaults to one minute.

If either the **/etc/default/boot** file or the variable needed cannot be found, the variable is assumed to be NO. However, if the filesystem cannot be found, PANICBOOT is set to YES.

The **/etc/default/boot** file is shipped with the following default figuration:

```
LOADXENIX=YES
FSCKFIX=YES
MULTIUSER=YES
PANICBOOT=NO
```

A scratch file is needed by *fsck* to check large filesystems. The user is informed during the installation of XENIX if the system needs a scratch file to *fsck* the root filesystem. If necessary, the installation procedure creates the filesystem **/dev/scratch** to write the *fsck* temporary file. *fsck* uses the file named on the **/etc/default/boot** line:

```
SCRATCH=
```

as a scratch file. If the installation procedure creates the scratch filesystem, the entry in the **/etc/default/boot** is automatically made.

SCRATCH need only be specified if the root filesystem is large enough to need a temporary file. If a file is specified, it is always passed to *fsck* when checking the root filesystem, even if the system is *booted* manually. The only exception is the first time XENIX is booted from the hard disk, when the user must specify the scratch file. The file specified as SCRATCH must not be on the filesystem being checked by *fsck*. SCRATCH also cannot be on an unmounted filesystem.

If the XENIX mail system, *mail*(C), is installed on the system, the output of each autoboot sequence is mailed to *root*. Otherwise, the system administrator should check the file **/etc/bootlog** for the boot sequence output. The output of *fsck*(ADM) is temporarily saved in the file **/dev/recover** before it is moved to **/etc/bootlog** and finally may be sent to the system administrator via *mail*.

Other boot options which take affect during *autoboot* are documented on the *boot*(HW) manual page.

Files

/etc/bootlog	*boot* output log for autobooting systems
/etc/default/boot	boot parameter file
/etc/rc	instructions for entering multiuser mode, including mounting and checking additional filesystems
/bin/sulogin	executed at startup, prompts the user to press Ctrl-d for multiuser mode or to enter the root password for maintenance mode
/dev/recover	allows saving of *fsck* output
/dev/scratch	temporary *fsck* file for large filesystems

See Also

boot(HW), fsck(ADM), init(M)

Notes

The utilities invoked during the boot procedure are passed the **-a** flag and time out only when the system *autoboots*. For example, *asktime* (ADM) times out after one minute when the system *autoboots*, but waits for a response from the user any other time it is invoked.

The previous *boot* modes of AUTO=CLEAN, DIRTY, NEVER have been retained for backwards compatibility, but are ignored if any of the newer modes are present.

Name

backup, dump - Performs incremental filesystem backup.

Syntax

backup [*key* [*arguments*] *filesystem*]

Description

backup copies all files changed after a certain date in the *filesystem*. *dump* is a link to *backup*; they refer to the same utility. The *key* specifies the date and other options about the backup, where a *key* consists of characters from the set **0123456789kfusd.** The meanings of these characters are described below:

f Places the backup on file specified by the next *argument* instead of the default device.

u If the backup completes successfully, writes the date of the beginning of the backup to the file **/etc/ddate**. This file records a separate date for each filesystem and each backup level.

0-9 This number is the "backup level". Backs up all files modified since the last date stored in the file **/etc/ddate** for the same filesystem at lesser levels. If no date is determined by the level, the beginning of time is assumed; thus the option **0** causes the entire filesystem to be backed up.

s This is the size of the tape in feet. The number of feet is taken from the next *argument*. When the specified size is reached, *backup* will wait for reels to be changed. The default size is 2,300 feet.

d This is the density of the tape, expressed in BPI, is taken from the next *argument*. This is used in calculating the amount of tape used per write. The default is 1600.

k The size (in K-bytes) of the volume being written is taken from the next *argument*. If the **k** argument is specified, any **s** and **d** arguments are ignored. The default is to use **s** and **d.**

If no arguments are given, the *key* is assumed to be **9u** and a default filesystem is backed up to the default device.

The first backup should be a full level-0 backup:

```
backup 0u
```

Next, periodic level 9 backups should be made on an exponential

progression of tapes or floppies:

```
backup 9u
```

This progression is shown as follows:

```
1 2 1 3 1 2 1 4 ...
```

where backup 1 is used every other time, backup 2 every fourth, backup 3 every eighth, etc.) When the level-9 incremental backup becomes unmanageable because a tape is full or too many floppies are required, a level-1 backup should be made:

```
backup 1u
```

After this, the exponential series should progress as if uninterrupted. These level-9 backups are based on the level-1 backup, which is based on the level-0 full backup. This progression of levels of backups can be carried as far as desired.

The default filesystem and the backup device depend on the settings of the variables DISK and TAPE, respectively, in the file **/etc/default/backup**.

Files

/etc/ddate	Records backup dates of filesystem/level
/etc/default/backup	Default backup information

See Also

XENIX *System Administrator's Guide*
cpio(C), default(F), dumpdir(ADM), restore(ADM), sddate(C), backup(F)

Diagnostics

If the backup requires more than one volume (where a volume is likely to be a floppy disk or tape), you will be asked to change volumes. Press RETURN after changing volumes.

Notes

Sizes are based on 1600 BPI for blocked tape. Although the **s** and **d** options are used by default, they are not commonly used; the **k** option is more popular because it specifies size in K-bytes. Write errors to the backup device are usually fatal. Read errors on the filesystem are ignored.

If the default archive medium specified in **/etc/default/backup** or **/etc/default/restor** is block structured, (example: floppy disk) then the volume size in Kbytes must be specified on the command line. Neither utility works correctly without this information. For example, using the default device (below) with the *backup* command, enter the following:

backup k 360

The default device entry for **/etc/default/backup** (tape=/dev/xxx) and **/etc/default/restor** (archive=/dev/xxx) is **/dev/rfd02.**

It is not possible to successfully *restore* an entire active root filesystem.

Warning

When backing up to floppy disks, be sure to have enough *formatted* floppies ready before starting a backup. You must also be sure to close the floppy door when inserting floppy disks. If you fail to do so in a multi-floppy backup, the entire backup will fail and you will have to begin again.

You should never backup more than one filesystem to the tape devices **/dev/nrct0** and **/dev/nrct2**. This is because, although *backup* can write more than one filesystem to **/dev/nrct0** or **/dev/nrct2**, *restore* may not be able to restore more than one filesystem from these devices.

Name

badtrk - Scans fixed disk for flaws and creates bad track table.

Syntax

badtrk [-e] [-s qtdn] [-f /dev/rhd*]

Description

Used chiefly during system installation, *badtrk* scans the media surface for flaws, creates a new bad track table, prints the current table, and adds and deletes entries to the table.

WARNING: The **-e** flag should not be invoked by the user. It is called by *hdinit* during installation to change the space allocated for bad tracks. Use of the **-e** flag at any other time may restructure the hard disk, rendering the information stored on it unusable.

To use *badtrk*, you must be in single user mode. (See *shutdown*(ADM)). To address the active XENIX partition on your *primary* fixed disk, enter:

```
badtrk -f /dev/rhd0a
```

To address the active XENIX partition on your *secondary* fixed disk, enter:

```
badtrk -f /dev/rhd1a
```

WARNING: *badtrk* must be applied to a partition, not a whole disk, division, or filesystem.

Usage

When *badtrk* is executed, the program first displays the main menu:

```
1. Print Current Bad Track Table
2. Scan Disk (You may choose Read-Only or Destructive later)
3. Add Entries to Current Bad Track Table by Cylinder/Head Number
4. Add Entries to Current Bad Track Table by Sector Number
5. Delete Entries Individually From Current Bad Track Table
6. Delete All Entries From Bad Track Table

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

You are prompted for option numbers, and, depending upon the option, more information may be queried for later.

A bad track table (option '1') might look like this:

```
Defective Tracks
```

	Cylinder	Head	Sector Number(s)
1.	190	3	12971-12987

```
Press <RETURN> to continue.
```

Option "2" scans the disk for flaws. If *badtrk* thinks changes may have been made to your bad track table since entering *badtrk* or updating your table, you will be asked if you want to update the device with the new table before scanning. You should answer "y" to save your changes, 'n' if you don't want to save changes made up to this point. Next you are prompted for the type of scan: all or part of the disk, a thorough or quick scan, and whether it is destructive or not. After you respond to these prompts, *badtrk* begins its scan. You can interrupt a scan by typing "q" at any time. You are then prompted to continue the scan or return to the main menu.

As the program finds flawed tracks, it displays the location of each bad track. Here is an example error message:

```
wd: ERROR : on fixed disk ctlr=0 dev=0/47 block=31434 cmd=00000020
    status=00005180, sector = 62899, cylinder/head = 483/4
```

(You may see this kind of message if there is a read or write error during the scanning procedure.)

When the scan is complete, the main menu reappears. The program automatically enters any detected flaws in the bad track table.

If there are no entries in your bad track table and a scan does not reveal any flaws, but your disk is furnished with a flaw map, you should enter these flaws into the bad track table. To add flaw locations to an existing bad track table, select either option "3" or option "4", depending upon the format of the flaw map furnished with your disk. Enter the defective tracks, one per line. (This should only be done on non-remapped drives; see cautions under **Notes**.)

When you are satisfied that *badtrk* contains a table of the desired flaws, quit the *badtrk* program by entering "q" at the main menu.

If *badtrk* was invoked with the **-e** option (which should only occur when called by *hdinit,* during the XENIX installation procedure), if you are reinstalling and you have a valid disk division table, the following message is displayed prior to the *badtrk* menu:

```
This device contains a valid division table.  Additional
(non-root) filesystems can be preserved across this reinstallation.
If you wish to be able to preserve these file systems later, you must
not change the current limit of the bad track table, which is
n bad tracks.  Do you wish to leave it unchanged? <y/n>:
```

If you respond "y", you will not be prompted later to enter a new limit for the size of your bad track table. You can add or delete entries, but you will not be allowed to increase the maximum number of bad tracks allocated. If you respond "n" and the size of your bad track table is changed, your disk division table will be destroyed.

If you do not have a valid disk division table or you selected "n" when prompted, you are prompted for the number of bad tracks to allocate. There will be a recommended number of replacement tracks to allocate based on the number of known bad tracks plus an allowance for tracks that will go bad in the future. You should choose to allocate at least as many as the recommended number of replacement tracks. Make your choice carefully, because if you want to change this amount later, you will have to reinstall XENIX.

At this point, you are asked if you want to update the table, meaning if you wish to save the changes made. You should answer "y" to save your changes, "n" to leave the bad track table as it was when last updated.

Arguments

-f *name*
Opens the partition *name* and reads the bad track table associated with that partition. The default is **/dev/rhd0a**.

-s *options*
Invokes *badtrk* non-interactively. Valid options for this flag are:

[q]uick
[t]horough
[d]estructive
[n]on-destructive

The **-s** flag takes two options at a time. Choose quick or thorough scan, and destructive or non-destructive scan.

Notes

This utility only applies to standard disk controllers and not SCSI host adapters or SMS-OMTI controllers.

badtrk can only be used in single-user mode.

If a bad spot develops in the boot blocks or system tables at the very beginning of the fdisk partition, reinstallation is required.

Some disk controllers support alternate modes known as "translation," "mapping" or "63-sector" modes that change the apparent shape of the drive. This is often used to make a drive that has more than 1024 cylinders appear to have less cylinders in order to make it compatible with MS-DOS. If your drive has been formatted using one of these options, do not use options 3 and 4 to manually add entries to the bad track.

Files

/etc/badtrk

Name

chroot - Changes root directory for command.

Syntax

chroot newroot command

Description

The given command is executed relative to the new root. The meaning of any initial slashes (/) in pathnames is changed for a command and any of its children to *newroot*. Furthermore, the initial working directory is *newroot*.

Notice that:

```
chroot newroot command >x
```

creates the file **x** relative to the original root, not the new one.

This command is restricted to the super-user.

The new root pathname is always relative to the current root even if a *chroot* is currently in effect. The *newroot* argument is relative to the current root of the running process. Note that it is not possible to change directories to what was formerly the parent of the new root directory; i.e., the *chroot* command supports the new root as an absolute root for the duration of the *command*. This means that "/.." is always equivalent to "/".

See Also

chdir(S)

Notes

Exercise extreme caution when referencing special files in the new root file system.

command must be under *newroot* or *command* is reported:
command: not found

Name

clri - Clears inode.

Syntax

/etc/clri file-system i-number ...

Description

clri writes zeros on the 64 bytes occupied by the inode numbered *i-number*. *File-system* must be a special filename referring to a device containing a file system. After *clri* is executed, any blocks in the affected file will show up as "missing" if the file system is checked with *fsck*(ADM). Use *clri* only in emergencies and exercise extreme care.

Read and write permission is required on the specified *file-system* device. The inode becomes allocatable.

The primary purpose of this routine is to remove a file which, for some reason, does not appear in a directory. If you use *clri* to destroy an inode which does appear in a directory, track down the entry and remove it. Otherwise, when the inode is reallocated to some new file, the old entry will still point to this file. At that point removing the old entry will destroy the new file. The new entry will again point to an unallocated inode, so the whole cycle is likely to be repeated again and again.

See Also

fsck(ADM), ncheck(ADM)

Notes

If the file is open, *clri* is likely to be ineffective.

Name

config - Configures a XENIX system.

Syntax

/usr/sys/conf/config [**-i**] [**-c** file] [-s] -m master dfile

Description

config takes a description of a XENIX system and generates compilable files that define the configuration tables for the various devices on the system.

Options include:

-m Specifies the name of the file that contains all the information regarding supported devices; **/usr/sys/conf/master** is the standard name. This file is supplied with the XENIX system and should *not* be modified by the user. The *configure*(ADM) utility should be used to update **/usr/sys/conf/master** and *dfile*.

-i Requests assembly-language output, instead of the default C language output.

-c Specifies the name of the configuration table file. **c.c** is the default names unless the **-i** option is given, in which case the default name is **c.asm .**

-s Specifies the name of the parameters file. **space.c** is the default name; if the **-i** option is used, the default name is **space.inc**.

dfile contains system device information and is divided into two parts. The first contains physical device specifications. The second contains system-dependent information. Any line with an asterisk (*) in column 1 is a comment. A standard *dfile* is provided as **/usr/sys/conf/xenixconf.** The *configure*(ADM) utility should also be used to update **/usr/sys/conf/xenixconf.**

All configurations are assumed to have a set of required devices, such as the system clock, which must be present to run XENIX. These devices *must not* be specified in *dfile*.

First Part of *dfile*

Each line contains two fields, delimited by spaces and/or tabs in the following format:

devname number

where *devname* is the name of the device, and *number* is the number (decimal) of devices associated with the corresponding controller. The device name can be any name given in part 1 of the **/usr/sys/conf/master** file, or any alias given in part 3 of the same file; *number* is optional, and if omitted, a default value which is the maximum value for that controller is used.

There are certain drivers that may be provided with the system that are actually *pseudo-device* drivers; that is, there is no real hardware associated with the driver. If the system has such drivers, they are described in section M of the *XENIX User's Reference*.

Second Part of *dfile*

The second part contains three different types of lines. Note that *all* specifications of this part *are required*, although their order is arbitrary.

1. **root/pipe** device specification

Two lines, each having three fields:

root	devname	minor
pipe	devname	minor

where *devname* is the name of the device, and *minor* is the minor device number (in octal). The device name can be any name given in part 1 of the **/usr/sys/conf/master** file, or any alias given in part 3 of the same file.

2. **swap** device specification

One line that contains five fields as follows:

swap	devname	minor	swplo	nswap

where *devname* is the name of the device, *minor* is the minor device number (in octal), *swplo* is the lowest disk block (decimal) in the swap area, and *nswap* is the number of disk blocks (decimal) in the swap area. The device name can be any name given in part 1 of the **/usr/sys/conf/master** file, or any alias given in part 3 of the same file.

3. *Parameter* specification

One or more lines, each having two fields as follows:

name number

where *name* is a tunable parameter name, and *number* is the desired value (in decimal) for the given parameter. Only names that have been defined in part 4 of the **/usr/sys/conf/master** file can be used; *number* overrides the default value for the given parameter.

A complete list of kernel parameters is found in "Tuning System Performance" in the *System Administrator's Guide*. Note that the parameters listed by *configure* are in uppercase and the values in **/usr/sys/conf/master** are in lowercase.

Files

/usr/sys/conf/master	default input master device table
c.c	default output driver configuration table file
space.c	default output resource configuration table file
c.asm	default driver configuration in assembly language
space.inc	default resource configuration in assembly language

See Also

configure(ADM), master(F)

Diagnostics

Diagnostics are routed to the standard output and are self-explanatory.

Notes

The value on the right-hand side of a parameter specification must be a double-quoted character string, an integer, the name of another parameter defined within the *master*(F) file, or some arithmetical combination of integers and defined parameter names. Only the "+", "-", "*", and "/" operators can be used in an arithmetical expression. Expressions are interpreted left-to-right: if operator precedence is in doubt, parenthesize.

Name

configure - **xenix** configuration program.

Syntax

configure [options] [*parm=val* ...]

Description

The *configure* program determines and alters different kernel resources. For end users, *configure* is easier than modifying the system configuration files directly. For device driver writers, *configure* avoids the difficulties of editing configuration files that have already been edited by an earlier driver configuration script.

Resources are modified interactively or with command-line arguments. Adding or deleting device driver components requires the command line options.

The next paragraphs discuss how to use *configure* interactively. Command line options are discussed in the "Options" section.

Interactive Usage

configure functions interactively when no options are given, or when **-f** is the only option specified on the command line.

When you invoke *configure* interactively, you first see a category menu that looks something like this:

```
   1.    Disk Buffers
   2.    Character Buffers
   3.    Files, Inodes, and Filesystems
   4.    Processes, Memory Management & Swapping
   5.    Clock
   6.    MultiScreens
   7.    Message Queues
   8.    Semaphores
   9.    Shared Data
   10.   System Name
   11.   Streams Data
   12.   Event Queues and Devices
   13.   Hardware Dependent Parameters

Select a parameter category to reconfigure by
typing a number from 1 to 13, or type 'q' to quit:
```

To choose a category, enter its number, (e.g. "1" for "Disk Buffers") then press RETURN.

Each category contains a number of configurable resources. Each resource is presented by displaying its true name, a short description, and its current value. For example, for the "Disk Buffers" category you might see:

```
NBUF: total disk buffers.  Currently determined at system start up:
NSABUF: system-addressable (near) disk buffers.  Currently 10:
NHBUF: hash buffers (for disk block sorting).  Currently 128:
```

To keep the current value, simply press RETURN. Otherwise, enter an appropriate value for the resource, then press RETURN. *configure* checks each value to make sure that it is within an appropriate range. If not, *configure* will warn you that the value is inappropriate and confirm that you wish to override the recommended value.

To exit from *configure* enter 'q' at the category menu prompt. If any changes are made, *configure* asks if it should update the configuration files with the changes. To keep the old configuration values, enter 'n' at this prompt, and no changes are made. Otherwise, enter 'y' and *configure* updates the required system configuration files. After *configure* has completed, the kernel is ready for linking.

To link the kernel, enter:

cd /usr/sys/conf
./link_xenix

Linking may take a few minutes. After the kernel is linked, enter the following commands to place a copy of the new kernel (*xenix.new*) in the root directory and reboot the system:

cp /usr/sys/conf/xenix /xenix.new
/etc/shutdown

Eventually, you see the boot prompt:

```
Boot
:
```

To test the new kernel, enter the following at the boot prompt:

xenix.new

The system is now running the new kernel. When you are satisfied with the performance of the new kernel, enter the following command to install the new kernel on the hard disk:

/usr/sys/conf/hdinstall

The *hdinstall*(ADM) program backs up the old */xenix* and copies */usr/sys/conf/xenix* to */xenix*.

Remove *xenix.new* by entering the following command:

rm /xenix.new

Reboot the system to run the new kernel.

Options

The command line options are designed for writers of driver-installation shell scripts. You can configure drivers, remove driver definitions from the configuration files, and modify some driver attributes, all from the command line. There are also options for querying the current driver configuration, querying kernel resources, and modifying these resources.

configure uses the following options:

-a [*func1 func2 ...*]
-d [*func1 func2 ...*]
-b
-c
-d [*func1 func2 ...*]
-f *master_file* [*dfile*]
-g dev_name handler | dev_name
-j [*prefix*] [**NEXTMAJOR**]
-l *priority_level*
-m *major*
-n
-q
-r
-t
-v *interrupt_vector* [*interrupt_vector2...*]
-w
-x
-y *resource*

-m, **-b**, and **-c**
These options are used to define which driver is being referenced. Following **-m** must be the major device number of the driver. If you are configuring a block driver, **-b** must appear; if you are configuring a character driver, **-c** must appear. Both are used when configuring a driver with both kinds of interfaces.

-a and **-d**
Each option is followed by a list of functions to add or delete, respectively. These are the names of the functions that appear

within *bdevsw*[ ] or *cdevsw*[ ], as appropriate, plus the names of the initialization, clock poll, halt and interrupt routines, if present, plus the names of the tty, stream, and tab structure pointers. *configure* enforces the rules that all of a driver's routines must have a common prefix, and that the prefix be 2-4 characters long.

-j When followed by a *prefix* used by a driver, the major device number is displayed. When followed by **NEXTMAJOR**, the smallest unused major device number is displayed.

-r This option forces a rewrite of the configuration files regardless of whether or not the command changed the configuration.

-v This option modifies the system's notion of the vectors on which this device can interrupt. A device may interrupt on up to 4 vectors.

-l This sets the interrupt priority level of the device, which is almost always the same as the type of *spl*( ) call used: a driver that interlocks using *spl5*( ) almost always has an interrupt priority level of 5.

-q If the **-q** option is given, no *qswtch*( ) is possible after returning from the device interrupt. Use of this option in new drivers is not recommended.

-f The configuration is maintained in two data files, whose default names are *master* and *xenixconf*. The **-f** option can be used to specify alternate names. Note that if **-f** is the only option present, the program is still interactive.

-n If **-n** is present, the two configuration data files are modified, but no '.o' files are produced. This option is useful when configuring a driver package containing multiple drivers.

-w This option suppresses warning messages.

-x This dumps all the resource prompts known to *configure*. These reveal the name, description and current value of each parameter capable of being reconfigured. Category prompts are not dumped.

-y The **-y** option prints out the current value of the requested resource.

-t This option prints out nothing (except possibly error messages). However, it has a return value of 1 if a driver corresponding to the given combination of **-m**, **-b**, **-c** and options is already configured, and returns 0 if no such driver is present.

-g This option is used to add or remove graphics input (GIN) device handlers. Devices such as mice, bitpads, and keyboards may have handlers to turn their input data into "events." The **-g** flag may be given one argument that is interpreted as a device name. That GIN

device is removed from the configuration files. If the **-g** flag has two arguments, the second is a handler for that device, and the device is added to the files. If it was already present, its handler is updated and the user is informed. Multiple devices may be added or removed by specifying **-g** multiple times.

Setting Command-line Parameters

Any number of arguments can be given on the command line of the form *resource=value*. These arguments can be given at the same time as an add or delete driver request, but must follow all the driver-configuration arguments on the command line.

Some resources have values that are character strings. In this case their values must be enclosed within the characters \" . The quotes are syntactically necessary for them to be used as C-language strings, and the backslashes protect the quotes from being removed by the shell.

Examples

Print out the current value of NCLIST:

configure -y NCLIST

Return 1 if character major device 7 and vector 3 are available:

configure -t -v 7 -m 3 -c

Add a clock-time polling and initialization routine to the already configured "foo" driver, a hypothetical character driver at major device #17:

configure -a foopoll fooinit -c -m 17

Delete the "foo" driver:

configure -m 17 -d -c

Add a new "hypo" driver, a block driver with a character interface. It absorbs 3 different interrupt vectors, at priority 6:

configure -a hypoopen hypoclose hyporead hypowrite hypoioctl
hypostrategy hypotab hypointr -b -c -l 6 -v 17 42 49

Notes

Kernel Data Space Restrictions (XENIX-286 only)

If the total size of all the allocated resources grows too large, the group will not fit within the kernel's 64k near data segment. You will not see messages about excessive size from *configure*, but you may see them from the linker when you attempt to link the kernel.

Files

/usr/sys/conf/master
/usr/sys/conf/xenixconf
/usr/sys/conf/config
/usr/sys/conf/space.o
/usr/sys/conf/c.o

See Also

master(F), config(ADM), event(M), hdinstall(ADM)

Name

custom - Installs specific portions of the XENIX System

Syntax

custom [**-odt**] [**-irl** [package]] [**-m** device] [**-f** [file]]

Description

With *custom* you can create a custom installation by selectively installing or deleting portions of the XENIX system. *custom* is executable only by the super-user and is either interactive or can be invoked from the command line with several options.

Files are extracted or deleted in *packages*. A package is a collection of individual files. Packages are grouped together in *sets*.

Three default *sets* are always available:

Operating System

Development System

Text Processing System

You can also install additional *sets*. You can list the available *packages* by using the *custom* command as described next.

Usage

To use *custom* interactively, enter:

custom

You see a list of sets. For example:

1. Operating System
2. Development System
3. Text Processing System
4. Add a Supported Product

The program prompts you to choose a set from which to work. If the data files for that set are not already installed on the hard disk, *custom* prompts you for the floppy which contains these data files and installs them. You may also see menu items for each product that has been previously added using the "Add a Supported Product" option. If you are adding a new product, you will be prompted for volume 1 of the new product distribution and *custom* will extract the product information necessary to support it.

When you select a valid set, you see a menu like this:

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. This is what the options prompt, and what action occurs:

1. Install
   Prompts for one or more package names.

   Calculates which installation volumes (distribution media) are needed, then prompts for the correct volume numbers. If multiple packages are specified, the names should be separated by spaces on the command line.

This option, as well as "2" and "3," displays a list of all available packages in the currently 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
   Extract the specified file from the distribution set.

   Filename should be a full pathname relative to the root directory "/".

5. Select a new set

   Allows you to work from a different set than the current one.

6. Display current disk usage

   Tells you your current disk usage.

7. Help

   Prints a page of instructions to help you use *custom.*

Options

Three arguments are required for a completely non-interactive use of *custom*:

A set identifier
(-o, -d, or **-t),**

A command
(-i, -r, -l, or **-f),**

And either one or more package names, or a file name

If any information is missing from the command line, *custom* prompts for the missing data.

Only one of **-o, -d,** or **-t** may be specified. These stand for:

-o Operating System

-d Development System

-t Text Processing System

Only one of **-i, -r, -l,** or **-f** may be specified, followed by an argument of the appropriate type (one or more package names, or a file name). These options perform the following:

-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.

The **-m** flag allows the media device to be specified. The default is /dev/install (which is always the 0 device, as in /dev/fd0). This is very useful if the system has a 5.25-inch drive on /dev/fd0 and a 3.5-inch floppy on /dev/fd1, and it is necessary to install 3.5-inch media. For example:

custom -m /dev/rfd196ds9

this will override the default device and use the one supplied with the **-m** flag.

Files

/etc/base.perms
/etc/soft.perms
/etc/text.perms
/etc/perms/*

See Also

fixperm(ADM), df(C), du(C), install(ADM)

Notes

If you upgrade any part of your system, *custom* detects if you have a different release and prompts you to insert the floppy volume that updates the custom data files. Likewise, if you insert an invalid product or a volume out of order, you will be prompted to reinsert the correct volume.

Name

dial, uuchat - Dials a modem.

Syntax

/usr/lib/uucp/dial*X* ttyname telno speed
/usr/lib/uucp/dial*X* **-h** ttyname speed
/usr/lib/uucp/uuchat ttyname speed chat-script

Description

/usr/lib/uucp/dial*X* dials a modem attached to *ttyname*. (*X* is a dialer name, such as **HA1200**.) The **-h** option is used to hang up the modem.

uucico(ADM), *ct*(C), and *cu*(C) use **/usr/lib/uucp/dial***X***.** A number of dialer binaries are distributed (there may be differences between XENIX-286 and XENIX-386 distributions):

Binary File	Modem
dialHA12	Hayes Smartmodem 1200 or compatible
dialHA24	Hayes Smartmodem 2400 or compatible
dialHA96V	Hayes Smartmodem 9600 or compatible
dialMUL	Multitech Multimodem 224 EH
dialVA3450	Racal Vadic 3451 modem
dialVA96	Racal Vadic 9600 modem
dialTBIT	Telebit Trailblazer Modem

Source for these is provided in their respective *.c* files.

uucico(ADM) invokes *dial*, with a *ttyname*, *telno* (phone number), and *speed*. *dial* attempts to dial the phone number on the specified line at the given speed. When using **dialHA12** or **dialHA24,** *speed* can be a range of baud rates. The range is specified with the form:

lowrate - highrate

where *lowrate* is the minimum acceptable connection baud rate and *highrate* is the maximum. The *dial* program returns the status of the attempt through the following dial return codes:

bit 0x80 = 1
The connection attempt failed.

bits 0x0f =

If bit 0x80 is a 1, then these bits are the dialer error code:

0	general or unknown error code.
1	line is being used.
2	a signal has aborted the dialer.
3	dialer arguments are invalid.
4	the phone number is invalid.
5	the baud rate is invalid or the dialer could not connect at the requested baud rate.
6	can't open the line.
7	ioctl error on the line.
8	timeout waiting for connection.
9	no dialtone was detected.
10	unused.
11	unused.
12	unused.
13	phone is busy.
14	no carrier is detected.
15	remote system did not answer.

Error codes 12-15 are used to indicate that the problem is at the remote end.

If bit 0x80 is a 0, then these bits are used to indicate the actual connection baud rate. If 0, the baud rate is the same as the baud rate used to dial the phone number or the highest baud rate if a range was specified. Otherwise, these four bits are the CBAUD bits in the **struct termio c_flag** and the **struct sgttyb sg_ispeed** and **sg_ospeed** tty ioctl structures.

You can copy and modify one of the files **/usr/lib/uucp/dialHA12.c** etc., to use a different modem. There is a makefile in **/usr/lib/uucp** which should be modified for the new dialer, and can be used to compile the new program.

If you create a *dial* program for another modem, send us the source. User generated *dial* programs will be considered for inclusion in future releases.

The *dial* program to be used on a particular line is specified in the fifth field of the entry for that line in **/usr/lib/uucp/Devices**. If there is no *dial* program of that name, then *uucico*, *ct*, and *cu* use a built-in dialer, together with the chat-script of that name in **/usr/lib/uucp/Dialers**.

dial -h is executed by *getty* when it is respawned on a line shared between dial-in and dial-out. If there is no *dial* program, then *getty* uses **/usr/lib/uucp/uuchat**, passing it the **&** chat-script from **/usr/lib/uucp/Dialers**.

Files

/usr/lib/uucp/Devices	
/usr/lib/uucp/dial*.c	Dialer source files
/usr/lib/uucp/dialHA12	Hayes Smartmodem 1200/1200B dialer
/usr/lib/uucp/dialHA24	Hayes Smartmodem 2400 dialer
/usr/lib/uucp/makefile	Makefile to compile new dialer
/usr/lib/uucp/dialTBIT	Telebit Trailblazer dialer
/usr/lib/uucp/uuchat	

See Also

ct(C), cu(C), uucico(ADM), dialers(F), getty(M)

Notes

You must have the Development System installed in order to compile and install a new *dial* program.

Name

divvy - Disk dividing utility

Syntax

divvy -b block_device **-c** character_device [**-v** virtual_drive] [**-p** physical_drive] [**-i**] [**-m**]

Description

divvy divides an *fdisk* (ADM) partition into a number of separate areas known as "divisions". A division is identified by unique major and minor device numbers and can be used for a filesystem, swap area, or for isolating bad spots on the device.

With *divvy* you can:

- Divide an *fdisk* partition into separate devices.
- Create new filesystems.
- Change the device names of filesystems.
- Change the size of filesystems.
- Remove filesystems.

Options

Options to *divvy* are:

-b *block_device*
Major device number of block interface.

-c *character_device*
Major device number of character interface.

-v *fdisk_partition*
For dividing an *fdisk* partition (also known as a "virtual drive").

-p *physical_drive*
For dividing one of several physical disks that share the same controller.

-i Disk being divided will contain a **root** filesystem on division 0.

-m Disk being divided should be made into a number of mountable file systems.

Usage

The device being divided must be a block device with a character interface. For example, to use *divvy* on a device with a block-interface major number 1 and character interface number of 1, enter:

```
divvy -b 1 -c 1
```

The **-v** option specifies which *fdisk* partition (virtual drive) to divide. The default is the active drive. Virtual drive numbers are determined with the *fdisk* (ADM) utility.

The **-p** option allows division of one of several physical disks sharing a controller. *divvy* defaults to the first physical device numbered "0." To access a second physical disk, use the **-p** 1 option.

The **-i** option specifies the device being divided will contain a **root** filesystem. With this option, device nodes are created relative to the new **root**, generally a hard disk, instead of the current **root**, often an installation floppy. A root filesystem and a recover area are created. *divvy* prompts for the size of the swap area. If the disk is large enough, then *divvy* prompts for a separate **/u** (user) filesystem. *divvy* also prompts for block-by-block control over the layout of the filesystem(s). If the root filesystem is large enough to require a scratch division, (more than 40,000 blocks) then *divvy* will prompt for whether one should be created. *divvy* is invoked with the **-i** option during XENIX installation.

The **-m** option is used for initial installation on devices that will not be used as the root. It causes the user to be prompted for a number of filesystems.

When *divvy* is invoked from the command line, you see a main menu:

```
n[ame]      Name or rename a division.
c[reate]    create a new filesystem on this division.
p[revent]   Prevent a new filesystem from being created on this division.
s[tart]     Start a division on a different block.
e[nd]       End a division on a different block.
r[estore]   Restore the original partition table.
Please enter your choice or 'q' to quit:
```

To choose a command, enter the first letter of the command, then press RETURN.

The *divvy* division table might look something like this:

Name	New File System?	#	First Block	Last Block
root	no, exists	0	0	13754
swap	no, exists	1	13755	15135
u	no, exists	2	15136	25135
	no	3	—	—
	no	4	—	—
	no	5	—	—
recover	no, exists	6	25136	25145
d1057all	no	7	0	25546

25146 blocks for divisions, 400 blocks reserved for the system

divvy also displays information about block allocation for system tables and bad tracks.

If you select option 'n', you can change the name of the device. *divvy* prompts you for the division number (from the *divvy* table displayed above), then for a new name.

Option 'c' causes a given division to become a new, empty filesystem when you exit from *divvy*. After using the 'c' option, you will see a 'yes' in the 'New File System?' column. If you use option 'p,' the 'yes' in the 'New File System?' column will change to a 'no', and the contents of the division will not change.

With the 's' or 'start' command, you can start a division on a different block number. With the 'e' or 'end' command, you can end a division on a different block number.

You can use these two commands to change the size of a division. For example, if your disk is similar to the one in the sample *divvy* table above, and you want to make the **root** filesystem larger and the **swap** area smaller, do this:

1. Make the swap area smaller with the 's' command.

2. Use the 'e' command to make the **root** division bigger.

Changing the size of an existing filesystem destroys any existing data on that filesystem. Note that if any of the divisions overlap, *divvy* will complain when you try to exit and put you back in the menus to correct the situation.

The 'r' or 'restore' command restores the original partition table. This is useful if you make a serious mistake and want to return to where you started.

When you exit from *divvy*, you are prompted whether you want to save any changes you made, or exit without saving the changes. At this time, you can also go back to the *divvy* menu, and may also have

the option to reinstall the original, default division table.

See Also

badtrk(ADM), fdisk(ADM), fsck(ADM), hd(HW), mkdev(C), mkfs(C), mknod(C)

Notes

divvy requires kernel level support from the device driver. If *divvy* lists the size of a disk as "0" blocks, or displays the following error messages, the device may not support dividing:

cannot read division table

or:

cannot get drive parameters

These errors may also occur if the prerequisite programs *fdisk* and *badtrk* are not run correctly.

If you change the size of filesystems (such as **/u**) after you have installed a XENIX filesystem, you will have to run *mkfs* on the filesystem and reinstall the files that are kept there. This is because the free list for that filesystem has changed. Be sure to backup the files in any filesystem you intend to change, using *backup*(C), *tar*(C), or *cpio*(C), before you run *divvy* . After XENIX is installed, the bounds of the **root** filesystem must not be changed.

During installation, if the filesystem on division 0 (generally root) becomes or remains large enough to require a scratch area during *fsck*, and one does not already exist, *divvy* prompts for whether one should be created. (The resulting filesystem, **/dev/scratch**, is used by *autoboot* if it runs *fsck*. **/dev/scratch** should also be entered when *fsck* prompts for a scratch file name, provided that the filesystem being checked is not larger than the root filesystem.) If all disk divisions have been used up, *divvy* will not prompt for a scratch filesystem, even if the root filesystem is large enough to require one.

This utility uses 1K blocks.

Name

dmesg - Displays the system messages on the console.

Syntax

dmesg [-]

Description

The *dmesg* command displays all the system messages that have been generated since the last time the system was booted. If the option — is specified, it displays only those messages that have been generated since the last time the *dmesg* command was performed.

dmesg can be invoked periodically by placing instructions in the file **/usr/lib/crontab .** It can also be invoked automatically by **/etc/rc** whenever the system is booted. See "Notes", below.

dmesg logs all error messages it prints in **/usr/adm/messages.** If *dmesg* is invoked automatically, the **messages** file continues to grow and can become very large. The system administrator should occasionally erase its contents.

Files

/etc/dmesg
/usr/adm/messages
/usr/adm/msgbuf

Notes

dmesg is included in this release for backwards compatibility only. The device **/dev/error** provides a more flexible means of logging error messages, and is recommended over *dmesg*. See *error*(M) for more information.

See Also

cron(C), error(M), messages(M)

Name

dparam - Displays/changes hard disk characteristics.

Syntax

dparam [**-w**]
dparam /dev/rhd[0| 1]0 [characteristics]

Description

The *dparam* command displays or changes the hard disk characteristics currently in effect. These changes go into effect immediately and are also written to the master boot block for subsequent boots. If a non-standard hard disk is used, this utility must be called before accessing the drive.

The **-w** option causes a copy of **/etc/masterboot** to be copied to disk to ensure that non-standard hard disks are supported for the specified drive. This call must precede a call to write non-standard disk parameters for the desired parameters to be saved correctly in the masterboot block.

When called without options or disk characteristics, *dparam* prints the current disk characteristics (on the standard output) for the specified hard disk. These values are printed in the same order as the argument list.

When writing characteristics for the specified hard disk, *dparam* changes the current disk controller status and updates the masterboot block. The argument ordering is critical and must be entered as specified below. All characteristics must be entered when writing disk characteristics, otherwise an error is returned. Hard disk characteristics (in respective order) are:

number of cylinders	total number of cylinders on the hard disk
number of heads	number of heads
reduced write current cylinder	hardware specific, consult your hardware manual
write precompensation cylinder	hardware specific, consult your hardware manual

ecc	number of bits of error correction on I/O transfers, consult your hardware manual
control	very hardware specific, consult your hardware manual
landing zone cylinder	where to park heads after shutting down the system
number of sectors per track	number of sectors per track on the hard disk

Examples

dparam -w

dparam /dev/rhd10

dparam /dev/rhd00 700 4 256 180 5 0 640 17

Notes

This utility changes the kernel's view of the hard disk parameters. It may be subject to restrictions imposed by the hardware configuration.

dparam is called automatically during XENIX installation and by *mkdev hd*.

Name

dumpdir - Prints the names of files on a backup archive.

Syntax

dumpdir [**f** filename]

Description

dumpdir is used to list the names and inode numbers of all files and directories on an archive written with the *backup* command. This is most useful when attempting to determine the location of a particular file in a set of backup archives.

The **f** option causes *filename* to be used as the name of the backup device instead of the default. The default backup device depends on the setting of the variable TAPE in the file **/etc/default/dumpdir**. The device specified as TAPE can be any type of backup device supported by the system (for example, a floppy drive or cartridge tape drive).

Files

/tmp/rst*	Temporary files
/etc/default/dumpdir	Default backup device

See Also

backup(ADM), restore(ADM), default(F)

Name

fdisk - Maintain disk partitions.

Syntax

fdisk [[**-p**] [**-ad** partition] [**-c** partition start size] [**-f** devicename]]

Description

fdisk displays information about disk partitions. *fdisk* also creates and deletes disk partitions and changes the active partition. *fdisk* functionality is a superset of the MS-DOS command of the same name. *fdisk* is usually used interactively from a menu.

The hard disk has at most four partitions. Only one partition is active at any given time. It is possible to assign a different operating system to each partition. Once a partition is made active, the operating system resident in that partition boots automatically once the current operating system is halted.

To use XENIX, at least one partition must be assigned to XENIX.

The *fdisk* utility does not allocate the first track or the last cylinder on the hard disk when the "Use Entire Disk for XENIX" option is used. The first track on the hard disk is reserved for masterboot and the last cylinder is generally used when running hard disk diagnostics. You should not allocate the last cylinder if you plan to run diagnostics on your hard disk.

For example, if a disk has 2442 tracks, *fdisk* reports these as tracks 0-2441. If your hard disk has 4 heads, *fdisk* will assign (using the "Use Entire Disk for XENIX" option) tracks 1-2437. (Track 0 is reserved for masterboot.) The last cylinder (tracks 2438-2441) is not assigned with the "Use Entire Disk for XENIX" option.

Partitions are defined by a "partition table" at the end of the master boot block. The partition table provides the location and size of the partitions on the disk. The partition table also defines the active partition. Each partition can be assigned to XENIX, DOS, or some other operating system. Once a DOS partition is set up, DOS files and directories resident in the DOS partition may be accessed while running XENIX by means of the *dos*(C) commands. DOS may be booted without the DOS partition being active via the "boot:dos" command. See *boot*(HW).

Arguments

-p, -a, -d, -c
These flags are used to invoke *fdisk* non-interactively:

-p	prints out the disk partition table.
-a *number*	activates the specified partition number.
-d *number*	deletes the specified partition number.
-c *number start size*	creates partition with specified start and size.

-f *name*
Open device *name* and read the partition table associated with that device's partition. The default is **/dev/rhd00**.

Options

The *fdisk* command displays a prompt and a menu of five options. Updates to the disk are not made until you enter "q" from the main menu.

1. Display Partition Table.
This option displays a table of information about each partition on the hard disk. The PARTITION column gives the partition number. The STATUS column tells whether the partition is active (A) or inactive (I). TYPE tells whether the partition is XENIX, DOS, or "other". The option also displays the starting track, ending track and total number of tracks in each partition.

2. Use Entire Disk for XENIX.
fdisk creates one partition that includes all the tracks on the disk, except the first track and the last cylinder. This partition is assigned to XENIX and is designated the active partition.

3. Create XENIX Partition
This option allows the creation of a partition by altering the partition table. *fdisk* reports the number of tracks available for each partition and the number of tracks in use. *fdisk* prompts for the partition to create, the starting track and size in tracks. The change is written to the operating system and the hard disk when you enter "q" from the main menu.

4. Activate Partition
This option activates the specified partition. Only one partition may be active at a time. The change is not effective until you exit. The operating system residing in the newly activated partition boots once the current operating system is halted.

5. Delete Partition
This option requests which partition you wish to delete. *fdisk* reports the new available amount of disk space in tracks. The change is not effective until you exit.

Exit the *fdisk* program by typing a 'q' at the main *fdisk* menu. Your changes are now written to the operating system and the hard disk.

Notes

The minimum recommended size for a XENIX partition is 5 megabytes.

Since *fdisk* is intended for use with DOS, it may not work with all operating system combinations.

See also

dos(C), hd(HW).

Name

fdswap - Swaps default boot floppy drive.

Syntax

fdswap [on| off]

Description

fdswap tells the CMOS to swap the default floppy drive used to read boot information at boot time. For example, if your computer defaults to read boot information on drive A, **fdswap on** changes the default drive to drive B.

fdswap with no arguments reports the current **fdswap** state, on or off. **fdswap off** switches the drive setting back to the default configuration. Changing the drives takes effect on the next boot of the system.

Notes

> This utility is only included on XENIX-386 distributions.

Support for this functionality is only available on a small number of machines. The ROMs must recognize and interpret the CMOS flag that specifies that the floppy drives are swapped.

Name

fixperm - Correct or initialize file permissions and ownership.

Syntax

fixperm [**-cfgilnsvwDS** [**-d** 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.

The specification file has the following format: Each non-blank line 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. The syntax for the definition section is simple: the first field indicates the type of id (either *uid* or *gid*), the second contains the name reference for the id, and the third is the corresponding numeric id. Example:

```
uid     root    0
```

An item specification consists of a package specifier, a permission specification, owner and group specifications, the number of links on the file, the file name, and an optional volume number.

The package specifier is an arbitrary string which is the name of a package within a distribution set. A package is a set of files.

After the package specifier is a permission specification. The permission specification consists of a file type, followed by a numeric permission specification. The item specification is one of the following characters:

x Executable.

a Archive.

e Empty file (create if **-c** option given).

b Block device.

c Character device.

d Directory.

f Text file.

p Named pipe.

If the item specification is used as an upper-case letter, then 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*(C). The owner and group are in the third column separated by a slash: e.g.,: "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, i.e., not preceded by a slash "/". The sixth column is only used for special files, giving the major and minor device numbers, or volume numbers.

Options

The following options are available from the command line:

-c Create empty files and missing directories. Also creates (or modifies) device files.

-g Instructs *fixperm* to list devices as specified in the permlist (similar to the **-f** flag, which lists files on standard output). No changes are made as a result of this flag.

-d *package*
Process input lines beginning with given package specifier string (see above). For instance, **-d**BASE processes only items specified as belonging to the Basic utilities set. The default action is to process all lines.

-u *package*
Like **-d**, but processes items that are not part of the given package.

-f List files only on standard output. Does not modify target files.

-i Check only if the selected packages are installed. Return values are:

0: package completely installed
3: package not found
4: package not installed
5: package partially installed

-l List files and directories on standard output. Does not modify target files.

-n Report errors only. Does not modify target files.

-D List directories only on standard output. Does not modify target files.

-v Verbose, in particular, issues a complaint if executable files are word swapped, not fixed stack, not separate I and D, or not stripped.

-s Modify special device files in addition to the rest of the permlist.

-w Lists where (what volume) the specified files or directories are located.

-S Issues a complaint if files are not in x.out format.

The following two lines make a distribution and invoke *tar*(C) to archive only the files in **/etc/perms/inst** on **/dev/sample**:

```
/etc/fixperm -f /etc/perms/inst > list
tar cfF /dev/sample list
```

This example reports *BASE* package errors:

```
/etc/fixperm -nd BASE
```

Notes

Usually *fixperm* is only run by a shell script at installation.

See Also

custom (ADM)

Name

fsave - Interactive, error-checking filesystem backup

Synopsis

fsave filesystem [dumpinfo] [mediainfo] [sitename]

Description

fsave is used by *fsphoto* (ADM) to provide a semi-automated interface to *backup* (ADM) for backing-up XENIX filesystems. Human intervention is required to mount and dismount tapes or floppies at the appropriate times, but is kept to a minimum to reduce the potential for error.

The operator is prompted each time some action is required, such as mounting or unmounting a tape or floppy. These prompts, and their possible selections, are described below.

For all prompts, an answer of **h**, **H**, or **?** will display a short summary of the possible answers.

Filesystem dump (backup)

The following prompt displays the defaults (gleaned from the *schedule* database file) and presents options to alter them:

Level *dumplevel* dump of filesystem *filesystem*, *date*
media size: *size* feet [or Kb]
media drive: *drive*
This *media* will be saved for *howlong*, and is *howvital*.

M)ounted volume, P)ostpone, C)heck or F)ormat volumes, R) Retension or H)elp:

The values displayed dictate the following instructions: *filesystem* is to be backed-up using *size*-foot long magtapes (or *size*-kilobyte big floppies) mounted on drive *drive*. The *media* will be saved for *howlong* ("1 year," "2 months," etc.), and being a level *dumplevel* dump, is *howvital* ("critical," "precautionary," etc.).

The menu options are:

m A volume of the asked for *size* has been mounted (write-enabled), so begin the dump.

m*newsize* Insufficient volumes of the originally asked for size are available, so a *newsize* big volume has been mounted instead. If the dump extends across more than one volume,

each volume must be of the same *size*.

p Postpone this backup until later (*fsphoto* will automatically retry this *filesystem* next time it is run).

c Recheck the volumes used to backup *filesystem* for errors. This answer is useful when a dump mysteriously fails and *fsave* is starting over from the beginning, but the operator doesn't believe there really is a problem (for example, the tape drive was accidentally left offline or the floppy door was left open), and wants to check the volumes again.

f Format the currently mounted volume (useful mainly for floppies).

r Retension cartridge tape using /usr/bin/tape.

If multiple volumes are required, *backup* will pause for the next volume to be mounted. Be certain to keep track of the volume order.

Format check

The format of "critical'' volumes are checked using *dumpdir*(ADM):

Check *vital* volumes for format errors
M)ounted first volume, S)kip format check, or H)elp:

The menu options are:

m The first volume has been (or still is) mounted, and *dumpdir* can now check the volume format.

s Skip checking the volume format, and continue on to the read error check (below).

The format is not always checked, but when it is, the first volume written must be mounted.

Read error check

All volumes are read using *restore*(ADM), which checks for errors during reading. If an error occurs, the dump is declared unsuccessful and is retried from the beginning.

Check *vital* volumes for read errors
M)ounted *which* volume, E)rror on previous volume, D)one, S)kip checks, or H)elp:

The menu options are:

m The *which* ("first" or "next") volume has been mounted on the drive and is ready to be checked for read errors.

e An error occurred on the last volume checked, and the dump should be retried.

d All volumes have been checked and no errors occurred, so the filesystem has been successfully backed-up; This backup is done.

s Don't bother (skip) checking the rest of the volumes for read errors.

Every volume should be checked for read errors; *restore* requires the volumes to be checked in first-to-last order. Volumes that produce read errors should be marked "suspect," discarded and the dump run once again.

After the backup has been successfully performed, instructions are given on how to label the volumes.

Arguments

fsave is normally run by *fsphoto*, which passes all the proper arguments based on the *schedule* (ADM) database.

filesystem
The filesystem to be backed-up.

dumpinfo
A set of blank-separated strings that give some optional information about this backup:

dumplevel size savetime importance marker

Each of these component strings may be quoted and can thus contain spaces.

dumplevel The level of the dump to be performed. This is a single digit from **0** to **9** (passed to *dump*), or the letter **x** (which means no dump is to be done). The default is to perform a level 0 dump.

size The size of the media volumes that should be used. This should be in feet for tapes and kilobytes for floppies. A *size* of - means to use the first size listed in *mediainfo*. This is the default.

savetime How long this backup is to be saved (for example, "3 months"). Default is "1 year."

importance
How important is this backup? (For example, "critical'' or "precautionary.") Those which are "critical'' have their format checked by *dumpdir*. Default is "important."

marker Either "none" (the default) or an additional label to place on each volume (for example, "a pink sticker").

A typical *dumpinfo* might look like:

```
9 1200 "2 weeks" useful "a blue X"
```

which specifies that a level 9 dump is to be done on a 1200 foot tape (or 1200 kilobyte floppy) which will be saved for 2 weeks and is to be marked with a blue cross (in addition to a more descriptive label). This backup is merely considered "useful" and thus will not be checked by *dumpdir*.

mediainfo
A set of blank-separated strings that give some optional information about this the media to be used:

drive **d** *density sizes*... [*format*]
drive **k** *sizes*... [*format*]

drive The name of backup device to use. The default is */dev/rmt0*.

k *sizes*... If **k** is specified, *drive* is assumed to be a floppy, and the list of *sizes* which follow define the allowable capacities of the floppies that can be used (in kilobytes).

d *density sizes*...
Otherwise, **d** must be specified. In this case, *drive* is assumed to be a magtape at *density* BPI , in one of the possible *sizes* (in feet).

format The XENIX command used to format the tape or floppy so described.

A *mediainfo* describing 9-track magtape would be:

```
media /dev/rmt0 d 1600 2400 1200 600
media /dev/rmt2 d 800  1400 1200 600
```

which specifies that */dev/rmt0* is a 1600 BPI magtape capable of handling 2400, 1200, and 600 foot reels, and that */dev/rmt2* is the 800 BPI device.

A floppy might be described with:

```
media /dev/fd0 k 1024 format /dev/fd0
```

which describes device */dev/fd0* as a megabyte (1024 kilobytes) floppy formatted by the command:

```
format /dev/fd0
```

sitename
Where this backup was made (for example, the name of the company or which building). Note that the *uucp*(C) nodename from */etc/systemid* is automatically placed on the volume labels.

Only the super-user can execute the *fsave* command.

Files

/etc/systemid
Name of this machine.

/etc/ddate
Dump-maintained record of last time each filesystem was backed-up.

/dev/tty
Always-existent character-special device.

See Also

fsphoto(ADM), schedule(ADM), backup(ADM), dumpdir(ADM), restore(ADM), basename(C)

Diagnostics

A successful backup exits successfully (0), but errors generate a complaint and an exit status of 1. *fsave* complains about illegal or incorrect arguments, and exits with a status of 2.

If the backup of *filesystem* is postponed, *fsave* exits with a status of 3.

Name

fsck - Checks and repairs filesystems.

Syntax

/bin/fsck [options] [filesystem] ...

Description

fsck audits and interactively repairs inconsistent conditions for XENIX System V filesystems. If the filesystem is consistent, the number of files, the number of blocks used, and the number of blocks free are reported. If the filesystem is inconsistent, the operator is prompted for concurrence before each correction is attempted. It should be noted that most corrective actions result in some loss of data. The amount and severity of the loss may be determined from the diagnostic output. (An experienced operator can resolve discrepancies manually using *fsdb*(ADM), the filesystem debugger.) The default action for each consistency correction is to wait for the operator to respond "yes" or "no". If the operator does not have write permission *fsck* defaults to the action of the **-n** option.

The following flags are interpreted by *fsck*:

-y Assumes a yes response to all questions asked by *fsck*.

-n Assumes a no response to all questions asked by *fsck*; do not open the filesystem for writing.

-s*cylinder*:*gapsize*
Ignore the actual free list and (unconditionally) reconstruct a new one by rewriting the super block of the file system. The filesystem must be unmounted while this is done; if this is not possible, care should be taken that the system is quiescent and that it is rebooted immediately afterwards. This precaution is necessary so that the old, bad, in-core copy of the super block will not continue to be used, or written on the file system. If *cylinder:gapsize* is not given, the values used when the file system was created are used.

-S Conditionally reconstructs the free list. This option is like **-s***cylinder*:*gapsize* above except that the free list is rebuilt only if there are no discrepancies discovered in the filesystem. Using **-S** forces a "no" response to all questions asked by *fsck*. This option is useful for forcing free list reorganization on uncontaminated filesystems.

-t If *fsck* cannot obtain enough memory to keep its tables, it uses a scratch file. If the **-t** option is specified, the file named in the next argument is used as the scratch file, if needed. Make certain you leave a space between the **-t** and the filename, or *fsck* will use the entire filesystem as a scratch file and erase the entire disk. If you created a scratch filesystem during installation then you can use /dev/scratch as the filename, provided that the filesystem being checked is no larger than the **root** filesystem. Without the **-t** flag, *fsck* prompts the operator for the name of the scratch file. The file chosen should not be on the filesystem being checked, and if it is not a special file or did not already exist, it is removed when *fsck* completes. If the system has a large hard disk there may not be enough space on another filesystem for the scratch file. In such cases, if the system has a floppy drive, use a blank, formatted floppy in the floppy drive with (for example) **/dev/fd0** specified as the scratch file.

-q Quiet *fsck*. Do not print size-check messages in Phase 1. Unreferenced **FIFO** files will selectively be removed. If *fsck* requires it, counts in the superblock will be automatically fixed and the free list salvaged.

-D Directories are checked for bad blocks. Useful after system crashes.

-f Fast check. Check block and sizes (Phase 1) and check the free list (Phase 5). The free list will be reconstructed (Phase 6) if it is necessary.

-rr Recovers and remounts the root filesystem. The required *filesystem* argument must refer to the root filesystem, and preferably to the block device (normally **/dev/root**). This switch implies **-y** and overrides **-n .**

-c Causes any supported filesystem to be converted to the type of the current filesystem. The user is prompted to verify the request for each filesystem that requires conversion unless the **-y** option is specified. It is recommended that every filesystem be checked with this option *while unmounted* if it is to be used with the current version of XENIX. To update the active root filesystem, it should be checked with:

```
fsck -c -rr /dev/root
```

If no *filesystems* are specified, *fsck* reads a list of default filesystems from the file **/etc/checklist**.

Inconsistencies checked are as follows:

- Blocks claimed by more than one inode or the free list
- Blocks claimed by an inode or the free list outside the range of the filesystem
- Incorrect link counts
- Size checks:
  Incorrect number of blocks
  Directory size not 16-byte aligned
- Bad inode format
- Blocks not accounted for anywhere
- Directory checks:
  File pointing to unallocated inode
  Inode number out of range
- Super block checks:
  More than 65536 inodes
  More blocks for inodes than there are in the filesystem
- Bad free block list format
- Total free block or free inode count incorrect

Orphaned files and directories (allocated but unreferenced) are, with the operator's concurrence, reconnected by placing them in the **lost+found** directory. The name assigned is the inode number. The only restriction is that the directory **lost+found** must preexist in the root of the filesystem being checked and must have empty slots in which entries can be made. This is accomplished by making **lost+found**, copying a number of files to the directory, and then removing them (before *fsck* is executed).

Files

/etc/checklist	Contains default list of filesystems to check
/etc/default/boot	Automatic boot control

See Also

autoboot(ADM), fsdb(ADM), checklist(F), filesystem(F), init(M)

Notes

fsck will not run on a mounted non-raw filesystem unless the filesystem is the root filesystem or unless the **-n** option is specified and no writing out of the filesystem will take place. If any such attempt is made, a warning is displayed and no further processing of the filesystem is done for the specified device.

Although checking a raw device is almost always faster, there is no way to tell if the filesystem is mounted. And cleaning a mounted filesystem will almost certainly result in an inconsistent superblock.

Warning

File systems created under XENIX-86 version 3.0 are not supported under XENIX System V because the word ordering in type *long* variables has changed. *fsck* is capable of auditing and repairing XENIX version 3.0 file systems if the word ordering is correct.

For the root filesystem, "fsck -rr /dev/root" should be run. For all other filesystems, "fsck /dev/??" on the *unmounted* block device should be used.

Diagnostics

Initialization Phase

Command syntax is checked. Before the filesystem check can be performed, **fsck** sets up certain tables and opens some files. The **fsck** terminates on initialization errors.

General Errors

Three error messages may appear in any phase. While they seem to offer the option to continue, it is generally best to regard them as fatal, end the run, and investigate what may have caused the problem.

CAN NOT SEEK: BLK B (CONTINUE?)
: The request to move to a specified block number *B* in the filesystem failed. The occurrence of this error condition indicates a serious problem (probably a hardware failure) that may require additional help.

CAN NOT READ: BLK B (CONTINUE?)
: The request for reading a specified block number *B* in the filesystem failed. The occurrence of this error condition indicates a serious problem (probably a hardware failure) that may require additional help.

CAN NOT WRITE: BLK B (CONTINUE?)
The request for writing a specified block number *B* in the filesystem failed. The disk may be write-protected.

Meaning of Yes/No Responses

Prompt	**n**(no)	**y**(yes)
CONTINUE?	Terminates program. (This is the recommended response.)	Attempts to continue to run filesystem check. Often, however, the problem persists. The error condition does not allow a complete check of the filesystem. A second run of *fsck* should be made to recheck this filesystem.

Phase 1: Check Blocks and Sizes

This phase checks the inode list.

Meaning of Yes/No Responses—Phase 1

Prompt	**n**(no)	**y**(yes)
CONTINUE?	Terminates the program. (Recommended response.)	Continues with the program. This error condition means that a complete check of the filesystem is not possible. A second run of *fsck* should be made to recheck this filesystem.
CLEAR?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Deallocates i-node *I* by zeroing its contents. This may invoke the UNALLOCATED error condition in Phase 2 for each directory entry pointing to this i-node.

Phase 1 Error Messages

UNKNOWN FILE TYPE I=I (CLEAR?)

The mode word of the i-node *I* suggests that the i-node is not a pipe, special character i-node, regular i-node, or directory i-node.

LINK COUNT TABLE OVERFLOW (CONTINUE?)
An internal table for *fsck* containing allocated i-nodes with a link count of zero has no more room.

B BAD I=I
I-node *I* contains block number *B* with a number lower than the number of the first data block in the filesystem or greater than the number of the last block in the filesystem. This error condition may invoke the EXCESSIVE BAD BLKS error condition in Phase 1 if i-node *I* has too many block numbers outside the filesystem range. This error condition invokes the BAD/DUP error condition in Phase 2 and Phase 4.

EXCESSIVE BAD BLOCKS I=I (CONTINUE?)
There is more than a tolerable number (usually 10) of blocks with a number lower than the number of the first data block in the filesystem or greater than the number of the last block in the filesystem associated with i-node *I*.

B DUP I=I
I-node *I* contains block number *B*, which is already claimed by another i-node. This error condition may invoke the EXCESSIVE DUP BLKS error condition in Phase 1 if i-node *I* has too many block numbers claimed by other i-nodes. This error condition invokes Phase 1B and the BAD/DUP error condition in Phase 2 and Phase 4.

EXCESSIVE DUP BLKS I=I (CONTINUE?)
There is more than a tolerable number (usually 10) of blocks claimed by other i-nodes.

DUP TABLE OVERFLOW (CONTINUE?)
An internal table in *fsck* containing duplicate block numbers has no more room.

POSSIBLE FILE SIZE ERROR I=I
The i-node *I* size does not match the actual number of blocks used by the i-node. This is only a warning. If the *-q* option is used, this message is not printed.

DIRECTORY MISALIGNED I=I
The size of a directory i-node is not a multiple of 16. This is only a warning. If the *-q* option is used, this message is not printed.

PARTIALLY ALLOCATED INODE I=I (CLEAR?)
I-node *I* is neither allocated nor unallocated.

Phase 1B: Rescan for More DUPS

When a duplicate block is found in the filesystem, the filesystem is rescanned to find the i-node that previously claimed that block. When the duplicate block is found, the following information message is printed:

B DUP I=I
I-node *I* contains block number *B*, which is already claimed by another i-node. This error condition invokes the BAD/DUP error condition in Phase 2. I-nodes with overlapping blocks may be determined by examining this error condition and the DUP error condition in Phase 1.

Phase 2: Check Path Names

This phase removes directory entires pointing to bad inodes found in Phase 1 and phase 1B.

Meaning of Yes/No Responses—Phase 2

Prompt	**n**(no)	**y**(yes)
FIX?	Terminates the program since *fsck* will be unable to continue.	In Phase 2, a y(yes) response to the FIX? prompt says: Change the root i-node type to "directory." If the root i-node data blocks are not directory blocks, a very large number of error conditions are produced.

(Continued)

Prompt	**n**(no)	**y**(yes)
CONTINUE?	Terminates the program.	Ignores DUPS/BAD error condition in root i-node and attempt to continue to run the filesystem check. If root i-node is not correct, then this may result in a large number of other error conditions.
REMOVE?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Removes duplicate or unallocated blocks.

Phase 2 Error Messages

ROOT INODE UNALLOCATED. TERMINATING
The root i-node (always i-node number 2) has no allocate mode bits. The occurrence of this error condition indicates a serious problem. The program stops.

ROOT INODE NOT DIRECTORY (FIX?)
The root i-node (usually i-node number 2) is not directory i-node type.

DUPS/BAD IN ROOT INODE (CONTINUE?)
Phase 1 or Phase 1B found duplicate blocks or bad blocks in the root i-node (usually i-node number 2) for the filesystem.

I OUT OF RANGE I=I NAME=F (REMOVE?)
A directory entry *F* has an i-node number *I* that is greater than the end of the i-node list.

UNALLOCATED I=I OWNER=O MODE=M SIZE=S MTIME=T NAME=F (REMOVE?)
A directory entry *F* has an i-node *I* without allocate mode bits. The owner *O*, mode *M*, size *S*, modify time *T*, and filename *F* are printed. If the filesystem is not mounted and the *-n* option was not specified, the entry is removed automatically if the i-node it points to is character size 0.

DUP/BAD I=I OWNER=O MODE=M SIZE=S MTIME=T

DIR=F (REMOVE?)
Phase 1 or Phase 1B found duplicate blocks or bad blocks associated with directory entry *F*, directory i-node *I*. The owner *O*, mode *M*, size *S*, modify time *T*, and directory name *F* are printed.

DUP/BAD I=I OWNER=O MODE=M SIZE=S MTIME=T FILE=F (REMOVE?)
Phase 1 or Phase 1B found duplicate blocks or bad blocks associated with file entry *F*, i-node *I*. The owner *O*, mode *M*, size *S*, modify time *T*, and filename *F* are printed.

BAD BLK B IN DIR I=I OWNER=O MODE=M SIZE=S MTIME=T
This message only occurs when the *-D* option is used. A bad block was found in DIR i-node *I*. Error conditions looked for in directory blocks are nonzero padded entries, inconsistent "." and ".." entries, and embedded slashes in the name field. This error message means that the user should at a later time either remove the directory i-node if the entire block looks bad or change (or remove) those directory entries that look bad.

Phase 3: Check Connectivity

This phase is concerned with the directory connectivity seen in Phase 2.

Meaning of Yes/No Responses—Phase 3

Prompt	**n**(no)	**y**(yes)
RECONNECT?	Ignores the error condition. This invokes the UNREF error condition in Phase 4. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Reconnects directory i-node *I* to the filesystem in directory for lost files (usually *lost+found*). This may invoke a *lost+found* error condition if there are problems connecting directory i-node *I* to *lost+found*. This invokes CONNECTED information message if link was successful.

Phase 3 Error Messages

UNREF DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (RECONNECT?)

The directory i-node *I* was not connected to a directory entry when the filesystem was traversed. The owner *O*, mode *M*, size *S*, and modify time *T* of directory i-node *I* are printed. The *fsck* program forces the reconnection of a nonempty directory.

SORRY. NO lost+found DIRECTORY

There is no *lost+found* directory in the root directory of the filesystem; *fsck* ignores the request to link a directory in *lost+found*. This invokes the UNREF error condition in Phase 4. Possible problem with access modes of *lost+found*.

SORRY. NO SPACE IN lost+found DIRECTORY

There is no space to add another entry to the *lost+found* directory in the root directory of the filesystem; *fsck* ignores the request to link a directory in *lost+found*. This invokes the UNREF error condition in Phase 4. Clean out unnecessary entries in *lost+found* or make *lost+found* larger.

DIR I=I1 CONNECTED. PARENT WAS I=I2

This is an advisory message indicating a directory i-node *I1* was successfully connected to the *lost+found* directory. The parent i-node *I2* of the directory i-node *I1* is replaced by the i-node number of the *lost+found* directory.

Phase 4: Check Reference Counts

This phase checks the link count information seen in Phases 2 and 3.

Meaning of Yes/No Responses—Phase 4

Prompt	**n**(no)	**y**(yes)
RECONNECT?	Ignores this error condition. This invokes a CLEAR error condition later in Phase 4.	Reconnect i-node *I* to filesystem in the directory for lost files (usually *lost+found*). This can cause a *lost+found* error condition in this phase if there are problems connecting i-node *I* to *lost+found.*
CLEAR?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Deallocates the i-node by zeroing its contents.
ADJUST?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Replaces link count of file i-node *I* with *Y*.
FIX?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Replaces count in super-block by actual count.

Phase 4 Error Messages

UNREF FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (RECONNECT?)

I-node *I* was not connected to a directory entry when the filesystem was traversed. The owner *O*, mode *M*, size *S*, and

modify time *T* of i-node *I* are printed. If the *-n* option is omitted and the filesystem is not mounted, empty files are cleared automatically. Nonempty files are not cleared.

SORRY. NO lost+found DIRECTORY
: There is no *lost+found* directory in the root directory of the filesystem; *fsck* ignores the request to link a file in *lost+found*. This invokes the CLEAR error condition later in Phase 4. Possible problem with access modes of *lost+found*.

SORRY. NO SPACE IN lost+found DIRECTORY
: There is no space to add another entry to the *lost+found* directory in the root directory of the filesystem; *fsck* ignores the request to link a file in *lost+found*. This invokes the CLEAR error condition later in Phase 4. Check size and contents of *lost+found*.

(CLEAR)
: The i-node mentioned in the immediately previous UNREF error condition cannot be reconnected.

LINK COUNT FILE I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST?)
: The link count for i-node *I*, which is a file, is *X* but should be *Y*. The owner *O*, mode *M*, size *S*, and modify time *T* are printed.

LINK COUNT DIR I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST?)
: The link count for i-node *I*, which is a directory, is *X* but should be *Y*. The owner *O*, mode *M*, size *S*, and modify time *T* of directory i-node *I* are printed.

LINK COUNT F I=I OWNER=O MODE=M SIZE=S MTIME=T COUNT=X SHOULD BE Y (ADJUST?)
: The link count for *F* i-node *I* is *X* but should be *Y*. The filename *F*, owner *O*, mode *M*, size *S*, and modify time *T* are printed.

UNREF FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR?)
: I-node *I*, which is a file, was not connected to a directory entry when the filesystem was traversed. The owner *O*, mode *M*, size *S*, and modify time *T* of i-node *I* are printed. If the *-n* option is omitted and the filesystem is not mounted, empty files are cleared automatically. Nonempty files are not cleared.

UNREF DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR?)

I-node *I*, which is a directory, was not connected to a directory entry when the filesystem was traversed. The owner *O*, mode *M*, size *S*, and modify time *T* of i-node *I* are printed. If the *-n* option is omitted and the filesystem is not mounted, empty directories are cleared automatically. Nonempty directories are not cleared.

BAD/DUP FILE I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR?)

Phase 1 or Phase 1B found duplicate blocks or bad blocks associated with file i-node *I*. The owner *O*, mode *M*, size *S*, and modify time *T* of i-node *I* are printed.

BAD/DUP DIR I=I OWNER=O MODE=M SIZE=S MTIME=T (CLEAR?)

Phase 1 or Phase 1B found duplicate blocks or bad blocks associated with directory i-node *I*. The owner *O*, mode *M*, size *S*, and modify time *T* of i-node *I* are printed.

FREE INODE COUNT WRONG IN SUPERBLK (FIX?)

The actual count of the free i-nodes does not match the count in the super-block of the filesystem. If the *-q* option is specified, the count will be fixed automatically in the super-block.

Phase 5: Check Free List

This phase checks the free-block list.

Meaning of Yes/No Responses—Phase 5

Prompt	**n**(no)	**y**(yes)
CONTINUE?	Terminates the program.	Ignores rest of the free-block list and continue execution of *fsck*. This error condition will always invoke BAD BLKS IN FREE LIST error condition later in Phase 5.

(Continued)

Prompt	**n**(no)	**y**(yes)
FIX?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Replaces count in super-block by actual count.
SALVAGE?	Ignores the error condition. A NO response is only appropriate if the user intends to take other measures to fix the problem.	Replaces actual free-block list with a new free-block list. The new free-block list will be ordered according to the gap and cylinder specs of the *-s* or *-S* option to reduce time spent waiting for the disk to rotate into position.

Phase 5 Error Messages

EXCESSIVE BAD BLKS IN FREE LIST (CONTINUE?)
The free-block list contains more than a tolerable number (usually 10) of blocks with a value less than the first data block in the filesystem or greater than the last block in the filesystem.

EXCESSIVE DUP BLKS IN FREE LIST (CONTINUE?)
The free-block list contains more than a tolerable number (usually 10) of blocks claimed by i-nodes or earlier parts of the free-block list.

BAD FREEBLK COUNT
The count of free blocks in a free-block list is greater than 50 or less than 0. This error condition will always invoke the BAD FREE LIST condition later in Phase 5.

X BAD BLKS IN FREE LIST
X blocks in the free-block list have a block number lower than the first data block in the filesystem or greater than the last block in the filesystem. This error condition will always invoke the BAD FREE LIST condition later in Phase 5.

X DUP BLKS IN FREE LIST
X blocks claimed by i-nodes or earlier parts of the free-block list were found in the free-block list. This error condition will always invoke the BAD FREE LIST condition later in Phase 5.

X BLK(S) MISSING
X blocks unused by the filesystem were not found in the free-block list. This error condition will always invoke the BAD FREE LIST condition later in Phase 5.

FREE BLK COUNT WRONG IN SUPERBLOCK (FIX?)
The actual count of free blocks does not match the count in the super-block of the filesystem.

BAD FREE LIST (SALVAGE?)
This message is always preceded by one or more of the Phase 5 information messages. If the *-q* option is specified, the free-block list will be salvaged automatically.

Phase 6: Salvage Free List

This phase reconstructs the free-block list. It has one possible error condition that results from bad blocks-per-cylinder and gap values.

Phase 6 Error Messages

DEFAULT FREE-BLOCK LIST SPACING ASSUMED
This is an advisory message indicating the blocks-to-skip (gap) is greater than the blocks-per-cylinder, the blocks-to-skip is less than 1, the blocks-per-cylinder is less than 1, or the blocks-per-cylinder is greater than 500. The values of 7 blocks-to-skip and 400 blocks-per-cylinder are used.

Cleanup Phase

Once a filesystem has been checked, a few cleanup functions are performed. The cleanup phase displays advisory messages about the filesystem and status of the filesystem.

Cleanup Phase Messages

X files Y blocks Z free
This is an advisory message indicating that the filesystem checked contained *X* files using *Y* blocks leaving *Z* blocks free in the filesystem.

***** REMOUNTING THE ROOT FILESYSTEM *****

This is an advisory message indicating the root filesystem was remounted. Appears when the *-rr* option was specified.

***** FILE SYSTEM WAS MODIFIED *****

This is an advisory message indicating that the current filesystem was modified by *fsck*.

Name

fsdb - File system debugger.

Syntax

/etc/fsdb special [-]

Description

fsdb can be used to patch up a damaged file system after a crash. It has conversions to translate block and i-numbers into their corresponding disk addresses. Also included are mnemonic offsets to access different parts of an i-node. These greatly simplify the process of correcting control block entries or descending the file system tree.

fsdb contains several error-checking routines to verify i-node and block addresses. These can be disabled if necessary by invoking *fsdb* with the optional - argument or by the use of the **O** symbol. (*fsdb* reads the i-size and f-size entries from the superblock of the file system as the basis for these checks.)

Numbers are considered decimal by default. Octal numbers must be prefixed with a zero. During any assignment operation, numbers are checked for a possible truncation error due to a size mismatch between source and destination.

fsdb reads a block at a time and will therefore work with raw as well as block I/O. A buffer management routine is used to retain commonly used blocks of data in order to reduce the number of read system calls. All assignment operations result in an immediate write-through of the corresponding block.

The symbols recognized by *fsdb* are:

#	absolute address
i	convert from i-number to i-node address
b	convert to block address
d	directory slot offset
+,-	address arithmetic
q	quit
>,<	save, restore an address
=	numerical assignment
=+	incremental assignment
=-	decremental assignment
="	character string assignment
O	error checking flip flop
p	general print facilities

f	file print facility
B	byte mode
W	word mode
D	double word mode
!	escape to shell

The print facilities generate a formatted output in various styles. The current address is normalized to an appropriate boundary before printing begins. It advances with the printing and is left at the address of the last item printed. The output can be terminated at any time by typing the delete character. If a number follows the **p** symbol, that many entries are printed. A check is made to detect block boundary overflows since logically sequential blocks are generally not physically sequential. If a count of zero is used, all entries to the end of the current block are printed. The print options available are:

i	print as i-nodes
d	print as directories
o	print as octal words
e	print as decimal words
c	print as characters
b	print as octal bytes

The **f** symbol is used to print data blocks associated with the current i-node. If followed by a number, that block of the file is printed. (Blocks are numbered from zero.) The desired print option letter follows the block number, if present, or the **f** symbol. This print facility works for small as well as large files. It checks for special devices and that the block pointers used to find the data are not zero.

Dots, tabs, and spaces may be used as function delimiters but are not necessary. A line with just a new-line character will increment the current address by the size of the data type last printed. That is, the address is set to the next byte, word, double word, directory entry or i-node, allowing the user to step through a region of a file system. Information is printed in a format appropriate to the data type. Bytes, words and double words are displayed with the octal address followed by the value in octal and decimal. A **.B** or **.D** is appended to the address for byte and double word values, respectively. Directories are printed as a directory slot offset followed by the decimal i-number and the character representation of the entry name. I-nodes are printed with labeled fields describing each element.

The following mnemonics are used for i-node examination and refer to the current working i-node:

md	mode
ln	link count
uid	user ID number
gid	group ID number

sz	file size
a#	data block numbers (0 - 12)
at	access time
mt	modification time
maj	major device number
min	minor device number

Examples

386i	prints i-number 386 in an i-node format. This now becomes the current working i-node.
ln=4	changes the link count for the working i-node to 4.
ln=+1	increments the link count by 1.
fc	prints, in ASCII, block zero of the file associated with the working i-node.
2i.fd	prints the first 32 directory entries for the root i-node of this file system.
d5i.fc	changes the current i-node to that associated with the 5th directory entry (numbered from zero) found from the above command. The first logical block of the file is then printed in ASCII.
512B.p0o	prints the superblock of this file system in octal.
2i.a0b.d7=3	changes the i-number for the seventh directory slot in the root directory to 3. This example also shows how several operations can be combined on one command line.
2i.a0b.p3d	prints the first 3 entries in the root directory. This example also shows how several operations can be combined on one command line.
d7.nm="name"	changes the name field in the directory slot to the given string. Quotes are optional when used with **nm** if the first character is alphabetic.
a2b.p0d	prints the third block of the current i-node as directory entries.

See Also

fsck(ADM), dir(F), filesystem(F).

Name

fsname- Prints or changes the name of a file system.

Syntax

fsname [**-p**] [**-s** name] /dev/*device*

Description

The */etc/fsname* utility is used to print or change the name of a filesystem. The options are:

-p Select the "pack" name field instead of the filesystem name field.

-s *name* Changes the specified field in the superblock.

The default action is to print the name of the filesystem.

See Also

mkfs(C), ustat(S), filesystem (F)

Name

fsphoto - Performs periodic semi-automated system backups

Syntax

fsphoto [**-i**] schedule [drive]

Description

fsphoto, in conjunction with *fsave*(ADM), provides a semi-automated interface to *backup*(C) for backing-up XENIX filesystems. A human operator is required to mount and dismount tapes or floppies at the appropriate times, so some interaction is necessary, but all such interaction is kept to a minimum to reduce the potential for human error.

The selection and timing of backups for all filesystems is governed by the *schedule*(ADM) database. The system administrator must set up this file, and make arrangements to run *fsphoto* on the implicitly defined schedule (normally once per weekday). *fsphoto* can be invoked most easily from the *sysadmin*(ADM) menu. *fsphoto* interprets *schedule*, and for each filesystem that should be backed-up on that day, runs *fsave* to interact with the operator and backup the filesystem without error.

The optional argument *drive* specifies the magtape or floppy device to use; the default is specified in the *schedule* file.

Backups may be postponed (via *fsave*) or interrupted. The resulting "partial" backups are automatically resumed the next time *fsphoto* is run: Any missed filesystems are backed-up as if the original backup had not been delayed. The **-i** flag ignores any pending partial backups.

If there is a pending partial backup, the normally scheduled backups are not done. This means that if a partial backup is resumed, and the normally scheduled backups are to be done, *fsphoto* must be run twice.

You must be the super-user to use this program.

Files

/usr/lib/sysadmin/schedule
Database describing which filesystems are to be backed-up when, and at what dump *level*.

/dev/tty
Source of interactive input.

/usr/lib/sysadmin/past
Record of filesystems successfully backed-up in the pending partial backup.

/tmp/backup*$$*
Temporary file for recording successfully backed-up filesystems.

See Also

fsave(ADM), schedule(ADM), backup(C), basename(C)

Diagnostics

fsphoto complains of syntax errors in *schedule*, and exits with a status of 1.

fsphoto complains about illegal or incorrect arguments, and exits with a status of 1.

An interrupt will cause an exit status of 2.

Notes

If a *drive* is explicitly given, the "raw" (**/dev/r***) form of the device should be used.

Name

haltsys, reboot - Closes out the file systems and shuts down the system.

Syntax

/etc/haltsys
/etc/reboot

Description

The *haltsys* utility performs a *uadmin*( ) system call (see *uadmin*(S)) to flush out pending disk I/O, mark the file systems clean, and halt the processor. *haltsys* takes effect immediately, so user processes should be killed beforehand. *shutdown*(ADM) is recommended for normal system shutdown, since it warns users, terminates processes, then calls *haltsys*. Use *haltsys* directly only if you cannot run shutdown; for example, because of some system problem.

The *reboot* command performs the same function as *haltsys*, except the system is rebooted automatically afterwards.

Only the super-user can execute *haltsys* or *reboot.*

Notes

haltsys locks hard disk heads.

See Also

shutdn(S), uadmin(S), shutdown(ADM)

Name

hdinstall - places newly-created kernel in default location.

Syntax

hdinstall

Description

When a new kernel is created with the Link Kit, *hdinstall* must be invoked to place the new kernel in **/xenix**. *hdinstall* moves the "old" */xenix* to a file called */xenix.old* and copies */usr/sys/conf/xenix* to */xenix* , the default location.

Files

/usr/sys/conf/xenix
/xenix
/xenix.old

Notes

Any kernel patches applied using *scopatch*(ADM) are added to *hdinstall* (XENIX-386 only).

See Also

configure(ADM), config(ADM), scopatch(ADM)

Name

idleout - Logs out idle users.

Syntax

idleout [minutes | hours:minutes]

Description

The *idleout* command monitors line activity and logs out users whose terminal remains idle longer than a specified period of time. Minutes are assumed; if a colon appears in the number, hours are assumed.

The utility uses a default file, */etc/default/idleout*, to indicate the interval a user's terminal may remain idle before being logged out. This file has one entry:

IDLETIME=*time*

The time format is identical to that used on the command line. The time specified in the default file is overridden by *idletime* if *idletime* is specified on the command line. Note that, if *idletime* is zero, no monitoring takes place and idle users are not logged out. You can either run *idleout* from the command line, or, to have continuous coverage, you must add the program name in **/etc/rc.d/8/userdef** to see to it that the program is run each time the system is rebooted.

Files

/etc/default/idleout
/etc/utmp
/etc/wtmp

See Also

who(C), getut(S), kill(S)

Name

install - Installation shell script.

Syntax

/etc/install [device]

Description

/etc/install is the *sh*(C) script used to install XENIX distribution (or application program) floppies. It performs the following tasks:

- Prompts for insertion of floppies.
- Extracts files using the *tar*(C) utility.
- Executes **/once/init.*** programs on each floppy after they have been extracted.
- Removes any **/once/init.*** programs when the installation is finished.

The optional argument to the command specifies the device used. The default device is **/dev/install**.

Files

/etc/install

/once/init.*

Name

ipcrm - Removes a message queue, semaphore set or shared memory ID.

Syntax

ipcrm [options]

Description

ipcrm removes one or more specified messages, a semaphore or shared memory identifiers. The identifiers are specified by the following *options*:

-q *msqid* removes the message queue identifier *msqid* from the system and destroys the message queue and data structure associated with it.

-m *shmid* removes the shared memory identifier *shmid* from the system. The shared memory segment and data structure associated with it are destroyed after the last detach.

-s *semid* removes the semaphore identifier *semid* from the system and destroys the set of semaphores and data structure associated with it.

-Q *msgkey* removes the message queue identifier, created with key *msgkey*, from the system and destroys the message queue and data structure associated with it.

-M *shmkey* removes the shared memory identifier, created with key *shmkey*, from the system. The shared memory segment and data structure associated with it are destroyed after the last detach.

-S *semkey* removes the semaphore identifier, created with key *semkey*, from the system and destroys the set of semaphores and data structure associated with it.

The details of the removes are described in *msgctl*(S), *shmctl*(S), and *semctl*(S). The identifiers and keys may be found by using *ipcs*(ADM).

See Also

ipcs(ADM), msgctl(S), msgget(S), msgop(S), semctl(S), semget(S), semop(S), shmctl(S), shmget(S), shmop(S)

Note

ipcrm cannot be used to remove semaphores created using *creatsem*(S) or to remove shared memory created using *sdget*(S).

Name

ipcs - Reports the status of inter-process communication facilities.

Syntax

ipcs [options]

Description

ipcs prints certain information about active inter-process communication facilities. Without *options*, information is printed in short format for message queues, shared memory, and semaphores that are currently active in the system. Otherwise, the information that is displayed is controlled by the following *options*:

-q Print information about active message queues.
-m Print information about active shared memory segments.
-s Print information about active semaphores.

If any of the options **-q**, **-m**, or **-s** are specified, information about only those indicated are displayed. If none of the three options are specified, information about all three are displayed.

-b Print biggest allowable size information (maximum number of bytes in messages on queue for message queues, size of segments for shared memory, and number of semaphores in each set for semaphores). See below, for the meaning of columns in a listing.
-c Print creator's login name and group name. See below.
-o Display information on outstanding usage (number of messages on queue, total number of bytes in messages on queue, and the number of processes attached to shared memory segments).
-p Display process number information. (Process ID of last process to send a message and process ID of last process to receive a message on message queues. It displays the process ID of the creating process and the process ID of the last process to attach or detach on shared memory segments.) See below.
-t Print time information. (Time of the last control operation that changed the access permissions for all facilities. Time of last *msgsnd* and last *msgrcv* on message queues, last *shmat* and last *shmdt* on shared memory, and last *semop*(S) on semaphores.) See below.
-a Use all print *options*. (This is a shorthand notation for **-b**, **-c**, **-o**, **-p**, and **-t**.)
-C *corefile*
Use the file *corefile* in place of **/dev/kmem**.
-N *namelist*
The argument will be taken as the name of an alternate *namelist* (**/xenix** is the default).

The column headings and the meaning of the columns in an *ipcs* listing are given below; the letters in parentheses indicate the *options* that cause the corresponding heading to appear; **all** means that the heading always appears. Note that these *options* only determine what information is provided for each facility; they do *not* determine which facilities will be listed.

T (all) Type of the facility:
- **q** message queue;
- **m** shared memory segment;
- **s** semaphore.

ID (all) The identifier for the facility entry. Note that ID is "X" for facilities created using *creatsem*(S) or *sdget*(S).

KEY (all) The key used as an argument to *msgget*, *semget*, or *shmget* to create the facility entry. (Note: The key of a shared memory segment is changed to **IPC_PRIVATE** from when the segment has been removed until all processes attached to the segment detach it.)

MODE (all) The facility access modes and flags: The mode consists of 11 characters that are interpreted as follows:

The first two characters are:
- **R** if a process is waiting on a *msgrcv*;
- **S** if a process is waiting on a *msgsnd*;
- **D** if the associated shared memory segment has been removed. It will disappear when the last process attached to the segment detaches it;
- **C** if the associated shared memory segment is to be cleared when the first attach is executed;
- **-** if the corresponding special flag is not set.

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 facility entry; and the last to all others. Within each set, the first character indicates permission to read, the second character indicates permission to write or alter the facility entry, and the last character is currently unused.

The permissions are indicated as follows:

r if read permission is granted;
w if write permission is granted;
a if alter permission is granted;
- if the indicated permission is *not* granted.

OWNER (all) The login name of the owner of the facility entry.

GROUP (all) The group name of the group of the owner of the facility entry.

CREATOR(a,c) The login name of the creator of the facility entry.

CGROUP (a,c) The group name of the group of the creator of the facility entry.

CBYTES (a,o) The number of bytes in messages currently outstanding on the associated message queue.

QNUM (a,o) The number of messages currently outstanding on the associated message queue.

QBYTES (a,b) The maximum number of bytes allowed in messages outstanding on the associated message queue.

LSPID (a,p) The process ID of the last process to send a message to the associated queue.

LRPID (a,p) The process ID of the last process to receive a message from the associated queue.

STIME (a,t) The time the last message was sent to the associated queue.

RTIME (a,t) The time the last message was received from the associated queue.

CTIME (a,t) The time when the associated entry was created or changed.

NATTCH (a,o) The number of processes attached to the associated shared memory segment.

SEGSZ (a,b) The size of the associated shared memory segment.

CPID (a,p) The process ID of the creator of the shared memory entry.

LPID (a,p) The process ID of the last process to attach or detach the shared memory segment.

ATIME (a,t) The time the last attach was completed to the associated shared memory segment.

DTIME (a,t) The time the last detach was completed on the associated shared memory segment.

NSEMS (a,b) The number of semaphores in the set associated with the semaphore entry.

OTIME (a,t) The time the last semaphore operation was completed on the set associated with the semaphore entry.

Files

/xenix	system namelist
/dev/kmem	memory
/etc/passwd	user names
/etc/group	group names

See Also

creatsem(S), msgop(S), sdget(S), semop(S), shmop(S)

Notes

Things can change while *ipcs* is running; the picture it gives is only a close approximation.

Name

kbmode - Set keyboard mode or test keyboard support.

Syntax

kbmode command [file]

Description

This command can be used to determine if your system keyboard supports AT mode. If it does, this utility can change the keyboard mode between AT mode and PC/XT compatibility mode.

If the **file** argument is specified, it should be a tty device of one of the multiscreens of the keyboard's group.

Valid commands are:

test	- determine if keyboard supports AT mode
at	- set keyboard to AT mode
xt	- set keyboard to PC/XT compatibility mode

Notes

Some keyboards look like an AT keyboard but do not support AT mode. Setting such a keyboard to AT mode will render it useless, unless it can be set to XT mode from another (serial) terminal.

See Also

keyboard(HW)

Name

lpadmin - Configures the lineprinter spooling system.

Syntax

/usr/lib/lpadmin -p printer [options...]
/usr/lib/lpadmin -x dest
/usr/lib/lpadmin -d[dest]

Description

lpadmin configures the lineprinter spooling system to describe printers, classes, and devices. It is used to add and remove destinations, change membership in classes, change devices for printers, change printer interface programs, and to change the system default destination. System managers may also use *lpinit* (ADM) to add new printing destinations to the system. *lpadmin* may not be used when the lineprinter scheduler, *lpsched* (ADM), is running, except where noted below.

Exactly one of the **-p**, **-d**, or **-x** options must be present for every legal invocation of *lpadmin*.

-d[*dest*] Makes *dest*, an existing destination, the new system default destination. If *dest* is not supplied, then there is no system default destination. This option may be used when *lpsched* (ADM) is running. No other *options* are allowed with **-d**.

-x*dest* Removes destination *dest* from the LP system. If *dest* is a printer and is the only member of a class, then the class will be deleted, too. No other *options* are allowed with **-x**.

-p*printer* Names a *printer* to which all of the *options* below refer. If *printer* does not exist then it will be created.

The following *options* are only useful with **-p** and may appear in any order. For ease of discussion, the printer will be referred to as *p* below.

-c*class* Inserts printer *p* into the specified *class*. *Class* will be created if it does not already exist.

-e*printer* Copies an existing *printer*'s interface program to be the new interface program for *p*.

-h Indicates that the device associated with *p* is hardwired. This *option* is assumed when creating a new printer unless the **-l** *option* is supplied.

-i*interface* Establishes a new interface program for *p*. *Interface* is the pathname of the new program.

-l Indicates that the device associated with *p* is a login terminal. The lineprinter scheduler, *lpsched*(ADM), disables all login terminals used as printers automatically each time it is started. Before re-enabling *p*, its current *device* should be established using *lpadmin*.

-m*model* specifies model interface program to be used (See "Models").

-r*class* Removes printer *p* from the specified *class*. If *p* is the last member of the *class*, then the *class* will be removed.

-v*device* Associates a new *device* with printer *p*. *Device* is the pathname of a file that is writable by the print system manager, *lp*. Note that there is nothing to stop a print system manager from associating the same *device* with more than one *printer*. If only the **-p** and **-v** *options* are supplied, then *lpadmin* may be used while the scheduler is running.

Restrictions

When creating a new printer, the **-v** option and one of the **-e**, **-i**, or **-m** options must be supplied. Only one of the **-e**, **-i**, or **-m** options may be supplied. The **-h** and **-l** keyletters are mutually exclusive. Printer and class names may be no longer than 14 characters and must consist entirely of the characters A - Z , a - z , 0 - 9 and _ (underscore).

Models

Model printer interface programs are shell procedures which interface between *lpsched*(ADM) and devices. Models reside in the directory **/usr/spool/lp/model** and may be used as is with *lpadmin* **-m**. Models should have 644 permission if owned by *lp* & bin, or 664 permission if owned by bin & bin. System managers may modify copies of models and then use *lpadmin* **-i** to associate them with printers. If printers have special options, these can be included in the interface program. Users can then choose an option with the *lp* **-o** command.

Several model interface programs are supplied.

Serial printers that need delays or other special *stty*(C) options (such as mapping CR to newline) should have this string included in the model interface program:

```
stty [ options ... ] 0<&1
```

Files

/usr/spool/lp/*

See Also

accept(C), enable(C), lp(C), lpinit(ADM), lpsched(ADM), lpstat(C)

Name

lpinit - Adds, reconfigures and maintains printers.

Syntax

/etc/lpinit

Description

lpinit is a shell script for configuring and adding new lineprinters to a system, and for maintaining and reconfiguring existing printers. It should only be executed by the system manager.

lpinit asks a series of questions for which the default answers are displayed. You can press RETURN to accept the default value or type in a new value.

lpinit displays a menu with the following options:

1) Add a new printer
2) Remove a printer
3) Reconfigure an existing printer
4) Assign a system default printer
5) Print lp status information

When reconfiguring an existing printer the following options are given:

1) Insert a printer into a class
2) Remove a printer from a class
3) Install a new interface program for a printer
4) Associate a new device with a printer

Information which the system manager may be asked to supply includes:

- The printer device (e.g. **/dev/lp0**).
- The printer character mode. (The default value is *non-interpretive*. See "Notes" below for more information.)
- The printer name (default is *printer*).
- The pathname of the interface program (several example programs are supported).
- The name of a class into which to insert or remove a printer.
- Whether the printer being added or reconfigured is a parallel, serial, or remote printer.
- Whether the printer being added or reconfigured requires special handling for carriage returns and line feeds.

The printer name can be any combination of up to 14 alphanumeric characters or underscores. A printer interface program can be a shell script, C program, or any executable program; or the model interface

program, **/usr/spool/lp/model/dumb**, can be copied and modified. (See the "Models" section of the *lpadmin*(ADM) manual page.)

When adding a new printer, *lpinit* changes the acceptance status of the new lineprinter to "accept," and enables it to print files. **/etc/ lpinit** then asks if the new printer will be the default printing destination. All nonspecific print requests are routed to the default destination (see *lp*(C)).

If the line printer scheduler is running when *lpinit* is invoked, the user is reminded that any jobs which are printing may be interrupted and the user is asked if he wants to continue. The scheduler is restarted when *lpinit* exits only if it was running when *lpinit* was invoked or if a new printer was added.

The steps to configure a new printer can be taken separately, (see *lpadmin*(ADM), *accept*(C), *enable*(C), and *lpsched*(ADM) for more information).

Files

/usr/lib/mkdev/lp
/etc/lpinit

Notes

Some printers (principally Tandy) require conversions for line-feeds, tabs and form-feeds. In *interpretive* mode, the system sends line-feeds as carriage-returns, tabs as the appropriate number of spaces, and form-feeds as the appropriate number of carriage-returns. In *non-interpretive* mode (the default value), the system sends every character to the printer unmodified.

If you are adding a parallel printer you are asked, after the menu of interface scripts, if the printer requires conversions for line-feed, tab and form-feed. If the printer does not, press RETURN. If the printer does, press **y**. This selects *interpretive* mode and assigns the device */dev/lp*[012]*f* to the printer.

If you choose *interpretive* mode, note the following:

You must be sure that the printer's actual top-of-form corresponds to top-of-form as interpreted by the printer driver.

If you run a program that does any non-standard line spacing, such as half-line feeds or 8 lines per inch, the printer's top-of-form will be out of place in subsequent output.

If your output contains characters that are not uniformly spaced, the tab translation may not work properly.

Note that if your printer can be set (for example, with dip switches) to treat line-feed as newline and carriage-return as carriage-return (without a line-feed), and if the printer can do its own tabs and form-feeds, you should select *non-interpretive* mode. If your printer cannot automatically do tabs, you can still use *non-interpretive* mode by using the **-e** option of the *pr*(C) command when printing files that contain tabs.

See Also

accept(C), enable(C), lp(C), lpadmin(ADM), lpsched(ADM), pr(C)

Name

lpsched, lpshut, lpmove - Starts/stops the lineprinter request scheduler and moves requests.

Syntax

/usr/lib/lpsched
/usr/lib/lpshut
/usr/lib/lpmove requests destination
/usr/lib/lpmove dest1 dest2

Description

lpsched schedules requests taken by *lp*(C) for printing on lineprinters.

lpshut shuts down the lineprinter scheduler. All printers that are printing at the time *lpshut* is invoked will stop printing. Requests that were printing at the time a printer was shut down will be reprinted in their entirety after *lpsched* is started again. All lineprinter commands perform their functions even when *lpsched* is not running.

lpmove moves requests that were queued by *lp*(C) between lineprinter destinations. This command may be used only when *lpsched* is not running. The first form of the command moves the named *requests* to the lineprinter *destination*. *Requests* are request IDs as returned by *lp*(C). The second form moves all requests for destination *dest1* to destination *dest2*. As a side effect, *lp*(C) will reject requests for *dest1*.

Note that *lpmove* never checks the acceptance status for the new destination when moving requests (see *accept*(C)).

Files

/usr/spool/lp/*

See Also

accept(C), enable(C), lp(C), lpadmin(ADM), lpinit(ADM), lpstat(C)

Name

makekey - Generates an encryption key.

Syntax

/usr/lib/makekey

Description

makekey improves the usefulness of encryption schemes by increasing the amount of time required to search the key space. It reads 10 bytes from its standard input, and writes 13 bytes on its standard output. The output depends on the input in a way that is intended to be difficult to compute (i.e., to require a substantial fraction of a second).

The first 8 input bytes (the *input key*) can be arbitrary ASCII characters. The last 2 input bytes (the *salt*) are best chosen from the set of digits, dot (.), slash (/), and uppercase and lowercase letters. The *salt* characters are repeated as the first 2 characters of the output. The remaining 11 output characters are chosen from the same set as the *salt* and constitute the *output key*.

The transformation performed is essentially the following: the *salt* is used to select one of 4,096 cryptographic machines all based on the National Bureau of Standards DES algorithm, but broken in 4,096 different ways. Using the *input key* as the key, a constant string is fed into the machine and recirculated. The 64 bits that come out are distributed into the 66 *output key* bits in the result.

Notes

Distribution of the encryption libraries and utilities is regulated by the U.S. Government and are not available to sites outside of the United States and its territories. Because we cannot control the destination of the software, these utilities are not included in the standard product. If your site is within the U.S. or its territories, you can obtain the encryption software through your product distributor or reseller.

See Also

passwd(F)

Name

mkdev - Calls scripts to add peripheral devices.

Syntax

/etc/mkdev lp
/etc/mkdev hd
/etc/mkdev serial
/etc/mkdev fs [device file]
/etc/mkdev fd
/etc/mkdev tape
/etc/mkdev shl
/etc/mkdev mouse

Description

mkdev calls the scripts to create the requested type of device file(s). *mkdev* calls scripts found in the directory /usr/lib/mkdev. If no arguments are listed, *mkdev* prints a usage message.

/etc/mkdev lp creates device files for use with line printers. (See *lpinit*(ADM).)

/etc/mkdev hd creates device files for use with a peripheral hard disk. The device files for an internal hard disk already exist. *hdinit* invokes the following utilities, where appropriate: *dparam*(ADM), *badtrk*(ADM), *fdisk*(ADM), and *divvy*(ADM).

/etc/mkdev serial creates device files for use with serial cards. The device files for the first and second ports already exist. Additional device files must be created for the ports added when expansion cards are added to the system. The **/etc/ttys** and **/etc/ttytype** files are updated.

/etc/mkdev fs performs the system maintenance tasks required to add a new filesystem to the system once the device is created (*mknod*(C)) and the filesystem is made (*mkfs*(ADM)). It creates the */file* and */file*/**lost+found** directories, reserves slots in the **lost+found** directory, (if either already exist, they are used unmodified) and modifies **/etc/checklist**, **/etc/default/filesys** and **/etc/default** to check (*fsck*(ADM)) and mount (*mount*(ADM), *mnt*(C)) the filesystem as appropriate. It is usually used in conjunction with *mkdev hd* when adding a second hard disk to the system or with *mkdev fd* when creating a mountable filesystem on a floppy, but can be used on any additional filesystem (for example, on a large internal hard disk).

/etc/mkdev fd creates bootable and root file system floppy disks. The three basic options are: boot and root on a single disk (96 or 135 tpi only), boot and root pair (48 tpi) or filesystem only. Use with *mkdev*

fs when creating a filesystem-only floppy.

Several boot and/or root floppies can be created during a single *mkdev fd* session, but mkdev does not display a prompt to remove the first floppy and insert the next one. Insert the next floppy when *mkdev* prompts "Would you like to format the floppy first? (y/n)."

/etc/mkdev tape configures the tape driver in preparation for linking a new kernel that includes tape support. It adds a standard quarter-inch cartridge tape driver and/or a mini-cartridge tape driver.

The current driver configurations can be displayed, and changed if necessary. A zero in any of the fields means the driver automatically detects the type of tape device installed and uses the built-in values for that device. If the autoconfiguration values are not correct for your drive, refer to your hardware manual for the correct values, configure the driver and relink the new kernel. *mkdev tape* can also be used to remove a tape driver from the existing kernel.

/etc/mkdev shl initializes necessary devices and configures kernel parameters associated with the number of shell layers sessions available on the system.

/etc/mkdev mouse initializes necessary devices and configures the system to use any supported mouse.

Once the driver is configured, you are prompted for re-linking the kernel. The appropriate devices in **/dev** are created.

The various *init* scripts prompt for the information necessary to create the devices.

Files

/usr/lib/mkdev/*

See Also

badtrk(ADM), divvy(ADM), dparam(ADM), fd(HW), fdisk(ADM), filesys(F), format(C), hd(HW), lp(HW), lpinit(ADM), mkfs(ADM), mknod(C), mount(ADM), serial(HW), usemouse(C), tape(HW).

Name

mkfs - Constructs a file system.

Syntax

/etc/mkfs [**-y**] [**-n**] special blocks[**:** inodes] [gap inblocks]
/etc/mkfs [**-y**] [**-n**] special proto [gap inblocks]
[**-s** blocks [: inodes]]

Description

mkfs constructs a file system by writing on the special file *special* , according to the directions found in the remainder of the command line.

If it appears that the special file contains a file system, operator confirmation is requested before overwriting the data. The **-y** "yes" option overrides this, and writes over any existing data without question. The **-n** option causes *mkfs* to terminate without question if the target contains an existing file system. The check used is to read block one from the target device (block one is the super-block) and see whether the bytes are the same. If they are not, this is taken to be meaningful data and confirmation is requested.

If the second argument is given as a string of digits, *mkfs* builds a file system with a single empty directory on it. The size of the file system is the value of *blocks* interpreted as a decimal number. The boot program is left uninitialized. If the number of inodes is specified, then this number should be the same as the estimated number of files in the file system. If the optional number of inodes is not given, the number of inodes is calculated as a function of the system file size.

If the second argument is a file name that can be opened, *mkfs* assumes it to be a prototype file, *proto*, and takes its directions from that file. The prototype file contains tokens separated by spaces or newlines. The first token is the name of a file to be copied onto block zero as the bootstrap program. The bootstrap program specified should already be stripped of the header (see *strip*(CP)). If the header has not been stripped from the bootstrap program, then *mkfs* issues a warning. The second token is a number specifying the size of the created file system. Typically, it will have been the number of blocks on the device, perhaps diminished by space for swapping. The next token is the i-list size in blocks. The next set of tokens comprise the specification for the root file. File specifications consist of tokens giving the mode, the user ID, the group ID, and the initial contents of the file. The syntax of the contents field depends on the mode.

The mode token for a file is a 6 character string. The first character specifies the type of the file. (The characters **-bcd** specify regular, block special, character special and directory files respectively.) The second character of the type is either **u** or **-** to specify set-user-ID mode or not. The third is **g** or **-** for the set-group-ID mode. The rest of the mode is a three digit octal number giving the owner, group, and other read, write, execute permissions; see *chmod*(C).

Two decimal number tokens come after the mode; they specify the user and group ID's of the owner of the file.

If the file is a regular file, the next token is a pathname whose contents and size are copied. If the file is a block or character special file, two decimal number tokens follow which give the major and minor device numbers. If the file is a directory, *mkfs* makes the entries **.** and **..** and then reads a list of names and (recursively) file specifications for the entries in the directory. The scan is terminated with the token **$.**

A sample prototype specification follows:

```
/stand/diskboot
4872 110
d--777 3 1
usr d--777 3 1
    sh  ---755 3 1 /bin/sh
    ken d--755 6 1
        $
    b0  b--644 3 1 0 0
    c0  c--644 3 1 0 0
    $
$
```

In the second version of the command the **-s** option is a command-line override of the size and number of inodes in the *proto* file.

In both commands, the disk interleaving factors, *gap* and *inblocks* , can be specified. The interleaving factors are a disk hardware function and are described in detail in the XENIX *System Administrator's Guide*.

See Also

chmod(C), filesystem(F), dir(F), strip(CP)

Notes

There is no way to specify links when using a prototype file. If the number of inodes is specified on the command line, then the maximum number of inodes in the file system is 65500. This utility uses 1K blocks.

Name

mkuser - Adds a login ID to the system.

Syntax

/etc/mkuser

Description

mkuser is used to add more user login IDs to the system. It is the preferred method for adding new users to the system, since it handles all directory creation and password file updating. To add a new user to the system, *mkuser* requires six pieces of information:

- login name
- user ID
- group ID
- user's login shell
- initial password
- comment string for the **/etc/passwd** file (optional).

The login name is checked against certain criteria (i.e., it must be at least three characters and begin with a lowercase letter). The password must follow standard XENIX conventions (see *passwd*(F)). The password file comment field can be up to 35 characters of information.

mkuser prompts for the shell type to assign to the new user. The selection of shells is determined by the number of shells installed on the system. The shells included in the Run Time System are the standard (Bourne) shell, *sh*, and the restricted shell, *rsh*. Each installed shell is represented by a subdirectory **/usr/lib/mkuser/***shell*, which is installed along with the given shell package (see *custom*(ADM)). The shell subdirectory contains the files needed to set up the user's environment to use that shell. These files are **mkuser.defs** and **mkuser.init**, plus any additional files that are specific to a given shell. (For example, **/usr/lib/mkuser/csh/cshrc** and **/usr/lib/mkuser/csh/login** are the standard **.cshrc** and **.login** files used by the *csh* and are copied to the user's home directory when *mkuser* is run.) The C shell and Korn shell (XENIX-386 only) are additional shells that can be loaded on the system with *custom*(ADM).

mkuser takes some of its parameters from a default file, **/etc/default/mkuser**. An example default file is:

```
HOME=/usr
HOMEMODE=0755
PROFMODE=0640
MAILMODE=0640
```

The HOME entry is the user's home directory, the HOMEMODE entry is the permissions for the user's home directory, the PROFMODE entry is the permissions for the *.login*, *.profile* and *.cshrc* files or other shell-specific files, and the MAILMODE entry specifies the permissions of the user's mailbox.

This file can be edited by the super-user to change these defaults. These defaults can also be defined on a per-shell basis by adding similar entries to the appropriate **/usr/lib/mkuser/***shell***/mkuser.def** file. In addition, there are other files in **/usr/lib/mkuser** that can be customized. These include **/usr/lib/mkuser/lib/mail**, which is the standard mail message sent to new users, **/usr/lib/mkuser/lib/help**, which is the explanation displayed by *mkuser* at startup, **/usr/lib/mkuser/***shell***/mkuser.init**, and any of the shell related files.

mkuser allocates user IDs starting at 200, or the largest number used in the password file. (The operator can also assign a specific user ID to a new user. It must be greater than or equal to 200 and must not already exist.) The default group ID for new users is 50. The minimum group ID allowed for user accounts is 50. The operator is given the choice of assigning the user to the default group or another existing group (only those groups with IDs greater than or equal to 50 are displayed, but any group can be selected). In addition, a new group can be created, in which case the operator may specify the name or ID (or both). If only the name is specified, the next available number is assigned.

mkuser can only be executed by the super-user.

The minimum length of a legal password, and the minimum and maximum number of weeks used in password aging are specified in **/etc/default/passwd** by the variables PASSLENGTH, MINWEEKS and MAXWEEKS. For example, these variables might be set as follows:

```
PASSLENGTH=6
MINWEEKS=2
MAXWEEKS=6
```

Files

/etc/passwd

/usr/spool/mail/*username*

/etc/default/mkuser

/etc/default/passwd

/usr/lib/mkuser/mkuser/lib/help

/usr/lib/mkuser/mkuser/lib/mail

/usr/lib/mkuser/*shell*/mkuser.defs

/usr/lib/mkuser/*shell*/mkuser.init

/usr/lib/mkuser/*shell*/*shellfiles*

See Also

chmod(C), custom(ADM), sh(C), csh(C), ksh(C), rsh(C), vsh(C), group(F), passwd(F), pwadmin(ADM), rmuser(ADM)

Name

mount - Mounts a file structure.

Syntax

/etc/mount [[**-r**] special-device directory] [readonly]

Description

mount announces to the system that a removable file structure is present on *special-device*. The file structure is mounted on *directory*. The *directory* must already exist; it becomes the name of the root of the newly mounted file structure. *directory* should be empty. If *directory* contains files, they will appear to have been removed while the *directory* is mounted and reappear when the *directory* is unmounted.

The *mount* and *umount* commands maintain a table of mounted devices. If each special device is invoked without any arguments, *mount* displays the name of the device, and the directory name of the mounted file structure, whether the file structure is read-only, and the date it was mounted.

The **-r** option mounts the device read-only. Physically write-protected file structures must be mounted in this way or errors occur when access times are updated, whether or not any explicit write is attempted.

umount removes the removable file structure previously mounted on device *special-device*.

Files

/etc/mnttab	Mount table
/etc/default/filesys	Filesystem data

See Also

umount(ADM), mnt(C), mount(S), mnttab(F), default(F)

Diagnostics

mount issues a warning if the file structure to be mounted is currently mounted under another name.

Busy file structures cannot be dismounted with *umount*. A file structure is busy if it contains an open file or some user's working directory.

Notes

Only the super-user can use the *mount* command.

Some degree of validation is done on the file structure, however it is generally unwise to mount corrupt file structures.

Be warned that when in single-user mode, the commands that look in **/etc/mnttab** for default arguments (for example *df*, *ncheck*, *quot*, *mount*, and *umount*) give either incorrect results (due to a corrupt **/etc/mnttab** from a non-shutdown stoppage) or no results (due to an empty mnttab from a *shutdown* stoppage).

When multi-user, this is not a problem; **/etc/rc** initializes **/etc/mnttab** to contain only **/dev/root** and subsequent mounts update it appropriately.

The *mount*(ADM) and *umount*(ADM) commands use a lock file to guarantee exclusive access to **/etc/mnttab**. The commands which just read it (those mentioned above) do not, so it is possible that they may hit a window, which is corrupt. This is not a problem in practice since *mount* and *umount* are not frequent operations. Block devices must be used, not raw (character) devices.

When mounting a file system on a floppy disk you need not use the same *directory* each time. However, if you do, the full pathnames for the files are consistent with each use.

Floppy disks must be unprotected (no write-protect tab) to be mounted as a filesystem unless the **-r** option is used. If floppy disks are write-protected, they must be mounted with the **-r** or **readonly** flag. Always **unmount** filesystems on floppy disks before removing them from the floppy drive. Failure to do so requires running *fsck* the next time the disk is mounted.

Name

mvdir - Moves a directory.

Syntax

/etc/mvdir dirname name

Description

mvdir moves directories within a file system. The directory (*dirname*) must be a directory. If there is already a directory or file with the same name as *name*, **mvdir** fails.

Neither name may be a sub-set of the other. For example, you cannot move a directory named **/x/y** to **/x/y/z**, and vice versa.

Notes

You must be *root* to use *mvdir*.

See Also

mkdir(C)

Name

ncheck - Generates names from inode numbers.

Syntax

ncheck [**-i** numbers] [**-a**] [**-s**] [filesystem]

Description

ncheck with no argument generates a pathname and inode number list of all files on the set of file systems specified in **/etc/mnttab**. The two characters "/." are appended to the names of directory files. The **-i** option reduces the report to only those files whose inode numbers follow. The **-a** option allows printing of the names **.** and **..**, which are ordinarily suppressed. The **-s** option reduces the report to special files and files with set-user-ID mode; it is intended to discover concealed violations of security policy. A single *filesystem* may be specified rather than the default list of mounted file systems.

Files

/etc/mnttab

See Also

fsck(ADM), sort(C)

Diagnostics

When the file system structure is improper, **??** denotes the "parent" of a parentless file and a pathname beginning with **...** denotes a loop.

Notes

See *Notes* under *mount*(ADM).

Name

netutil - Administers the Micnet network.

Syntax

netutil [option] [**-x**] [**-e**]

Description

The *netutil* command allows the user to create and maintain a network of XENIX machines. A Micnet network is a link through serial lines of two or more XENIX systems. It is used to send mail between systems with the *mail*(C) command, transfer files between systems with the *rcp*(C) command, and execute commands from a remote system with the *remote*(C) command.

The **netutil** command is used to create and distribute the data files needed to implement the network. It is also used to start and stop the network. The *option* argument may be any one of **install**, **save**, **restore**, **start**, **stop**, or the numbers 1 through 5 respectively. The **-x** option logs transmissions and the **-e** option logs errors. The **-x** and **-e** options work only when they are used in conjunction with **start**, **stop** or their decimal equivalents (4 and 5).

The **install** option interactively creates the data files needed to run the network. The **save** option saves these files on floppy or hard disks, allowing them to be distributed to the other systems in the network. If you save the micnet files to the hard disk, you can then use *uucp*(C) to transfer the files to the other machines. This option specifies the name of the backup device and prompts for whether this is the desired device to use. The user can specify an alternate device, including a file on the hard disk. The name of the default backup device is located in the file **/etc/default/micnet**. This can be changed depending on system configuration. The **restore** option copies the data files from floppy disk back to a system. The **start** option starts the network. The **stop** option stops the network. An *option* may also be any decimal digit in the range 1 to 5. If invoked without an *option*, the command displays a menu from which to choose one. Once an option is selected, it prompts for additional information if needed.

A network must be installed before it can be started. Installation consists of creating appropriate configuration files with the **install** option. This option requires the name of each machine in the network, the serial lines to be used to connect the machines, the speed of transmission for each line, and the names of the users on each machine. Once created, the files must be distributed to each computer in the network with the **save** and **restore** options. The network is started by using the **start** option on each machine in the network. Once started, mail and remote commands can be passed along the network. A record of the transmissions between computers in a network can be kept in the network log files. Installation of the network is described in the XENIX *System Administrator's Guide*.

Files

/bin/netutil
/etc/default/micnet

See Also

aliases(M), aliashash(ADM), mail(C), micnet(F), remote(C), rcp(C), systemid(F), top(F).

Name

pwadmin - Performs password aging administration.

Syntax

pwadmin [**-min** weeks **-max** weeks] options

Description

pwadmin is used to examine and modify the password aging information in the password file.

The options are as follows:

-d *user* Displays the password aging information for the user.

-f *user* Forces the user to change his password at the next login.

-c *user* Prevents the user from changing his password.

-a *user* Enables password aging for the given user. This option sets the minimum number of weeks that the user must wait before changing his password and the maximum number of weeks that a user can keep his current password to the values defined by the MINWEEKS and MAXWEEKS variables in the **/etc/default/passwd** file. If the file is not found or the defined values are not in the range 0 to 63, the default values 2 and 4 are used.

-n *user* Disables password aging for the user.

-min *weeks*
Enables password aging and sets the minimum number of weeks before a password can be changed.

-max *weeks*
Enables password aging and sets the number of weeks a password can be used.

Files

/etc/passwd

/etc/default/passwd

See Also

passwd(C), passwd(F)

Notes

The user must not attempt to force a new password by setting both the **-min** and **-max** values to zero. To force a password, use the **-f** option.

The user must not attempt to prevent further password changes by setting the **-min** value greater than the **-max** value. To prevent changes, use the **-c** option.

Name

restore, restor - Invokes incremental file system restorer.

Syntax

restore key [arguments]

restor key [arguments]

Description

restore is used to read archive media backed up with the *backup*(ADM) command.

The *key* specifies what is to be done. *Key* is one of the characters **cC**, **rR**, **tT**, or **xX** optionally combined with **k** and/or **f** or **F**. *restor* is an alternate spelling for the same command.

c,C
Verify (check) a dump tape. Used after a dump is made to make sure the tape has no I/O errors or bad checksums. **C** is the same as **c** except that it provides a higher level of checking.

f Uses the first *argument* as the name of the archive (backup device /dev/*) instead of the default.

F **F** is the number of the first file on the tape to read. All files up to that point are skipped.

k Follow this option with the size of the backup volume. This allows for reading multivolume dumps from media such as floppies.

r,R
The archive is read and loaded into the file system specified in *argument*. This should not be done lightly (see below). If the key is **R**, *restore* asks which archive of a multivolume set to start on. This allows *restore* to be interrupted and then restarted (an *fsck* must be done before the restart).

t Prints the date the archive was written and the date the file system was backed up.

T Prints a full listing of a dump tape. Similar to **t**.

x Each file on the archive named by an *argument* is extracted. The filename has all "mount" prefixes removed; for example, if **/usr** is a mounted file system, **/usr/bin/lpr** is named **/bin/lpr** on the archive. The extracted file is placed in a file with a numeric name supplied by *restore* (actually the inode number). In order to keep

the amount of archive read to a minimum, the following procedure is recommended:

1. Mount volume 1 of the set of backup archives.

2. Type the *restore* command with the appropriate key and arguments.

3. *restore* will check *dumpdir*, then announce whether or not it found the files, give the numeric name that it will assign to the file, and in the case of a tape, rewind to the start of the archive.

4. It then asks you to "mount the desired tape volume". Type the number of the volume you choose. On a multivolume backup, the recommended procedure is to mount the last through the first volumes, in that order. *restore* checks to see if any of the requested files are on the mounted archive (or a later archive, thus the reverse order). If the requested files are not there, *restore* doesn't read through the tape. If you are working with a single-volume backup or if the number of files being restored is large, respond to the query with **1** and *restore* will read the archives in sequential order.

X Same as **x** except that files are replaced in original location. When you use this option, omit the initial slash (/) in the filename on the *restore* command line.

The **r** option should only be used to restore a complete backup archive onto a clear file system, or to restore an incremental backup archive onto a file system so created. It should not be used to restore a backup archive onto the root file system. Thus:

```
/etc/mkfs /dev/hd1 10000
restore r /dev/hd1
```

is a typical sequence to restore a complete backup. Another *restore* can be done to get an incremental backup in on top of this.

A *backup* followed by a *mkfs* and a *restore* is used to change the size of a file system.

Files

rst*	Temporary files
/etc/default/restor	Name of default archive device

The default archive unit varies with installation.

Notes

It is not possible to successfully *restore* an entire active root file system.

Note also that *restore* may be unable to restore more than one filesystem from the tape devices */dev/nrct0* and */dev/nrct2*.

Diagnostics

There are various diagnostics involved with reading the archive and writing the disk. There are also diagnostics if the i-list or the free list of the file system is not large enough to hold the dump.

If the dump extends over more than one disk or tape, *restor* may ask you to change disks or tapes. Reply with a newline when the next unit has been mounted.

See Also

backup(ADM), dumpdir(ADM), fsck(ADM), mkfs(ADM), sddate(ADM)

Name

rmuser - Removes a user account from the system.

Syntax

/etc/rmuser

Description

rmuser removes users from the system. It begins by prompting for a user name; after receiving a valid user name as a response, it then deletes the named user's entry in the password file, and removes the user's mailbox file, the **.profile** file, and the entire home directory. It will also remove the users group entry in **/etc/group** if the user was the only remaining member of that group, and the group ID was greater than 50.

Before removing a user ID from the system, make sure its mailbox is empty and that all files belonging to that user ID have been saved or deleted as required.

The *rmuser* program will refuse to remove a user ID or any of its files if one or more of the following checks fails:

- The user name given is one of the "system" user names such as root, sys, sysinfo, cron, or uucp. All user IDs less than 200 are considered reserved for system use, and cannot be removed using *rmuser*. Likewise, all group IDs less than 50 are not removable using *rmuser*.

- The user's mailbox exists and is not empty.

- The user's home directory contains files other than **.profile .**

rmuser can only be executed by the super-user.

Files

/etc/passwd

/usr/spool/mail/*username*

$HOME

See Also

mkuser(ADM), backup(C)

Name

runbig - Runs a command that may require more memory than normal.

Syntax

runbig command [arguments]

Description

runbig executes commands that may require more memory than is normally available to a user process. While *runbig* is executing the specified *command*, it ignores the restriction on the default of memory available to the user process. The *command* will run normally until it grows to be larger than the amount of memory available to a user process. It is then locked in core memory and not swapped until it either exits or shrinks to a size less than or equal to the size of a default user process.

The removal of the process size restriction during execution of *runbig* will be preserved during an *exec*(S) system call, but not for a *fork*(S) system call.

See Also

exec(S), fork(S)

Notes

Running programs greater than the default process size, and therefore, possibly greater than the size of the disk swap area, may severely impact system performance.

runbig has no effect on systems whose memory size is much less than the size of the disk swap area.

Name

schedule - Database for automated system backups.

Description

The *schedule* database is used in conjunction with *fsphoto*(ADM) to partially automate system-wide backups. For each filesystem to be backed-up, a cyclical schedule of *backup*(ADM) levels is specified.

This cyclical schedule (or *cycle*) is a list of backup levels to perform (including no backup at all) and a pointer to the last-used element of that list. The pointer is advanced to the next element of the list on a regular basis (each time *fsphoto* is run, usually once per day), starting over at the beginning each time it falls off the end. It is advanced, however, only on success - the desired backup must have been successful.

Each entry in the file is on a separate line. Blank and comment lines (beginning with "#") may be placed anywhere. Several keywords are recognized:

site *sitename*
Sitename is passed to *fsave* as a description to place on each tape label. Usually, *sitename* is the name of the company or a building number.

media *drive* **k** *sizes...* [*format*]
Device *drive* is a floppy capable of handling volumes with any of the listed *sizes* (in kilobytes). If specified, *format* is the XENIX command used to format the described floppies. This also applies to standard cartridge tapes.

media *drive* **d** *density sizes...* [*format*]
Device *drive* is a *density* BPI magtape capable of handling tapes of any of the indicated *sizes* (in feet). Like floppies, *format* is the optional XENIX command used to format the described tape.

[**0-9**] *size savetime importance marker*
Description of each backup level, as described in *fsave*(ADM). The possible values are:

Level	Size	Savetime	Importance	Marker
0	-	"1 year"	critical	none
1	-	"3 months"	necessary	none
2...7	-	"1 month"	important	none
8	-	"2 weeks"	useful	none
9	-	"1 week"	precautionary	none

All four fields must be specified. On XENIX-386 distributions, only levels 0, 1, 2 and 3 are used in the default schedule file. On XENIX-286 distributions, levels 0, 1, 8 and 9 are used.

A *size* of - means to use the first size listed in the appropriate **media** *sizes* list.

Keywords should be placed before any filesystem backup schedules. A filesystem backup schedule is of the form:

/dev/rfilesys *cycle*
The filesystem resident on device **/dev/rfilesys** is to be backed-up according to *cycle*, which is a space-separated list of backup levels (the digits **0** to **9**, passed to *backup*), or the letter **x**, meaning no backup should occur. The specified device should be the raw (character) device associated with the filesystem.

A backup *cycle* must have at least one member, but it may be of any length. Different filesystems may have *cycles* of different lengths.

The default schedule file differs slightly under XENIX-286; the backup device is the floppy drive and the Schedule Table uses levels 0, 1, 8, and 9. Here is the default *schedule* file for XENIX-386:

```
# SYSTEM BACKUP SCHEDULE
site mymachine

# Media Entries
#
# 96 tpi 1.2 MB floppy 0
# media /dev/rfd096ds15 k 1200 format /dev/rfd096ds15
# 96 tpi 1.2 MB floppy 1
# media /dev/rfd196ds15 k 1200 format /dev/rfd196ds15
# 135 tpi 1.44 MB floppy 0
# media /dev/rfd0135ds18 k 1440 format /dev/rfd0135ds18
# 135 tpi 1.44 MB floppy 1
# media /dev/rfd1135ds18 k 1440 format /dev/rfd1135ds18
# Cartridge tape 1
media /dev/rct0 k 60000 125000 150000 tape erase
# Mini cartridge drive (10MB)
# media /dev/rctmini k 8800 format /dev/rctmini
# Mini cartridge drive (20MB)
# media /dev/rctmini k 17200 format /dev/rctmini
# Mini cartridge drive (40MB)
# media /dev/rctmini k 37500 format /dev/rctmini
# 9-track tape drive
# media /dev/rmt0 d 1600 2400 1200 600
# Backup Descriptor Table
#   Backup   Vol.   Save for     Vitality        Label
#   level    size   how long    (importance)    marker
```

```
    0       -       "1 year"      critical        "a red sticker"
    1       -       "4 months"    necessary       "a yellow sticker"
    2       -       "3 weeks"     useful          "a blue sticker"
    3       -       "1 week"      precautionary   none

# Schedule Table
#             1 2 3 4 5   6 7 8 9 0   1 2 3 4 5   6 7 8 9 0
# Filesystem  M T W T F   M T W T F   M T W T F   M T W T F
/dev/rroot    0 x 3 x 3   2 x 3 x 3   1 x 3 x 3   2 x 3 x 3
/dev/ru       3 0 3 3 3   3 2 3 3 3   3 1 3 3 3   3 2 3 3 3
```

/dev/rroot is backed-up using a level 0 backup the first time *fsphoto* is run (on a Monday), and if that backup is successful, the next (second) time it runs (Tuesday), no backup is performed. If doing nothing is successful, the third time (Wednesday) a level 3 backup occurs. If that backup succeeds, no backup occurs the fourth time (Thursday), but the fifth time *fsphoto* is run (Friday), a level 3 backup is made.

Each time a successful backup at the specified level happens, the pointer advances so that the next run of *fsphoto* (on the next weekday) will do the next backup scheduled for that filesystem. If however, a backup fails (or is interrupted or postponed by the operator) the pointer is not advanced; hence, the next time *fsphoto* is attempted, the same level backup will again be tried so the sequence will not be broken (but the timing may be off).

The larger and more rapidly changing filesystem **/dev/ru** is backed-up more frequently (each time *fsphoto* is run - once a day - instead of every other time), and the levels used are staggered to prevent having to perform two full-scale backups (like levels 0 or 1) of the large filesystems on the same day. The backup cycle period is also shorter, two weeks instead of four.

See Also

fsphoto(ADM), fsave(ADM), backup(ADM)

Notes

Keywords and filesystem names must not be preceded by any spaces or tabs.

It is not necessary to specify the name of the "raw" (/dev/*r**) device for each filesystem, but the backups are faster if this is done.

Name

scopatch - Applies kernel patches.

Syntax

/etc/scopatch patchfile

Description

scopatch applies a kernel patch named *patchfile* found in **/usr/lib/scopatch**. Any patches applied are added to *hdinstall*(ADM) to ensure that they are retained in subsequent relinks.

A list of current patches available is contained in the *Release Notes*.

Notes

This utility only applies to XENIX-386 distributions.

Files

/usr/lib/scopatch	Patch source directory
/usr/lib/patchlog	Patch log file

See Also

hdinstall(ADM)

Name

sddate - Prints and sets backup dates.

Syntax

sddate [name lev date]

Description

If no argument is given, the contents of the backup date file **/etc/ddate** are printed. The backup date file is maintained by *backup*(ADM) and contains the date of the most recent backup for each backup level for each filesystem.

If arguments are given, an entry is replaced or made in **/etc/ddate.** *name* is the last component of the device pathname, *lev* is the backup level number (from 0 to 9), and *date* is a time in the form taken by *date*(C):

mmddhhmm[yy]

Where the first *mm* is a two-digit month in the range 01-12, *dd* is a two-digit day of the month, *hh* is a two-digit military hour from 00-23, and the final *mm* is a two-digit minute from 00-59. An optional two-digit year, *yy,* is presumed to be an offset from the year 1900, i.e., 19*yy*.

Some sites may wish to back up file systems by copying them verbatim to backup media. *sddate* could be used to make a "level 0" entry in **/etc/ddate**, which would then allow incremental backups.

For example:

sddate rhd0 5 10081520

makes an **/etc/ddate** entry showing a level 5 backup of **/dev/rhd0** on October 8, at 3:20 PM.

Files

/etc/ddate

See Also

backup(ADM), restore(ADM), date(C)

Diagnostics

bad conversion If the date set is syntactically incorrect.

Name

setclock - Sets the system real-time (time of day) clock.

Syntax

setclock [time]

Description

The **setclock** file sets the battery-powered, real-time time of day clock to the given *time*. If *time* is not given, the current contents of the battery-powered clock are displayed. The *time* must be a combination of digits with the form:

MMddhhmmyy

where *MM* is the month, *dd* is the day, *hh* is the hour, *mm* is the minute, and *yy* is the last two digits of the year. If *yy* is not given, it is taken from the current system time. For example, the command:

082615092

sets the time of day clock to 15:03 on August 26, 1992.

Files

/etc/setclock

See Also

clock(F)

Notes

Not all computers have battery-powered real-time time of day clocks. Refer to your computer's hardware reference manual.

Name

setmnt - Establishes /etc/mnttab table.

Syntax

/etc/setmnt

Description

setmnt creates the **/etc/mnttab** table (see *mnttab*(F)), which is needed for both the *mount*(ADM) and *umount*(ADM) commands. *setmnt* reads the standard input and creates a *mnttab* entry for each line. Input lines have the format:

filesys node

where *filesys* is the name of the file system's *special file* (e.g., "hd0") and *node* is the root name of that file system. Thus *filesys* and *node* become the first two strings in the *mnttab*(F) entry.

Files

/etc/mnttab

See Also

mnttab(F)

Notes

If *filesys* or *node* are longer than 128 characters, errors can occur.

setmnt silently enforces an upper limit on the maximum number of *mnttab* entries.

setmnt is normally invoked by **/etc/rc** when the system boots up.

Name

settime - Changes the access and modification dates of files.

Syntax

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

sfmt - Performs special formatting.

Syntax

/etc/sfmt *device_name*

Description

The *sfmt* command performs a low-level formatting, initializes non-standard disk parameters, and performs initial processing of manufacturer-supplied defect lists of the disk *device_name*. *device_name* should be the character-special device representing the whole disk, for example, */dev/rhd10*.

The *sfmt* command must be issued from the Boot: prompt, and should be used only if the "type=E" banner appears during power-up.

Low-level disk formatting is usually performed on bundled systems before delivery. If this formatting has not been done, you must format the disk before installing it. You must know the hard disk parameters before you invoke *sfmt*.

Files

/dev/rhd?0

Name

shutdown - Terminates all processing.

Syntax

/etc/shutdown [time] [su]

Description

The primary function of *shutdown* is to terminate all currently running processes in an orderly and cautious manner. *shutdown* goes through the following steps:

1. All users logged on the system are notified to log off the system by a broadcast message.

2. **/etc/init** is called to perform the the actual shutdown.

the *time* argument is the number of minutes before a shutdown will occur. The optional *su* argument lets the user go single-user, without completely shutting down the system.

You must be super-user to execute the *shutdown* command.

See Also

sync(ADM), umount(ADM), wall(ADM), boot(HW)

Diagnostics

The most common error diagnostic that will occur is *device busy*. This diagnostic appears when a particular file system could not be unmounted. See *umount*(ADM).

Notes

Once *shutdown* has been invoked, it must be allowed to run to completion and must *not* be interrupted by pressing BREAK or DEL.

shutdown does not work when executed from within a shell layer.

shutdown locks the hard disk heads.

Name

sync - Updates the super-block.

Syntax

sync

Description

sync executes the *sync* system primitive. If the system is to be stopped, *sync* must be called to ensure file system integrity. Note that *shutdown* (ADM) automatically calls *sync* before shutting down the system.

See Also

sync(S)

Name

sysadmin - Performs file system backups and restores files.

Syntax

/etc/sysadmin

Description

sysadmin is a utility for performing filesystem backups and for restoring files from backup volumes, and includes several options. Its main function is to act as a front-end for the *fsphoto*(ADM) utility, which performs backups according to an established schedule. Depending on the day of the week, a daily incremental backup (level 9), or a periodic full backup (level 0) is automatically selected. *sysadmin* can also be invoked to do an unscheduled backup. It can provide a listing of the files backed up and also has facilities for restoring individual files and complete filesystems from backups.

The main *sysadmin* menu appears as follows:

Filesystem Maintenance Options

1. Perform a scheduled backup
2. Perform an unscheduled backup
3. List the contents of an archive
4. Restore backed up file(s)
5. Restore an entire filesystem
6. Check backup archive integrity

Enter an option or enter q to quit:

Any supported archive medium may be used to create backups. Any filesystem may be backed up. Menus of these devices are created for each option from the files **/tmp/backup.list**, **/etc/default/archive**, and **/etc/default/filesys**.

You must be the super-user to use this program.

Files

/tmp/backup.list
/etc/default/archive
/etc/default/filesys

See Also

fsphoto(ADM), mkfs(ADM), backup(C), dumpdir(C), restore(C), archive(F), filesys(F)

Notes

/tmp/backup.list, **/etc/default/archive** and **/etc/default/filesys** may be edited to add devices, or to delete entries for devices that are no longer used.

Warning

You should never backup more than one filesystem to the tape devices */dev/nrct0* and */dev/nrct2*. This is because, although *backup* can write more than one filesystem to */dev/nrct0* or */dev/nrct2*, *restore* may not be able to restore more than one filesystem from these devices.

You must also be sure to close the floppy door when inserting floppy disks during a backup. If you fail to do so in a multi-floppy backup, the entire backup will fail and you will have to begin again.

Name

sysadmsh - Menu driven system administration utility

Syntax

sysadmsh

Description

sysadmsh is an easy-to-use menu interface designed to provide novice users with the tools needed for day-to-day system administration of the XENIX system.

WARNING: *sysadmsh* does not replace the XENIX documentation. It provides an overview of available system administration features and a reminder of tasks which need to be performed regularly. An understanding of the XENIX *Installation Guide,* the XENIX *System Administrator's Guide,* and the XENIX *User's Guide* is necessary to use *sysadmsh.*

Usage

To use this utility enter:

sysadm

at the login prompt. This sets your login shell to be the *sysadmsh* menu hierarchy. You may access many useful commands and submenus, all presented in simple, descriptive terms.

Alternately, *sysadmsh* menus may also be invoked by logging in as the super-user (root) and entering:

sysadmsh

at the shell prompt.

Once you are in *sysadmsh,* on-line instructions for its use may be obtained by selecting the **<F1>** key.

Some *sysadmsh* options must be run from the system console device. Some options must be run while in single user (system maintenance) mode. Check the documentation manual page referenced by the menu selection for more information.

Files

See Also

XENIX System Administrator's Guide
XENIX User's Guide
XENIX Installation Guide

acctcom(ADM), accton(ADM), alias(M), asktime(ADM), at(C), badtrk(ADM), checklist(F), chgrp(C), chmod(S), chown(C), configure(ADM) copy(C), cron(C), csh(C), custom(ADM), df(C), diff(C), dircmp(C), disable(C), diskcmp(C), diskcp(C), dmesg(ADM), dos(C), dtype(C), du(C), enable(C), fdisk(ADM), find(C), finger(C), fixperm(ADM), format(C), fsck(ADM), fstab(F), grpcheck(C), init(M), kill(C), login(M), lp(C), lpadmin(ADM), lpinit(ADM), lpstat(C), mail(C), mkdev(ADM), mkuser(ADM), more(C), mount(ADM), netutil(ADM), ps(C), pwadmin(ADM), pwcheck(C), quot(C), rmuser(ADM), shutdown(ADM), sysadmin(ADM), systemid(F), tar(C), ttys(F), umount(ADM), uuinstall(ADM), vi(C), wall(ADM), who(C), write(C)

Notes

A knowledge of *vi*(C) is assumed for file edit selections, although the SCO Lyrix® editor is used when available.

Acknowledgements

This utility takes its design from the SCO Lyrix Word Processing System.

Name

telinit, mkinittab - Alternative method of turning terminals on and off.

Syntax

telinit state
mkinittab [ttysfile]...

Description

telinit directs the actions of *init*(M). It is an alternative to using *enable*(C) and *disable*(C) to allow and disallow logins on terminals.

telinit generates a new **/etc/ttys** file from the **/etc/inittab** file. Only those lines from *inittab*(F) which apply in *state* are converted to their *ttys*(F) equivalent. *init* is then signaled to allow or disallow logins on terminals according to **/etc/ttys**.

The recognized *state* arguments are:

0-6
Generate **/etc/ttys** using the lines in **/etc/inittab** which apply to the specified *state*.

q, Q
Do not generate a new **/etc/ttys** file, but signal *init* to examine the existing **/etc/ttys** file.

s, S
Signal *init* to enter System Maintenance (single-user) mode.

Only the superuser can run *telinit*. Users currently logged onto terminals that are disabled are abruptly killed. Logins are not allowed on terminals not listed in **/etc/ttys**.

mkinittab writes on the standard output an *inittab*-format file generated from the specified *ttysfiles*. Each *ttysfile* must be in *ttys* format. If no *ttysfile* is specified, the standard input is read.

Files

/etc/ttys

/etc/inittab

See Also

disable(C), enable(C), getty(M), init(M), inittab(F), login(M), ttys(F)

Notes

inittab is provided for users more familiar with the *telinit* approach to terminal administration, as opposed to the standard XENIX *enable* and *disable* approach.

Name

umount - Dismounts a file structure.

Syntax

/etc/umount special-device

Description

umount announces to the system that the removable file structure previously mounted on device *special-device* is to be removed. Any pending I/O for the file system is completed, and the file structure is flagged clean. For a detailed explanation of the mounting process, see *mount*(ADM).

Files

/etc/mnttab Mount table

See Also

mount(ADM), mount(S), mnttab(F)

Diagnostics

device busy	An executing process is using a file on the named filesystem, often caused by a user working in the filesystem.

Name

uucheck - Checks the uucp directories and permissions file.

Syntax

/usr/lib/uucp/uucheck [**-v**] [**-x** debug_level]

Description

uucheck checks for the presence of the *uucp* system required files and directories. It also checks for some obvious errors in the Permissions file (**/usr/lib/uucp/Permissions**). When executed with the **-v** option, it gives a detailed explanation of how the uucp programs will interpret the Permissions file. The **-x** option is used for debugging. *debug-option* is a single digit in the range 1-9; the higher the value, the greater the detail.

Note that *uucheck* can only be used by the super-user or *uucp*.

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/Permissions
/usr/lib/uucp/Devices
/usr/lib/uucp/Maxuuscheds
/usr/lib/uucp/Maxuuxqts
/usr/spool/uucp/*
/usr/spool/uucppublic/*

See Also

uucico(ADM), uusched(ADM), uucp(C), uustat(C), uux(C)

Notes

The program does not check file/directory modes or some errors in the Permissions file such as duplicate login or machine name.

Name

uucico - File transport program for the UUCP system.

Syntax

/usr/lib/uucp/uucico [**-r** role_number] [**-x** debug_level]
[**-i** interface] [**-d** spool_directory] [**-s**] [**-S**] system_name

Description

uucico is the file transport program for *uucp* work file transfers. Role numbers for **-r** are the digit 1 for master mode or 0 for slave mode (default). The **-r** option should be specified as the digit 1 for master mode when *uucico* is started by a program or *cron*. *uux* and *uucp* both queue jobs that will be transferred by *uucico*. It is normally started by the scheduler, *uusched* , but can be started manually; this is done for debugging. For example, the shell *uutry* starts *uucico* with debugging turned on. The **-x** option specifies the level of debugging (1-9), with 9 displaying the most information.

The **-i** option defines the interface used with *uucico*. This interface only affects slave mode. Known interfaces are UNIX (default), TLI (basic Transport Layer Interface), and TLIS (Transport Layer Interface with Streams modules, read/write); only the default, UNIX, is applicable in this release.

The **-d** option can be used to specify the **spool** directory: the default is **/usr/spool/uucp**.

If **-s** is specified, a call to the specified site is made even if there is no work for site *sitename* in the spool directory, but the call is made only when times in the **Systems** file permit it. This is useful for polling sites that do not have the hardware to initiate a connection.

The **-S** option can be used to specify the system name, overriding the call schedule given in the **Systems** file. For example, **-S** can be used to call a system which is listed as "Never" to be called in the *Systems* file.

Changing Packet Parameters

An additional feature is the ability to change two specialized parameters contained in the *uucico* program without having to recompile the source. (The *uucico* binary is provided unstripped so that patches can be applied using *scopatch*(ADM). The first is a parameter called **windows**, which specifies the size of window that the sliding-window protocol should use (how many packets it can send before getting any ack/nack's from the remote site). **windows** can be changed using the

following command:

scopatch windows

You are prompted for the new value. In addition, the parameter **pktime** can be altered. This is the number of seconds *uucico* should wait before giving up and re-transmitting the packet being sent sent. This interval can be as long as 35 seconds, which can be costly with overseas phone connections. **pktime** can be changed in same way as **windows** by using **pktime** as the argument to the *scopatch* command. You are prompted for a new value for the parameter.

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/Permissions
/usr/lib/uucp/Devices
/usr/lib/uucp/Maxuuxqts
/usr/lib/uucp/Maxuuscheds
/usr/spool/uucp/*
/usr/spool/uucppublic/*

See Also

scopatch(ADM), uusched(ADM), uutry(ADM), cron(C), uucp(C), uustat(C), uux(C)

Name

uuclean - UUCP spool directory clean-up.

Syntax

/usr/lib/uucp/uuclean [**-C**time] [**-D**time] [**-W**time] [**-X**time] [**-m**string] [**-o**time] [**-s**system] [**-x**debug_level]

Description

uuclean will scan the UUCP spool directories for old files and take appropriate action to remove them in a useful way:

Inform the requestor of send/receive requests for systems that cannot be reached.

Return mail, which cannot be delivered, to the sender.

Delete or execute *rnews* for *rnews* type files (depending on where the news originated--locally or remotely).

Remove all other files.

In addition, there is provision to warn users of requests that have been waiting for a given number of days (default 1). Note that *uuclean* will process as if all option *times* were specified to the default values unless *time* is specifically set.

The following options are available.

-C*time* Any **C.** files greater or equal to *time* days old will be removed with appropriate information to the requestor. (default 7 days)

-D*time* Any **D.** files greater or equal to *time* days old will be removed. An attempt will be made to deliver mail messages and execute rnews when appropriate. (default 7 days)

-W*time* Any **C.** files equal to *time* days old will cause a mail message to be sent to the requestor warning about the delay in contacting the remote. The message includes the *JOBID*, and in the case of mail, the mail message. The administrator may include a message line telling whom to call to check the problem (**-m** option). (default 1 day)

-X*time* Any **X.** files greater or equal to *time* days old will be removed. The **D.** files are probably not present (if they were, the **X.** could get executed). But if there are **D.** files,

they will be taken care of by D. processing. (default 2 days)

-m*string* This line will be included in the warning message generated by the **-W** option. The default line is "See your local administrator to locate the problem".

-o*time* Other files whose age is more than *time* days will be deleted. (default 2 days)

-s*system* Execute for *system* spool directory only.

-x*debug_level*
The **-x** debug level is a single digit between 0 and 9; higher numbers give more detailed debugging information.

This program is typically started by the shell *uudemon.clean*, which should be started by *cron*(C). *uuclean* can only be executed by the super user or uucp.

Files

/usr/lib/uucp	directory with commands used by *uuclean* internally
/usr/spool/uucp	spool directory

See Also

cron(C), uucp(C), uux(C).

Name

uudemon: uudemon.admin, uudemon.clean, uudemon.hour, uudemon.poll, uudemon.poll2 - UUCP administrative scripts.

Description

UUCP communications and file maintenance can be automated with the use of the **uudemon.hour**, **uudemon.poll**, **uudemon.poll2**, **uudemon.admin**, and **uudemon.clean** shell scripts. While in multi-user mode, **cron** scans files in **/usr/spool/cron/crontabs** once each minute for entries to execute at this time. An example crontabs file, *crontab.eg*, is provided to activate these daemons. The system administrator should copy these from **/usr/lib/uucp** to **/usr/spool/cron/crontabs/uucp**. To do this, log in as user **uucp**, edit the **crontab.eg** file to make any changes, and then enter the following command:

crontab crontab.eg

This will replace the original crontab entry.

uudemon.admin

The **uudemon.admin** shell script, as delivered, runs the **uustat** command with **-p** and **-q** options. The **-q** reports on the status of work files (C.), data files (D.), and execute files (X.) that are queued. The **-p** prints process information for networking processes listed in the lock files (/usr/spool/locks). It sends resulting status information to the UUCP administrative login (**uucp**) via mail.

The default crontab entry for **uudemon.admin** is:

```
48 10,14 * * 1-5 /bin/su uucp -c \
        "/usr/lib/uucp/uudemon.admin" > /dev/null
```

This runs daily at 10:48 AM and 2:48 PM.

uudemon.clean

The **uudemon.clean** shell script, as delivered, takes log files for individual machines from the /usr/spool/.Log directory, merges them, and places them in the /usr/spool/.Old directory with other old log information. If log files get large, the ulimit may need to be increased. It also removes work files (C.) 7 days or older, data files (D.) 7 days old or older, and execute files (X.) 2 days old or older from the spool files. **uudemon.clean** mails a summary of the status information gathered during the current day to the UUCP administrative login (uucp).

The default crontab entry for **uudemon.clean** is:

```
45 23 * * * ulimit 5000; /bin/su uucp -c \
      "/usr/lib/uucp/uudemon.clean" > /dev/null
```

This runs daily at 11:45 PM.

uudemon.hour

The **uudemon.hour** shell script calls the **uusched** program to search the spool directories for work files (C.) that have not been processed and schedules these files for transfer to a remote machine. It then calls the **uuxqt** daemon to search the spool directories for execute files (X.) that have been transferred to your computer and were not processed at the time they were transferred.

This is the default root *crontab* entry for **uudemon.hour :**

```
39,9 * * * * /usr/lib/uucp/uudemon.hour > /dev/null
```

This script runs twice per hour (at 39 and 9 minutes past).

uudemon.poll

uudemon.poll uses the **Poll** (or the alternative **Poll.hour** and **Poll.day**) file (see *poll*(F)) for polling remote computers. The **uudemon.poll** script controls polling but does not actually perform the poll. It merely sets up a polling file (**C.sysnxxxx**) in the /usr/spool/uucp/*nodename* directory, where *nodename* is replaced by the name of the machine. This file will in turn be acted upon by the scheduler (started by **uudemon.hour**). The **uudemon.poll** script is scheduled to run twice an hour just before **uudemon.hour** so that the work files will be there when **uudemon.hour** is called. The default root crontab entry for **uudemon.poll** is as follows:

```
1,30 * * * * "/usr/lib/uucp/uudemon.poll > /dev/null"
```

This runs twice per hour (at 1 and 30 minutes past). **uudemon.poll2** is an alternative to **uudemon.poll**, which uses a different scheme and different poll files. Listing a site in the **Poll** file gives you control over the lower bound on number-of-calls-per-day (at least as many as you specify in **Poll**), but still no control on the upper bound. (This is because **uudemon.poll** uses the the time field of the **Systems** file, which is not suited to the purposes of polling). **uudemon.poll2** permits much more precise control of scheduling. To use **uudemon.poll2**, you must remove the call to *uusched* from **uudemon.hour**, and run **uudemon.poll2** in place of **uudemon.poll** from *cron*.

uudemon.poll2 reads **Poll.hour** (or **Poll.day** if called with the **-d** option) to determine whom to poll much like **uudemon.poll**, but calls *uucico* directly, using the **-S** option, thus overriding the time field of the **Systems** file.

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/uudemon.admin
/usr/lib/uucp/uudemon.clean
/usr/lib/uucp/uudemon.hour
/usr/lib/uucp/uudemon.poll
/usr/lib/uucp/uudemon.poll2
/usr/lib/uucp/Poll
/usr/lib/uucp/Poll.hour
/usr/lib/uucp/Poll.day

See Also

uusched(ADM) uucico(ADM), uuclean(ADM), cron(C), uucp(C), poll(F), systems(F)

Name

uuinstall - Administers UUCP control files.

Syntax

/etc/uuinstall [-r]

Description

The *uuinstall* program is used to manage the content of the control files used by the *uucp* communications system. It allows the user to change the contents of these files without using a text editor. The user need not know the detailed format of each of the control files, although he must be familiar with the function of the various fields within the files. These details are explained in the XENIX *System Administrator's Guide* .

The *uuinstall* program can only be executed by the super-user. When invoked with the optional **-r** flag, *uuinstall* will not allow any of the files to be modified whether or not the user has made changes to the files.

If *uuinstall* finds any of the required **uucp** control files missing from the system, it will create them with the correct access permissions and ownership.

Files

/etc/systemid
/usr/lib/uucp/Systems
/usr/lib/uucp/Permissions
/usr/lib/uucp/Devices

See Also

mkuser(ADM)

Name

uusched - The scheduler for the uucp file transport program.

Syntax

/usr/lib/uucp/uusched [**-x** debug_level] [**-u** debug_level]

Description

uusched is the *uucp* file transport scheduler. It is usually started by the daemon *uudemon.hour* that is started by *cron*(C) from an entry in */usr/spool/cron/crontabs/root*:

39,9 * * * * /bin/su uucp -c "/usr/lib/uucp/uudemon.hour" > /dev/null

The two options are for debugging purposes only; **-x** *debug_level* will output debugging messages from *uusched* and **-u** *debug_level* will be passed as **-x** *debug_level* to *uucico*. The *debug_level* is a number between 0 and 9; higher numbers give more detailed information.

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/Permissions
/usr/lib/uucp/Devices
/usr/lib/uucp/Maxuuscheds
/usr/spool/uucp/*
/usr/spool/uucppublic/*

See Also

uucico(ADM), cron(C), uucp(C), uustat(C), uux(C).

Name

uutry - Tries to contact remote system with debugging on.

Syntax

/usr/lib/uucp/uutry [**-x** debug_level] [**-r**] system

Description

The **uutry** program is a shell script that invokes *uucico* to call a remote site. Debugging is automatically enabled at default level 5; **-x** overrides this value. If **uutry** successfully connects to the remote system, **uutry** stores the debugging output in the file */tmp/system*, where *system* is the name of the remote system. In addition, **uutry** uses *tail* **-f** to print the last 10 lines of the debugging output to the standard output.

To break out of the shell created by **uutry** , press DELETE or BREAK . This returns control to the terminal while *uucico* continues to run, sending the output to **/tmp/***system.*

The **-r** option overrides the retry time in the **Systems** file.

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/Permissions
/usr/lib/uucp/Devices
/usr/lib/uucp/Maxuuscheds
/usr/lib/uucp/Maxuuxqts
/usr/spool/uucp/*
/usr/spool/uucppublic/*
/tmp/*system*

See Also

uucico(ADM), uucp(C), uux(C).

Name

uuxqt - Executes remote command requests.

Syntax

/usr/lib/uucp/uuxqt [**-s** system] [**-x** debug_level]

Description

uuxqt is the program that executes remote job requests from remote systems generated by the use of the *uux* command. (*Mail* uses *uux* for remote mail requests). *uuxqt* searches the spool directories looking for *X.* files. For each *X.* file, *uuxqt* checks to see if all the required data files are available and accessible, and file commands are permitted for the requesting system. The *Permissions* file is used to validate file accessibility and command execution permission.

There are two environment variables that are set before the *uuxqt* command is executed:

UU_MACHINE is the machine that sent the job (the previous one).

UU_USER is the user that sent the job.

These can be used in writing commands that remote systems can execute to provide information, auditing, or restrictions.

The **-x** *debug_level* is a single digit between 0 and 9. Higher numbers give more detailed debugging information.

Files

/usr/lib/uucp/Permissions
/usr/lib/uucp/Maxuuxqts
/usr/spool/uucp/*

See Also

uucico(ADM), uucp(C), uustat(C), uux(C), mail(C).

Name

wall - Writes to all users.

Syntax

/etc/wall

Description

wall reads a message from the standard input until an end-of-file. It then sends this message to all users currently logged in preceded by "Broadcast Message from ...". *wall* is used to warn all users, for example, prior to shutting down the system.

The sender should be super-user to override any protections the users may have invoked.

Files

/dev/tty*

See Also

mesg(C), write(C)

Diagnostics

Cannot send to ...	The open on a user's tty file has failed.

Contents

Commands (C)

cu	Calls another XENIX system.
date	Prints and sets the date.
dc	Invokes an arbitrary precision calculator.
dd	Converts and copies a file.
devnm	Identifies device name.
df	Reports number of free disk blocks.
diff	Compares two text files.
diff3	Compares three files.
dircmp	Compares directories.
dirname	Delivers directory part of pathname.
disable	Turns off terminals and printers.
diskcp, diskcmp	Copies or compares floppy disks.
dos, doscat, doscp, dosdir, dosformat, dosls, dosmkdir, dosrm, dosrmdir	Accesses DOS files.
dtype	Determines disk type.
du	Summarizes disk usage.
echo	Echoes arguments.
ed	Invokes the ed text editor.
enable	Turns on terminals and line printers.
env	Sets or dsiplays environment for command execution.
ex	Invokes the ex text editor.
expr	Evaluates arguments as an expression.
factor	Factor a number.
false	Returns with a nonzero exit value.
file	Determines file type.
find	Finds files.
finger	Finds information about users.
fixhdr	Changes executable binary file headers.
format	Formats floppy disks.
getopt	Parses command options.
grep, egrep, fgrep	Searches a file for a pattern.
grpcheck	Checks group file.
hd	Displays files in hexadecimal format.
hdr	Displays selected parts of an object file.
head	Prints the first few lines of a stream.
hello	Sends a message to another user.
help	Asks for help with UNIX commands and SCCS error messages.
hwconfig	Displays hardware configuration information.
id	Prints user and group IDs and names.

join	Joins two relations.
kill	Terminates a process.
ksh, rksh	KornShell, a command and programming language.
last	Indicate last logins of users and teletypes.
line	Reads one line.
ln	Makes a link to a file.
lock	Locks a user's terminal.
logname	Gets login name.
lp, lpr, cancel	Sends/cancels requests to lineprinter.
lprint	Prints to a printer attached to the user's terminal.
lpstat	Prints lineprinter status information.
ls, l, lc	Gives information about contents of directories.
mail	Sends, reads, or disposes of mail.
man	Prints reference pages in this guide.
mesg	Permits or denies messages sent to a terminal.
mkdir	Makes a directory.
mknod	Builds special files.
mnt	Mounts a filesystem.
more	Views a file one screen full at a time.
mv	Moves or renames files.
newform	Changes the format of a text file.
newgrp	Logs users into a new group.
news	Print news items.
nice	Runs a command at a different priority.
nl	Adds line numbers to a file.
nm	Prints name list.
nohup	Runs a command immune to hangups and quits.
od	Displays files in octal format.
pack, pcat, unpack	Compresses and expands files.
passwd	Changes login password.
pax	Portable archive exchange.
pcpio	Copy file archives in and out.
pg	Paginates display for soft-copy terminals.
pr	Prints files on the standard output.
ps	Reports process status.
pstat	Reports system information.
ptar	Process tape archives.
pwcheck	Checks password file.
pwd	Prints working directory name.
quot	Summarizes file system ownership.
random	Generates a random number.
ranlib	Converts archives to random libraries.
rcp	Copies files across XENIX systems.

remote	Executes commands on a remote XENIX system.
rm, rmdir	Removes files or directories.
rsh	Invokes a restricted shell (command interpreter).
sdiff	Compares files side-by-side.
sed	Invokes the stream editor.
setcolor	Sets screen color.
setkey	Assigns the function keys.
sh	Invokes the shell command interpreter.
shl	Manages shell layers.
size	Prints the size of an object file.
sleep	Suspends execution for an interval.
sort	Sorts and merges files.
split	Splits a file into pieces.
strings	Finds the printable strings in an object file.
stty	Sets the options for a terminal.
su	Makes the user a super-user or another user.
sum	Calculates checksum and counts blocks in a file.
tail	Delivers the last part of a file.
tape	Maintains tape drives
tapedump	Dumps magnetic tape to output file.
tar	Archives files.
tee	Creates a tee in a pipe.
test	Tests conditions.
tic	Compiles terminfo descriptions.
tid	Decompiles terminfo descriptions.
touch	Updates access and modification times of a file.
tput	Queries the terminfo database.
tr	Translates characters.
translate	Translates files from one format to another.
true	Returns with a zero exit value.
tset	Sets terminal modes.
tty	Gets the terminal's name.
umask	Sets file-creation mode mask.
uname	Prints the name of the current XENIX system.
uniq	Reports repeated lines in a file.
units	Converts units.
uptime	Displays information about the system activity.
usemouse	Maps mouse input to keystrokes for use with non-mouse based programs.
uucp, uulog, uuname	Copies files from XENIX to XENIX.
uuencode, uudecode	Encodes/decodes a binary file for transmission via mail

uustat	Displays UUCP status and controls UUCP jobs.
uuto, uupick	Copies files across UUCP network.
uux	Executes command on remote XENIX.
vi, view, vedit	Invokes a screen-oriented display editor.
vidi	Sets the font and video mode for a video device.
vmstat	Reports virtual memory statistics.
vsh	Menu-driven visual shell.
w	Displays information about who is on the system and what they are doing.
wait	Awaits completion of background processes.
wc	Counts lines, words and characters.
what	Identifies files.
who	Lists who is on the system.
whodo	Determines who is doing what.
write	Writes to another user.
xargs	Constructs and executes commands.
yes	Prints string repeatedly.

Name

intro - Introduces XENIX commands.

Description

This section describes use of the individual commands available in the XENIX Operating System. Each individual command is labeled with either a C, a CP, or a CT for easy reference from other volumes. The letter "C" stands for "command". The letters "P" and "T" stand for commands that come with the optional XENIX Development System (Programming) and the XENIX Text Processing System, respectively. For example, the reference *date*(C) indicates a reference to a discussion of the **date** command in the C section; the reference *cc*(CP) indicates a reference to a discussion of the **cc** command in the XENIX Development System; and the reference *spell*(CT) indicates a reference to a discussion of the **spell** command in the XENIX Text Processing System. The Text Processing and Development Systems are optional supplemental packages to the standard Operating System.

The "M" Miscellaneous section contains miscellaneous information including a great deal of system maintenance information. Other reference sections include the "S" System Services section, the "DOS" Routines section, the "F" File Format section, and the "ADM" sysem administration section.

Syntax

Unless otherwise noted, commands described in this section accept options and other arguments according to the following syntax:

name [*option*(*s*)] [*cmdarg*(*s*)]

where:

name	Is the name of an executable file.
option	- *noargletter*(*s*) or, - *argletter*<>*optarg* where <> is optional whitespace.
noargletter	Is a single letter representing an option without an argument.
argletter	Is a single letter representing an option requiring an argument.

optarg Is an argument (character string) satisfying preceding *argletter*.

cmdarg Is a pathname (or other command argument) *not* beginning with **-.** - by itself usually indicates the standard input.

See Also

getopt(C), getopt(S)

Diagnostics

Upon termination, each command returns 2 bytes of status, one supplied by the system and giving the cause for termination, and (in the case of "normal" termination) one supplied by the program (see *wait*(S) and *exit*(S)). The former byte is 0 for normal termination; the latter is customarily 0 for successful execution and nonzero to indicate troubles such as erroneous parameters, bad or inaccessible data. It is called variously "exit code", "exit status", or "return code", and is described only where special conventions are involved.

Notes

Not all commands adhere to the syntax described here.

Name

accept, reject - Allows/prevents print requests to a lineprinter or class of printers.

Syntax

/usr/lib/accept destinations
/usr/lib/reject [**-r**[reason]] destinations

Description

accept allows *lp*(C) to accept requests for the named *destinations*. A *destination* can be either a printer or a class of printers. Use *lpstat*(C) to find the status of *destinations*.

reject prevents *lp*(C) from accepting requests for the named *destinations*. A *destination* can be either a printer or a class of printers. Use *lpstat*(C) to find the status of *destinations*. The following option is useful with *reject*:

-r[*reason*] Associates a *reason* with disabling (using *disable (C)) the printer. The reason* applies to all printers listed up to the next **-r** option. If the **-r** option is not present or the **-r** option is given without a *reason,* then a default *reason* is used. *Reason* is reported by *lpstat(C).* Please see *disable(C)* for an example of *reason* syntax.

Files

/usr/spool/lp/*

See Also

enable(C), lp(C), lpadmin(ADM), lpinit(ADM), lpsched(ADM), lpstat(C), disable(C).

Name

ar - Maintains archives and libraries.

Syntax

ar key [posname] afile names ...

Description

ar maintains groups of files combined into a single XENIX format archive file. Its main use is to create and update library files as used by the link editor though it can be used for any similar purpose.

key is one character from the set **drqtpmx**, optionally concatenated with one or more of **vuaibcln**. *afile* is the archive file. The *names* are constituent files in the archive file. The *posname* is the name of a constituent file, and is required when certain keys are used. The meanings of the *key* characters are:

d Deletes the named files from the archive file.

r Replaces the named files in the archive file. If the optional character **u** is used with **r**, then only those files with modified dates later than the archive files are replaced. If an optional positioning character from the set **abi** is used, then the *posname* argument must be present and specifies that new files are to be placed after (**a**) or before (**b** or **i**) *posname*. Otherwise new files are placed at the end.

q Quickly appends the named files to the end of the archive file. Optional positioning characters are invalid. The command does not check whether the added members are already in the archive. Useful only to avoid quadratic behavior when creating a large archive piece by piece.

t Prints a table of contents of the archive file. If no names are given, all files in the archive are tabled. If names are given, only those files are tabled.

p Prints the named files in the archive.

m Moves the named files to the end of the archive. If a positioning character is present, then the *posname* argument must be present and, as in **r**, specifies where the files are to be moved.

x Extracts the named files. If no names are given, all files in the archive are extracted. Unless the optional character **n** is used with **x**, an extracted file's modification date will be set to the date stored in that file's archive header. In neither case does **x** alter the archive file.

v Verbose. Under the verbose option, *ar* gives a file-by-file description of the making of a new archive file from the old archive and the constituent files. When used with **t**, it gives a long listing of all information about the files. When used with **x**, it precedes each file with a name.

c Create. Normally *ar* will create *afile* when it needs to. The create option suppresses the normal message that is produced when *afile* is created.

l Local. Normally *ar* places its temporary files in the directory **/tmp**. This option causes them to be placed in the local directory.

n New. When used with the *key* character **x** it sets the extracted file's modification date to the current date.

When *ar* creates an archive, it always creates the header in XENIX format (see *ar*(F)).

Files

/tmp/v* Temporary files

See Also

ld(CP), lorder(CP), ar(F)

Notes

If the same file is mentioned twice in an argument list, it may be put in the archive twice.

Failure to process a library with *ranlib*, or failure to reprocess a library with *ranlib*, will cause *ld* to fail. Because generation of a library by *ar* and randomization by *ranlib* are separate, phase errors are possible. The loader *ld* warns when the modification date of a library is more recent than the creation of its dictionary; but this means you get the warning even if you only copy the library.

Name

assign, deassign - Assigns and deassigns devices.

Syntax

assign [**-u**] [**-v**] [**-d**] [device] ...

deassign [**-u**] [**-v**] [device] ...

Description

assign attempts to assign *device* to the current user. The *device* argument must be an assignable device that is not currently assigned. An *assign* command without an argument prints a list of assignable devices along with the name of the user to whom they are assigned.

deassign is used to "deassign" devices. Without any arguments, *deassign* will deassign all devices assigned to the user. When arguments are given, an attempt is made to deassign each *device* given as an argument.

With these commands you can exclusively use a device, such as a tape drive or floppy drive. This keeps other users from using the device. They have a similar effect to *chown*(C) and *chmod*(C), although they only act on devices in **/dev**. Other aspects are discussed further on.

Available options include:

-d Performs the action of *deassign*. The **-d** option may be embedded in *device* names to assign some devices and deassign others.

-v Gives verbose output.

-u Suppresses assignment or deassignment, but performs error checking.

The *assign* command will not assign any assignable devices if it cannot assign all of them. *deassign* gives no diagnostic if the *device* cannot be deassigned. Devices may be automatically deassigned at logout, but this is not guaranteed. *Device* names may be just the beginning of the device required. For example,

```
assign fd
```

should be used to assign all floppy disk devices. Raw versions of *device* will also be assigned, e.g., the raw floppy disk devices **/dev/rfd?** would be assigned in the above example.

Note that in many installations the assignable devices such as floppy disks have general read and write access, so the *assign* command may not be necessary. This is particularly true on single-user systems. Devices supposed to be assignable with this command should be owned by the user *asg*. The directory **/dev** should be owned by **bin** and have mode 755. The *assign* command (after checking for use by someone else) will then make the device owned by whoever invokes the command, without changing the access permissions. This allows the system administrator to set up individual devices that are freely available, assignable (owned by *asg*), or nonassignable and restricted (not owned by *asg* and with some restricted mode).

Note that the first time *assign* is invoked, it builds the assignable devices table **/etc/atab** . This table is used in subsequent invocations to save repeated searches of the **/dev** directory. If one of the devices in **/dev** is changed to be assignable (i.e., owned by *asg*), then **/etc/atab** should be removed (by the super-user) so that a correct list will be built the next time the command is invoked.

Return Values

Exit code 0 returned if successful, 1 if problems, 2 if *device* cannot be assigned.

Name

at, batch - Executes commands at a later time.

Syntax

at time [date] [+ increment]

at -r job ...

at -l[job ...]

at -q[letter] time [date] [job ...]

Description

at and *batch* read commands from the standard input to be executed at a later time. (*batch* has the same options shown for *at*.) *at* allows you to specify a time when the commands should be executed, while *batch* executes jobs when the system load level permits.

Standard output and standard error output are mailed to the user unless they are redirected elsewhere. The shell environment variables, current directory, *umask*, and *ulimit* are retained when the commands are executed. Open file descriptors, traps, and priorities are lost.

A user is permitted to use *at* if their login name appears in the file **/usr/lib/cron/at.allow**. If that file does not exist, the file **/usr/lib/cron/at.deny** is checked to determine if the user should be denied access to *at*. If neither file exists, only root is allowed to submit a job. If only the **at.deny** file exists, global usage is permitted. The allow/deny files consist of one user name per line.

The options are:

time The *time* may be specified as 1, 2, or 4 digits. One- and two-digit numbers are taken to be hours, four digits to be hours and minutes. The time may alternately be specified as two numbers separated by a colon, meaning *hour:minute*. A suffix **am** or **pm** may be appended; otherwise a 24-hour clock time is understood. The suffix **zulu** may be used to indicate GMT. The special names **noon**, **midnight**, **now**, and **next** are also recognized.

date An optional *date* may be specified as either a month name followed by a day number (and possibly year number preceded by an optional comma) or a day of the week (fully spelled or abbreviated to three characters). Two special "days", **today** and **tomorrow**, are recognized. If no *date* is given, **today** is assumed if the given hour is greater than the current hour and **tomorrow** is assumed if it is less. If the given month is less

than the current month (and no year is given), next year is assumed.

increment
The optional *increment* is simply a number suffixed by one of the following: **minutes**, **hours**, **days**, **weeks**, **months**, or **years**. (The singular form is also accepted.) Thus, legitimate commands include:

```
at 0815am Jan 24
at 8:15am Jan 24
at now + 1 day
at 5 pm Friday
```

-r Removes jobs previously scheduled by the *at* or *batch* command. Unless you are the super-user, you can only remove your own jobs.

-l Lists all the jobs currently scheduled for the invoking user.

-q*letter*
Places the specified job in a queue denoted by *letter*, where *letter* is any letter from "a" to "z" (not uppercase). The queue letter is appended to the job number. The following letters have special significance:

a	*at* queue
b	*batch* queue
c	*cron* queue

at and *batch* write the job number and schedule time to standard error. *batch* submits a batch job. It is almost equivalent to "at now," but with a difference: **batch** goes into a different queue; **at now** will respond with the error message "too late."

Examples

The *at* and *batch* commands read the commands to be executed at a later time from the standard input. *sh*(C) provides different ways of specifying standard input. Within your commands, it may be useful to redirect standard output.

The following sequence can be used at a terminal:

```
batch
nroff filename > outfile
<Ctrl-D> (press "Ctrl" and press "D")
```

This sequence, which demonstrates redirecting standard error to a pipe (|), is useful in a shell procedure (the sequence of output redirection specifications is significant):

```
batch <<!
nroff filename 2>&1 >outfile | mail
loginid
!
```

To have a job reschedule itself, invoke *at* from within the shell procedure by including code similar to the following within the shell file:

```
echo "sh shellfile" | at 1900 thursday next week
```

The most simple use of *at* is to specify that a given command or regular file containing commands, *file*, be run on the *date* specified:

```
at date < file
```

Files

/usr/lib/cron	main cron directory
/usr/lib/cron/at.allow	list of allowed users
/usr/lib/cron/at.deny	list of denied users
/usr/lib/cron/queue	scheduling information
/usr/spool/cron/atjobs	spool area

See Also

cron(C), kill(C), mail(C), nice(C), ps(C), sh(C), queuedefs(F).

Diagnostics

Complains about syntax errors and times out of range.

Name

awk — Pattern scanning and processing language.

Syntax

awk [**—F** re] [parameter...] ['prog'] [**—f** progfile] [file...]

Description

The **—F** *re* option defines the input field separator to be the regular expression *re*.

Parameters, in the form x=... y=... may be passed to *awk*, where x and y are *awk* built-in variables (see list below).

awk scans each input *file* for lines that match any of a set of patterns specified in *prog*. The *prog* string must be enclosed in single quotes (') to protect it from the shell. For each pattern in *prog* there may be an associated action performed when a line of a *file* matches the pattern. The set of pattern-action statements may appear literally as *prog* or in a file specified with the **—f** *progfile* option.

Input files are read in order; if there are no files, the standard input is read. The file name — means the standard input. Each input line is matched against the pattern portion of every pattern-action statement; the associated action is performed for each matched pattern.

An input line is normally made up of fields separated by white space. (This default can be changed by using the FS built-in variable or the **—F** *re* option.) The fields are denoted **$1**, **$2**, ...; **$0** refers to the entire line.

A pattern-action statement has the form:

pattern { action }

Either pattern or action may be omitted. If there is no action with a pattern, the matching line is printed. If there is no pattern with an action, the action is performed on every input line.

Patterns are arbitrary Boolean combinations (**!**, **| |**, **&&**, and parentheses) of relational expressions and regular expressions. A rela-

tional expression is one of the following:

expression relop expression
expression matchop regular expression

where a relop is any of the six relational operators in C, and a matchop is either ~ (contains) or ! ~ (does not contain). A conditional is an arithmetic expression, a relational expression, the special expression

var **in** array,

or a Boolean combination of these.

The special patterns BEGIN and END may be used to capture control before the first input line has been read and after the last input line has been read respectively.

Regular expressions are as in *egrep* (see *grep*(C)). In patterns they must be surrounded by slashes. Isolated regular expressions in a pattern apply to the entire line. Regular expressions may also occur in relational expressions. A pattern may consist of two patterns separated by a comma; in this case, the action is performed for all lines between an occurrence of the first pattern and next occurrence of the second pattern.

A regular expression may be used to separate fields by using the **—F** *re* option or by assigning the expression to the built-in variable FS . The default is to ignore leading blanks and to separate fields by blanks and/or tab characters. However, if FS is assigned a value, leading blanks are no longer ignored.

Other built-in variables include:

ARGC	command line argument count
ARGV	command line argument array
FILENAME	name of the current input file
FNR	ordinal number of the current record in the current file
FS	input field separator regular expression (default blank)
NF	number of fields in the current record
NR	ordinal number of the current record
OFMT	output format for numbers (default **%.6g**)
OFS	output field separator (default blank)
ORS	output record separator (default new-line)
RS	input record separator (default new-line)

An action is a sequence of statements. A statement may be one of the following:

if (conditional) statement [**else** statement]
while (conditional) statement
do statement **while** (conditional)
for (expression ; conditional ; expression) statement
for (var **in** array) statement
delete array[subscript]
break
continue
{ [statement] ... }
expression # commonly variable = expression
print [expression-list] [>expression]
printf format [, expression-list] [>expression]
next # skip remaining patterns on this input line
exit [expr] # skip the rest of the input; exit status is expr
return [expr]

Statements are terminated by semicolons, new lines, or right braces. An empty expression-list stands for the whole input line. Expressions take on string or numeric values as appropriate, and are built using the operators +, —, *, /, %, and concatenation (indicated by a blank). The C operators ++, ——, +=, —=, *=, /=, and %= are also available in expressions. Variables may be scalars, array elements (denoted x[i]), or fields. Variables are initialized to the null string or zero. Array subscripts may be any string, not necessarily numeric; this allows for a form of associative memory. String constants are quoted (").

The **print** statement prints its arguments on the standard output, or on a file if *>expression* is present, or on a pipe if | *cmd* is present. The arguments are separated by the current output field separator and terminated by the output record separator. The **printf** statement formats its expression list according to the format (see *printf*(S) in the *Programmer's Reference Manual*).

awk has a variety of built-in functions: arithmetic, string, input/output, and general.

The arithmetic functions are: *atan2*, *cos*, *exp*, *int*, *log*, *rand*, *sin*, *sqrt*, and *srand*. *int* truncates its argument to an integer. *rand* returns a random number between 0 and 1. *srand* (expr) sets the seed value for *rand* to *expr* or uses the time of day if *expr* is omitted.

The string functions are:

gsub(*for*, *repl*, *in*)
behaves like *sub* (see below), except that it replaces successive occurrences of the regular expression (like the *ed* global substitute command).

index(*s*, *t*) returns the position in string *s* where string *t* first occurs, or 0 if it does not occur at all.

length(*s*) returns the length of its argument taken as a string, or of the whole line if there is no argument.

match(*s*, *re*) returns the position in string *s* where the regular expression *re* occurs, or 0 if it does not occur at all. RSTART is set to the starting position (which is the same as the returned value), and RLENGTH is set to the length of the matched string.

split(*s*, *a*, *fs*) splits the string *s* into array elements *a*[*1*], *a*[*2*], *a*[*n*], and returns *n*. The separation is done with the regular expression *fs* or with the field separator FS if *fs* is not given.

sprintf(*fmt*, *expr*, *expr*,...) formats the expressions according to the *printf*(S) format given by *fmt* and returns the resulting string.

sub(*for*, *repl*, *in*) substitutes the string *repl* in place of the first instance of the regular expression *for* in string *in* and returns the number of substitutions. If *in* is omitted, *awk* substitutes in the current record (**$0**).

substr(*s*, *m*, *n*) returns the *n*-character substring of *s* that begins at position *m*.

The input/output and general functions are:

close(*filename*) closes the file or pipe named *filename*.

cmd|*getline* pipes the output of *cmd* into *getline*; each successive call to *getline* returns the next line of output from *cmd*.

getline sets **$0** to the next input record from the current input file.

getline <*file* sets **$0** to the next record from *file*.

getline var sets variable *var* instead.

getline var <*file* sets *var* from the next record of *file*.

system(*cmd*) executes *cmd* and returns to its exit status.

All forms of *getline* return 1 for successful input, 0 for end of file, and —1 for an error.

awk also provides user-defined functions. Such functions may be defined (in the pattern position of a pattern-action statement) as

```
function name(args,...) { stmts }
func name(args,...) { stmts }
```

Function arguments are passed by value if scalar and by reference if array name. Argument names are local to the function; all other variable names are global. Function calls may be nested and functions may be recursive. The **return** statement may be used to return a value.

Examples

Print lines longer than 72 characters:

```
length > 72
```

Print first two fields in opposite order:

```
{ print $2, $1 }
```

Same, with input fields separated by comma and/or blanks and tabs:

```
BEGIN   { FS = ",[ \t]*[ \t]+" }
        { print $2, $1 }
```

Add up the first column, print sum and average:

```
        { s += $1 }
END     { print "sum is", s, " average is", s/NR }
```

Print fields in reverse order:

```
{ for (i = NF; i > 0; ——i) print $i }
```

Print all lines between start/stop pairs:

```
/start/, /stop/
```

Print all lines whose first field is different from previous one:

```
$1 != prev { print; prev = $1 }
```

Simulate *echo*(C):

```
BEGIN   {
        for (i = 1; i < ARGC; i++)
            printf "%s", ARGV[i]
        printf "\n"
        exit
        }
```

Print file, filling in page numbers starting at 5:

```
/Page/  { $2 = n++; }
        { print }
```

command line: **awk —f program n=5 input**

See Also

grep(C), sed(C).
lex(CP), printf(S) in the *Programmer's Reference Manual.*

Bugs

Input white space is not preserved on output if fields are involved.

There are no explicit conversions between numbers and strings. To force an expression to be treated as a number add 0 to it; to force it to be treated as a string concatenate the null string (" ") to it.

Name

banner - Prints large letters.

Syntax

banner strings

Description

banner prints its arguments (each up to 10 characters long) in large letters on the standard output. This is useful for printing names at the front of printouts.

See Also

echo(C)

Name

basename - Removes directory names from pathnames.

Syntax

basename string [suffix]

Description

basename deletes any prefix ending in / and the *suffix* (if present in *string*) from *string*, and prints the result on the standard output. The result is the "base" name of the file, i.e., the filename without any preceding directory path and without an extension. It is used inside substitution marks (` `) in shell procedures to construct new filenames.

The related command *dirname* deletes the last level from *string* and prints the resulting path on the standard output.

Examples

The following command displays the filename **memos** on the standard output:

```
basename /usr/johnh/memos.old .old
```

The following shell procedure, when invoked with the argument **/usr/src/cmd/cat.c**, compiles the named file and moves the output to a file named **cat** in the current directory:

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

See Also

dirname(C), sh(C)

Name

bc - Invokes a calculator.

Syntax

bc [**-c**] [**-l**] [file ...]

Description

bc is an interactive processor for a language that resembles C but provides unlimited precision arithmetic. It takes input from any files given, then reads the standard input. The **-l** argument stands for the name of an arbitrary precision math library. The syntax for *bc* programs is as follows: L means the letters a-z, E means expression, S means statement.

Comments:

Enclosed in /* and */

Names:

Simple variables: L
Array elements: L [E]
The words "ibase", "obase", and "scale"

Other operands:

Arbitrarily long numbers with optional sign and decimal point
(E)
sqrt (E)
length (E) Number of significant decimal digits
scale (E) Number of digits right of decimal point
L (E , ... , E)

Additive operators:

+
-

Multiplicative operators:

*
/
% (remainder)
^ (exponentiation)

Unary operators:

```
++
- -        (prefix and postfix; apply to names)
```

Relational operators:

```
==
<=
>=
!=
<
>
```

Assignment operators:

```
=
=+
=-
=*
=/
=%
=^
```

Statements:

```
E
{ S ; ... ; S }
if ( E ) S
while ( E ) S
for ( E ; E ; E ) S
null statement
break
quit
```

Function definitions:

```
define L ( L ,..., L ) {
        auto L, ... , L
        S; ... S
        return ( E )
}
```

Functions in **-l** math library:

s(x)	Sine
c(x)	Cosine
e(x)	Exponential
l(x)	Log
a(x)	Arctangent
j(n,x)	Bessel function

All function arguments are passed by value.

The value of a statement that is an expression is printed unless the main operator is an assignment. Either semicolons or newlines may separate statements. Assignment to *scale* influences the number of digits to be retained on arithmetic operations in the manner of *dc*(C). Assignments to *ibase* or *obase* set the input and output number radix respectively.

The same letter may be used as an array, a function, and a simple variable simultaneously. All variables are global to the program. "Auto" variables are pushed down during function calls. When using arrays as function arguments or defining them as automatic variables, empty square brackets must follow the array name.

bc is actually a preprocessor for *dc*(C), which it invokes automatically, unless the **-c** (compile only) option is present. If the **-c** option is present, the *dc* input is sent to the standard output instead.

Example

The following defines a function to compute an approximate value of the exponential function:

```
scale = 20
define e(x){
        auto a, b, c, i, s
        a = 1
        b = 1
        s = 1
        for(i=1; 1==1; i++){
                a = a*x
                b = b*i
                c = a/b
                if(c == 0) return(s)
                s = s+c
        }
}
```

The following prints the approximate values of the exponential function of the first ten integers:

```
for(i=1; i<=10; i++) e(i)
```

Files

/usr/lib/lib.bc	Mathematical library
/usr/bin/dc	Desk calculator proper

See Also

dc(C)
The XENIX User's Guide

Notes

A *For* statement must have all three E's.

Quit is interpreted when read, not when executed.

Trigonometric values should be given in radians.

Name

bdiff - Compares files too large for *diff*.

Syntax

bdiff file1 file2 [n] [**-s**]

Description

bdiff compares two files, finds lines that are different, and prints them on the standard output. It allows processing of files that are too large for *diff*. *bdiff* splits each file into *n*-line segments, beginning with the first nonmatching lines, and invokes *diff* upon the corresponding segments. The arguments are:

n The number of lines *bdiff* splits each file into for processing. The default value is 3500. This is useful when 3500-line segments are too large for *diff*.

-s Suppresses printing of *bdiff* diagnostics. Note that this does not suppress printing of diagnostics from *diff*.

If *file1* (or *file2*) is a dash (-), the standard input is read.

The output of *bdiff* is exactly that of *diff*. Line numbers are adjusted to account for the segmenting of the files, and the output looks as if the files had been processed whole.

Files

/tmp/bd?????

See Also

diff(C)

Notes

Because of the segmenting of the files, *bdiff* does not necessarily find a smallest sufficient set of file differences.

Specify the maximum number of lines if the first difference is too far down in the file for *diff* and an error is received.

Name

bfs - Scans big files.

Syntax

bfs [**-**] name

Description

bfs is like *ed* (C) except that it is read-only and processes much larger files. Files can be up to 1024K bytes and 32K lines, with up to 255 characters per line. *bfs* is usually more efficient than *ed* for scanning a file, since the file is not copied to a buffer. It is most useful for identifying sections of a large file where *csplit*(C) can be used to divide it into more manageable pieces for editing.

Normally, the size of the file being scanned is printed, as is the size of any file written with the **w** command. The optional dash (**-**) suppresses printing of sizes. Input is prompted for with an asterisk (*****) when "P" and RETURN are typed. The "P" acts as a toggle, so prompting can be turned off again by entering another "P" and a RETURN. Note that messages are given in response to errors only if prompting is turned on.

All address expressions described under *ed* are supported. In addition, regular expressions may be surrounded with two symbols other than the standard slash (/) and (**?**): A greater-than sign (**>**) indicates downward search without wraparound, and a less-than sign (**<**) indicates upward search without wraparound. Note that parentheses and curly braces are special and need to be escaped with a backslash (\). Since *bfs* uses a different regular expression-matching routine from *ed*, the regular expressions accepted are slightly wider in scope (see *regex* (S)). Differences between *ed* and *bfs* are listed below:

\+ A regular expression followed by + means *one or more times*. For example, **[0-9]**+ is equivalent to **[0-9][0-9]***.

\{m\} \{m,\} \{m,u\}
Integer values enclosed in \{ \} indicate the number of times the preceding regular expression is to be applied. *m* is the minimum number and *u* is a number, less than 256, which is the maximum. If only *m* is present (e.g., \{m\}), it indicates the exact number of times the regular expression is to be applied. \{m,\} is analogous to \{m,infinity\}. The plus (+) and star (*) operations are equivalent to \{1,\} and \{0,\} respectively.

(...)**$***n* The value of the enclosed regular expression is to be returned. The value will be stored in the *(n+1)*th argument following the subject argument. At most ten enclosed regular expressions are allowed. *regex* makes its assignments unconditionally.

(...) Parentheses are used for grouping. An operator, e.g. *, +, \{ \}, can work on a single character or a regular expression enclosed in parenthesis. For example, \(a*\(cb+\)*\)$0.

There is also a slight difference in mark names: only the letters "a" through "z" may be used, and all 26 marks are remembered.

The **e**, **g**, **v**, **k**, **p**, **q**, **w**, **=**, **!** and null commands operate as described under *ed* except that **e** doesn't remember filenames and **g** and **v** when given no arguments return the line after the line you were on. Commands such as **---**, **+++-**, **+++=**, **-12**, and **+4p** are accepted. Note that **1,10p** and **1,10** will both print the first ten lines. The **f** command only prints the name of the file being scanned; there is no remembered filename. The **w** command is independent of output diversion, truncation, or crunching (see the **xo**, **xt** and **xc** commands, below). The following additional commands are available:

xf*file*
Further commands are taken from the named *file*. When an end-of-file is reached, an interrupt signal is received, or an error occurs, reading resumes with the file containing the **xf**. **xf** commands may be nested to a depth of 10.

xo [*file*]
Further output from the **p** and null commands is diverted to the named *file*. If *file* is missing, output is diverted to the standard output. Note that each diversion causes truncation or creation of the file.

: *label*
This positions a *label* in a command file. The *label* is terminated by a newline, and blanks between the **:** and the start of the *label* are ignored. This command may also be used to insert comments into a command file, since labels need not be referenced.

(.,.)**xb**/*regular expression*/*label*
A jump (either upward or downward) is made to *label* if the command succeeds. It fails under any of the following conditions:

1. Either address is not between **1** and **$**.

2. The second address is less than the first.

3. The regular expression doesn't match at least one line in the specified range, including the first and last lines.

On success, dot (.) is set to the line matched and a jump is made to *label*. This command is the only one that doesn't issue an error message on bad addresses, so it may be used to test whether addresses are bad before other commands are executed. Note that the command

```
xb/^/ label
```

is an unconditional jump.

The **xb** command is allowed only if it is read from somewhere other than a terminal. If it is read from a pipe only a downward jump is possible.

xt *number*
Output from the **p** and null commands is truncated to a maximum of *number* characters. The initial number is 255.

xv[*digit*] [*spaces*] [*value*]
The variable name is the specified *digit* following the **xv**. **xv5100** or **xv5 100** both assign the value **100** to the variable **5**. **xv61,100p** assigns the value **1,100p** to the variable **6**. To reference a variable, put a **%** in front of the variable name. For example, using the above assignments for variables **5** and **6**:

```
1,%5p
1,%5
%6
```

prints the first 100 lines.

```
g/%5/p
```

globally searches for the characters **100** and prints each line containing a match. To escape the special meaning of **%**, a \ must precede it. For example,

```
g/".*\%[cds]/p
```

could be used to match and list lines containing *printf* characters, decimal integers, or strings.

Another feature of the **xv** command is that the first line of output from a XENIX command can be stored into a variable.

The only requirement is that the first character of *value* be a **!**. For example,

```
xv5!cat junk
!rm junk
!echo "%5"
xv6!expr %6 + 1
```

puts the current line in variable **5**, prints it, and increments the variable **6** by one. To escape the special meaning of **!** as the first character of *value*, precede it with a \. For example,

```
xv7\!date
```

stores the value **!date** into variable **7**.

xbz *label*

xbn *label*

These two commands test the last saved *return code* from the execution of a XENIX command (**!***command*) or nonzero value, respectively, and jump to the specified label. The two examples below search for the next five lines containing the string **size**:

```
xv55
: l
/size/
xv5!expr %5 - 1
!if 0%5 != 0 exit 2
xbn l
xv45
: l
/size/
xv4!expr %4 - 1
!if 0%4 = 0 exit 2
xbz l
```

xc [*switch*]

If *switch* is **1**, output from the **p** and null commands is crunched; if *switch* is **0**, it is not. Without an argument, **xc** reverses *switch*. Initially *switch* is set for no crunching. Crunched output has strings of tabs and blanks reduced to one blank and blank lines suppressed.

See Also

csplit(C), ed(C), umask(C)

Diagnostics

? for errors in commands if prompting is turned off. Self-explanatory

error messages when prompting is on.

Name

cal - Prints a calendar.

Syntax

cal [[month] year]

Description

cal prints a calendar for the specified year. If a month is also specified, a calendar for that month only is printed. If no arguments are specified, the current, previous, and following months are printed, along with the current date and time. The *year* must be a number between 1 and 9999; *month* must be a number between 1 and 12 or enough characters to specify a particular month. For example, **May** must be given to distinguish it from March, but **S** is sufficient to specify September. If only a month string is given, only that month of the current year is printed.

Notes

Beware that "cal 84" refers to the year 84, not 1984.

The calendar produced is that for England and her colonies. Note that England switched from the Julian to the Gregorian calendar in September of 1752, at which time eleven days were excised from the year. To see the result of this switch, try "cal 9 1752".

Name

calendar - Invokes a reminder service.

Syntax

calendar [-]

Description

calendar consults the file **calendar** in the user's current directory and mails him lines that contain today's or tomorrow's date. Most reasonable month-day dates, such as "Sep. 7," "september 7", and "9/7", are recognized, but not "7 September", "7/12" or "07/12".

On weekends "tomorrow" extends through Monday. Lines that contain the date of a Monday will be sent to the user on the previous Friday. This is not true for holidays.

When an argument is present, *calendar* does its job for every user who has a file **calendar** in his login directory and sends the result to the standard output. Normally this is done daily, in the early morning, under the control of *cron* (C).

Files

calendar

/usr/lib/calprog To figure out today's and tomorrow's dates

/etc/passwd

/tmp/cal*

See Also

cron(C), mail(C)

Notes

To get reminder service, a user's **calendar** file must have read permission for all.

Name

capinfo, fixpad - convert termcap descriptions into terminfo descriptions.

Syntax

capinfo capfile infofile
fixpad

Description

capinfo invokes an *ex*(C) script to begin the conversion of a termcap terminal description into the equivalent terminfo description. *capinfo* calls *fixpad* to convert the padding specifications. The conversion needs to be completed by hand. The following should be given special attention:

- Many *terminfo* capabilities do not have *termcap* equivalents. The XENIX extensions to termcap do not have terminfo equivalents.

- The *termcap* capabilities *cr*, *nl*, and *ht* are noted in the *ex* script as being problematical.

See Also

termcap(M), terminfo(M), terminfo(F), tic(C)

Name

cat - Concatenates and displays files.

Syntax

cat [**-u**] [**-s**] [**-v**] [**-t**] [**-e**] file ...

Description

cat reads each *file* in sequence and writes it on the standard output. If no input file is given, or if a single dash (-) is given, *cat* reads from the standard input. The options are:

-s Suppresses warnings about nonexistent files.

-u Causes the output to be unbuffered.

-v Causes non-printing characters (with the exception of tabs, new-lines, and form feeds) to be displayed. Control characters are displayed as "^X" (Ctrl-*X*), where *X* is the key pressed with the Ctrl key (for example, Ctrl-M is displayed as ^M). The DEL character (octal 0177) is printed as "^?." Non-ASCII characters (with the high bit set) are printed as "M -x," where *x* is the character specified by the seven low order bits.

-t Causes tabs to be printed as "^I" and form feeds as "^L". This option is ignored if the **-v** option is not specified.

-e Causes a "$" character to be printed at the end of each line (prior to the new-line). This option is ignored if the **-v** option is not set.

No input file may have the same name as the output file unless it is a special file.

Examples

The following example displays *file* on the standard output:

```
cat file
```

The following example concatenates *file1* and *file2* and places the result in *file3*:

```
cat file1 file2 >file3
```

The following example concatenates *file1* and appends it to *file2*:

```
cat file1 >> file2
```

See Also

cp(C), pr(C)

Warning

Command lines such as:

```
cat file1 file2 > file1
```

will cause the original data in *file1* to be lost; therefore, you must be careful when using special shell characters.

Name

cd - Changes working directory.

Syntax

cd [directory]

Description

If specified, *directory* becomes the new working directory; otherwise the value of the shell parameter $HOME is used. The process must have search (execute) permission in all directories (components) specified in the full pathname of *directory*.

Because a new process is created to execute each command, *cd* would be ineffective if it were written as a normal command; therefore, it is recognized and executed by the shell.

If the shell is reading its commands from a terminal, and the specified directory does not exist (or some component cannot be searched), spelling correction is applied to each component of *directory*, in a search for the "correct" name. The shell then asks whether or not to try and change directory to the corrected directory name; an answer of *n* means "no", and anything else is taken as "yes".

Notes

Wildcard designators will work with the **cd** command.

See Also

pwd(C), sh(C), chdir(S)

Name

chgrp - Changes group ID.

Syntax

chgrp *groupfile ...*

Description

chgrp changes the group ID of each *file* to *group*. The group may be either a decimal group ID or a group name found in the file **/etc/group.**

Files

/etc/passwd

/etc/group

See Also

chown(C), chown(S), passwd(F), group(F)

Notes

Only the owner or the super-user can change the group ID of a file.

Name

chmod - Changes the access permissions of a file or directory.

Syntax

chmod mode file ...
chmod [who] +-= [permission ...] file ...

Description

The *chmod* command changes the access permissions (or *mode*) of a specified file or directory. It is used to control file and directory access by users other than the owner and super-user. The *mode* may be an expression composed of letters and operators (called *symbolic mode*), or a number (called *absolute mode*).

A *chmod* command using *symbolic mode* has the form:

chmod [*who*] +-= [permission ...] *filename*

In place of *who* you can use one or any combination of the following letters:

a Stands for "all users". If *who* is not indicated on the command line, **a** is the default. The definition of "all users" depends on the user's *umask*. See *umask*(C).

g Stands for "group", all users who have the same group ID as the owner of the file or directory.

o Stands for "others", all users on the system.

u Stands for "user", the owner of the file or directory.

The operators are:

\+ Adds permission

\- Removes permission

= Assigns the indicated permission and removes all other permissions (if any) for that *who*. If no permission is assigned, existing permissions are removed.

Permissions can be any combination of the following letters:

x Execute (search permission for directories)

r Read

w Write

s Sets owner or group ID on execution of the file to that of the owner of the file. The mode "u+s" sets the user ID bit for the file. The mode "g+s" sets the group ID bit. Other combinations have no effect.

t Saves text in memory upon execution. ("Sticky bit", see *chmod*(S)). Only the mode "u+t" sets the sticky bit. All other combinations have no effect. This mode can only be set by the super-user.

l Advisory locking calls on the file will automatically be promoted to mandatory locking. Applies only to normal files (not directories, special devcie files, etc.).

Mandatory file and record locking refers to locking the read or write permissions while a program is accessing that file. Under advisory locking, processes are expected to cooperate by not reading or writing sections of a file unless a lock can be obtained. The system will not prevent processes from violating these cooperative procedures as it does with mandatory locking. A file cannot have group execution permission and be able to be locked on execution. In addition, it is not possible to turn on the set-group-ID and enable a file to be locked on execution at the same time. The following examples show illegal uses of *chmod* and will generate error messages:

chmod g+x,+l *filename*

chmod g+s,+l *filename*

A *chmod* command using *absolute mode* has the form:

chmod *mode filename*

where *mode* is an octal number constructed by performing logical OR on the following:

4000	Set user ID on execution
20#0	Set group ID on execution if "#" is 7, 5, 3, or 1 and enable mandatory locking if "#" is 6, 4, 2, or 0.
1000	Sets the sticky bit (see *chmod*(S))
0400	Read by owner
0200	Write by owner

0100	Execute (search in directory) by owner
0040	Read by group
0020	Write by group
0010	Execute (search in directory) by group
0004	Read by others
0002	Write by others
0001	Execute (search in directory) by others
0000	No permissions

Examples

Symbolic Mode

The following command causes advisory locking calls on *file* to be promoted to mandatory locking:

chmod +x *file*

Multiple symbolic modes may be given, separated by commas, on a single command line. The following command removes read and write permission for group and others from *file*:

chmod go-rw *file*

The following command gives other users read and write permission for *file*:

chmod o+rw *file*

The following command gives read permission to group and other:

chmod g+r,o+r *file*

Absolute Mode

The following command gives all users read, write and execute permission for *file*:

chmod 0777 *file*

The following command gives read and write permission to all users for *file*:

chmod 0666 *file*

The following command gives read and write permission to the owner of *file* only:

chmod 0600 *file*

The following example causes the file to be locked on access:

chmod +l *file*

See Also

ls(C), chmod(S), locking(S), lockf(S), fcntl(S)

Notes

The setuid, setgid, and sticky bit settings are only useful for binary executable files. They have no effect on shell scripts.

Name

chown - Changes owner ID.

Syntax

chown owner file ...

Description

chown changes the owner ID of the *files* to *owner*. The owner may be either a decimal user ID or a login name found in the file **/etc/passwd.**

Files

/etc/passwd

/etc/group

See Also

chgrp(C), chown(S), group(F), passwd(F)

Notes

Only the owner or the super-user can change a file's owner or group ID.

Name

clear - Clears a terminal screen.

Syntax

clear [term]

Description

The *clear* command clears the screen. If *term* is not specified, the terminal type is obtained from the **TERM** environment variable.

If a video terminal does not have a clear screen capability, newlines are output to scroll the screen clear. If the terminal is a hardcopy, the paper is advanced to the top of the next page.

Files

/etc/termcap

See Also

environ(M), termcap(M), tput(C)

Notes

If the standard output is not a terminal, *clear* issues an error message.

Name

cmchk - Reports hard disk block size.

Syntax

cmchk

Description

Reports the hard disk block size (BSIZE) in bytes.

Name

cmp - Compares two files.

Syntax

cmp [**-l**] [**-s**] file1 file2

Description

cmp compares two files and, if they are different, displays the byte and line number of the differences. If *file1* is **-**, the standard input is used.

The options are:

-l Prints the byte number (decimal) and the differing bytes (octal) for each difference.

-s Returns an exit code only, 0 for identical files, 1 for different files and 2 for inaccessible or missing file(s).

This command should be used to compare binary files; use *diff* (C) or *diff3* (C) to compare text files.

See Also

comm(C), diff(C), diff3(C)

Diagnostics

Exit code 0 is returned for identical files, 1 for different files, and 2 for an inaccessible or missing argument.

Name

comm - Selects or rejects lines common to two sorted files.

Syntax

comm [**-** [**123**]] file1 file2

Description

comm reads *file1* and *file2*, which should be ordered in ASCII collating sequence (see *sort* (C)), and produces a three-column output: lines only in *file1*; lines only in *file2*; and lines in both files. The filename **-** means the standard input.

Flags 1, 2, or 3 suppress printing of the corresponding column. Thus **comm -12** prints only the lines common to the two files; **comm -23** prints only lines in the first file but not in the second; **comm -123** is a no-op.

See Also

cmp(C), diff(C), sort(C), uniq(C)

Name

compress - compress data for storage.
uncompress - uncompress a stored file.
zcat - display a stored file.

Syntax

compress [**-dfFqc**] [**-b** *bits*] *file*
uncompress [**-fqc**] *file*
zcat *file*

Description

compress takes a file and compresses it to the smallest possible size, creates a compressed output file, and removes the original file unless the **-c** option is present. Compression is achieved by encoding common strings within the file. *uncompress* restores a previously compressed file to its uncompressed state and removes the compressed version. *zcat* uncompresses and displays a file on the standard output. When *zcat* is used to display a file, the file is uncompressed and concatenated on the screen or standard output, and the compressed version of the file is not removed.

If no file is specified on the command line, input is taken from the standard input and the output is directed to the standard output. Output defaults to a file with the same filename as the input file with the suffix ".Z" or it can be directed through the standard output. The output files have the same permissions and ownership as the corresponding input files or the user's standard permissions if output is directed through the standard output.

If no space is saved by compression, the output file is not written unless the **-F** flag is present on the command line.

Options

The following options are available from the command line:

-d Decompresses a compressed file.

-c Writes output on the standard output and does not remove original file.

-b*bits* Specifies the maximum number of bits to use in encoding.

-f Overwrites previous output file.

-F Writes output file even if compression saves no space.

-q Generates no output except error messages, if any.

See Also

pack(C), pcat(C), ar(C), tar(C), cat(C)

Name

copy - Copies groups of files.

Syntax

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.

Options do not have to be given as separate arguments, and may appear in any order, even after the other arguments. The options are:

-a Asks the user before attempting a copy. If the response does not begin with a "y", then a copy is not done.

-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 the 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 a **-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.

Arguments to *copy* are:

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 the 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.

Examples

This command line verbosely copies all files in the current directory to **/tmp/food**:

```
copy -v . /tmp/food
```

The next command line copies all files, except for those that begin with a period (.), and copies the immediate contents of any child directories:

```
copy * /tmp/logic
```

This command is the same as the previous one, except that it recursively examines all subdirectories, and it sets group and ownership permissions on the destination files to be the same as the source files:

```
copy -ro * /tmp/logic
```

Notes

Special device files can be copied. When they are copied, any data associated with the specified device is *not* copied.

Name

cp - Copies files.

Syntax

cp file1 file2

cp files directory

Description

There are two ways to use the *cp* command. With the first way, *file1* is copied to *file2*. Under no circumstance can *file1* and *file2* be identical. With the second way, *directory* is the location of a directory into which one or more *files* are copied.

See Also

copy(C), cpio(C), ln(C), mv(C), rm(C), chmod(S)

Notes

Special device files can be copied. If the file is a named pipe, then the data in the pipe is copied to a regular file. Similarly, if the file is a device, then the file is read until the end-of-file is reached, and that data is copied to a regular file. It is illegal to copy a directory to a file.

Name

cpio - Copy file archives in and out.

Syntax

cpio -o [**acBvV**] [**-C** bufsize] [[**-O** file] [**-K** volumesize] [**-M** message]]

cpio -i [**BcdmrtTuvVfsSb6k**] [**-C** bufsize] [[**-I** file] [**-K** volumesize] [**-M** message]] [pattern ...]

cpio -p [**adlmuvV**] directory

Description

cpio -o (copy out) reads the standard input to obtain a list of path names and copies those files onto the standard output together with path name and status information. Output is padded to a 512-byte boundary by default.

NOTE: The following table lists options that are not available on XENIX-286 distributions:

Options	Related options
-o, -p	**-V**
-i	**-T, -S, -6, -k**
Other	**-K, -I, -M, -C**

cpio -i (copy in) extracts files from the standard input, which is assumed to be the product of a previous **cpio -o**. Only files with names that match *patterns* are selected. *patterns* are regular expressions given in the filename-generating notation of *sh*(C). In *patterns*, metacharacters **?**, *****, and [...] match the slash (/) character, and backslash (\) is an escape character. A **!** metacharacter means *not*. (For example, the **!abc*** pattern would exclude all files that begin with **abc**.) Multiple *patterns* may be specified and if no *patterns* are specified, the default for *patterns* is * (i.e., select all files). Each *pattern* must be enclosed in double quotes; otherwise the name of a file in the current directory is used. Extracted files are conditionally created and copied into the current directory tree based upon the options described below. The permissions of the files will be those of the previous *cpio -o* . The owner and group of the files will be that of the current user unless the user is super-user, which causes *cpio* to retain the owner and group of the files of the previous *cpio -o* . NOTE: If *cpio -i* tries to create a file that already exists and the existing file is the same age or newer, *cpio* will output a warning message and not replace the file. (The **-u** option can be used to unconditionally overwrite the existing file.)

cpio -p (pass) reads the standard input to obtain a list of path names of files that are conditionally created and copied into the destination *directory* tree based upon the options described below. Archives of text files created by *cpio* are portable between implementations of UNIX System V.

The meanings of the available options are:

-a Reset *access* times of input files after they have been copied. Access times are not reset for linked files when *cpio -pla* is specified.

-b Reverse the order of the *bytes* within each word. Use only with the **-i** option.

-B Input/output is to be blocked 5,120 bytes to the record. The default buffer size is 512 bytes when this and the **-C** options are not used. (**-B** does not apply to the *pass* option; **-B** is meaningful only with data directed to or from a character-special device, e.g., **/dev/rfd096ds15**.)

-c Write header information in ASCII *character* form for portability. Always use this option when origin and destination machines are different types.

-C *bufsize*
Input/output is to be blocked *bufsize* bytes to the record, where *bufsize* is replaced by a positive integer. The default buffer size is 512 bytes when this and **-B** options are not used. (**-C** does not apply to the *pass* option; **-C** is meaningful only with data directed to or from a character-special device, e.g., **/dev/rct0**.) When used with the **-K** option, *bufsize* is forced to be a 1K multiple.

-d *directories* are to be created as needed.

-f Copy in all *files* except those in *patterns*. (See the paragraph on *cpio -i* for a description of *patterns*.)

-I *file*
Read the contents of *file* as input. If *file* is a character-special device, when the first medium is full, replace the medium and type a carriage return to continue to the next medium. Use only with the **-i** option.

-k Attempt to skip corrupted file headers and I/O errors that may be encountered. If you want to copy files from a medium that is corrupted or out of sequence, this option lets you read only those files with good headers. (For *cpio* archives that contain other *cpio* archives, if an error is encountered, *cpio* may terminate prematurely. *cpio* will find the next good header, which may be one for a smaller archive, and terminate when the smaller archive's trailer is encountered.) Used only with the **-i** option.

-l Whenever possible, *link* files rather than copying them. Usable only with the **-p** option.

-m
Retain previous file *modification* time. This option is ineffective on directories that are being copied.

-K *volumesize*
Specifies the size of the media volume. Must be in 1K blocks. For example, a 1.2 MB floppy disk has a *volumesize* of 1200. Must

include the **-C** option with a *bufsize* multiple of 1K.

-M *message*
Define a message to use when switching media. When you use the **-O** or **-I** options and specify a character-special device, you can use this option to define the message that is printed when you reach the end of the medium. One **%d** can be placed in the message to print the sequence number of the next medium needed to continue.

-O *file*
Direct the output of cpio to *file*. If *file* is a character-special device, when the first medium is full, replace the medium and type a carriage return to continue to the next medium. Use only with the **-o** option.

-r Interactively *rename* files. If the user types a null line, the file is skipped. If the user types a ".", the original pathname will be copied. (Not available with *cpio -p*.)

-s *swap* bytes within each half word. Use only with the **-i** option.

-S *Swap* halfwords within each word. Use only with the **-i** option.

-T Truncate long filenames to 14 characters. Use only with the **-i** option.

-t Print a *table of contents* of the input. No files are created.

-u Copy *unconditionally* (normally, an older file will not replace a newer file with the same name).

-v *verbose*: causes a list of file names to be printed. When used with the **-t** option, the table of contents looks like the output of an **ls -l** command [see *ls*(C)].

-V *Special* Verbose: print a dot for each file seen. Useful to assure the user that *cpio* is working without printing out all file names.

-6 Process an old (i.e., UNIX System *Sixth* Edition format) file. Use only with the **-i** option.

NOTE: *cpio* assumes 4-byte words.

If *cpio* reaches end of medium (end of a diskette for example) when writing to (**-o**) or reading from (**-i**) a character-special device, and **-O** and **-I** are not used, *cpio* will print the message:

If you want to go on, type device/file name when ready.

To continue, you must replace the medium and type the character-special device name (**/dev/rfd096ds15** for example) and a carriage return. You may want to continue by directing *cpio* to use a different device. For example, if you have two floppy drives, you may want to switch between them so *cpio* can proceed while you are changing the floppies. (A carriage return alone causes the *cpio* process to exit.)

Examples

The following examples show three uses of *cpio*.

When standard input is directed through a pipe to **cpio -o**, it groups the files so they can be directed (>) to a single file (*../newfile*). The **-c** option insures that the file will be portable to other machines. Instead of *ls*(C), you could use *find*(C), *echo*(C), *cat*(C), etc., to pipe a list of names to *cpio*. You could direct the output to a device instead of a file.

ls | cpio -oc >*../newfile*

cpio -i uses the output file of **cpio -o** (directed through a pipe with **cat** in the example), extracts those files that match the patterns (**memo/a1**, **memo/b***), creates directories below the current directory as needed (**-d** option), and places the files in the appropriate directories. The **-c** option is used when the file is created with a portable header. If no patterns were given, all files from *newfile* would be placed in the directory.

cat newfile | cpio -icd *"memo/a1" "memo/b*"*

cpio -p takes the file names piped to it and copies or links (**-l** option) those files to another directory on your machine (*newdir* in the example). The **-d** options says to create directories as needed. The **-m** option says retain the modification time. [It is important to use the **-depth** option of *find*(C) to generate path names for *cpio*. This eliminates problems *cpio* could have trying to create files under read-only directories.]

find . -depth -print | cpio -pdlmv *newdir*

See Also

cat(C), echo(C), find(C), ls(C), tar(C), cpio(F)

Notes

1) Path names are restricted to 256 characters.
2) Only the super-user can copy special files.
3) Blocks are reported in 512-byte quantities.
4) If a file has 000 permissions, contains more than 0 characters of data, and the user is not root, the file will not be saved or restored.

Name

cron - Executes commands at specified times.

Syntax

/etc/cron
crontab [file]
crontab -r
crontab -l

Description

cron is the clock daemon that executes commands at specified dates and times according to the instructions in the files located in **/usr/spool/cron/crontabs**. Regularly scheduled commands can be specified according to instructions found in crontab files; users can submit their own crontab file via the *crontab* command. Commands which are to be executed only once may be submitted via the *at*(C) command. Because *cron* never exits, it should be executed only once.

crontab copies the specified file, or standard input if no file is specified, into a directory that holds all users' crontabs. The *crontab* file in the **crontabs** directory is given the user's login name. The **-r** option removes a user's crontab from the crontab directory. *crontab* **-l** will list the crontab file for the invoking user.

A user is permitted to use *crontab* if their name appears in the file **/usr/lib/cron/cron.allow**. If that file does not exist, the file **/usr/lib/cron/cron.deny** is checked to determine if the user should be denied access to *crontab*. If neither file exists, only root is allowed to submit a job. Global usage is permitted by the existence of an empty **cron.deny** file. **cron.deny** is checked only if **cron.allow** does not exist. The allow/deny files consist of one user name per line.

The **crontabs** files consist of lines of six fields each. The fields are separated by spaces or tabs. The first five are integer patterns that specify the minute (0-59), hour (0-23), day of the month (1-31), month of the year (1-12), and day of the week (0-6, with 0=Sunday). Each of these patterns may contain:

- A number in the (respective) range indicated above
- Two numbers separated by a minus (indicating an inclusive range)

- A list of numbers separated by commas (meaning all of these numbers)

- An asterisk (meaning all legal values)

Note that the specification of days may be made by two fields (day of the month and day of the week). If both are specified as a list of elements, both are adhered to. For example, 0 0 1,15 * 1 would run a command on the first and fifteenth of each month, as well as on every Monday. To specify days by only one field, the other field should be set to * (for example, 0 0 * * 1 would run a command only on Mondays).

The sixth field is a string that is executed by the shell at the specified time(s). A **%** in this field is translated into a newline character. Only the first line (up to a **%** or end-of-line) of the command field is executed by the shell. The other lines are made available to the command as standard input.

The shell is invoked from your **$HOME** directory with an **arg0** of **sh**. Users who desire to have their *.profile* executed must explicitly do so in the crontab file. *cron* supplies a default environment for every shell, defining **HOME**, **LOGNAME**, **SHELL (=/bin/sh)**, and **PATH (=:/bin:/usr/bin)**.

cron examines the **crontabs** directory periodically to see if it has changed; if it has, *cron* reads it. Thus it takes only a short while for entries to become effective.

crontab exits and returns a value of 55 if it cannot allocate enough memory. If it exits for any other reason, it returns a value of 1.

Examples

An example **crontabs** file follows:

```
30 4 * * *      /etc/sa -s > /dev/null
0  4 * * *      calendar -
15 4 * * *      find /usr/preserve -mtime +7 -a -exec rm -f {} ;
40 4 * * *      find / -name '#*' -atime +3 -exec rm -f {} ;
1,21,41 * * * * (echo -n ' '; date; echo ) >/dev/console
```

A history of all actions by *cron* can be recorded in **/usr/lib/cron/log**. This logging occurs only if the variable CRONLOG in **/etc/default/cron** is set to YES. By default this value is set to NO and no logging occurs. If logging should be turned on, be sure to monitor the size of **/usr/lib/cron/log** so that it doesn't unreasonably consume disk space.

Files

/usr/lib/cron	main cron directory
/usr/spool/cron/crontabs/*	spool area
/usr/lib/cron/log	accounting information
/usr/lib/cron/cron.allow	list of allowed users
/usr/lib/cron/cron.deny	list of denied users
/usr/lib/cron/.proto	cron environment information
/usr/lib/cron/queuedefs	cron data file
/etc/default/cron	cron logging default information

See Also

at(C), sh(C), queuedefs(F).

Notes

cron reads the files in the **crontabs** directory only when there is a change, but it reads the in-core version of the tables periodically.

Users should remember to redirect the standard output and standard error of their commands, otherwise any generated output or errors will be mailed to the user.

crontab will overwrite any previous entry with the same name. To modify an existing *crontab* file, use *crontab -l* to copy it to a file, edit the file, then resubmit it with *crontab*.

Name

crypt - Encode/decode.

Syntax

crypt [password]
crypt [**-k**]

Description

The *crypt* command reads from the standard input and writes to the standard output. The *password* is a key that selects a particular transformation. If no argument is given, *crypt* demands a key from the terminal and turns off printing while the key is being typed in. If the **-k** option is used, *crypt* will use the key assigned to the environment variable CRYPTKEY. The *crypt* command encrypts and decrypts with the same key:

```
crypt key <clear >cypher
crypt key <cypher | pr
```

Files encrypted by *crypt* are compatible with those treated by the editors *ed*(C), *edit*(C), *ex*(C), and *vi*(C) in encryption mode.

The security of encrypted files depends on three factors: the fundamental method must be hard to solve; direct search of the key space must be infeasible; "sneak paths" by which keys or clear text can become visible must be minimized.

The *crypt* command implements a one-rotor machine designed along the lines of the German Enigma, but with a 256-element rotor. Methods of attack on such machines are known, but not widely; moreover the amount of work required is likely to be large.

The transformation of a key into the internal settings of the machine is deliberately designed to be expensive, i.e., to take a substantial fraction of a second to compute. However, if keys are restricted to (say) three lower-case letters, then encrypted files can be read by expending only a substantial fraction of five minutes of machine time.

If the key is an argument to the *crypt* command, it is potentially visible to users executing *ps*(C) or a derivative. To minimize this possibility, *crypt* takes care to destroy any record of the key immediately upon entry. The choice of keys and key security are the most vulnerable aspect of *crypt*.

Files

/dev/tty for typed key

See Also

ed(C), edit(C), ex(C), makekey(C), ps(C), stty(C), vi(C)

Notes

If two or more files encrypted with the same key are concatenated and an attempt is made to decrypt the result, only the contents of the first of the original files will be decrypted correctly.

Distribution of the crypt libraries and utilities is regulated by the U.S. Government and are not available to sites outside of the United States and its territories. Because we cannot control the destination of the software, these utilities are not included in the standard product. If your site is within the U.S. or its territories, you can obtain the *crypt* software through your product distributor or reseller.

Name

csh - Invokes a shell command interpreter with C-like syntax.

Syntax

csh [**-cefinstvVxX**] [arg ...]

Description

csh is a command language interpreter. It begins by executing commands from the file **.cshrc** in the home directory of the invoker. If this is a login shell, it also executes commands from the file **.login** there. In the normal case, the shell begins reading commands from the terminal, prompting with % . Processing of arguments and the use of the shell to process files containing command scripts will be described later.

The shell then repeatedly performs the following actions: a line of command input is read and broken into *words*. This sequence of words is placed on the command history list and then parsed. Finally, each command in the current line is executed.

When a login shell terminates, it executes commands from the file **.logout** in the user's home directory.

Lexical structure

The shell splits input lines into words at blanks and tabs with the following exceptions. The characters &, |, ;, <, >, (,), form separate words. If doubled in &&, | |, <<, or >>, these pairs form single words. These parser metacharacters may be made part of other words, or their special meaning prevented, by preceding them with \. A newline preceded by a \ is equivalent to a blank.

In addition, strings enclosed in matched pairs of quotations, ´, ` or ", form parts of a word; metacharacters in these strings, including blanks and tabs, do not form separate words. These quotations have semantics to be described subsequently. Within pairs of ´ or " characters, a newline preceded by a \ gives a true newline character.

When the shell's input is not a terminal, the character # introduces a comment which continues to the end of the input line. It does not have this special meaning when preceded by \ or placed inside the quotation marks `, ´, or ".

Commands

A simple command is a sequence of words, the first of which specifies the command to be executed. A simple command or a sequence of simple commands separated by | characters forms a pipeline. The output of each command in a pipeline is connected to the input of the next. Sequences of pipelines may be separated by ;, and are then executed sequentially. A sequence of pipelines may be executed without waiting for it to terminate by following it with a &. Such a sequence is automatically prevented from being terminated by a hangup signal; the *nohup* command need not be used.

Any of the above may be placed in parentheses to form a simple command (which may be a component of a pipeline, etc.) It is also possible to separate pipelines with || or && indicating, as in the C language, that the second is to be executed only if the first fails or succeeds respectively. (See *Expressions.)*

Substitutions

The following sections describe the various transformations the shell performs on the input in the order in which they occur.

History Substitutions

History substitutions can be used to reintroduce sequences of words from previous commands, possibly performing modifications on these words. Thus, history substitutions provide a generalization of a *redo* function.

History substitutions begin with the character ! and may begin **anywhere** in the input stream if a history substitution is not already in progress. The ! may be preceded by a \ to prevent its special meaning; a ! is passed unchanged when it is followed by a blank, tab, newline, =, or (. History substitutions may also occur when an input line begins with ^. This special abbreviation will be described later.

Any input line which contains history substitution is echoed on the terminal before it is executed as it could have been entered without history substitution.

Commands input from the terminal which consist of one or more words are saved on the history list, the size of which is controlled by the *history* variable. The previous command is always retained. Commands are numbered sequentially from 1.

For example, enter the command:

history

Now, consider the following output from the history command:

```
 9  write michael
10  ex write.c
11  cat oldwrite.c
12  diff *write.c
```

The commands are shown with their event numbers. It is not usually necessary to use event numbers, but the current event number can be made part of the prompt by placing a ! in the prompt string.

Events can be referred by event number (example: !11), or relatively (example: !-2), or by prefix of a command word (example: !d for event 12), or by a string (example: !?mic? for event 9). These forms, without further modification, simply reintroduce the words of the specified events, each separated by a single blank. As a special case !! refers to the previous command; thus !! alone is essentially a *redo*. The form !# references the current command (the one being entered). It allows a word to be selected from further left in the line, to avoid retyping a long name, as in !#:1.

To select words from an event, we can follow the event specification by a : and a designator for the desired words. The words of an input line are numbered from 0, the first (usually command) word being 0, the second word (first argument) being 1, and so on. The basic word designators are:

0 First (command) word

n *n*th argument

^ First argument, i.e. 1

$ Last argument

% Word matched by (immediately preceding) ?*s*? search

x-*y*
Range of words

-*y* Abbreviates 0-*y*

* Abbreviates ^-$, or nothing if only 1 word in event

*x** Abbreviates *x*-$

x- Like *x** but omitting word $

The : separating the event specification from the word designator can be omitted if the argument selector begins with a ^, $, *, - or %. After the optional word designator, a sequence of modifiers can be placed, each preceded by a :. The following modifiers are defined:

h Removes a trailing pathname component

r Removes a trailing .xxx component

s/*l* /*r* /
Substitutes *r* for *l*

t Removes all leading pathname components

& Repeats the previous substitution

g Applies the change globally, prefixing the above

p Prints the new command but does not execute it

q Quotes the substituted words, preventing further substitutions

x Like q, but breaks into words at blanks, tabs, and newlines

Unless preceded by a g, the modification is applied only to the first modifiable word. In any case it is an error for no word to be applicable.

The left sides of substitutions are not regular expressions in the sense of the editors, but rather strings. Any character may be used as the delimiter in place of /; a \ quotes the delimiter within the *l* and *r* strings. The character & in the right side is replaced by the text from the left. A \ quotes & also. A null *l* uses the previous string either from a *l* or from a contextual scan string *s* in !?*s*?. The trailing delimiter in the substitution may be omitted if a newline follows immediately as may the trailing ? in a contextual scan.

A history reference may be given without an event specification, e.g., !$. In this case the reference is to the previous command unless a previous history reference occurred on the same line in which case this form repeats the previous reference. Thus !?foo?^!$ gives the first and last arguments from the command matching ?foo?.

A special abbreviation of a history reference occurs when the first nonblank character of an input line is a ^. This is equivalent to !:s^, providing a convenient shorthand for substitutions on the text of the previous line. Thus ^lb^lib fixes the spelling of lib in the previous command. Finally, a history substitution may be surrounded with { and } if necessary to insulate it from the characters that follow. Thus, after ls -ld ~paul we might do !{l}a to do ls -ld ~paula, while !la would

look for a command starting la.

Quotations With ´ and "

The quotation of strings by ´ and " can be used to prevent all or some of the remaining substitutions. Strings enclosed in ´ are prevented any further interpretation. Variable and command expansion occurs in strings enclosed in ". Since ! substitution occurs before quoting, ! must be escaped with \, within quotes, to prevent history substitution.

In both cases, the resulting text becomes (all or part of) a single word; only in one special case (see *Command Substitution* below) does a " quoted string yield parts of more than one word; ´ quoted strings never do.

Alias Substitution

The shell maintains a list of aliases which can be established, displayed and modified by the *alias* and *unalias* commands. After a command line is scanned, it is parsed into distinct commands and the first word of each command, left-to-right, is checked to see if it has an alias. If it does, then the text which is the alias for that command is reread with the history mechanism available as though that command were the previous input line. The resulting words replace the command and argument list. If no reference is made to the history list, then the argument list is left unchanged.

Thus if the alias for ls is "ls -l" the command "ls /usr" would map to "ls -l /usr". Similarly if the alias for "lookup" was "grep \!^ /etc/passwd" then "lookup bill" would map to "grep bill /etc/passwd".

If an alias is found, the word transformation of the input text is performed and the aliasing process begins again on the reformed input line. Looping is prevented if the first word of the new text is the same as the old by flagging it to prevent further aliasing. Other loops are detected and cause an error.

Note that the mechanism allows aliases to introduce parser metasyntax. Thus we can alias print "´pr \!* | lpr´ " to make a command that paginates its arguments to the lineprinter.

There are four *csh* aliases distributed. These are **pushd, popd, swapd,** and **flipd**. These aliases maintain a directory stack.

pushd *dir*
Pushes the current directory onto the top of the directory stack, then changes to the directory *dir*.

popd
Changes to the directory at the top of the stack, then removes (pops) the top directory from the stack, and announces the current directory.

swapd
Swaps the top two directories on the stack. The directory on the top becomes the second to the top, and the second to the top directory becomes the top directory.

flipd
Flips between two directories, the current directory and the top directory on the stack. If you are currently in **dir1**,and **dir2** is on the top of the stack, when **flipd** is invoked, you change to **dir2** and **dir1** is replaced as the top directory on the stack. When **flipd** is again invoked, you change to **dir1** and **dir2** is again the top directory on the stack.

Variable Substitution

The shell maintains a set of variables, each of which has a list of zero or more words as its value. Some of these variables are set by the shell or referred to by it. For instance, the *argv* variable is an image of the shell's argument list, and words of this variable's value are referred to in special ways.

The values of variables may be displayed and changed by using the *set* and *unset* commands. Of the variables referred to by the shell a number are toggles; the shell does not care what their value is, only whether they are set or not. For instance, the *verbose* variable is a toggle which causes command input to be echoed. The setting of this variable results from the **-v** command line option.

Other operations treat variables numerically. The at-sign (@) command permits numeric calculations to be performed and the result assigned to a variable. However, variable values are always represented as (zero or more) strings. For the purposes of numeric operations, the null string is considered to be zero, and the second and subsequent words of multiword values are ignored.

After the input line is aliased and parsed, and before each command is executed, variable substitution is performed, keyed by dollar sign ($) characters. This expansion can be prevented by preceding the dollar sign with a backslash (\) except within double quotation marks (") where it *always* occurs, and within single quotation marks (') where it *never* occurs. Strings quoted by back quotation marks (`) are interpreted later (see *Command substitution* below) so dollar sign substitution does not occur there until later, if at all. A dollar sign is passed unchanged if followed by a blank, tab, or end-of-line.

Input and output redirections are recognized before variable expansion, and are expanded separately. Otherwise, the command name and entire argument list are expanded together. It is thus possible for the first (command) word to generate more than one word, the first of which becomes the command name, and the rest of which become arguments.

Unless enclosed in double quotation marks or given the :q modifier, the results of variable substitution may eventually be subject to command and filename substitution. Within double quotation marks ("), a variable whose value consists of multiple words expands to a portion of a single word, with the words of the variable's value separated by blanks. When the :q modifier is applied to a substitution, the variable expands to multiple words with each word separated by a blank and quoted to prevent later command or filename substitution.

The following sequences are provided for introducing variable values into the shell input. Except as noted, it is an error to reference a variable which is not set.

$name
${name}
: Are replaced by the words of the value of variable *name*, each separated by a blank. Braces insulate *name* from following characters which would otherwise be part of it. Shell variables have names consisting of up to 20 letters, digits, and underscores.

If *name* is not a shell variable, but is set in the environment, then that value is returned (but : modifiers and the other forms given below are not available in this case).

$name[selector]
${name[selector]}
: May be used to select only some of the words from the value of *name*. The selector is subjected to $ substitution and may consist of a single number or two numbers separated by a -. The first word of a variable's value is numbered 1. If the first number of a range is omitted it defaults to 1. If the last member of a range is omitted it defaults to $#name. The selector * selects all words. It is not an error for a range to be empty if the second argument is omitted or in range.

$#name
${#name}
: Gives the number of words in the variable. This is useful for later use in a [selector].

$0 Substitutes the name of the file from which command input is being read. An error occurs if the name is not known.

$number
${number}
Equivalent to $argv[number].

$* Equivalent to $argv[*].

The modifiers :h, :t, :r, :q and :x may be applied to the substitutions above as may :gh, :gt and :gr. If braces { } appear in the command form then the modifiers must appear within the braces. Only one : modifier is allowed on each $ expansion.

The following substitutions may not be modified with : modifiers.

$?name
${?name}
Substitutes the string 1 if name is set, 0 if it is not.

$?0 Substitutes 1 if the current input filename is known, 0 if it is not.

$$ Substitutes the (decimal) process number of the (parent) shell.

Command and Filename Substitution

Command and filename substitution are applied selectively to the arguments of built-in commands. This means that portions of expressions which are not evaluated are not subjected to these expansions. For commands which are not internal to the shell, the command name is substituted separately from the argument list. This occurs very late, after input-output redirection is performed, and in a child of the main shell.

Command Substitution

Command substitution is indicated by a command enclosed in back quotation marks (‘). The output from such a command is normally broken into separate words at blanks, tabs and newlines, with null words being discarded. This text then replaces the original string. Within double quotation marks, only newlines force new words; blanks and tabs are preserved.

In any case, the single final newline does not force a new word. Note that it is possible for a command substitution to yield only part of a word, even if the command outputs a complete line.

Filename Substitution

If a word contains any of the characters *, ?, [or { or begins with the character ~, then that word is a candidate for filename substitution, also known as globbing. This word is then regarded as a pattern, and is replaced with an alphabetically sorted list of filenames which match the pattern. In a list of words specifying filename substitution it is an

error for no pattern to match an existing filename, but it is not required for each pattern to match. Only the metacharacters *, ?, and [imply pattern matching. The characters ~ and { are more akin to abbreviations.

In matching filenames, the character . at the beginning of a filename or immediately following a /, as well as the character / must be matched explicitly. The character * matches any string of characters, including the null string. The character ? matches any single character. The sequence within square brackets [] matches any one of the characters enclosed. Within square brackets [], a pair of characters separated by - matches any character lexically between the two.

The character ~ at the beginning of a filename is used to refer to home directories. Standing alone, it expands to the invoker's home directory contained in the variable HOME. When followed by a name consisting of letters, digits and _ characters the shell searches for a user with that name and substitutes their home directory; thus **~ken** might expand to **/usr/ken** and **~ken/chmach** to **/usr/ken/chmach**. If the character ~ is followed by a character other than a letter or /, or if it does not appear at the beginning of a word, it is left unchanged.

The metanotation a{b,c,d}e is a shorthand for abe ace ade. Left to right order is preserved, with results of matches being sorted separately at a low level to preserve this order. Thus **~source/s1/{oldls,ls}.c** expands to **/usr/source/s1/oldls.c /usr/source/s1/ls.c**, whether or not these files exist, assuming that the home directory for source is **/usr/source**. Similarly **../{memo,*box}** might expand to **../memo ../box ../mbox**. (Note that memo was not sorted with the results of matching *box.) As a special case {, } and {} are passed unchanged. This construct can be nested.

Spelling Checker

If the local variable *cdspell* has been set, the shell checks spelling whenever you use *cd* to change directories. For example, if you change to a different directory using *cd* and misspell the directory name, the shell responds with an alternative spelling of an existing directory. Enter "y" and press RETURN (or just press RETURN) to change to the offered directory. If the offered spelling is incorrect, enter "n", then retype the command line. In this example the **csh**(C) response is boldfaced:

```
cd /usr/spol/uucp
/usr/spool/uucp? y
ok
```

Input/Output

The standard input and standard output of a command may be redirected with the following syntax:

< name
: Opens file *name* (after variable, command and filename expansion) as the standard input.

<< word
: Reads the shell input up to a line which is identical to *word*. *Word* is not subjected to variable, filename or command substitution, and each input line is compared to *word* before any substitutions are done on this input line. Unless a quoting backslash, double, or single quotation mark, or a back quotation mark appears in *word*, variable and command substitution is performed on the intervening lines, allowing \ to quote $, \ and `. Commands which are substituted have all blanks, tabs, and newlines preserved, except for the final newline which is dropped. The resulting text is placed in an anonymous temporary file which is given to the command as standard input.

> name
>! name
>& name
>&! name
: The file *name* is used as standard output. If the file does not exist, then it is created; if the file exists, it is overwritten.

: If the variable *noclobber* is set, then an error results if the file already exists or if it is not a character special file (e.g., a terminal or **/dev/null**). This helps prevent accidental destruction of files. In this case, the ! forms can be used to suppress this check.

: The forms involving & route the standard error into the specified file as well as the standard output. *Name* is expanded in the same way as < input filenames are.

>> name
>>& name
>>! name
>>&! name
: Uses file *name* as standard output like > but places output at the end of the file. If the variable *noclobber* is set, then it is an error for the file not to exist unless one of the ! forms is given. Otherwise similar to >.

If a command is run in the background (followed by &) then the default standard input for the command is the empty file /dev/null. Otherwise, the command receives the input and output parameters from its parent shell. Thus, unlike some previous shells, commands run from a file of shell commands have no access to the text of the

commands by default; rather they receive the original standard input of the shell. The << mechanism should be used to present inline data. This permits shell command scripts to function as components of pipelines and allows the shell to block read its input.

Standard error can be directed through a pipe with the standard output. Simply use the form |& rather than just |.

Expressions

A number of the built-in commands (to be described later) take expressions, in which the operators are similar to those of C, with the same precedence. These expressions appear in the *@, exit, if,* and *while* commands. The following operators are available:

```
|| && | ^ & == != <= >= < > << >>
+ - * / % ! ~ ( )
```

Here the precedence increases to the right, == and !=, <=, >=, <, and >, << and >>, + and -, * / and % being, in groups, at the same level. The == and != operators compare their arguments as strings, all others operate on numbers. Strings which begin with 0 are considered octal numbers. Null or missing arguments are considered 0. The result of all expressions are strings, which represent decimal numbers. It is important to note that no two components of an expression can appear in the same word unless a word is adjacent to components of expressions which are syntactically significant to the parser (& | < > ( )), in which case it should be surrounded by spaces.

Also available in expressions as primitive operands are command executions enclosed in { and } and file enquiries of the form *-l* name where *l* is one of:

r	Read access
w	Write access
x	Execute access
e	Existence
o	Ownership
z	Zero size
f	Plain file
d	Directory

Command and filename expansion is applied to the specified name, then the result is tested to see if it has the specified relationship to the real user. If the file does not exist or is inaccessible then all enquiries return false, i.e. 0. Command executions succeed, returning true, i.e. 1, if the command exits with status 0, otherwise they fail, returning false, i.e. 0.

If more detailed status information is required then the command should be executed outside of an expression and the variable *status* examined.

Control Flow

The shell contains a number of commands which can be used to regulate the flow of control in command files (shell scripts) and (in limited but useful ways) from terminal input. Due to the implementation, some restrictions are placed on the word placement for the *foreach, switch,* and *while* statements, as well as the *if-then-else* form of the *if* statement. Please pay careful attention to these restrictions in the descriptions in the next section.

If the shell's input is not seekable, the shell buffers up input whenever a loop is being read and performs seeks in this internal buffer to accomplish the rereading implied by the loop. (To the extent that this allows, backward goto commands will succeed on nonseekable inputs.)

Built-In Commands

Built-in commands are executed within the shell. If a built-in command occurs as any component of a pipeline except the last, then it is executed in a subshell.

alias
alias name
alias name wordlist
The first form prints all aliases. The second form prints the alias for *name*. The final form assigns the specified *wordlist* as the alias of *name; wordlist* is a command, and filename substitution is applied to wordlist. *Name* is not allowed to be *alias* or *unalias*.

break
Causes execution to resume after the *end* of the nearest enclosing *foreach* or *while* statement. The remaining commands on the current line are executed. Multilevel breaks are thus possible by writing them all on one line.

breaksw
Causes a break from a *switch,* resuming after the *endsw*.

case label:
This is part of the *switch* statement discussed below.

cd
cd name
chdir
chdir name
Changes the shell's working directory to directory *name*. If no argument is given, it then changes to the home directory of the user. If *name* is not found as a subdirectory of the current directory (and does not begin with /, ./, or ../), then each component of the variable *cdpath* is checked to see if it has a subdirectory

name. Finally, if all else fails but *name* is a shell variable whose value begins with /, then this is tried to see if it is a directory.

If *cdspell* has been set, the shell runs a spelling check as follows. If the shell is reading its commands from a terminal, and the specified directory does not exist (or some component cannot be searched), spelling correction is applied to each component of *directory* in a search for the "correct" name. The shell then asks whether or not to try and change the directory to the corrected directory name; an answer of *n* means "no," and anything else is taken as "yes."

continue
Continues execution of the nearest enclosing *while* or *foreach*. The rest of the commands on the current line are executed.

default:
Labels the default case in a *switch* statement. The default should come after all *case* labels.

echo wordlist
The specified words are written to the shell's standard output. A \c causes the echo to complete without printing a newline. A \n in *wordlist* causes a newline to be printed. Otherwise the words are echoed, separated by spaces.

else
end
endif
endsw
See the description of the *foreach, if, switch,* and *while* statements below.

exec command
The specified command is executed in place of the current shell.

exit
exit(expr)
The shell exits either with the value of the *status* variable (first form) or with the value of the specified *expr* (second form).

foreach name (wordlist)
...
end
The variable *name* is successively set to each member of *wordlist* and the sequence of commands between this command and the matching *end* are executed. (Both *foreach* name*(wordlist)* and *end* must appear alone on separate lines.)

The built-in command *continue* may be used to continue the loop prematurely and the built-in command *break* to terminate it prematurely. When this command is read from the terminal, the contents of the loop are read by prompting with ? until *end* is typed before any statements in the loop are executed.

glob wordlist
Like *echo* but no \ escapes are recognized and words are delimited by null characters in the output. Useful for programs which wish to use the shell to apply filename expansion to a list of words.

goto word
Filename and command expansion is applied to the specified *word* to yield a string of the form *label:*. The shell rewinds its input as much as possible and searches for a line of the form label: possibly preceded by blanks or tabs. Execution continues after the specified line.

history
Displays the history event list.

if (expr) command
If the specified expression evaluates true, then the single *command* with arguments is executed. Variable substitution on *command* happens early, at the same time it does for the rest of the *if* command. *Command* must be a simple command, not a pipeline, a command list, or a parenthesized command list. Input/output redirection occurs even if *expr* is false, and *command* is **not** executed.

if (expr) **then**
...
else if (expr2) **then**
...
else
...
endif
If the specified *expr* is true then the commands before the first *else* are executed; else if *expr2* is true then the commands after the second *then* and before the second *else* are executed, etc. Any number of *else-if* pairs are possible; only one *endif* is needed. The *else* part is likewise optional. (The words *else* and *endif* must appear at the beginning of input lines; the *if* (expr) then must appear alone on its input line or after an *else.)*

logout
Terminates a login shell. The only way to log out if *ignoreeof* is set.

nice
nice +number
nice command
nice +number command

The first form sets the *nice* for this shell to 4. By default, commands run under C-Shell have a "nice value" of 0. The second form sets the *nice* to the given number. The final two forms run *command* at priority 4 and *number* respectively. The super-user may specify negative niceness by using "nice -number ...." The command is always executed in a subshell, and the restrictions placed on commands in simple *if* statements apply.

nohup
nohup command

The first form can be used in shell scripts to cause hangups to be ignored for the remainder of the script. The second form causes the specified command to be run with hangups ignored. Unless the shell is running in the background, *nohup* has no effect. All processes running in the background with & are automatically *nohup*ed.

onintr
onintr -
onintr label

Controls the action of the shell on interrupts. The first form restores the default action of the shell on interrupts which is to terminate shell scripts or to return to the terminal command input level. The second form, *onintr* -, causes all interrupts to be ignored. The final form causes the shell to execute a *goto label* when an interrupt is received or a child process terminates because it was interrupted.

In any case, if the shell is running in the background, interrupts are ignored whether any form of *onintr* is present or not.

rehash

Causes the internal hash table of the contents of the directories in the *path* variable to be recomputed. This is needed if new commands are added to directories in the *path* while you are logged in.

repeat count command

The specified *command*, which is subject to the same restrictions as the *command* in the simple *if* statement above, is executed *count* times. I/O redirection occurs exactly once, even if *count* is 0.

set
set name
set name=word

set name[index]=word
set name=(wordlist)

The first form of the command shows the value of all shell variables. Variables which have other than a single word as value print as a parenthesized word list. The second form sets *name* to the null string. The third form sets *name* to the single *word*. The fourth form sets the *indexth* component of *name* to *word*; this component must already exist. The final form sets *name* to the list of words in *wordlist*. Command and filename expansion is applied in all cases.

These arguments may be repeated to set multiple values in a single set command. Note however, that variable expansion happens for all arguments before any setting occurs.

setenv name value

Sets the value of the environment variable *name* to be *value*, which must be a single string. Two useful environment variables are TERM, the type of your terminal and SHELL, the shell you are using.

shift
shift variable

In the first form, the members of *argv* are shifted to the left, discarding *argv[1]*. It is an error for *argv* not to be set or to have less than one word as a value. The second form performs the same function on the specified variable.

source name

The shell reads commands from *name*. *Source* commands may be nested, but if they are nested too deeply, the shell may run out of file descriptors. An error in a *source* at any level terminates all nested *source* commands, including the *csh* process from which *source* was called. If *source* is called from the login shell, it is logged out. Input during *source* commands is never placed on the history list.

switch (string)
case str1:
...
breaksw
...
default:
...
breaksw
endsw

Command and filename substitution is applied to *string*. Then each case label is successively matched against the result. Variable expansion is also applied to the case labels, so the file metacharacters *, ?, and [...] can be used. If none of the labels match before a default label is found, then the execution begins after the default label. Each case label and the default label

must appear at the beginning of a line. The command *breaksw* causes execution to continue after the *endsw*. Otherwise control may fall through case labels and default labels, as in C. If no label matches and there is no default, execution continues after the *endsw*.

time
time command
With no argument, a summary of CPU time used by this shell and its children is printed. If arguments are given, the specified simple command is timed and a time summary as described under the *time* variable is printed. If necessary, an extra shell is created to print the time statistic when the command completes. *command* has the same restrictions as the simple *if* statement described above.

umask
umask value
The file creation mask is displayed (no arguments) or set to the specified value (one argument). The mask is given in octal. Common values for the mask are 002 giving all access to the group and read and execute access to others, or 022 giving read and execute access to users in the group and all other users.

unalias pattern
All aliases whose names match the specified pattern are discarded. Thus, all aliases are removed by unalias *. It is not an error for nothing to be *unaliased.*

unhash
Use of the internal hash table to speed location of executed programs is disabled.

unset pattern
All variables whose names match the specified pattern are removed. Thus, all variables are removed by unset *; this has noticeably distasteful side-effects. It is not an error for nothing to be *unset.*

wait
All child processes are waited for. If the shell is interactive, then an interrupt can disrupt the wait, at which time the shell prints names and process numbers of all children known to be outstanding.

while (expr)
...
end
While the specified expression evaluates nonzero, the commands between the *while* and the matching *end* are evaluated. *Break* and *continue* may be used to terminate or continue the

loop prematurely. (The *while* (expr) and *end* must appear alone on their input lines.) Prompting occurs here the first time through the loop as for the *foreach* statement if the input is a terminal.

@
@ name = expr
@ name[index] = expr

The first form prints the values of all the shell variables. The second form sets the specified *name* to the value of *expr*. If the expression contains <, >, & or | then at least this part of the expression must be placed within ( ). The third form assigns the value of *expr* to the *index*th argument of *name*. Both *name* and its *index*th component must already exist.

The operators *=, +=, etc. are available as in C. The space separating the name from the assignment operator is optional. Spaces are mandatory in separating components of *expr* which would otherwise be single words. The space between @ and *name* is also mandatory.

Special postfix ++ and -- operators increment and decrement *name* respectively, i.e. @ i++.

Predefined Variables

The following variables have special meaning to the shell. Of these, *argv, child, home, path, prompt, shell* and *status* are always set by the shell. Except for *child* and *status* this setting occurs only at initialization; these variables will not be modified unless done explicitly by the user.

The shell copies the environment variable PATH into the variable *path*, and copies the value back into the environment whenever *path* is set. Thus it is not necessary to worry about its setting other than in the file *.login* because inferior *csh* processes will import the definition of *path* from the environment.

argv Set to the arguments to the shell, it is from this variable that positional parameters are substituted, i.e., $1 is replaced by $argv[1], etc. argv[0] is not defined, but $0 is.

cdpath Gives a list of alternate directories searched to find subdirectories in *cd* commands.

child The process number of the last command forked with &. This variable is *unset* when this process terminates.

echo Set when the **-x** command line option is given. Causes each command and its arguments to be echoed just before it is executed. For nonbuilt-in commands all expansions occur before echoing. Built-in commands are echoed before command and filename substitution, since these substitutions are then done selectively.

histchars Can be assigned a two-character string. The first character is used as a history character in place of !, the second character is used in place of the ^ substitution mechanism. For example, set histchars=",;" will cause the history characters to be comma and semicolon.

history Can be given a numeric value to control the size of the history list. Any command which has been referenced in this many events will not be discarded. A *history* that is too large may run the shell out of memory. The last executed command is always saved on the history list.

home The home directory of the invoker, initialized from the environment. The filename expansion of ~ refers to this variable.

ignoreeof If set, the shell ignores end-of-file from input devices that are terminals. This prevents a shell from accidentally being terminated by pressing Ctrl-D.

mail The files where the shell checks for mail. This check is executed after each command completion. The shell responds with, "You have new mail" if the file exists with an access time not greater than its modify time.

If the first word of the value of *mail* is numeric, it specifies a different mail checking interval: in seconds, rather than the default, which is 10 minutes.

If multiple mail files are specified, then the shell responds with "New mail in *name*", when there is mail in the file *name*.

noclobber As described in the section *Input/Output,* restrictions are placed on output redirection to insure that files are not accidentally destroyed, and that >> redirections refer to existing files.

noglob If set, filename expansion is inhibited. This is most useful in shell scripts which are not dealing with filenames, or after a list of filenames has been obtained and further expansions are not desirable.

nonomatch If set, it is not an error for a filename expansion to not match any existing files; rather, the primitive pattern is returned. It is still an error for the primitive pattern to be malformed, i.e., echo [still gives an error.

path Each word of the path variable specifies a directory in which commands are to be sought for execution. A null word specifies the current directory. If there is no *path* variable, then only full pathnames will execute. The usual search path is /bin, /usr/bin, and ., but this may vary from system to system. For the super-user, the default search path is /etc, /bin and /usr/bin. A shell which is given neither the **-c** nor the **-t** option will normally hash the contents of the directories in the *path* variable after reading *.cshrc,* and each time the *path* variable is reset. If new commands are added to these directories while the shell is active, it may be necessary to give the *rehash* command, or the commands may not be found.

prompt The string which is printed before reading each command from an interactive terminal input. If a ! appears in the string, it will be replaced by the current event number unless a preceding \ is given. Default is % , or # for the super-user.

shell The file in which the shell resides. This is used in forking shells to interpret files which have execute bits set, but which are not executable by the system. (See the description of *Nonbuilt-In Command Execution* below.) Initialized to the home of the shell.

status The status returned by the last command. If it terminated abnormally, then 0200 is added to the status. Built-in commands which fail return exit status 1, otherwise these commands set status to 0.

time Controls automatic timing of commands. If set, then any command which takes more than this many cpu seconds will cause a line to be sent to the screen displaying user time, system time, real time, and a utilization percentage which is the ratio of user plus system times to real time.

verbose Set by the **-v** command line option, causes the words of each command to be printed after history substitution.

Nonbuilt-In Command Execution

When a command to be executed is not a built-in command, the shell attempts to execute the command via *exec* (S). Each word in the variable *path* names a directory from which the shell will attempt to execute the command. If it is given neither a **-c** nor a **-t** option, the shell will hash the names in these directories into an internal table so that it will only try an *exec* in a directory if there is a possibility that the command resides there. This greatly speeds command location when a large number of directories are present in the search path. If this mechanism has been turned off (via *unhash),* or if the shell was given a **-c** or **-t** argument, and for each directory component of *path* which does not begin with a /, the shell concatenates each directory component of *path* with the given command name to form a pathname of a file which it then attempts to execute.

Parenthesized commands are always executed in a subshell. Thus

```
(cd; pwd); pwd
```

prints the home directory but leaves you in the original directory, while

```
cd; pwd
```

moves you to the home directory.

If the file has execute permissions but is not an executable binary to the system, then it is assumed to be a file containing shell commands and a new shell is spawned to read it.

If there is an *alias* for *shell* then the words of the alias are prepended to the argument list to form the shell command. The first word of the *alias* should be the full pathname of the shell (e.g. $shell). Note that this is a special, late occurring, case of *alias* substitution, and only allows words to be prepended to the argument list without modification.

Argument List Processing

If argument 0 to the shell is - then this is a login shell. The flag arguments are interpreted as follows:

-c Commands are read from the (single) following argument which must be present. Any remaining arguments are placed in *argv*.

-e The shell exits if any invoked command terminates abnormally or yields a nonzero exit status.

-f The shell will start faster, because it will neither search for nor execute commands from the file .cshrc in the invoker's home directory.

-i The shell is interactive and prompts for its top-level input, even if it appears to not be a terminal. Shells are interactive without this option if their input and output are terminals.

-n Commands are parsed, but not executed. This may aid in syntactic checking of shell scripts.

-s Command input is taken from the standard input.

-t A single line of input is read and executed. A \ may be used to escape the newline at the end of this line and continue onto another line.

-v Causes the *verbose* variable to be set, with the effect that command input is echoed after history substitution.

-x Causes the *echo* variable to be set, so that commands are echoed immediately before execution.

-V Causes the *verbose* variable to be set even before .cshrc is executed.

-X Causes the *echo* variable to be set even before .cshrc is executed.

After processing the flag arguments, if arguments remain but none of the **-c, -i, -s,** or **-t** options were given, the first argument is taken as the name of a file of commands to be executed. The shell opens this file, and saves its name for possible resubstitution by $0. On a typical system, most shell scripts are written for the standard shell (see *sh*(C)). The C shell will execute such a standard shell if the first character of the script is not a # (i.e. if the script does not start with a comment). Remaining arguments initialize the variable *argv*.

Signal Handling

The shell normally ignores *quit* signals. The *interrupt* and *quit* signals are ignored for an invoked command if the command is followed by &; otherwise the signals have the values which the shell inherited from its parent. The handling of interrupts can be controlled by *onintr*. By default, login shells catch the *terminate* signal; otherwise this signal is passed on to children from the state in the shell's parent. In no case are interrupts allowed when a login shell is reading the file .logout.

Files

~/.cshrc	Read at by each shell at the beginning of execution
/etc/cshrc	Systemwide default *cshrc* file
~/.login	Read by login shell, after .cshrc at login
~/.logout	Read by login shell, at logout
/bin/sh	Shell for scripts not starting with a #
/tmp/sh*	Temporary file for <<
/dev/null	Source of empty file
/etc/passwd	Source of home directories for ~name

Limitations

Words can be no longer than 512 characters. The number of arguments to a command which involves filename expansion is limited to 1/6 the number of characters allowed in an argument list, which is 5120, less the characters in the environment. The length of any argument of a command after filename expansion cannot exceed 159 characters. Also, command substitutions may substitute no more characters than are allowed in an argument list.

To detect looping, the shell restricts the number of *alias* substitutions on a single line to 20.

See Also

access(S), exec(S), fork(S), pipe(S), signal(S), umask(S), wait(S), a.out(F), environ(M)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

Built-in control structure commands like **foreach** and **while** cannot be used with |, & or ;.

Commands within loops, prompted for by ?, are not placed in the *history* list.

It is not possible to use the colon (:) modifiers on the output of command substitutions.

The C-shell has many built-in commands with the same name and functionality as Bourne shell commands. However, the syntax of these C-shell and Bourne shell commands often differs. Two examples are the *nice* and *echo* commands. Be sure to use the correct syntax when working with these built-in C-shell commands.

When a C-shell user logs in, the system reads and executes commands in */etc/cshrc* before executing commands in the user's *$HOME/.cshrc* and *$HOME/login*. You can, therefore, modify the C-shell environment for all users on the system by editing */etc/cshrc*.

During intervals of heavy system load, pressing the delete key while at a C-shell prompt (%) may cause the shell to exit. If *csh* is the login shell, the user is logged out.

csh attempts to import and export the PATH variable for use with regular shell scripts. This only works for simple cases, where the PATH contains no meta-characters.

Name

csplit - Splits files according to context.

Syntax

csplit [**-s**] [**-k**] [**-f** prefix] file arg1 [. . . argn]

Description

csplit reads *file* and separates it into n+1 sections, defined by the arguments *arg1*. . . *argn*. By default the sections are placed in xx00 . . . xx*n* (*n* may not be greater than 99). These sections get the following pieces of *file*:

00: From the start of *file* up to (but not including) the line referenced by *arg1*.

01: From the line referenced by *arg1* up to the line referenced by *arg2*.

⋮

n+1: From the line referenced by *argn* to the end of *file*.

The options to *csplit* are:

-s *csplit* normally prints the character counts for each file created. If the **-s** option is present, *csplit* suppresses the printing of all character counts.

-k *csplit* normally removes created files if an error occurs. If the **-k** option is present, *csplit* leaves previously created files intact.

-f *prefix* If the **-f** option is used, the created files are named *prefix***00** . . . *prefixn*. The default is **xx00** . . . **xx***n*.

The arguments (*arg1* . . . *argn*) to *csplit* can be a combination of the following:

/rexp/ A file is to be created for the section from the current line up to (but not including) the line containing the regular expression *rexp*. The current line becomes the line containing *rexp*. This argument may be followed by an optional +or - some number of lines (e.g., **/Page/-5**).

%rexp% This argument is the same as */rexp/*, except that no file is created for the section.

lnno A file is to be created from the current line up to (but not including) *lnno*. The current line becomes *lnno*.

{*num*} Repeat argument. This argument may follow any of the above arguments. If it follows a *rexp* type argument, that argument is applied *num* more times. If it follows *lnno*, the file will be split every *lnno* lines (*num* times) from that point.

Enclose all *rexp* type arguments that contain blanks or other characters meaningful to the shell in the appropriate quotation marks. Regular expressions may not contain embedded newlines. *csplit* does not affect the original file; it is the user's responsibility to remove it.

Examples

```
csplit -f cobol file ´/procedure division/´ /par5./ /par16./
```

This example creates four files, **cobol00 . . . cobol03**. After editing the "split" files, they can be recombined as follows:

```
cat cobol0[0-3] > file
```

Note that this example overwrites the original file.

```
csplit -k file 100 {99}
```

This example would split the file at every 100 lines, up to 10,000 lines. The **-k** option causes the created files to be retained if there are less than 10,000 lines; however, an error message would still be printed.

```
csplit -k prog.c ´%main(%´ ´/^}/+1´ {20}
```

Assuming that **prog.c** follows the normal **C** coding convention of ending routines with a } at the beginning of the line and that main( ) is the first function in **proc.c** this example will create a file containing each separate **C** routine (up to 21) in **prog.c**.

See Also

ed(C), sh(C), regex(S)

Diagnostics

Self-explanatory except for "arg - out of range," which means that the given argument did not reference a line between the current position and the end of the file.

Name

ct - spawn getty to a remote terminal

Syntax

ct [**-w**n] [**-x**n] [**-h**] [**-v**] [-sspeed] telno ...

Description

ct dials the telephone number of a modem that is attached to a terminal, and spawns a *getty* process to that terminal. *Telno* is a telephone number, with equal signs for secondary dial tones and minus signs for delays at appropriate places. (The set of legal characters for *telno* is 0 thru 9, -, =, *, and #. The maximum length *telno* is 58 characters). If more than one telephone number is specified, *ct* will try each in succession until one answers; this is useful for specifying alternate dialing paths.

ct will try each ACU line listed in the file **/usr/lib/uucp/Devices** until it finds an available line with appropriate attributes or runs out of entries. If there are no free lines, *ct* will ask if it should wait for one, and if so, for how many minutes it should wait before it gives up. *ct* will continue to try to open the dialers at one-minute intervals until the specified limit is exceeded. The dialogue may be overridden by specifying the **-w***n* option, where *n* is the maximum number of minutes that *ct* is to wait for a line.

The **-x***n* option is used for debugging; it produces a detailed output of the program execution on stderr. The debugging level, *n*, is a single digit; **-x**9 is the most useful value. If the **-v** option is used, *ct* will send a running narrative to the standard error output stream.

Normally, *ct* will hang up the current line, so the line can answer the incoming call. The **-h** option will prevent this action. The **-h** option will also wait for the termination of the specified *ct* process before returning control to the user's terminal.

The data rate may be set with the **-s** option, where *speed* is expressed in baud. The default rate is 1200.

After the user on the destination terminal logs out, *ct* prompts, **Reconnect?** If the response does not begin with the letter **y**, the line will be dropped; otherwise, *getty* will be started again and the **login:** prompt will be printed.

To log out properly, the user must type **control D**.

Of course, the destination terminal must be attached to a modem that can answer the telephone.

Files

/usr/lib/uucp/Devices
/usr/lib/uucp/LCK..(tty-device)
/usr/adm/ctlog

See Also

cu(C), login(M), uucp(C), getty(M).

Notes

In hangup mode (**-h** not specified), when a suitable dialer has been allocated, *ct* prompts "Proceed to hang-up?" If the response does not begin with the letter y, the program simply exits. If you are logged in on a computer through a local terminal and you want to connect a remote terminal to the computer, you should use **nohup** with *ct* to accomplish this:

nohup ct -h -s*speed phone*

After the command is executed, a login prompt is displayed on the remote terminal. The user can then log in and work on the computer just as on a local terminal.

Name

cu - Call another XENIX/UNIX system.

Syntax

cu [**-s**speed] [**-l**line] [**-h**] [**-t**] [**-xn**] [**-o** | **-e** | **-oe**] [**-n**] telno
cu [**-s** speed] [**-h**] [**-xn**] [[**-o** | **-e** | **-oe**] **-l** line [**dir**]
cu [**-h**] [**-xn**] [**-o** | **-e** | **-oe**] systemname

Description

cu calls up another UNIX system, a terminal, or possibly a non-UNIX system. It manages an interactive conversation with possible transfers of ASCII files.

cu accepts the following options and arguments:

-s*speed* Specifies the transmission speed (150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400). The default value is "Any" speed which will depend on the order of the lines in the **/usr/lib/uucp/Devices** file. A speed range can also be specified (for example, -s1200-4800).

-l*line* Specifies a device name to use as the communication line. This can be used to override the search that would otherwise take place for the first available line having the right speed. When the **-l** option is used without the **-s** option, the speed of a line is taken from the Devices file. When the **-l** and **-s** options are both used together, cu will search the Devices file to check if the requested speed for the requested line is available. If so, the connection will be made at the requested speed; otherwise an error message will be printed and the call will not be made. The specified device is generally a directly connected asynchronous line (e.g., **/dev/tty***ab*) in which case a telephone number (*telno*) is not required. The specified device need not be in the **/dev** directory. If the specified device is associated with an auto dialer, a telephone number must be provided. Use of this option with *systemname* rather than *telno* will not give the desired result (see *systemname* below).

-h Emulates local echo, supporting calls to other computer systems which expect terminals to be set to half-duplex mode.

-t Used to dial an ASCII terminal which has been set to auto answer. Appropriate mapping of carriage-return to carriage-return-line-feed pairs is set.

-x*n* Causes diagnostic traces to be printed; it produces a detailed output of the program execution on stderr. The debugging level, **n**, is a single digit; **-x**9 is the most useful value.

-n For added security, will prompt the user to provide the telephone number to be dialed rather than taking it from the command line.

telno When using an automatic dialer, the argument is the telephone number with equal signs for secondary dial tone or minus signs placed appropriately for delays of 4 seconds.

systemname A UUCP system name may be used rather than a telephone number. In this case, *cu* will obtain an appropriate direct line or telephone number from **/usr/lib/uucp/Systems.** Note: the *systemname* option should not be used in conjunction with the **-l** and **-s** options as *cu* will connect to the first available line for the system name specified, ignoring the requested line and speed.

dir The keyword **dir** can be used with **cu -l***line*, in order to talk directly to a modem on that line, instead of talking to another system via that modem. This can be useful when debugging or checking modem operation. Note: only users with write access to the *Devices* file are permitted to use **cu -l***line* **dir**.

In addition, *cu* uses the following options to determine communications settings:

-o If the remote system expects or sends 7-bit with odd parity.

-e If the remote system expects or sends 7-bit with even parity.

-oe
If the remote system expects or sends 7-bit, ignoring parity and sends 7-bit with either parity.

By default, *cu* expects and sends 8-bit characters without parity. If the login prompt received appears to contain incorrect 8-bit characters, or a correct login is rejected, use the 7-bit options described above.

After making the connection, *cu* runs as two processes: the *transmit* process reads data from the standard input and, except for lines beginning with ~, passes it to the remote system; the *receive* process accepts data from the remote system and, except for lines beginning with ~, passes it to the standard output. Normally, an automatic XON/XOFF protocol is used to control input from the remote so the buffer is not overrun. Lines beginning with ~ have special meanings.

The *transmit* process interprets the following user initiated commands:

~.	terminate the conversation.
~!	escape to an interactive shell on the local system.
~!*cmd*...	run *cmd* on the local system (via **sh -c**).
~$*cmd*...	run *cmd* locally and send its output to the remote system.
~+*cmd*...	runs *cmd* on the local system (via **sh -c**), with both standard input and standard output of *cmd* redirected to the remote system.
~%**cd**	change the directory on the local system. Note: ~**!cd** will cause the command to be run by a sub-shell, probably not what was intended.
~%**take** *from* [*to*]	copy file *from* (on the remote system) to file *to* on the local system. If *to* is omitted, the *from* argument is used in both places.
~%**put** *from* [*to*]	copy file *from* (on local system) to file *to* on remote system. If *to* is omitted, the *from* argument is used in both places. For both ~%**take** and ~%**put** commands, as each block of the file is transferred, consecutive single digits are printed to the terminal.
~~*line*	send the line ~*line* to the remote system.
~%**break**	transmit a **BREAK** to the remote system (which can also be specified as ~%**b**).
~%**debug**	toggles the **-x** debugging level between 0 and 9 (which can also be specified as ~%**d**).
~**t**	prints the values of the termio structure variables for the user's terminal (useful for debugging).
~**l**	prints the values of the termio structure variables for the remote communication line (useful for debugging).

~%nostop toggles between XON/XOFF input control protocol and no input control. This is useful in case the remote system is one which does not respond properly to the DC3 and DC1 characters.

The *receive* process normally copies data from the remote system to its standard output. Internally the program accomplishes this by initiating an output diversion to a file when a line from the remote begins with ~. Data from the remote is diverted (or appended, if >> is used) to *file* on the local system. The trailing ~> marks the end of the diversion.

The use of **~%put** requires *stty*(C) and *cat*(C) on the remote side. It also requires that the current erase and kill characters on the remote system be identical to these current control characters on the local system. Backslashes are inserted at appropriate places.

The use of **~%take** requires the existence of *echo*(S) and *cat*(C) on the remote system. Also, *tabs* mode (See *stty(C))* should be set on the remote system if tabs are to be copied without expansion to spaces. These commands must be executed at a shell prompt on the remote system.

When *cu* is used on *system1* to connect to *system2* and subsequently used on *system2* to connect to *system3*, commands on *system2* can be executed by using ~~. Executing a tilde command reminds the user of the local system *uname*. For example, *uname* can be executed on systems 1, 2, and 3 as follows:

```
uname
system3
~system1!uname
system1
~~system2!uname
system2
```

In general, ~ causes the command to be executed on the original machine, ~~ causes the command to be executed on the next machine in the chain.

Examples

To dial a system whose telephone number is 9 201 555 1212 using 1200 baud (where dialtone is expected after the 9):

```
cu -s1200  9=12015551212
```

If the speed is not specified, "Any" is the default value.

To login to a system connected by a direct line:

```
cu -l /dev/ttyXX
```

or

```
cu -l ttyXX
```

To dial a system with the specific line and a specific speed:

```
cu -s1200 -l ttyXX
```

To dial a system using a specific line associated with an auto dialer:

```
cu -l ttyXX 9=12015551212
```

To use a system name:

```
cu systemname
```

To talk directly to an ACU (connect directly with the modem and enter modem commands manually):

```
cu -lttyXX dir
```

Files

/usr/lib/uucp/Systems
/usr/lib/uucp/Devices
/usr/lib/uucp/LCK..(tty-device)

See Also

cat(C), ct(C), echo(S), stty(C), uucp(C), uname(C)

Diagnostics

Exit code is zero for normal exit, otherwise, one.

Warnings

The *cu* command does not do any integrity checking on data it transfers. Data fields with special *cu* characters may not be transmitted properly. Depending on the interconnection hardware, it may be necessary to use a ~. to terminate the conversion even if **stty 0** has been used. Non-printing characters are not dependably transmitted using either the ~**%put** or ~**%take** commands.

Notes

There is an artificial slowing of transmission by *cu* during the ~**%put** operation so that loss of data is unlikely.

Name

date - Prints and sets the date.

Syntax

date [mmddhhmm[yy]] [+format]

Description

If no argument is given, or if the argument begins with +, the current date and time are printed as defined by the locale. Otherwise, the current date is set. 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 2 digits of the year number and is optional. For example:

date 10080045

sets the date to Oct 8, 12:45 AM, if the local language is set to English. The current year is the default if no year is mentioned. The system operates in GMT. *date* takes care of the conversion to and from local standard and daylight time.

If the argument begins with +, the output of *date* is under the control of the user. The format for the output is similar to that of the first argument to *printf* (S). All output fields are of fixed size (zero padded if necessary). Each field descriptor is preceded by a percent sign (**%**) and will be replaced in the output by its corresponding value. A single percent sign is encoded by doubling the percent sign, i.e., by specifying "%%". All other characters are copied to the output without change. The string is always terminated with a newline character.

Field Descriptors:

n Inserts a newline character

t Inserts a tab character

m Month of year - 01 to 12

d Day of month - 01 to 31

y Last 2 digits of year - 00 to 99

D Date as mm/dd/yy

H Hour - 00 to 23

M Minute - 00 to 59

S Second - 00 to 59

T Time as HH:MM:SS

j Julian date - 001 to 366

w Day of the week - Sunday = 0

a Abbreviated weekday - Sun to Sat

h Abbreviated month - Jan to Dec

r Time in AM/PM notation

Example

The line

date ´+DATE: %m/%d/%y%nTIME: %H:%M:%S´

generates output similar to this:

```
DATE: 08/01/90
TIME: 14:45:05
```

Diagnostics

no permission	You aren't the super-user and you are trying to change the date.
bad conversion	The date set is syntactically incorrect.
bad format character	The field descriptor is not recognizable.

Name

dc - Invokes an arbitrary precision calculator.

Syntax

dc [file]

Description

dc is an arbitrary precision arithmetic package. Ordinarily it operates on decimal integers, but you may specify an input base, output base, and a number of fractional digits to be maintained. The overall structure of *dc* is a stacking (reverse Polish) calculator. If an argument is given, input is taken from that file until its end, then from the standard input. The following constructions are recognized:

number
: The value of the number is pushed on the stack. A number is an unbroken string of the digits 0-9. It may be preceded by an underscore (_) to input a negative number. Numbers may contain decimal points.

+ - / * % ^
: The top two values on the stack are added (+), subtracted (-), multiplied (*), divided (/), remaindered (%), or exponentiated (^). The two entries are popped off the stack; the result is pushed on the stack in their place. Any fractional part of an exponent is ignored.

s*x*
: The top of the stack is popped and stored into a register named *x*, where *x* may be any character. If the **s** is capitalized, *x* is treated as a stack and the value is pushed on it.

l*x*
: The value in register *x* is pushed on the stack. The register *x* is not altered. All registers start with zero value. If the **l** is capitalized, register *x* is treated as a stack and its top value is popped onto the main stack.

d
: The top value on the stack is duplicated.

p
: The top value on the stack is printed. The top value remains unchanged.

P
: Interprets the top of the stack as an ASCII string, removes it, and prints it.

f
: All values on the stack are printed.

q Exits the program. If executing a string, the recursion level is popped by two. If **q** is capitalized, the top value on the stack is popped and the string execution level is popped by that value.

x Treats the top element of the stack as a character string and executes it as a string of *dc* commands.

X Replaces the number on the top of the stack with its scale factor.

[...] Puts the bracketed ASCII string onto the top of the stack.

<x >x =x
The top two elements of the stack are popped and compared. Register *x* is evaluated if they obey the stated relation.

v Replaces the top element on the stack by its square root. Any existing fractional part of the argument is taken into account, but otherwise the scale factor is ignored.

! Interprets the rest of the line as a XENIX command.

c All values on the stack are popped.

i The top value on the stack is popped and used as the number radix for further input.

I Pushes the input base on the top of the stack.

o The top value on the stack is popped and used as the number radix for further output.

O Pushes the output base on the top of the stack.

k The top of the stack is popped, and that value is used as a non-negative scale factor; the appropriate number of places are printed on output, and maintained during multiplication, division, and exponentiation. The interaction of scale factor, input base, and output base will be reasonable if all are changed together.

z The stack level is pushed onto the stack.

Z Replaces the number on the top of the stack with its length.

? A line of input is taken from the input source (usually the terminal) and executed.

; : Used by *bc* for array operations.

Example

This example prints the first ten values of n!:

```
[la1+dsa*pla10>y]sy
0sa1
lyx
```

See Also

bc(C)

Diagnostics

x is unimplemented	The octal number *x* corresponds to a character that is not implemented as a command
stack empty	Not enough elements on the stack to do what was asked
Out of space	The free list is exhausted (too many digits)
Out of headers	Too many numbers being kept around
Out of pushdown	Too many items on the stack
Nesting Depth	Too many levels of nested execution

Notes

bc is a preprocessor for *dc*, providing infix notation and a C-like syntax which implements functions and reasonable control structures for programs. For interactive use, *bc* is preferred to *dc* .

Name

dd - Converts and copies a file.

Syntax

dd [option=value] ...

Description

dd copies the specified input file to the specified output with possible conversions. The standard input and output are used by default. The input and output block size may be specified to take advantage of raw physical I/O.

Option	*Value*
if=*file*	Input filename; standard input is default
of=*file*	Output filename; standard output is default
ibs=*n*	Input block size *n* bytes (default is 1024)
obs=*n*	Output block size (default is 1024)
bs=*n*	Sets both input and output block size, superseding *ibs* and *obs*; also, if no conversion is specified, it is particularly efficient since no in-core copy needs to be done
cbs=*n*	Conversion buffer size
skip=*n*	Skips *n* input records before starting copy
seek=*n*	Seeks *n* records from beginning of output file before copying
count=*n*	Copies only *n* input records
conv=ascii	Converts EBCDIC to ASCII
conv=ebcdic	Converts ASCII to EBCDIC
conv=ibm	Slightly different map of ASCII to EBCDIC
conv=lcase	Maps alphabetics to lowercase

Option	*Value*
conv=ucase	Maps alphabetics to uppercase
conv=swab	Swaps every pair of bytes
conv=sync	Pads every input record to *ibs*
conv="...,..."	Several comma-separated conversions

Where sizes are specified, a number of bytes is expected. A number may end with **k**, **b**, or **w** to specify multiplication by 1024, 512, or 2 respectively; a pair of numbers may be separated by **x** to indicate a product.

Cbs is used only if *ascii* or *ebcdic* conversion is specified. In the former case *cbs* characters are placed into the conversion buffer, converted to ASCII, and trailing blanks trimmed and newline added before sending the line to the output. In the latter case ASCII characters are read into the conversion buffer, converted to EBCDIC, and blanks added to make up an output record of size *cbs*.

After completion, *dd* reports the number of whole and partial input and output blocks.

Examples

This command reads an EBCDIC tape, blocked ten 80-byte EBCDIC card images per record, into the ASCII file **outfile** :

```
dd if=/dev/rct0 of=outfile ibs=800 cbs=80 conv=ascii,lcase
```

dd is especially suited to I/O on raw physical devices because it allows reading and writing in arbitrary record sizes.

See Also

copy(C), cp(C), tar(C)

Diagnostics

f+p records in(out)	Numbers of full and partial records read(written)

Notes

The ASCII/EBCDIC conversion tables are taken from the 256-character standard in the CACM Nov, 1968. The *ibm* conversion corresponds better to certain IBM print train conventions. There is no universal solution.

Newlines are inserted only on conversion to ASCII; padding is done only on conversion to EBCDIC.

When using *dd* with a raw device, specify the block size as a multiple of 1K. For example, to use a 9K block size, enter:

```
dd if=file of=/dev/rfd0 bs=18b
```

You could also enter:

```
dd if=file of=/dev/rfd0 bs=9K
```

Name

devnm - Identifies device name.

Syntax

/etc/devnm [names]

Description

Devnm identifies the special file associated with the mounted file system where the argument *name* resides.

This command is most commonly used by **/etc/rc** to construct a mount table entry for the **root** device.

Examples

Be sure to type full pathnames in this example:

```
/etc/devnm  /u
```

If **/dev/hd1** is mounted on **/u**, this produces:

```
hd1  /u
```

Files

/dev/*	Device names
/etc/rc	XENIX startup commands

See Also

setmnt(ADM)

Name

df - Report number of free disk blocks.

Syntax

df [**-t**] [**-f**] [**-v -i**] [filesystems]

Description

df prints out the number of free blocks and free inodes available for on-line filesystems by examining the counts kept in the super-blocks; *filesystems* may be specified by device name (e.g., **/dev/root**). If the *filesystems* argument is unspecified, the free space on all of the mounted filesystems is sent to the standard output. The list of mounted file systems is given in **/etc/mnttab**.

Options include:

-t Causes total allocated block figures to be reported as well as number of free blocks.

-f Reports only an actual count of the blocks in the free list (free inodes are not reported). With this option, df reports on raw devices.

-v Reports the percent of blocks used as well as the number of blocks used and free.

-i Reports the percent of inodes used as well as the number of inodes used and free. Use the **-i** option with the **-v** option to display counts of blocks and inodes free as well as the percentage of inodes and blocks used.

The **-v** and **-i** options can not be used with other *df* options.

Files

/dev/*
/etc/mnttab

See Also

mount(ADM), fsck(ADM), mnttab(F)

Notes

See *Notes* under *mount*(ADM).

This utility reports sizes in 512 byte blocks. This means a file of 500 bytes uses 2 blocks. *df* will report 2 blocks less free space, rather than 1 block, because the file uses one system block of 1024 bytes.

Name

diff - Compares two text files.

Syntax

diff [**-efbh**] file1 file2

Description

diff tells what lines must be changed in two files to bring them into agreement. If *file1* or *file2* is a dash (-), the standard input is used. If *file1* or *file2* is a directory, *diff* uses the file in that directory that has the same name as the file (*file2* or *file1* respectively) it is compared to. For example:

diff */tmp dog*

compares the file named *dog*, that is in the */tmp* directory, with the file *dog* in the current directory.

The normal output contains lines of these forms:

n1 **a** *n3,n4*
n1,n2 **d** *n3*
n1,n2 **c** *n3,n4*

These lines resemble *ed* commands to convert *file1* into *file2*. The numbers after the letters pertain to *file2*. In fact, by exchanging **a** for **d** and reading backward, one may ascertain equally how to convert *file2* into *file1*. As in *ed*, identical pairs where *n1* = *n2* or *n3* = *n4* are abbreviated as a single number.

Following each of these lines come all the lines that are affected in the first file flagged by <, then all the lines that are affected in the second file flagged by >.

The **-b** option causes trailing blanks (spaces and tabs) to be ignored and other strings of blanks to compare equal.

The **-e** option produces a script of *a, c* and *d* commands for the editor *ed*, which will recreate *file2* from *file1*. The **-f** option produces a similar script, not useful with *ed*, in the opposite order. In connection with **-e**, the following shell procedure helps maintain multiple versions of a file:

(shift; cat $*; echo ´1,$p´) | ed - $1

This works by performing a set of editing operations on an original ancestral file. This is done by combining the sequence of *ed* scripts given as all command line arguments except the first. These scripts are presumed to have been created with *diff* in the order given on the command line. The set of editing operations is then piped as an editing script to *ed* where all editing operations are performed on the ancestral file given as the first argument on the command line. The final version of the file is then printed on the standard output. Only an ancestral file ($1) and a chain of version-to-version *ed* scripts ($2,$3,...) made by *diff* need be on hand.

Except in rare circumstances, *diff* finds the smallest sufficient set of file differences.

The **-h** option does a fast, less-rigorous job. It works only when changed stretches are short and well separated, but also works on files of unlimited length. The **-e** and **-f** options cannot be used with the **-h** option.

Files

/tmp/d?????

/usr/lib/diffh for **-h**

See Also

cmp(C), comm(C), ed(C)

Diagnostics

Exit status is 0 for no differences, 1 for some differences, 2 for errors.

Notes

Editing scripts produced under the **-e** or **-f** option do not always work correctly on lines consisting of a single period (.).

Name

diff3 - Compares three files.

Syntax

diff3 [**-ex3**] file1 file2 file3

Description

diff3 compares three versions of a file, and publishes disagreeing ranges of text flagged with these codes:

====	All three files differ
====1	*File1* is different
====2	*File2* is different
====3	*File3* is different

The type of change suffered in converting a given range of a given file to some other range is indicated in one of these ways:

f **:** *n1* **a**	Text is to be appended after line number *n1* in file *f*, where *f* = 1, 2, or 3.
f **:** *n1* **,** *n2* **c**	Text is to be changed in the range line *n1* to line *n2*. If *n1* = *n2*, the range may be abbreviated to *n1*.

The original contents of the range follows immediately after a **c** indication. When the contents of two files are identical, the contents of the lower-numbered file is suppressed.

Under the **-e** option, *diff3* publishes a script for the editor *ed* that will incorporate into *file1* all changes between *file2* and *file3*, i.e., the changes that normally would be flagged ==== and ====3. The **-x** option produces a script to incorporate changes flagged with "====". Similarly, the **-3** option produces a script to incorporate changes flagged with "====3". The following command applies a resulting editing script to *file1*:

```
(cat script; echo '1,$p') | ed - file1
```

Files

/tmp/d3*

/usr/lib/diff3prog

See Also

diff(C)

Notes

diff3 does not work properly for lines consisting of a single period.

The input file size limit is 64K bytes.

Name

dircmp - Compares directories.

Syntax

dircmp [**-d**] [**-s**] [**-w***n*] dir1 dir2

Description

dircmp examines *dir1* and *dir2* and generates tabulated information about the contents of the directories. Listings of files that are unique to each directory are generated in addition to a list that indicates whether the files common to both directories have the same contents.

There are three options available:

-d Performs a full *diff* on each pair of like-named files if the contents of the files are not identical.

-s Suppresses output of identical filenames.

-w*n* Changes the width of the output line to *n* characters. The default width is 72.

See Also

cmp(C), diff(C).

Name

dirname - Delivers directory part of pathname.

Syntax

dirname string

Description

dirname delivers all but the last component of the pathname in *string* and prints the result on the standard output. If there is only one component in the pathname, only a "dot" is printed. It is normally used inside substitution marks (` `) within shell procedures.

The companion command *basename* deletes any prefix ending in a slash (/) and the *suffix* (if present in *string*) from *string*, and prints the result on the standard output.

Examples

The following example sets the shell variable NAME to **/usr/src/cmd**:

```
NAME=`dirname /usr/src/cmd/cat.c`
```

This example prints **/a/b/c** on the standard output:

```
dirname /a/b/c/d
```

This example prints a "dot" on the standard output:

```
dirname file.ext
```

See Also

basename(C), sh(C)

Name

disable - Turns off terminals and printers.

Syntax

disable tty ...
disable [**-c**][**-r**[reason]] printers

Description

For terminals, this program manipulates the **/etc/ttys** file and signals *init* to disallow logins on a particular terminal. For printers, *disable* stops print requests from being sent to the named printer. The following options can be used:

-c Cancels any requests that are currently printing.

-r[*reason*] Associates a *reason* with disabling the printer. The *reason* applies to all printers listed up to the next **-r** option. If the **-r** option is not present or the **-r** option is given without a *reason*, then a default *reason* is used. *Reason* is reported by *lpstat*(C).

Examples

In this example, a printer named *linepr* is disabled because of a paper jam:

```
disable -r"paper jam" linepr
```

Files

/dev/tty*

/etc/ttys

/usr/spool/lp/*

See Also

login(M), enable(C), ttys(F), getty(M), init(M), lp(C), lpinit(ADM), lpstat(C), ungetty(M)

Name

diskcp, diskcmp - Copies, compares floppy disks.

Syntax

diskcp [**-f**] [**-d**] [**-s**] [**-48ds9**] [**-96ds9**] [**-96ds15**] [**-135ds9**] [**-135ds18**]
diskcmp [**-d**] [**-s**] [**-48ds9**] [**-96ds9**] [**-96ds15**] [**-135ds9**] [**-135ds18**]

Description

diskcp is used to make an image (exact copy) of a source floppy disk on a target floppy disk. On machines with one floppy drive *diskcp* temporarily transfers the image to the hard disk until a blank "target" floppy is inserted into the floppy drive. On machines with two floppy drives *diskcp* immediately places the image of the source floppy directly on the target floppy.

The options are:

-f Format the target floppy disk before the image is copied (*diskcp* only).

-d The computer has dual floppy drives. *diskcp* copies the image directly onto the target floppy.

-s Uses *sum*(C) to compare the contents of the source and target floppies; gives an error message if the two do not match.

-48ds9
This setting is for low density 48tpi (360K) floppies. It is the default setting.

-96ds9
This setting is for medium density 96tpi (720K) floppies.

-96ds15
This setting is for high density 96tpi (1200K) floppies.

-135ds9
This setting is for low density 135tpi (720K) 3.5 inch floppies.

-135ds18
This setting is for high density 135tpi (1440K) 3.5 inch floppies.

When using the -96ds9 and -96ds15 options of **diskcp**, if the first target disk is unformatted, the program will note it, format it and make the copy. If another copy is requested and another unformatted target disk is inserted, **diskcp** exits with a "System Error." Quit, format the floppy, and reinvoke **diskcp** to make another copy.

diskcmp functions similarly to *diskcp*. It compares the contents of one floppy disk with the contents of a second floppy disk using the *cmp* utility.

Examples

To make a copy of a floppy, place the source floppy in the drive and type:

```
diskcp
```

When *diskcp* is finished copying to the hard disk, it prompts you to insert the target floppy in the drive. If you specify the **-f** flag when you invoke *diskcp* , the program formats the target floppy. When the copy is finished, *diskcp* prompts if you would like to make another copy of the same source disk. If you enter 'n', it prompts if you would like to copy another source disk.

Specify the **-d** flag on the command line if you have two floppy drives:

```
diskcp -d
```

Notes

If *diskcp* encounters a write error while copying the source image to the target disk, it formats the disk and tries to write the source image again. This happens most often when an unformatted floppy is used and the **-f** flag is not specified.

Files

/usr/bin/diskcp
/usr/bin/diskcmp
/tmp/disk$$

See Also

cmp(C), dd(C), sum(C)

Name

dos: doscat, doscp, dosdir, dosformat, dosmkdir, dosls, dosrm, dosrmdir - Access to and manipulation of DOS files.

Syntax

doscat [-r | -m] file ...

doscp [-r | -m] file1 file2

doscp [-r | -m] file ... directory

dosdir directory ...

dosformat [-fqv] drive

dosls directory ...

dosmkdir directory ...

dosrm file ...

dosrmdir directory ...

Description

The *dos* commands provide access to the files and directories on MS-DOS floppy disks and on a DOS partition of a hard disk. Note that in order to use these commands on a DOS partition of a hard disk, the partition must be bootable, although not active.

The *dos* commands perform the following actions:

doscat — Copies one or more DOS files to the standard output. If **-r** is given, the files are copied without newline conversions. If **-m** is given, the files are copied with newline conversions (see "Conversions" below).

doscp — Copies files between a DOS disk and a XENIX filesystem. If *file1* and *file2* are given, *file1* is copied to *file2*. If a *directory* is given, one or more files are copied to that directory. If **-r** is given, the files are copied without newline conversions. If **-m** is given, the files are copied with newline conversions (see "Conversions" below).

dosdir — Lists DOS files in the standard DOS style directory format.

dosformat Creates a DOS 2.0 formatted diskette. The drive may be specified in either DOS drive convention, using the default file **/etc/default/msdos**, or using the XENIX special file name. *dosformat* cannot be used to format a hard disk. The **-f** option suppresses the interactive feature. The **-q** (quiet) option is used to suppress information normally displayed during *dosformat* . The **-q** option does not suppress the interactive feature. The **-v** option prompts the user for a volume label after the diskette has been formatted. The maximum size of the volume label is 11 characters.

dosls Lists DOS directories and files in a XENIX format (see *ls*(C)).

dosrm Removes files from a DOS disk.

dosmkdir Creates a directory on a DOS disk.

dosrmdir Deletes directories from a DOS disk.

The *file* and *directory* arguments for DOS files and directories have the form:

device:name

where *device* is a XENIX pathname for the special device file containing the DOS disk, and *name* is a pathname to a file or directory on the DOS disk. The two components are separated by a colon (:). For example, the argument:

/dev/fd0:/src/file.asm

specifies the DOS file, **file.asm**, in the directory, **/src**, on the disk in the device file **/dev/fd0**. Note that slashes (and not backslashes) are used as filename separators for DOS pathnames. Arguments without a *device:* are assumed to be XENIX files.

For convenience, the user configurable default file, **/etc/default/msdos**, can define DOS drive names to be used in place of the special device file pathnames. For example, it can contain lines with the following format:

```
A=/dev/fd0
C=/dev/hd0d
D=/dev/hd1d
```

The drive letter "A" may be used in place of special device file pathname **/dev/fd0** when referencing DOS files (see "Examples" below). The drive letter "C" or "D" refers to the DOS partition on the first or second hard disk.

The commands operate on the following kinds of disks:

DOS partitions on a hard disk
5 1/4 inch DOS
3 1/2 inch DOS
8, 9, 15, or 18 sectors per track
40 or 80 tracks per side
1 or 2 sides
DOS versions 1.0, 2.0 or 3.0

Conversions

In the case of *doscp*, certain conversions are performed when copying a XENIX file. Filenames with a basename longer than eight characters are truncated. Filename extensions (the part of the name following separating period) longer than three characters are truncated. For example, the file 123456789.12345 becomes 12345678.123. A message informs the user that the name has been changed and the altered name is displayed. Filenames containing illegal DOS characters are stripped when writing to the MS-DOS format. A message informs the user that characters have been removed and displays the name as written.

All DOS text files use a carriage-return/linefeed combination, CR-LF , to indicate a newline. XENIX files use a single newline LF character. When the *doscat* and *doscp* commands transfer DOS text files to the XENIX filesystem, they automatically strip the CR. When text files are transferred to DOS , the commands insert a CR before each LF character.

Under some circumstances the automatic newline conversions do not occur. The **-m** option may be used to ensure the newline conversion. The **-r** option can be used to override the automatic conversion and force the command to perform a true byte copy regardless of file type.

Examples

```
doscat /dev/fd0:/docs/memo.txt
doscat /tmp/f1 /tmp/f2 /dev/fd0:/src/file.asm

dosdir /dev/fd0:/src
dosdir A:/src A:/dev

doscp A:autoexec.bat /u/naomib/test.txt
doscp /u/naomib/test.txt A:test.txt
dosformat /dev/fd0

dosls /dev/fd0:/src
dosls B:

dosmkdir /dev/fd0:/usr/docs
```

```
dosrm /dev/fd0:/docs/memo.txt
dosrm A:/docs/memo1.txt

dosrmdir /dev/fd0:/usr/docs
```

Files

/etc/default/msdos	Default information
/dev/fd*	Floppy disk devices
/dev/hd*	Hard disk devices

See Also

assign(C), dtype(C), mkfs(ADM) and "Using DOS and OS/2" in the *XENIX System Administrator's Guide*

Notes

Using the DOS utilities, is not possible to refer to DOS files with wild card specifications. The programs mentioned above cooperate among themselves so no two programs will access the same DOS disk. Only one process will access a given DOS disk at any time, while other processes wait. If a process has to wait too long, it displays the error message, "can't seize a device," and exits with an exit code of 1.

You cannot use the *dosformat* command to format device A: because it is aliased to **/dev/install**, which cannot be formatted. Use **/dev/rfd0/** instead.

The following hard disk devices:

```
/dev/hd0d
/dev/rhd0d
/dev/hd1d
/dev/rhd1d
```

are similar to **/dev/hd0a** in that the disk driver determines which partition is the DOS partition and uses that as *hd?d*. This means that software using the DOS partition does not need to know which partition is DOS.

The Development System supports the creation of DOS executable files, using *cc* (CP). Refer to the *C User's Guide* and *C Library Guide* for more information on using your XENIX system to create programs suitable for DOS systems.

All of the DOS utilities leave temporary files in */tmp*. These files are automatically removed when the system is rebooted. They can also be manually removed.

You must have DOS 3.3 or earlier. Extended DOS partitions are not supported.

Name

dtype - Determines disk type.

Syntax

dtype [-s] device ...

Description

dtype determines type of disk, prints pertinent information on the standard output unless the silent (**-s**) option is selected, and exits with a corresponding code (see below). When more than one argument is given, the exit code corresponds to the last argument.

Disk Type	**Exit** Code	**Message** (optional)
Misc.	60	error (specified)
	61	empty or unrecognized data
Storage	70	dump format, volume n
	71	tar format[, extent e of n]
	72	cpio format
	73	cpio character (-c) format
MS-DOS	80	DOS 1.x, 8 sec/track, single sided
	81	DOS 1.x, 8 sec/track, dual sided
	90	DOS 2.x, 8 sec/track, single sided
	91	DOS 2.x, 8 sec/track, dual sided
	92	DOS 2.x, 9 sec/track, single sided
	93	DOS 2.x, 9 sec/track, dual sided
	94	DOS 2.x, fixed disk
	110	DOS 3.x, 9 sec/track, dual sided
XENIX	120	XENIX 2.x filesystem [needs cleaning]
	130	XENIX 3.x or later filesystem [needs cleaning]

Notes

word-swapped refers to byte ordering of long words in relation to the host system.

XENIX file systems and dump and cpio binary formats may not be recognized if created on a foreign system. This is due to such system differences as byte and word swapping and structure alignment.

This utility only works reliably for floppy diskettes.

Name

du - Summarizes disk usage.

Syntax

du [**-afrsu**] [names]

Description

du gives the number of blocks contained in all files and (recursively) directories within each directory and file specified by the *names* argument. The block count includes the indirect blocks of the file. If *names* is missing, the current directory is used.

The optional argument **-s** causes only the grand total (for each of the specified *names*) to be given. The optional argument **-a** causes an entry to be generated for each file. Absence of either causes an entry to be generated for each directory only.

The **-f** option causes **du** to display the usage of files in the current file system only. Directories containing mounted file systems will be ignored. The **-u** option causes *du* to ignore files that have more than one link.

du is normally silent about directories that cannot be read, files that cannot be opened, etc. The **-r** option will cause *du* to generate messages in such instances.

A file with two or more links is only counted once.

Notes

If the **-a** option is not used, nondirectories given as arguments are not listed.

If there are too many distinct linked files, *du* will count the excess files more than once.

Files with holes in them will get an incorrect block count.

This utility reports sizes in 512 byte blocks.

Name

echo - Echoes arguments.

Syntax

echo [arg] ...
/bin/echo [arg] ...

Description

echo writes its arguments separated by blanks and terminated by a newline on the standard output. *echo* also understands C-like escape conventions. The following escape sequences need to be quoted so that the shell interprets them correctly:

\b Backspace

\c Prints line without newline

\f Form feed

\n Newline

\r Carriage return

\t Tab

\v Vertical tab

\\ Backslash

n The 8-bit character whose ASCII code is a 1, 2 or 3-digit octal number. In all cases, *n* must start with a zero. For example:

```
echo "\07"      - Echoes Ctl-G.
echo "\007"     - Also echoes Ctl-G.
echo "\065"     - Echoes the number "5".
echo "\0065"    - Also echoes the number "5".
echo "\0101"    - Echoes the letter "A".
```

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

See Also

sh(C)

Notes

The *csh*(C) has a built-in *echo* utility which has a different syntax than this *echo*. Be aware that users running under *csh* will get the built-in *echo* unless they specify **/bin/echo .**

Name

ed, red - Invokes the ed text editor.

Syntax

ed [-] [**-p** string] [file]

red [-] [**-p** string] [file]

Description

ed is the standard text editor. If the *file* argument is given, *ed* simulates an *e* command (see below) on the named file; that is to say, the file is read into *ed*'s buffer so that it can be edited. *ed* operates on a copy of the file it is editing; changes made to the copy have no effect on the file until a *w* (write) command is given. The copy of the text being edited resides in a temporary file called the *buffer*. There is only one buffer.

red is a restricted version of *ed*(C). It will only allow editing of files in the current directory. It prohibits executing *sh*(C) commands via the **!** command. *red* displays an error message on any attempt to bypass these restrictions.

In general, *red* does not allow commands like

```
!date
```

or

```
!sh
```

Furthermore, *red* will not allow pathnames in its command line. For example, the command:

```
red /etc/passwd
```

when the current directory is not **/etc** causes an error.

Options

The options to *ed* are:

- Suppresses the printing of character counts by the *e*, *r*, and *w* commands, of diagnostics from *e* and *q* commands, and the **!** prompt after a **!***shell command*.

-p Allows the user to specify a prompt string.

ed supports formatting capability. After including a format specification as the first line of *file* and invoking *ed* with your terminal in **stty -tabs** or **stty tab3** mode (see *stty*(C)), the specified tab stops will automatically be used when scanning *file*. For example, if the first line of a file contained:

<:t5,10,15 s72:>

tab stops would be set at columns 5, 10, and 15, and a maximum line length of 72 would be imposed. NOTE: While inputing text, tab characters are expanded to every eighth column as the default.

Commands to *ed* have a simple and regular structure: zero, one, or two *addresses* followed by a single-character *command*, possibly followed by parameters to that command. These addresses specify one or more lines in the buffer. Every command that requires addresses has default addresses, so that the addresses can very often be omitted.

In general, only one command may appear on a line. Certain commands allow the input of text. This text is placed in the appropriate place in the buffer. While *ed* is accepting text, it is said to be in *input mode*. In this mode, *no* commands are recognized; all input is merely collected. Input mode is left by entering a period (.) alone at the beginning of a line.

ed supports a limited form of *regular expression* notation; regular expressions are used in addresses to specify lines and in some commands (e.g., *s*) to specify portions of a line that are to be substituted. A regular expression specifies a set of character strings. A member of this set of strings is said to be *matched* by the regular expression. The regular expressions allowed by *ed* are constructed as follows:

The following one-character regular expressions match a *single* character:

1.1 An ordinary character (*not* one of those discussed in 1.2 below) is a one-character regular expression that matches itself.

1.2 A backslash (\) followed by any special character is a one-character regular expression that matches the special character itself. The special characters are:

a. ., *, [, and \ (dot, star, left square bracket, and backslash, respectively), which are otherwise special, *except* when they appear within square brackets ([ ]); see 1.4 below).

b. ^ (caret), which is special at the *beginning* of an *entire* regular expression (see 3.1 and 3.2 below), or when it immediately follows the left of a pair of square brackets ([ ]) (see 1.4 below).

c. **$** (dollar sign), which is special at the *end* of an entire regular expression (see 3.2 below).

d. The character used to bound (i.e., delimit) an entire regular expression, which is special for that regular expression (for example, see how slash (/) is used in the *g* command below).

1.3 A period (.) is a one-character regular expression that matches any character except newline.

1.4 A nonempty string of characters enclosed in square brackets ([ ]) is a one-character regular expression that matches *any one* character in that string. If, however, the first character of the string is a caret (^), the one-character regular expression matches any character *except* newline and the remaining characters in the string. The star (*) also has this special meaning *only* if it occurs first in the string. The dash (-) may be used to indicate a range of consecutive ASCII characters; for example, [0-9] is equivalent to [0123456789]. The dash (-) loses this special meaning if it occurs first (after an initial caret (^), if any) or last in the string. The right square bracket (]) does not terminate such a string when it is the first character within it (after an initial caret (^), if any); e.g., [ ]**a-f**] matches either a right square bracket (]) or one of the letters "a" through "f" inclusive. Dot, star, left bracket, and the backslash lose their special meaning within such a string of characters.

Ranges of characters (characters separated by -) are treated according to the current locale's collation sequence (see *locale*(M)). Therefore, if the collation sequence in use is A, a, B, b, C, c, then the expression **[a-d]** is equivalent to the expression [aBbCcDd].

To specify a collation item within a class, the item must be enclosed between **[.** and **.]** . Two character to one collation item mappings *must* be specified this way. For example, if the current collation rules specify that the characters "Ch" map to one character for collation purposes (as in Spanish), then this collation item would be specified as **[.Ch.]** .

To specify a group of collation items, which are classified as equal unless all other collation items in the string also match, in which case a secondary "weight" becomes significant, a single member of that group must be enclosed between [= and =] . For example, if the characters A and a are in the same group then the class expressions **[[=a=]b]**, **[[=A=]b]** and **[Aab]** are all equivalent.

The **ctype** classes can also be specified within regular expressions. These are enclosed between **[:** and **:]** . The possible **ctype** classes are:

[:alpha:]	Matches alphabetic characters
[:upper:]	Matches upper case characters
[:lower:]	Matches lower case characters
[:digit:]	Matches digits
[:alnum:]	Matches alphanumeric characters
[:space:]	Matches white space
[:print:]	Matches printable characters
[:punct:]	Matches punctuation marks
[:graph:]	Matches graphical characters
[:cntrl:]	Matches control characters

The following rules may be used to construct regular expressions from one-character regular expressions:

2.1
A one-character regular expression followed by a star (*) is a regular expression that matches *zero* or more occurrences of the one-character regular expression. If there is any choice, the longest leftmost string that permits a match is chosen.

2.2
A one-character regular expression followed by \{*m*\}, \{*m*,\}, or \{*m*,*n*\} is a regular expression that matches a *range* of occurrences of the one-character regular expression. The values of *m* and *n* must be nonnegative integers less than 255; \{*m*\} matches *exactly* *m* occurrences; \{*m*,\} matches *at least* *m* occurrences; \{*m*,*n*\} matches any number of occurrences between *m* and *n*, inclusive. Whenever a choice exists, the regular expression matches as many occurrences as possible.

2.3
The concatenation of regular expressions is a regular expression that matches the concatenation of the strings matched by each component of the regular expression.

2.4
A regular expression enclosed between the character sequences \(and \) is a regular expression that matches whatever the unadorned regular expression matches. See 2.5 below for a discussion of why this is useful.

2.5
The expression *n* matches the same string of characters as was matched by an expression enclosed between \(and \) *earlier* in the same regular expression. Here *n* is a digit; the subexpression specified is that beginning with the *n*-th occurrence of \(counting from the left. For example, the expression **^\(.*\)\1$** matches a line consisting of two repeated appearances of the same string.

Finally, an *entire regular expression* may be constrained to match only an initial segment or final segment of a line (or both):

3.1 A caret (^) at the beginning of an entire regular expression constrains that regular expression to match an *initial* segment of a line.

3.2 A dollar sign ($) at the end of an entire regular expression constrains that regular expression to match a *final* segment of a line. The construction ^*entire regular expression* $ constrains the entire regular expression to match the entire line.

The null regular expression (e.g., //) is equivalent to the last regular expression encountered.

To understand addressing in *ed* , it is necessary to know that there is a *current line* at all times. Generally speaking, the current line is the last line affected by a command; the exact effect on the current line is discussed under the description of each command. *Addresses* are constructed as follows:

1. The character . addresses the current line.

2. The character $ addresses the last line of the buffer.

3. A decimal number *n* addresses the *n*-th line of the buffer.

4. ´*x* addresses the line marked with the mark name character *x*, which must be a lowercase letter. Lines are marked with the *k* command described below.

5. A regular expression enclosed by slashes (/) addresses the first line found by searching *forward* from the line *following* the current line toward the end of the buffer and stopping at the first line containing a string matching the regular expression. If necessary, the search wraps around to the beginning of the buffer and continues up to and including the current line, so that the entire buffer is searched.

6. A regular expression enclosed in question marks (?) addresses the first line found by searching *backward* from the line *preceding* the current line toward the beginning of the buffer and stopping at the first line containing a string matching the regular expression. If necessary, the search wraps around to the end of the buffer and continues up to and including the current line. See also the last paragraph before *Files* below.

7. An address followed by a plus sign (+) or a minus sign (-) followed by a decimal number specifies that address plus or minus the indicated number of lines. The plus sign may be omitted.

8. If an address begins with + or -, the addition or subtraction is taken with respect to the current line; e.g, **-5** is understood to mean **.-5**.

9. If an address ends with + or -, then 1 is added to or subtracted from the address, respectively. As a consequence of this rule and of rule 8 immediately above, the address - refers to the line preceding the current line. (To maintain compatibility with earlier versions of the editor, the character ^ in addresses is entirely equivalent to -.) Moreover, trailing + and - characters have a cumulative effect, so -- refers to the current line less 2.

10. For convenience, a comma (,) stands for the address pair **1,$**, while a semicolon (;) stands for the pair **.,$**.

Commands may require zero, one, or two addresses. Commands that require no addresses regard the presence of an address as an error. Commands that accept one or two addresses assume default addresses when an insufficient number of addresses is given; if more addresses are given than such a command requires, the last address(es) are used.

Typically, addresses are separated from each other by a comma (,). They may also be separated by a semicolon (;). In the latter case, the current line (.) is set to the first address, and only then is the second address calculated. This feature can be used to determine the starting line for forward and backward searches (see rules 5 and 6 above). The second address of any two-address sequence must correspond to a line that follows, in the buffer, the line corresponding to the first address.

In the following list of *ed* commands, the default addresses are shown in parentheses. The parentheses are *not* part of the address.

It is generally illegal for more than one command to appear on a line. However, any command (except *e*, *f*, *r*, or *w*) may be suffixed by **p** or by **l**, in which case the current line is either printed or listed, respectively, as discussed below under the *p* and *l* commands.

(.)a
<text>
.

The *a*ppend command reads the given text and appends it after the addressed line; dot is left at the address of the last inserted line, or, if there were no inserted lines, at the addressed line. Address 0 is legal for this command: it causes the "appended" text to be placed at the beginning of the buffer.

(.)c
<text>
.

The *c*hange command deletes the addressed lines, then accepts input text that replaces these lines; dot is left at the address of the last line input, or, if there were none, at the first line that was not deleted.

(.,.)d

The *d*elete command deletes the addressed lines from the buffer. The line after the last line deleted becomes the current line; if the

lines deleted were originally at the end of the buffer, the new last line becomes the current line.

e *file*
The *e*dit command causes the entire contents of the buffer to be deleted, and then the named file to be read in; dot is set to the last line of the buffer. If no filename is given, the currently remembered filename, if any, is used (see the *f* command). The number of characters read is typed. *file* is remembered for possible use as a default filename in subsequent *e*, *r*, and *w* commands. If *file* begins with an exclamation (!), the rest of the line is taken to be a shell command. The output of this command is read for the *e* and *r* commands. For the *w* command, the file is used as the standard input for the specified command. Such a shell command is *not* remembered as the current filename.

E *file*
The *E*dit command is like *e*, except the editor does not check to see if any changes have been made to the buffer since the last *w* command.

f *file*
If *file* is given, the *f*ilename command changes the currently remembered filename to *file*; otherwise, it prints the currently remembered filename.

(1,$)g/*regular-expression*/*command list*
In the *g*lobal command, the first step is to mark every line that matches the given regular expression. Then, for every such line, the given *command list* is executed with **.** initially set to that line. A single command or the first of a list of commands appears on the same line as the global command. All lines of a multiline list except the last line must be ended with a \; *a*, *i*, and *c* commands and associated input are permitted; the **.** terminating input mode may be omitted if it would be the last line of the *command list*. An empty *command list* is equivalent to the *p* command. The *g*, *G*, *v*, and *V* commands are *not* permitted in the *command list*. See also *Notes* and the last paragraph before *Files* below.

(1,$)G/*regular-expression*/
In the interactive *G*lobal command, the first step is to mark every line that matches the given regular expression. Then, for every such line, that line is printed, dot (**.**) is changed to that line, and any *one* command (other than one of the *a*, *c*, *i*, *g*, *G*, *v*, and *V* commands) may be input and is executed. After the execution of that command, the next marked line is printed, and so on. A newline acts as a null command. An ampersand (**&**) causes the re-execution of the most recent command executed within the current invocation of *G*. Note that the commands input as part of the execution of the *G* command may address and affect *any* lines in the buffer. The *G* command can be terminated by entering an INTERRUPT (pressing the DEL key).

h

The *h*elp command gives a short error message that explains the reason for the most recent **?** diagnostic.

H

The *H*elp command causes *ed* to enter a mode in which error messages are printed for all subsequent **?** diagnostics. It will also explain the previous diagnostic if there was one. The *H* command alternately turns this mode on and off. It is initially off.

(.)i
<text>
.

The *i*nsert command inserts the given text before the addressed line; dot is left at the address of the last inserted line, or if there were no inserted lines, at the addressed line. This command differs from the *a* command only in the placement of the input text. Address 0 is not legal for this command.

(.,.+1)j

The *j*oin command joins contiguous lines by removing the appropriate newline characters. If only one address is given, this command does nothing.

(.)k*x*

The mar*k* command marks the addressed line with name *x*, which must be a lowercase letter. The address *'x* then addresses this line. Dot is unchanged.

(.,.)l

The *l*ist command prints the addressed lines in an unambiguous way: a few nonprinting characters (e.g., tab, backspace) are represented by mnemonic overstrikes, all other nonprinting characters are printed in octal, and long lines are folded. An *l* command may be appended to any command other than *e*, *f*, *r*, or *w*.

(.,.)m*a*

The *m*ove command repositions the addressed line(s) after the line addressed by *a*. Address 0 is legal for *a* and causes the addressed line(s) to be moved to the beginning of the file. It is an error if address *a* falls within the range of moved lines. Dot is left at the last line moved.

(.,.)n

The *n*umber command prints the addressed lines, preceding each line by its line number and a tab character. Dot is left at the last line printed. The *n* command may be appended to any command other than *e*, *f*, *r*, or *w*.

(.,.)p

The *p*rint command prints the addressed lines. Dot is left at the last line printed. The *p* command may be appended to any

command other than *e*, *f*, *r*, or *w*; for example, *dp* deletes the current line and prints the new current line.

P

The editor will prompt with a * for all subsequent commands. The *P* command alternately turns this mode on and off. It is initially off.

q

The *q*uit command causes *ed* to exit. No automatic write of a file is done.

Q

The editor exits without checking if changes have been made in the buffer since the last *w* command.

(**$**)**r** *file*

The *r*ead command reads in the given file after the addressed line. If no filename is given, the currently remembered filename, if any, is used (see *e* and *f* commands). The currently remembered filename is *not* changed unless *file* is the very first filename mentioned since *ed* was invoked. Address 0 is legal for *r* and causes the file to be read at the beginning of the buffer. If the read is successful, the number of characters read is typed. Dot is set to the address of the last line read in. If *file* begins with **!**, the rest of the line is taken to be a shell command whose output is to be read. Such a shell command is *not* remembered as the current filename.

(**.**,**.**)**s**/*regular-expression*/*replacement*/ **or**

(**.**,**.**)**s**/*regular-expression*/*replacement*/**g** **or**

(**.**,**.**)**s**/*regular-expression*/*replacement* /*n* *n*=**1-512**

The *s*ubstitute command searches each addressed line for an occurrence of the specified regular expression. In each line in which a match is found, all nonoverlapped matched strings are replaced by *replacement* if the global replacement indicator **g** appears after the command. If the global indicator does not appear, only the first occurrence of the matched string is replaced. It is an error for the substitution to fail on *all* addressed lines. Any character other than space or newline may be used instead of / to delimit *regular-expression* and *replacement*. Dot is left at the address of the last line on which a substitution occurred.

The *n* character represents any number between one and 512. This number indicates the instance of the pattern to be replaced on each addressed line.

An ampersand (**&**) appearing in *replacement* is replaced by the string matching the *regular-expression* on the current line. The special meaning of the ampersand in this context may be suppressed by preceding it with a backslash. The characters *n*,

where *n* is a digit, are replaced by the text matched by the *n*-th regular subexpression of the specified regular expression enclosed between \(and \). When nested parenthesized subexpressions are present, *n* is determined by counting occurrences of \(starting from the left. When the character **%** is the only character in *replacement*, the *replacement* used in the most recent substitute command is used as the *replacement* in the current substitute command. The **%** loses its special meaning when it is in a replacement string of more than one character or when it is preceded by a \.

A line may be split by substituting a newline character into it. The newline in the *replacement* must be escaped by preceding it with a \. Such a substitution cannot be done as part of a *g* or *v* command list.

(.,.)t*a*
This command acts just like the *m* command, except that a *copy* of the addressed lines is placed after address *a* (which may be 0). Dot is left at the address of the last line of the copy.

u
The *u*ndo command nullifies the effect of the most recent command that modified anything in the buffer, namely the most recent *a*, *c*, *d*, *g*, *i*, *j*, *m*, *r*, *s*, *t*, *v*, *G*, or *V* command.

(1,$)v/*regular-expression***/***command list*
This command is the same as the global command *g* except that the *command list* is executed with dot initially set to every line that does *not* match the regular expression.

(1,$)V/*regular-expression***/**
This command is the same as the interactive global command *G* except that the lines that are marked during the first step are those that do *not* match the regular expression.

(1,$)w *file*
The *w*rite command writes the addressed lines into the named file. If the file does not exist, it is created with mode 666 (readable and writeable by everyone), unless the *umask* setting (see *sh*(C)) dictates otherwise. The currently remembered filename is *not* changed unless *file* is the very first filename mentioned since *ed* was invoked. If no filename is given, the currently remembered filename, if any, is used (see *e* and *f* commands), and dot remains. If the command is successful, the number of characters written is displayed. If *file* begins with an exclamation (**!**), the rest of the line is taken to be a shell command to which the addressed lines are supplied as the standard input. Such a shell command is *not* remembered as the current filename.

(**$**)=
The line number of the addressed line is typed. Dot is unchanged by this command.

!*shell command*
The remainder of the line after the **!** is sent to the XENIX shell (*sh*(C)) to be interpreted as a command. Within the text of that command, the unescaped character **%** is replaced with the remembered filename. If a **!** appears as the first character of the shell command, it is replaced with the text of the previous shell command. Thus, **!!** will repeat the last shell command. If any expansion is performed, the expanded line is echoed. Dot is unchanged.

(**.+1**)
An address alone on a line causes the addressed line to be printed. A RETURN alone on a line is equivalent to **.+1p**. This is useful for stepping forward through the editing buffer a line at a time.

If an interrupt signal (ASCII DEL or BREAK) is sent, *ed* prints a question mark (**?**) and returns to its command level.

ed has size limitations: 512 characters per line, 256 characters per global command list, 64 characters per filename, and 128K characters in the buffer. The limit on the number of lines depends on the amount of user memory.

When reading a file, *ed* discards ASCII NUL characters and all characters after the last newline. Files (e.g., **a.out**) that contain characters not in the ASCII set (bit 8 on) cannot be edited by *ed*.

If the closing delimiter of a regular expression or of a replacement string (e.g., /) would be the last character before a newline, that delimiter may be omitted, in which case the addressed line is printed. Thus, the following pairs of commands are equivalent:

s/s1/s2	s/s1/s2/p
g/s1	g/s1/p
?s1	?s1?

Files

/tmp/e#	Temporary; # is the process number
ed.hup	Work is saved here if the terminal is hung up

See Also

coltbl(M), grep(C), locale(M), sed(C), sh(C), stty(C), regexp(S)

Diagnostics

? Command errors
? *file* An inaccessible file

Use the *h*elp and *H*elp commands for detailed explanations.

If changes have been made in the buffer since the last *w* command that wrote the entire buffer, *ed* warns the user if an attempt is made to destroy *ed*'s buffer via the *e* or *q* commands by printing **?** and allowing you to continue editing. A second *e* or *q* command at this point will take effect. The dash (-) command-line option inhibits this feature.

Notes

An exclamation (!) command cannot be subject to a *g* or a *v* command.

The ! command and the **!** escape from the *e*, *r*, and *w* commands cannot be used if the the editor is invoked from a restricted shell (see *sh*(C)).

The sequence **\n** in a regular expression does not match any character.

The *l* command mishandles DEL.

Because 0 is an illegal address for the *w* command, it is not possible to create an empty file with *ed*.

If the editor input is coming from a command file (i.e., *ed file* < *ed-cmd-file*), the editor will exit at the first failure of a command in the command file.

Name

enable - Turns on terminals and line printers.

Syntax

enable tty ...
enable printers

Description

For terminals this program manipulates the **/etc/ttys** file and signals *init* to allow logins on a particular terminal.

For line printers, *enable* activates the named printers and enables them to print requests taken by *lp*(C). Use *lpstat*(C) to find the status of the printers.

Examples

A simple command to enable **tty01** follows:

```
enable tty01
```

Files

/dev/tty*

/etc/ttys

/usr/spool/lp/*

See Also

disable(C), getty(M), init(M), login(M), lp(C), lpstat(C), ttys(F)

Name

env - Sets environment for command execution.

Syntax

env [-] [name=value] ... [command args]

Description

env obtains the current *environment*, modifies it according to its arguments, then executes the command with the modified environment. Arguments of the form *name=value* are merged into the inherited environment before the command is executed. The - flag causes the inherited environment to be ignored completely, so that the command is executed with exactly the environment specified by the arguments.

If no command is specified, the resulting environment is printed, one name-value pair per line.

See Also

sh(C), exec(S), profile(F), environ(M)

Name

ex, edit - Invokes a text editor.

Syntax

ex [**-s**] [**-v**] [**-t** tag] [**-r** file] [**-L**] [**-R**] [**-c** command] name ...

edit [**-r**] [**-x**] [**-C**] name ...

Description

ex is the root of the editors *ex* and *vi*. *ex* is a superset of *ed*, with the most notable extension being a display editing facility. Display based editing is the focus of *vi*.

edit is a variant of the text editor *ex* recommended for new or casual users who wish to use a command-oriented editor. It operates precisely as *ex*(C) with the following options automatically set:

novice	ON
report	ON
showmode	ON
magic	OFF

These options can be turned on or off via the *set* command in *ex*(C).

Refer to the *vi*(C) page for a complete description of the *ex* commands.

Files

/usr/lib/ex3.7strings	Error messages
/usr/lib/ex3.7recover	Recover command
/usr/lib/ex3.7preserve	Preserve command
/etc/termcap	Describes capabilities of terminals
$HOME/.exrc	Editor startup file
/tmp/Ex*nnnnn*	Editor temporary
/tmp/Rx*nnnnn*	Named buffer temporary
/usr/preserve	Preservation directory

See Also

awk(C), ctags(CP), ed(C), grep(C), sed(C), termcap(F), vi(C)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Name

expr - Evaluates arguments as an expression.

Syntax

expr arguments

Description

The arguments are taken as an expression. After evaluation, the result is written on the standard output. Terms of the expression must be separated by blanks. Characters special to the shell must be escaped. Note that zero is returned to indicate a zero value, rather than the null string. Strings containing blanks or other special characters should be quoted. Integer-valued arguments may be preceded by a unary minus sign. Internally, integers are treated as 32-bit, 2's complement numbers.

The operators and keywords are listed below. Characters that need to be escaped are preceded by \. The list is in order of increasing precedence, with equal precedence operators grouped within braces ({ and }).

expr | *expr*
Returns the first *expr* if it is neither null nor **0**, otherwise returns the second *expr*.

expr **&** *expr*
Returns the first *expr* if neither *expr* is null nor **0**, otherwise returns **0**.

expr { =, >, >=, <, <=, != } *expr*
Returns the result of an integer comparison if both arguments are integers, otherwise returns the result (that is, 0 for false, 1 for true) of a lexical comparison, as defined by the locale.

expr { +, - } *expr*
Addition or subtraction of integer-valued arguments.

expr { *, /, % } *expr*
Multiplication, division, or remainder of the integer-valued arguments.

expr **:** *expr*
The matching operator **:** compares the first argument with the second argument, which must be a regular expression; regular expression syntax is the same as that of *ed*(C), except that all patterns are "anchored" (i.e., begin with a caret (^)) and therefore the caret is not a special character in that context. (Note

that in the shell, the caret has the same meaning as the pipe symbol (|).) Normally the matching operator returns the number of characters matched (zero on failure). Alternatively, the \(...\) pattern symbols can be used to return a portion of the first argument.

Examples

1. a=`expr $a + 1`

   Adds 1 to the shell variable **a**.

2. # For $a ending in "/file"
   expr $a : '.*/\(.*\)'

   Returns the last segment of a pathname (i.e., file). Watch out for the slash alone as an argument: *expr* will take it as the division operator (see *Notes*).

3. expr $VAR : '.*'

   Returns the number of characters in **$VAR**.

See Also

coltbl(M), ed(C), locale(M), sh(C), awk(C), bc(C)

Diagnostics

As a side effect of expression evaluation, *expr* returns the following exit values:

0	If the expression is neither null nor zero
1	If the expression is null or zero
2	For invalid expressions

Other diagnostics include:

syntax error For operator/operand errors, including unset variables

nonnumeric argument If arithmetic is attempted on a nonnumeric string

Notes

After argument processing by the shell, *expr* cannot tell the difference between an operator and an operand except by the value. If **$a** is an equals sign (=), the command:

```
expr $a = =
```

looks like:

```
expr = = =
```

The arguments are passed to *expr* and will all be taken as the = operator. The following permits comparing equals signs:

```
expr X$a = X=
```

Name

factor - Factor a number.

Syntax

factor [number]

Description

When *factor* is invoked without an argument, it waits for a number to be typed in. If you type in a positive number less than 2^{46} (about 7.2×10^{13}) it will factor the number and print its prime factors; each one is printed the proper number of times. Then it waits for another number. It exits if it encounters a zero or any non-numeric character.

If *factor* is invoked with an argument, it factors the number as above and then exits.

The time it takes to factor a number, n, is proportional to $\sqrt{n}$. It usually takes longer to factor a prime or the square of a prime, than to factor other numbers.

Diagnostics

factor returns an error message if the supplied input value is greater than 2^{46} or is not an integer number.

Name

false - Returns with a nonzero exit value.

Syntax

false

Description

false does nothing except return with a nonzero exit value. *true*(C), *false's* counterpart, does nothing except return with a zero exit value. "False" is typically used in shell procedures such as:

```
until false
do
        command
done
```

See Also

sh(C), true(C)

Diagnostics

false is any non-zero value.

Name

file - Determines file type.

Syntax

file [**-m**] file ...

file [**-m**] **-f** namesfile

Description

file performs a series of tests on each argument in an attempt to classify it. If an argument appears to be ASCII, *file* examines the first 512 bytes and tries to guess its language.

If the **-f** option is given, *file* takes the list of filenames from *namesfile*. If the **-m** option is given, *file* sets the access time for the examined file to the current time. Otherwise, the access time remains unchanged.

Several object file formats are recognized. For **a.out** and **x.out** format object files, *file* reports "separate" if the file was linked with **cc -i**, "pure" if the file was linked with **cc -n**, and "not stripped" if the file was not linked with **cc -s** or if *strip*(CP) was not run.

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

file makes errors; in particular it often mistakes command files for C programs.

The *file* command can only distinguish English text. If an 8 bit character (a character not in the English alphabet) is found, then the text will be defined as "8 bit text".

Name

find - Finds files.

Syntax

find pathname-list expression

Description

find recursively descends the directory hierarchy for each pathname in the *pathname-list* (one or more pathnames), seeking files that match a Boolean *expression* written in the primaries (options) given below. In the descriptions, the argument *n* is used as a decimal integer where *+n* means more than *n*, *-n* means less than *n* and *n* means exactly *n*.

-depth Always true; causes descent of the directory hierarchy to be done so that all entries in a directory are acted upon before the directory itself. This can be useful when used with *cpio*(C) to transfer files located in directories without write permission.

-name *file* True if *file* matches the current file name. Normal shell argument syntax may be used if escaped (watch out for the left bracket ([), the question mark (?) and the asterisk (*)).

[-perm] *-onum* True if the file permission flags exactly match the octal number *onum* [see *chmod*(C)]. If *onum* is prefixed by a minus sign, only the bits that are set in *onum* are compared with the file permission flags, and the expression evaluates true if they match.

-type *x* True if the type of the file is *x*, where *c* is **b**, **c**, **d**, **p**, or **f** for block special file, character special file, directory, FIFO (first-in-first-out), or plain file respectively.

-links *n* True if the file has *n* links.

-inum *num* True if the file's inode is *num*. This is useful for locating files with matching inodes.

-user *uname* True if the file belongs to the user *uname*. If *uname* is numeric and does not appear as a login name in the **/etc/passwd** file, it is taken as a user ID.

-group *gname* True if the file belongs to the group *gname*. If *gname* is numeric and does not appear in the **/etc/group** file, it is taken as a group ID.

-size *n* True if the file is *n* blocks long (512 bytes per block).

-atime *n* True if the file has been accessed in the past *n* days.

-mtime *n* True if the file has been modified in the past *n* days.

-ctime *n* True if the file was created in the past *n* days.

-exec *cmd* True if the executed *cmd* returns a zero value as exit status. The end of *cmd* must be punctuated by an escaped semicolon. A command argument { } is replaced by the current path name.

-ok *cmd* Like **-exec** except that the generated command line is printed with a question mark first, and is executed only if the user responds by typing **y**.

-cpio *device* Always true; write the current file on *device* in *cpio*(F) format (5120-byte records).

-print Always true; causes the current path name to be printed.

-newer *file* True if the current file has been modified more recently than the argument *file*.

(*expression*) True if the parenthesized expression is true (parentheses are special to the shell and must be escaped).

The primaries may be combined using the following operators (in order of decreasing precedence):

negation The negation of a primary is specified with the exclamation (!) unary *not* operator.

AND The AND operation is implied by the juxtaposition of two primaries.

OR The OR operation is specified with the **-o** operator given between two primaries.

Example

The following command searches for files named *chapter1* in the current directory and all directories below it and sends the pathname of any such files it finds to the standard output:

```
find . -name chapter1 -print
```

The following removes all files named **core** or **a.out** that have not been accessed for a week:

```
find / \( -name core -name a.out \) -atime +7 -exec rm {} \;
```

Files

/etc/passwd
/etc/group

See Also

cpio(C), sh(C), stat(S), test(C)

Notes

If none of the **-print**, **-exec**, **-ok**, or **-cpio** primaries are given, *find* locates the specified files but nothing is done.

Name

finger - Finds information about users.

Syntax

finger [**-bfilpqsw**] [login1 [login2 ...]]

Description

By default *finger* lists the login name, full name, terminal name and write status (as a "*" before the terminal name if write permission is denied), idle time, login time, office location, and phone number (if they are known) for each current XENIX user. (Idle time is minutes if it is a single integer, hours and minutes if a colon (:) is present, or days and hours if a "d" is present.)

A longer format also exists and is used by *finger* whenever a list of names is given. (Account names as well as first and last names of users are accepted.) This is a multiline format; it includes all the information described above as well as the user's home directory and login shell, any plan which the person has placed in the file *.plan* in their home directory, and the project on which they are working from the file *.project* which is also in the home directory.

finger options are:

-b Briefer long output format of users.

-f Suppresses the printing of the header line (short format).

-i Quick list of users with idle times.

-l Forces long output format.

-p Suppresses printing of the *.plan* files.

-q Quick list of users.

-s Forces short output format.

-w Forces narrow format list of specified users.

Files

/etc/utmp	Who file
/etc/passwd	User names, offices, phones, login directories, and shells

$HOME/.plan	Plans
$HOME/.project	Projects

See Also

who(C)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

Only the first line of the *.project* file is printed.

Entries in the **/etc/passwd file** have the following format:

login name:user password(coded):user ID:group ID:comments:home directory:login shell

The comment field corresponds to configurable columns in the *finger* output. For example, in the following **/etc/passwd** entry:

```
blf:Tg6bLFzOwgfbA:47:5:Brian Foster, Mission, x70, 767-1234
:/u/blf:/bin/sh
```

the comment field, "Brian Foster, Mission, x70, 767-1234" , contains data for the "In Real Life" , "Office" , and "Home Phone" columns of the *finger* listings.

Idle time is computed as the elapsed time since any activity on the given terminal. This includes previous invocations of *finger* which may have modified the terminal's corresponding device file **/dev/tty**??.

Name

fixhdr - Changes executable binary file headers.

Syntax

fixhdr option files

Description

fixhdr changes the header of output files created by link editors or assemblers. The kinds of modifications include changing the format of the header, the fixed stack size, the standalone load address, and symbol names.

Using *fixhdr* allows the use of binary executable files, created under other versions or machines, by simply changing the header information so that it is usable by the target cpu.

These are the options to *fixhdr :*

-xa Change the *x.out* format of the header to the *a.out* format.

-xb Change the *x.out* format of the header to the *b.out* format.

-x4 Change the *x.out* format of the header to the 4.2BSD *a.out* format.

-x5 [-n] Change the *x.out* format of the header to 5.2 (UNIX™ System V release 2) *a.out* format. The **-n** flag causes leading underscores on symbol names to be passed with no modifications.

-ax -c [11,86]
Change the *a.out* format of the header to the *x.out* format. The **-c** flag specifies the target cpu. 11 specifies a PDP-11 cpu. 86 specifies one of the 8086 family of cpus (8086, 8088, 80186, 80286 or 80386).

-bx Change the *b.out* format of the header to the *x.out* format.

-5x [-n] Change the 5.2 (UNIX System V release 2) *a.out* format of the header to the *x.out* format. The **-n** flag causes leading underscores on symbol names to be passed with no modifications.

-86x Add the *x.out* header format to the *86rel* object module format. See *86rel*(F).

-F num Add (or change) the fixed stack size specified in the *x.out* format of the header. *num* must be a hexadecimal number.

-A num Add (or change) the standalone load address specified in the *x.out* format of the header. *num* must be a hexadecimal number.

-M[smlh] Change the model of the *x.out* or *86rel* format. Model refers to the compiler model specified when creating the binary. **s** refers to small model, **m** refers to medium model, **l** refers to large model, and **h** refers to huge model.

-v [2,3,5,7] Change the version of XENIX specified in the header. XENIX version 2 was based on UNIX Version 7.

-s s1=s2 [-s s3=s4]
Change symbol names, where symbol name *s1* is changed to *s2*.

-r Ensure that the resolution table is of non-zero size.

-C cpu Set the *cpu* type. *cpu* can be 186, 286, 386, 8086, others.

Files

/usr/bin/fixhdr

See Also

a.out(F), 86rel(F)

Notes

Give *fixhdr* one option at a time. If you need to make more than one kind of modification to a file, use *fixhdr* on the original file. Then use it again on the *fixhdr* output, specifying the next option. Copy the original file if you need an unmodified version as *fixhdr* makes the modifications directly to the file.

Name

format - format floppy disks

Syntax

format [**-n**] [**-v**] [**-e**] [**-f**] [**-q**] [device] [**-i** interleave]

Description

format formats diskettes for use with XENIX. It may be used either interactively or from the command line. The default drive is **/dev/rfd0**, as defined in **/etc/default/format**.

Options

The following command line options are available:

-f Suppresses the interactive feature. The *format* program does not wait for user-confirmation before starting to format the diskette. Regardless of whether or not you run *format* interactively, track and head information is displayed.

-e Erases the servo information on a mini-cartridge. This option applies only to QIC-40 drives. Note that formatting mini-cartridges is not recommended; for best results use preformatted cartridges.

device
This specifies the device to be formatted. The default device is **/dev/rfd0 .**

-i *interleave*
Specifies the interleave factor.

-q Quiet option. Suppresses the track and head output information normally displayed. Although this option does not suppress the interactive prompt, it would typically be used with **-f** to produce no output at all.

-v Specifies format verification.

-n Specifies that the diskette is not to be verified (overrides verify entry in **/etc/default/format**).

The file **/etc/default/format** is used to specify the default device to be formatted and whether or not each diskette is to be verified. The entries must be in the format DEVICE=/dev/rfd*nnn* and VERIFY=[yYnN], as in the following example:

```
DEVICE=/dev/rfd096ds15
VERIFY=y
```

The device must be a character (raw) device.

Usage

To run *format* interactively, enter:

```
format
```

followed by any of the legal options except **-f**, and press RETURN. When you run *format* interactively, you see the prompt:

```
insert diskette in drive and press return when ready
```

When you press RETURN at this prompt, *format* begins to format the diskette.

If you specify the **-f** option, you do not see this prompt. Instead, the program begins formatting immediately upon invocation.

Unless you specify the **-q** option, *format* displays which track and head it is currently on:

```
track #    head #
```

The number signs above are replaced by the actual track and head information.

Files

/etc/default/format

/dev/rfd[0 - n]

See Also

fd(HW)

Notes

The *format* utility does not format floppies for use under DOS; use the *dosformat* command documented in *dos*(C).

XENIX requires error free floppies.

It is not advisable to format a low density (48tpi) diskette on a high density (96tpi) floppy drive. Diskettes written on a high density drive should be read on high density drives. A low density diskette written on a high density drive may not be readable on a low density drive.

Name

getopt - Parses command options.

Syntax

set -- `getopt optstring $*`

Description

getopt is used to check and break up options in command lines for parsing by shell procedures. *Optstring* is a string of recognized option letters (see *getopt* (S)). If a letter is followed by a colon, the option is expected to have an argument which may or may not be separated from it by whitespace. The special option -- is used to delimit the end of the options. *getopt* will place -- in the arguments at the end of the options, or recognize it if used explicitly. The shell arguments ($1 $2...) are reset so that each option is preceded by a dash (-) and in its own shell argument; each option argument is also in its own shell argument.

Example

The following code fragment shows how one can process the arguments for a command that can take the options **a** and **b**, and the option **o**, which requires an argument:

```
set -- `getopt abo: $*`
if [ $? != 0 ]
then
        echo $USAGE
        exit 2
fi
for i in $*
do
        case $i in
        -a | -b)        FLAG=$i; shift;;
        -o)             OARG=$2;shift; shift;;
        --)             shift; break;;
        esac
done
```

This code will accept any of the following as equivalent:

```
cmd -aoarg file file
cmd -a -o arg file file
cmd -oarg -a file file
cmd -a -oarg -- file file
```

See Also

sh(C), getopt(S)

Diagnostics

getopt prints an error message on the standard error when it encounters an option letter not included in *optstring*.

Notes

The "Syntax" given for this utility assumes the user has an *sh*(C) shell.

Name

grep, egrep, fgrep - Searches a file for a pattern.

Syntax

grep [**-bchlnsvy**] [**-e** expression] [files]

egrep [**-bchlnv**] [**-e** expression] [files]

fgrep [**-bclnvxy**] [**-f** expfile] [files]

Description

Commands of the *grep* family search the input *files* (or standard input if no *files* are specified) for lines matching a pattern. Normally, each matching line is copied to the standard output. If more than one file is being searched, the name of the file in which each match occurs is also written to the standard output along with the matching line (unless the **-h** option is used, see below).

grep patterns are limited regular *expression*s in the style of *ed*(C). *grep* uses a compact nondeterministic algorithm. *egrep* patterns are full regular *expression*s; it uses a fast deterministic algorithm that sometimes needs exponential space. *fgrep* patterns are fixed *strings*. *fgrep* is fast and compact. The following *options* are recognized:

-v All lines but those matching are displayed.

-x Displays only exact matches of an entire line. (*fgrep* only.)

-c Only a count of matching lines is displayed.

-l Only the names of files with matching lines are displayed, separated by newlines.

-h Prevents the name of the file containing the matching line from being prepended to that line. Used when searching multiple files. (This option works with *grep* and *egrep* only.)

-n Each line is preceded by its relative line number in the file.

-b Each line is preceded by the block number on which it was found. This is sometimes useful in locating disk block numbers by context.

-s Suppresses error messages produced for nonexistent or unreadable files. (*grep* only). Note that the **-s** option will not suppress error messages generated by the **-f** option.

-y Turns on matching of letters of either case in the input so that case is insignificant. Conversion between uppercase and lowercase letters is dependent on the locale setting. **-y** does not work with *egrep*.

-e *expression or strings*
Same as a simple *expression* argument, but useful when the *expression* begins with a dash (**-**).

-f *expfile*
The regular *expression* for *grep* or *egrep*, or *strings* list for *fgrep* is taken from the *expfile*.

In all cases (except with **-h**) the filename is output if there is more than one input file. Care should be taken when using the characters **$**, *, [, ^, |, (,), and \ in *expression*, because they are also meaningful to the shell. It is safest to enclose the entire *expression* or *strings* argument in single quotation marks. For example:

```
grep '[Ss]omeone' text.file
```

This command would find all lines containing the word "someone" in the file **text.file**, whether the initial "s" is uppercase or lowercase.

Multiple strings can be specified in *fgrep* without using a separate strings file by using the quoting conventions of the shell to imbed newlines in the *string* argument. For example, if you were using the Bourne shell (*sh*(C)) you might enter the following on the command line:

```
fgrep 'Someone
someone' text.file
```

This would have the same effect as the *grep* example above. See the *csh*(C) manual page for ways to imbed newlines in a string when using *csh*(C).

egrep accepts regular expressions as in *ed*(C), with the addition of the following:

- A regular expression followed by a plus sign (+) matches one or more occurrences of the regular expression.

- A regular expression followed by a question mark (**?**) matches 0 or 1 occurrences of the regular expression.

- Two regular expressions separated by a vertical bar (|) or by a newline match strings that are matched by either regular expression.

- A regular expression may be enclosed in parentheses ( ) for grouping. For example:

  egrep ´([Ss]ome|[Aa]ny)one´ text.file

This example displays all lines in **text.file** containing the words "someone" or "anyone", whether or not they are spelled with initial capital letters. Without the parentheses, this example would display all lines containing the words "some" or "anyone" (because the vertical bar (|) operator is of lower precedence than concatenation, see below).

Because of the algorithm used, *egrep* does not support extended ranges as in *ed*(C): Ranges like **[a-z]** are interpreted on the basis of the machine's collating sequence, not the collating sequence defined by the locale. *grep* supports *col*(C) extended ranges.

The \(and \) operators, supported by *ed*(C), are not supported by *egrep*.

The order of precedence of operators is [ ], then * ? +, then concatenation, then backslash (\) with newline or vertical bar (|).

See Also

col(C), coltbl(M), ed(C), locale(M), sed(C), sh(C)

Diagnostics

Exit status is 0 if any matches are found, 1 if no matches are found, and 2 for syntax errors or inaccessible files.

Notes

Ideally there should be only one *grep*, but there isn't a single algorithm that spans a wide enough range of space-time tradeoffs.

Lines are limited to 256 characters. Longer lines are truncated.

When using *grep* with the **-y** option, the search is not made totally case insensitive in character ranges specified within brackets.

Name

grpcheck - Checks group file.

Syntax

grpcheck [file]

Description

grpcheck verifies all entries in the group file. This verification includes a check of the number of fields, group name, group ID, and whether all login names appear in the password file. The default group file is **/etc/group**.

Files

/etc/group

/etc/passwd

See Also

pwcheck(C), group(F), passwd(F)

Diagnostics

Group entries in **/etc/group** with no login names are flagged.

Name

hd - Displays files in hexadecimal format.

Syntax

hd [-format ...] [**-s** offset] [**-n** count] [file] ...

Description

The *hd* command displays the contents of files in hexadecimal, octal, decimal, and character 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:

-s *offset* 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* can be given in decimal, hexadecimal (preceded by '0x'), or octal (preceded 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), half kilobytes (512 bytes), or kilobytes (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 ambiguous trailing 'b', any offset and multiplier can be separated by an asterisk (*). (The asterisk might need to be enclosed in quotation marks to protect it from the shell.)

-n *count* Specify the number of bytes to process. The *count* is in the same format as *offset*, above.

Format Flags

Format flags can specify addresses, characters, bytes, words (2 bytes) or longs (4 bytes) to be printed in hex, decimal, or octal. Two special formats can also be indicated: text or ascii. Format and base specifiers can be freely combined and repeated as desired in order to specify different bases (hexadecimal, decimal or octal) for different output formats (addresses, characters, etc.). All format flags appearing in a single argument are applied as appropriate to all other flags in that argument.

acbwlA
Output format specifiers for addresses, 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 the 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 output format (other than addresses) is given, **bx** is assumed. If no base specifier is given, *all* of **xdo** are used.

xdo
Output base specifiers for hexadecimal, decimal and octal. If no format specifier is given, *all* of **acbwl** are used.

t Print a text 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 '^_'. 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

hdr - Display selected parts of an object file.

Syntax

hdr [**-dhprsSt**] file ...

Description

hdr displays executable binary file headers, symbol tables, and text or data relocation records in human-readable formats. It also prints out seek positions for the various segments in the executable binary file.

a.out, **x.out**, and **x.out** segmented formats and archives are understood.

The symbol table format consists of six fields. In **a.out** formats the third field is missing. The first field is the symbol's index or position in the symbol table, printed in decimal. The index of the first entry is zero. The second field is the type, printed in hexadecimal. The third field is the **s_seg** field, printed in hexadecimal. The fourth field is the symbol's value in hexadecimal. The fifth field is a single character which represents the symbol's type as in *nm*(C), except **C** common is not recognized as a special case of undefined. The last field is the symbol name.

If long form relocation is present, the format consists of six fields. The first is the descriptor, printed in hexadecimal. The second is the symbol ID, or index, in decimal. This field is used for external relocations as an index into the symbol table. It should reference an undefined symbol table entry. The third field is the position, or offset, within the current segment at which relocation is to take place; it is printed in hexadecimal. The fourth field is the name of the segment referenced in the relocation: text, data, bss or EXT for external. The fifth field is the size of relocation: byte, word (2 bytes), or long. The last field will indicate, if present, that the relocation is relative.

If short form relocation is present, the format consist of three fields. The first field is the relocation command in hexadecimal. The second field contains the name of the segment referenced; text or data. The last field indicates the size of relocation: word or long.

Options and their meanings are:

-d Causes the data relocation records to be printed out.

-h Causes the executable binary file header and extended header to be printed out. Each field in the header or extended header is labeled. This is the default option.

-p Causes seek positions to be printed out as defined by macros in the include file, **<a.out.h>**.

-r Causes both text and data relocation to be printed.

-s Prints the symbol table.

-S Prints the file segment table with a header. (Only applicable to **x.out** segmented executable files.)

-t Causes the text relocation records to be printed out.

See Also

a.out(F), nm(C)

Name

head - Prints the first few lines of a stream.

Syntax

head [-count] [file ...]

Description

This filter prints the first *count* lines of each of the specified files. If no files are specified, *head* reads from the standard input. If no *count* is specified, then 10 lines are printed.

See Also

tail(C)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Name

hello - Send a message to another user.

Syntax

hello user [tty]

Description

hello sends messages from one user to another. When first called, *hello* displays the following message:

Message from *sender's-system! sender's-name sender's-tty*

The recipient of the message should write back at this point. Communication continues until an interrupt is sent. (On most terminals, pressing the **Del** key sends an interrupt.) At that point *hello* prints "EOT" on the other terminal, and exits.

To write to a user who is logged in more than once, the user can employ the *tty* argument to specify the appropriate terminal name. The *who*(C) command can be used to determine the correct terminal name.

Permission to write may be allowed or denied by the recipient, using the *mesg* command. Writing is allowed by default. Certain commands, such as *nroff* and *pr*, prohibit messages in order to prevent disruption of output.

If the character **!** is found at the beginning of a line, *hello* calls the shell to execute the rest of the line as a command.

The following protocol is suggested for using *hello*. When first writing to another user, the sender should wait for that user to write back before sending a message. Each party should end each message with a signal indicating that the other may reply: **o** for "over" is conventional. The signal **oo** for "over and out" is suggested when conversation is about to be terminated.

Files

/etc/utmp
/bin/sh

See Also

mesg(C), who(C), mail(C), write(C)

Name

help - Asks for help with XENIX commands and SCCS error messages.

Syntax

help [command] [imessagenumber]

Description

help provides on-line explanations of most commonly-used XENIX commands. *help* also displays information explaining SCCS error messages. Multiple arguments can be supplied. If no arguments are given, *help* will prompt for one.

The arguments may be XENIX command names or SCCS message numbers. Message numbers are displayed at the end of SCCS error messages. SCCS message numbers come in two forms: numbers and letter-number combinations (for example, **ge6** or **212**).

When all else fails, try "help stuck".

Files

/usr/lib/help	Directory containing files of message text

Name

hwconfig - Display hardware configuration information.

Syntax

/etc/hwconfig [**-f** filename] [**-chlnq**] [field=value] [field] ...

Description

hwconfig displays hardware configuration information as reported by device drivers during system bootup, from the file /usr/adm/hwconfig or a specified file. Using combinations of the remaining options, the user can select which devices to report on as well as what information to report about these devices. *hwconfig* can also be used to detect conflicts in device settings.

Two display formats are available. By default, *hwconfig* displays a series of *field=value* entries for each recognized device. The fields include (but are not restricted to) name, base I/O address, offset (number of consecutive I/O addresses used), interrupt vector, DMA channel, and fields specific to each device. This format is easily interpreted by programs.

In the default format, an argument of *field=value* causes only lines with a matching field to be displayed. A *field* argument without a value causes only the specified fields of the selected lines to display, and selects only those lines which contain that field.

Using the **-h** option, the *hwconfig* display looks similar to this:

```
device      address     vec  dma  comment
======      =======     ===  ===  =======
floppy    0x3f2-0x3f7   06   2   unit=0 type=96ds15
serial    0x210-0x217   03   -   unit=1 type=DIGIBOARD nports=4
console       -          -   -   unit=vga type=0
disk      0x1f0-0x1f7   36   -   type=W0 unit=0 cyls=1023 hds=8 secs=52
```

Options

The following options are available:

-f *filename* use *filename* instead of **/usr/adm/hwconfig**.

-h Display tabular format with headers, rather than *field=value* pairs. If *field=value* or *field* arguments are included, only lines matching all such arguments are displayed. (The complete line is always displayed.)

-c Check for device conflicts, including I/O addresses, DMA channels and interrupt vectors which are being used by more than one driver.

-q Check quietly for device conflicts; display nothing. When both -c and -q are given, display conflicts only.

-n Display names; same as a field argument of **name.**

-l Display all fields, even if field selectors have been given.

field=value Display all devices with a *field* matching the stated *value.*

field Display only the matching fields of selected devices. With **-h**, display whole lines with a matching *field.*

Examples

hwconfig The entire contents of the file **/usr/adm/hwconfig** is printed.

hwconfig base
prints all *base* values found in **/usr/adm/hwconfig.**

hwconfig -f conf base=300 vec=31
prints all entries in *conf* that match the *base* and *vec* values given.

hwconfig name=floppy base
prints the *base* values for any floppy entries in **/usr/adm/hwconfig.**

hwconfig -n base dma
displays name, base and dma of all entries in **/usr/adm/hwconfig** with *base* and *dma* values.

hwconfig base dma vec=4
displays the base and dma values of all **/usr/adm/hwconfig** entries with base and dma values and vec=4.

hwconfig -l base dma
displays in full all entries in **/usr/adm/hwconfig** with both base and dma values.

hwconfig -ch
displays **/usr/adm/hwconfig** in an easy-to-read tabular format and checks for device conflicts.

Files

/etc/hwconfig	program file
/usr/lib/hwconfig.awk	awk program which hwconfig uses
/usr/adm/hwconfig	default source file

Diagnostics

hwconfig returns 0 for success, 1 for conflicts detected, 2 for invalid arguments.

Notes

Information about conflicts is purely advisory because *hwconfig* can only report about hardware devices which have been correctly recognized by a kernel driver.

/usr/adm/hwconfig is not normally readable by users, but can be made so by the System Administrator.

/usr/adm/hwconfig is written by the error logger daemon. The logger daemon does not run while in System Maintenance mode. This means that the hwconfig report is not valid until the system is brought into multi-user mode.

Name

id - Prints user and group IDs and names.

Syntax

id

Description

Id writes a message on the standard output, giving the user and group IDs and the corresponding names of the invoking process. If the effective and real IDs do not match, both are printed.

See Also

logname(C), getuid(S)

Name

join - Joins two relations.

Syntax

join [options] file1 file2

Description

join forms, on the standard output, a join of the two relations specified by the lines of *file1* and *file2*. If *file1* is a dash (-), the standard input is used.

File1 and *file2* must be sorted in increasing ASCII collating sequence on the fields on which they are to be joined, normally the first in each line.

There is one line in the output for each pair of lines in *file1* and *file2* that have identical join fields. The output line normally consists of the common field, then the rest of the line from *file1*, then the rest of the line from *file2*.

Fields are normally separated by blank, tab or newline. In this case, multiple separators count as one, and leading separators are discarded.

These options are recognized:

-a*n* In addition to the normal output, produces a line for each unpairable line in file *n*, where *n* is 1 or 2.

-e *s* Replaces empty output fields by string *s*.

-j*n m* Joins on the *m*th field of file *n*. If *n* is missing, uses the *m*th field in each file.

-o *list* Each output line comprises the fields specified in *list*, each element of which has the form *n.m*, where *n* is a file number and *m* is a field number.

-t*c* Uses character *c* as a separator (tab character). Every appearance of *c* in a line is significant.

See Also

awk(C), comm(C), sort(C)

Notes

With default field separation, the collating sequence is that of *sort* **-b**. With **-t**, the sequence is that of a plain sort.

Name

kill - Terminates a process.

Syntax

kill [-signo] processid ...

Description

kill sends signal 15 (terminate) to the specified processes. This will normally kill processes that do not catch or ignore the signal. The process number of each asynchronous process started with **&** is reported by the shell (unless more than one process is started in a pipeline, in which case the number of the last process in the pipeline is reported). Process numbers can also be found by using *ps*(C).

For example, if process number 0 is specified, all processes in the process group are signaled.

The killed process must belong to the current user unless he is the super-user.

If a signal number preceded by - is given as the first argument, that signal is sent instead of the terminate signal (see *signal*(S)). In particular "kill -9 . . ." is a sure kill.

See Also

ps(C), sh(C), kill(S), signal(S)

Name

ksh, rksh - Korn Shell, a standard/restricted command and programming language.

Syntax

ksh [**±aefhiknoprstuvx**] [**±o** option] ... [**-c** string] [arg ...]
rksh [**±aefhiknoprstuvx**] [**±o** option] ... [**-c** string] [arg ...]

Description

ksh is a command and programming language that executes commands read from a terminal or a file. *rksh* is a restricted version of the command interpreter *ksh*; it is used to set up login names and execution environments whose capabilities are more controlled than those of the standard shell. See *Invocation* below for the meaning of arguments to the shell.

Definitions

A *metacharacter* is one of the following characters:

; & ( ) | < > new-line space tab

A *blank* is a **tab** or a **space**. An *identifier* is a sequence of letters, digits, or underscores starting with a letter or underscore. Identifiers are used as names for *functions* and *named parameters*. A *word* is a sequence of *characters* separated by one or more non-quoted *metacharacters*.

A *command* is a sequence of characters in the syntax of the shell language. The shell reads each command and carries out the desired action either directly or by invoking separate utilities. A special command is a command that is carried out by the shell without creating a separate process.

Commands

A *simple-command* is a sequence of *blank* separated words which may be preceded by a parameter assignment list. (See *Environment* below). The first word specifies the name of the command to be executed. Except as specified below, the remaining words are passed as arguments to the invoked command. The command name is passed as argument 0 (see *exec*(S)). The *value* of a simple-command is its exit status if it terminates normally, or (octal) 200+*status* if it terminates abnormally (see *signal*(S) for a list of status values).

A *pipeline* is a sequence of one or more *commands* separated by |. The standard output of each command but the last is connected by a *pipe*(S) to the standard input of the next command. Each command is run as a separate process; the shell waits for the last command to terminate. The exit status of a pipeline is the exit status of the last command.

A *list* is a sequence of one or more pipelines separated by **;**, **&**, **&&**, or | |, and optionally terminated by **;**, **&**, or **|&**. Of these five symbols, **;**, **&**, and **|&** have equal precedence, which is lower than that of **&&** and | |. The symbols **&&** and | | also have equal precedence. A semicolon (**;**) causes sequential execution of the preceding pipeline; an ampersand (**&**) causes asynchronous execution of the preceding pipeline (i.e., the shell does *not* wait for that pipeline to finish). The symbol **|&** causes asynchronous execution of the preceding command or pipeline with a two-way pipe established to the parent shell. The standard input and output of the spawned command can be written to and read from by the parent shell using the **-p** option of the special commands **read** and **print** described later. The symbol **&&** (| |) causes the *list* following it to be executed only if the preceding pipeline returns a zero (non-zero) value. An arbitrary number of new-lines can appear instead of a semicolon in a *list,* to delimit a command.

A *command* is either a simple-command or one of the following. Unless otherwise stated, the value returned by a command is that of the last simple-command executed in the command.

for *identifier* [**in** *word* ...] **;do** *list* **;done**
Each time a **for** command is executed, *identifier* is set to the next *word* taken from the **in** *word* list. If **in** *word* ... is omitted, then the **for** command executes the **do** *list* once for each positional parameter that is set (see *Parameter Substitution* below). Execution ends when there are no more words in the list.

select *identifier* [**in** *word* ...] **;do** *list* **;done**
A **select** command prints on standard error (file descriptor 2), the set of *word*s, each preceded by a number. If **in** *word* ... is omitted, then the positional parameters are used instead (see *Parameter Substitution* below). The **PS3** prompt is printed and a line is read from the standard input. If this line consists of the number of one of the listed *word*s, then the value of the parameter *identifier* is set to the *word* corresponding to this number. If this line is empty the selection list is printed again. Otherwise the value of the parameter *identifier* is set to *null*. The contents of the line read from standard input is saved in the parameter **REPLY.** The *list* is executed for each selection until a **break** or *end-of-file* is encountered.

case *word* **in** [[(]*pattern* [| *pattern*]...) *list* **;;**]... **esac**
A **case** command executes the *list* associated with the first *pattern* that matches *word*. The form of the patterns is the same as that used for file-name generation (see *File Name Generation* below).

if *list* **;then** *list* [; **elif** *list* **;then** *list*] ... [**;else** *list*] **;fi**
The *list* following **if** is executed and, if it returns a zero exit status, the *list* following the first **then** is executed. Otherwise, the *list* following **elif** is executed and, if its value is zero, the *list* following the next **then** is executed. Failing that, the **else** *list* is executed. If no **else** *list* or **then** *list* is executed, then the **if** command returns a zero exit status.

while *list* **;do** *list* **;done**
until *list* **;do** *list* **;done**
A **while** command repeatedly executes the **while** *list* and, if the exit status of the last command in the list is zero, executes the **do** *list*; otherwise the loop terminates. If no commands in the **do** *list* are executed, then the **while** command returns a zero exit status; **until** may be used in place of **while** to negate the loop termination test.

(*list*)
Executes *list* in a separate environment. Note, that if two adjacent open parentheses are needed for nesting, a space must be inserted to avoid arithmetic evaluation as described below.

{ *list*;}
list is simply executed. Note that unlike the metacharacters (and), { and } are *reserved words* and must be at the beginning of a line or after a ; in order to be recognized.

[[*expression*]]
Evaluates *expression* and returns a zero exit status when *expression* is true. See *Conditional Expressions* below, for a description of *expression.*

function *identifier* { *list* ;}
identifier () { *list* ;}
Defines a function which is referenced by *identifier*. The body of the function is the *list* of commands between { and }. (See *Functions* below).

time *pipeline*
The *pipeline* is executed and the elapsed time as well as the user and system time are printed on standard error.

The following reserved words are only recognized as the first word of a command and when not quoted:

if then else elif fi case esac for while until do done { } function select time [[ ]]

Comments

A word beginning with # causes that word and all the following characters up to a new-line to be ignored.

Aliasing

The first word of each command is replaced by the text of an **alias** if an **alias** for this word has been defined. The first character of an **alias** name can be any non-special printable character, but the rest of the characters must be the same as for a valid *identifier*. The replacement string can contain any valid shell script including the metacharacters listed above. The first word of each command in the replaced text, other than any that are in the process of being replaced, will be tested for aliases. If the last character of the alias value is a *blank* then the word following the alias will also be checked for alias substitution. Aliases can be used to redefine special builtin commands but cannot be used to redefine the reserved words listed above. Aliases can be created, listed, and exported with the **alias** command and can be removed with the **unalias** command. Exported aliases remain in effect for scripts invoked by name, but must be reinitialized for separate invocations of the shell (See *Invocation* below).

Aliasing is performed when scripts are read, not while they are executed. Therefore, for an alias to take effect the **alias** definition command has to be executed before the command which references the alias is read.

Aliases are frequently used as a short hand for full path names. An option to the aliasing facility allows the value of the alias to be automatically set to the full pathname of the corresponding command. These aliases are called *tracked* aliases. The value of a *tracked* alias is defined the first time the corresponding command is looked up and becomes undefined each time the **PATH** variable is reset. These aliases remain *tracked* so that the next subsequent reference will redefine the value. Several tracked aliases are compiled into the shell. The **-h** option of the **set** command makes each referenced command name into a tracked alias.

The following *exported aliases* are compiled into the shell but can be unset or redefined:

```
autoload='typeset -fu'
false='let 0'
functions='typeset -f'
hash='alias -t'
history='fc -l'
integer='typeset -i'
nohup='nohup '
r='fc -e -'
true=':'
type='whence -v'
```

The alias of nohup with a trailing space allows nohup to be used with aliases.

Tilde Substitution

After alias substitution is performed, each word is checked to see if it begins with an unquoted ~. If it does, then the word up to a / is checked to see if it matches a user name in the **/etc/passwd** file. If a match is found, the ~ and the matched login name are replaced by the login directory of the matched user. This is called a *tilde* substitution. If no match is found, the original text is left unchanged. A ~ by itself, or in front of a /, is replaced by the value of the **HOME** parameter. A ~ followed by a + or - is replaced by **$PWD** and **$OLDPWD** respectively.

In addition, *tilde* substitution is attempted when the value of a *variable assignment parameter* begins with a ~.

Command Substitution

The standard output from a command enclosed in parenthesis preceded by a dollar sign ($()) or a pair of grave accents (``) may be used as part or all of a word; trailing new-lines are removed. In the second (archaic) form, the string between the quotes is processed for special quoting characters before the command is executed. (See *Quoting* below). The command substitution **$(cat file)** can be replaced by the equivalent but faster **$(<file)**. Command substitutions of most special commands that do not perform input/output redirection are carried out without creating a separate process.

An arithmetic expression enclosed in double parentheses preceded by a dollar sign ($(())) is replaced by the value of the arithmetic expression within the double parentheses.

Parameter Substitution

A *parameter* is an *identifier*, one or more digits, or any of the characters *, @, #, ?, -, $, and !. A *named parameter* (a parameter denoted by an identifier) has a *value* and zero or more *attributes*. *Named parameters* can be assigned *values* and *attributes* by using the **typeset** special command. The attributes supported by the shell are described later with the **typeset** special command. Exported parameters pass values and attributes to the environment.

The shell supports a one-dimensional array facility. An element of an array parameter is referenced by a *subscript*. A *subscript* is denoted by a [, followed by an *arithmetic expression* (see Arithmetic evaluation below) followed by a]. To assign values to an array, use **set -A** *name value* .... The value of all subscripts must be in the range of 0 through 1023. Arrays need not be declared. Any reference to a named parameter with a valid subscript is legal and an array will be created if necessary. Referencing an array without a subscript is equivalent to referencing the element zero.

The *value* of a *named parameter* may also be assigned by writing:

name=*value* [*name*=*value*] ...

If the integer attribute, **-i**, is set for *name* the *value* is subject to arithmetic evaluation as described below.
Positional parameters, parameters denoted by a number, may be assigned values with the **set** special command. Parameter **$0** is set from argument zero when the shell is invoked.

The character **$** is used to introduce substitutable *parameters*.
${*parameter***}**
The shell reads all the characters from **${** to the matching **}** as part of the same word even if it contains braces or metacharacters. The value, if any, of the parameter is substituted. The braces are required when *parameter* is followed by a letter, digit, or underscore that is not to be interpreted as part of its name or when a named parameter is subscripted. If *parameter* is one or more digits then it is a positional parameter. A positional parameter of more than one digit must be enclosed in braces. If *parameter* is * or **@**, then all the positional parameters, starting with **$1**, are substituted (separated by a field separator character). If an array *identifier* with subscript * or **@** is used, then the value for each of the elements is substituted (separated by a field separator character).
${#*parameter***}**
If *parameter* is * or **@**, the number of positional parameters is substituted. Otherwise, the length of the value of the *parameter* is substituted.
${#*identifier***[*]}**
The number of elements in the array *identifier* is substituted.
${*parameter***:-***word***}**
If *parameter* is set and is non-null then substitute its value; otherwise substitute *word*.
${*parameter***:=***word***}**
If *parameter* is not set or is null then set it to *word*; the value of the parameter is then substituted. Positional parameters may not be assigned to in this way.
${*parameter***:?***word***}**
If *parameter* is set and is non-null then substitute its value; otherwise, print *word* and exit from the shell. If *word* is omitted then a standard message is printed.
${*parameter***:+***word***}**
If *parameter* is set and is non-null then substitute *word*; otherwise substitute nothing.
${*parameter***#***pattern***}**
${*parameter***##***pattern***}**
If the shell *pattern* matches the beginning of the value of *parameter*, then the value of this substitution is the value of the *parameter* with the matched portion deleted; otherwise the value of this *parameter* is substituted. In the first form the smallest matching pattern is deleted and in the second form the largest matching pattern is deleted.

${*parameter***%***pattern***}**
${*parameter***%%***pattern***}**
If the shell *pattern* matches the end of the value of *parameter*, then the value of this substitution is the value of the *parameter* with the matched part deleted; otherwise substitute the value of *parameter*. In the first form the smallest matching pattern is deleted and in the second form the largest matching pattern is deleted.

In the above, *word* is not evaluated unless it is to be used as the substituted string, so that, in the following example, **pwd** is executed only if **d** is not set or is null:

```
echo ${d:-$(pwd)}
```

If the colon (**:**) is omitted from the above expressions, then the shell only checks whether *parameter* is set or not.

The following parameters are automatically set by the shell:

$0-$*n*
Positional parameters.

The number of positional parameters in decimal.

- Flags supplied to the shell on invocation or by the **set** command.

? The decimal value returned by the last executed command.

$ The process number of this shell.

_ Initially, the value _ is an absolute pathname of the shell or script being executed as passed in the *environment*. Subsequently it is assigned the last argument of the previous command. This parameter is not set for commands which are asynchronous. This parameter is also used to hold the name of the matching **MAIL** file when checking for mail.

! The process number of the last background command invoked.

ERRNO
The value of *errno* as set by the most recently failed system call. This value is system dependent and is intended for debugging purposes.

LINENO
The line number of the current line within the script or function being executed.

OLDPWD
The previous working directory set by the **cd** command.

OPTARG
The value of the last option argument processed by the **getopts** special command.

OPTIND
The index of the last option argument processed by the **getopts** special command.

PPID
The process number of the parent of the shell.

PWD
The present working directory set by the **cd** command.

RANDOM
Each time this parameter is referenced, a random integer, uniformly distributed between 0 and 32767, is generated. The sequence of random numbers can be initialized by assigning a numeric value to **RANDOM**.

REPLY
This parameter is set by the **select** statement and by the **read** special command when no arguments are supplied.

SECONDS
Each time this parameter is referenced, the number of seconds since shell invocation is returned. If this parameter is assigned a value, then the value returned upon reference will be the value that was assigned plus the number of seconds since the assignment.

The following parameters are used by the shell:

CDPATH
The search path for the *cd* command.

COLUMNS
If this variable is set, the value is used to define the width of the edit window for the shell edit modes and for printing **select** lists.

EDITOR
If the value of this variable ends in *emacs*, *gmacs*, or *vi* and the **VISUAL** variable is not set, then the corresponding option (see Special Command **set** below) will be turned on.

ENV
If this parameter is set, then parameter substitution is performed on the value to generate the pathname of the script that will be executed when the shell is invoked. (See *Invocation* below.) This file is typically used for *alias* and *function* definitions.

FCEDIT
The default editor name for the **fc** command.

FPATH
The search path for function definitions. This path is searched when a function with the **-u** attribute is referenced and when a command is not found. If an executable file is found, then it is read and executed in the current environment.

IFS
Internal field separators, normally **space**, **tab**, and **new-line** that is used to separate command words which result from command or parameter substitution and for separating words with the special command **read**. The first character of the **IFS** parameter is used to separate arguments for the **"$*"** substitution (See *Quoting* below).

HISTFILE
If this parameter is set when the shell is invoked, then the value is the pathname of the file that will be used to store the command history. (See *Command re-entry* below.)

HISTSIZE
If this parameter is set when the shell is invoked, then the number of previously entered commands that are accessible by this shell will be greater than or equal to this number. The default is 128.

HOME
The default argument (home directory) for the **cd** command.

LINES
If this variable is set, the value is used to determine the column length for printing **select** lists. Select lists will print vertically until about two-thirds of **LINES** lines are filled.

MAIL
If this parameter is set to the name of a mail file *and* the **MAILPATH** parameter is not set, then the shell informs the user of arrival of mail in the specified file.

MAILCHECK
This variable specifies how often (in seconds) the shell will check for changes in the modification time of any of the files specified by the **MAILPATH** or **MAIL** parameters. The default value is 600 seconds. When the time has elapsed the shell will check before issuing the next prompt.

MAILPATH
A colon (**:**) separated list of file names. If this parameter is set then the shell informs the user of any modifications to the specified files that have occurred within the last **MAILCHECK** seconds. Each file name can be followed by a **?** and a message that will be printed. The message will undergo parameter substitution with the parameter, **$_** defined as the name of the file that has changed. The default message is *you have mail in $_*.

PATH
The search path for commands (see *Execution* below). The user may not change **PATH** if executing under *rksh* (except in *.profile*).

PS1
The value of this parameter is expanded for parameter substitution to define the primary prompt string which by default is "**$** ". The character **!** in the primary prompt string is replaced by the *command* number (see *Command Re-entry* below).

PS2
Secondary prompt string, by default "> ".

PS3
Selection prompt string used within a **select** loop, by default "**#?** ".

PS4
The value of this parameter is expanded for parameter substitution and precedes each line of an execution trace. If omitted, the execution trace prompt is "+ ".

SHELL
The pathname of the *shell* is kept in the environment. At invocation, if the basename of this variable matches the pattern ***r*sh**, then the shell becomes restricted.

TMOUT
If set to a value greater than zero, the shell will terminate if a command is not entered within the prescribed number of seconds after issuing the **PS1** prompt.

VISUAL
If the value of this variable ends in *emacs*, *gmacs*, or *vi* then the corresponding option (see Special Command **set** below) will be turned on.

The shell gives default values to **PATH**, **PS1**, **PS2**, **MAILCHECK**, **TMOUT** and **IFS**, while **HOME**, **SHELL**, **ENV** and **MAIL** are not set at all by the shell (although **HOME**, **MAIL**, and **SHELL** *are* set by *login*(M)).

Blank Interpretation

After parameter and command substitution, the results of substitutions are scanned for the field separator characters (those found in **IFS**) and split into distinct arguments where such characters are found. Explicit null arguments ("" or ´´) are retained. Implicit null arguments (those resulting from *parameters* that have no values) are removed.

File Name Generation

Following substitution, each command *word* is scanned for the characters *****, **?**, and **[** unless the **-f** option has been **set**. If one of these characters appears then the word is regarded as a *pattern*. The word is replaced with lexicographically sorted file names that match the pattern. If no file name is found that matches the pattern, then the word is left unchanged. When a *pattern* is used for file name generation, the character **.** at the start of a file name or immediately following a /, as well as the character / itself, must be matched explicitly. In other instances of pattern matching the / and **.** are not treated specially.

***** Matches any string, including the null string.
? Matches any single character.
[. . .]
Matches any one of the enclosed characters. A pair of characters separated by - matches any character lexically between the pair, inclusive. If the first character following the opening "[" is a "! " then any character not enclosed is matched. A - can be included in the character set by putting it as the first or last character.

A *pattern-list* is a list of one or more patterns separated by each other with a |. Composite patterns can be formed with one or more of the following:

?(*pattern-list***)**
Optionally matches any one of the given patterns.

(pattern-list***)**
Matches zero or more occurrences of the given patterns.
+(*pattern-list***)**
Matches one or more occurrences of the given patterns.
@(*pattern-list***)**
Matches exactly one of the given patterns.
!(*pattern-list***)**
Matches anything, except one of the given patterns.

Quoting

Each of the *metacharacters* listed above (See *Definitions* above) has a special meaning to the shell and causes termination of a word unless quoted. A character may be *quoted* (i.e., made to stand for itself) by preceding it with a \. The pair **\new-line** is ignored. All characters enclosed between a pair of single quote marks (´´), are quoted. A single quote cannot appear within single quotes. Inside double quote marks (" "), parameter and command substitution occurs and \ quotes the characters \, `, ", and **$**. The meaning of **$*** and **$@** is identical when not quoted or when used as a parameter assignment value or as a file name. However, when used as a command argument, **"$*"** is equivalent to **"$1***d***$2***d*...", where *d* is the first character of the **IFS** parameter, whereas **"$@"** is equivalent to **"$1" "$2"** .... Inside grave quote marks (``) \ quotes the characters \, `, and **$**. If the grave quotes occur within double quotes then \ also quotes the character ".

The special meaning of reserved words or aliases can be removed by quoting any character of the reserved word. The recognition of function names or special command names listed below cannot be altered by quoting them.

Arithmetic Evaluation

An ability to perform integer arithmetic is provided with the special command **let**. Evaluations are performed using *long* arithmetic. Constants are of the form [*base***#**]*n* where *base* is a decimal number between two and thirty-six representing the arithmetic base and *n* is a number in that base. If *base* is omitted then base 10 is used.

An arithmetic expression uses the same syntax, precedence, and associativity of expression of the C language. All the integral operators, other than **++**, **--**, **?:**, and **,** are supported. Named parameters can be referenced by name within an arithmetic expression without using the parameter substitution syntax. When a named parameter is referenced, its value is evaluated as an arithmetic expression.

An internal integer representation of a *named parameter* can be specified with the **-i** option of the **typeset** special command. Arithmetic evaluation is performed on the value of each assignment to a named parameter with the **-i** attribute. If you do not specify an

arithmetic base, the first assignment to the parameter determines the arithmetic base. This base is used when parameter substitution occurs.

Since many of the arithmetic operators require quoting, an alternative form of the **let** command is provided. For any command which begins with a ((, all the characters until a matching)) are treated as a quoted expression. More precisely, ((...)) is equivalent to **let** "...".

Prompting

When used interactively, the shell prompts with the value of **PS1** before reading a command. If at any time a new-line is typed and further input is needed to complete a command, then the secondary prompt (i.e., the value of **PS2**) is issued.

Conditional Expressions

A *conditional expression* is used with the [[compound command to test attributes of files and to compare strings. Word splitting and file name generation are not performed on the words between [[and]]. Each expression can be constructed from one or more of the following unary or binary expressions:

-a *file*
: True, if *file* exists.

-b *file*
: True, if *file* exists and is a block special file.

-c *file*
: True, if *file* exists and is a character special file.

-d *file*
: True, if *file* exists and is a directory.

-f *file*
: True, if *file* exists and is an ordinary file.

-g *file*
: True, if *file* exists and is has its setgid bit set.

-k *file*
: True, if *file* exists and is has its sticky bit set.

-n *string*
: True, if length of *string* is non-zero.

-o *option*
: True, if option named *option* is on.

-p *file*
: True, if *file* exists and is a FIFO (first-in-first-out) special file or a pipe.

-r *file*
: True, if *file* exists and is readable by current process.

-s *file*
: True, if *file* exists and has size greater than zero.

-t *fildes*
True, if file descriptor number *fildes* is open and associated with a terminal device.
-u *file*
True, if *file* exists and is has its setuid bit set.
-w *file*
True, if *file* exists and is writable by current process.
-x *file*
True, if *file* exists and is executable by current process. If *file* exists and is a directory, then the current process has permission to search in the directory.
-z *string*
True, if length of *string* is zero.
-O *file*
True, if *file* exists and is owned by the effective user id of this process.
-G *file*
True, if *file* exists and its group matches the effective group id of this process.
file1 **-nt** *file2*
True, if *file1* exists and is newer than *file2*.
file1 **-ot** *file2*
True, if *file1* exists and is older than *file2*.
file1 **-ef** *file2*
True, if *file1* and *file2* exist and refer to the same file.
string = *pattern*
True, if *string* matches *pattern*.
string **!=** *pattern*
True, if *string* does not match *pattern*.
string1 < *string2*
True, if *string1* comes before *string2* based on ASCII value of their characters.
string1 > *string2*
True, if *string1* comes after *string2* based on ASCII value of their characters.
exp1 **-eq** *exp2*
True, if *exp1* is equal to *exp2*.
exp1 **-ne** *exp2*
True, if *exp1* is not equal to *exp2*.
exp1 **-lt** *exp2*
True, if *exp1* is less than *exp2*.
exp1 **-gt** *exp2*
True, if *exp1* is greater than *exp2*.
exp1 **-le** *exp2*
True, if *exp1* is less than or equal to *exp2*.
exp1 **-ge** *exp2*
True, if *exp1* is greater than or equal to *exp2*.

In each of the above expressions, if *file* is of the form **/dev/fd/***n*, where *n* is an integer, then the test is applied to the open file whose descriptor number is *n*.

A compound expression can be constructed from these primitives by using any of the following, listed in decreasing order of precedence.

(*expression*)
True, if *expression* is true. Used to group expressions.

! *expression*
True if *expression* is false.

expression1 **&&** *expression2*
True, if *expression1* and *expression2* are both true.

expression1 **||** *expression2*
True, if either *expression1* or *expression2* is true.

Spelling Checker

By default, the shell checks spelling whenever you use *cd* to change directories. For example, if you change to a different directory using *cd* and misspell the directory name, the shell responds with an alternative spelling of an existing directory. Enter "y" and press RETURN (or just press RETURN) to change to the offered directory. If the offered spelling is incorrect, enter "n", then retype the command line. In this example the user input is boldfaced:

```
# cd /usr/spol/uucp
/usr/spool/uucp? y
ok
```

The spell check feature is controlled by the CDSPELL environment variable. The default value of CDSPELL is set to the string "cdspell" whenever a *ksh* session is run. A user can change it to any value, including the null string, but the value is immaterial, if CDSPELL is set to any value, the spell check feature is engaged.

To disable the spelling checker, enter the following at the *ksh* prompt :

unset CDSPELL

When the user does a **set** at the *ksh* prompt, CDSPELL is not listed if the **unset** was successful.

Input/Output

Before a command is executed, its input and output may be redirected using a special notation interpreted by the shell. The following may appear anywhere in a simple-command or may precede or follow a *command* and are *not* passed on to the invoked command. Command and parameter substitution occurs before *word* or *digit* is used except as noted below. File name generation occurs only if the pattern matches a single file and blank interpretation is not performed.

<*word*	Use file *word* as standard input (file descriptor 0).
>*word*	Use file *word* as standard output (file descriptor 1). If the file does not exist then it is created. If the file exists, and the **noclobber** option is on, this causes an error; otherwise, it is truncated to zero length.
>|*word*	Sames as >, except that it overrides the **noclobber** option.
>>*word*	Use file *word* as standard output. If the file exists then output is appended to it (by first seeking to the end-of-file); otherwise, the file is created.
<>*word*	Open file *word* for reading and writing as standard input.
<<[-]*word*	The shell input is read up to a line that is the same as *word*, or to an end-of-file. No parameter substitution, command substitution or file name generation is performed on *word*. The resulting document, called a *here-document*, becomes the standard input. If any character of *word* is quoted, then no interpretation is placed upon the characters of the document; otherwise, parameter and command substitution occurs, **new-line* is ignored, and \ must be used to quote the characters \, $, `, and the first character of *word*. If - is appended to <<, then all leading tabs are stripped from *word* and from the document.
<&*digit*	The standard input is duplicated from file descriptor *digit* (see *dup*(S)). Similarly for the standard output using >& *digit*.
<&-	The standard input is closed. Similarly for the standard output using >&-.
<&p	The input from the co-process is moved to standard input.
>&p	The output to the co-process is moved to standard output.

If one of the above is preceded by a digit, then the file descriptor number referred to is that specified by the digit (instead of the default 0 or 1). For example:

... 2>&1

means file descriptor 2 is to be opened for writing as a duplicate of file descriptor 1.

The order in which redirections are specified is significant. The shell evaluates each redirection in terms of the (*file descriptor*, *file*) association at the time of evaluation. For example:

... 1>*fname* 2>&1

first associates file descriptor 1 with file *fname*. It then associates file descriptor 2 with the file associated with file descriptor 1 (i.e. *fname*). If the order of redirections were reversed, file descriptor 2 would be associated with the terminal (assuming file descriptor 1 had been) and then file descriptor 1 would be associated with file *fname*. File descriptor 0 is used for standard input, 1 for standard output, and 2 for standard error.

Environment

The *environment* (see *environ*(M)) is a list of name-value pairs that is passed to an executed program in the same way as a normal argument list. The names must be *identifiers* and the values are character strings. The shell interacts with the environment in several ways. On invocation, the shell scans the environment and creates a parameter for each name found, giving it the corresponding value and marking it *export*. Executed commands inherit the environment. If the user modifies the values of these parameters or creates new ones, using the **export** or **typeset -x** commands they become part of the environment. The environment seen by any executed command is thus composed of any name-value pairs originally inherited by the shell, whose values may be modified by the current shell, plus any additions which must be noted in **export** or **typeset -x** commands.

The environment for any *simple-command* or function may be augmented by prefixing it with one or more parameter assignments. A parameter assignment argument is a word of the form *identifier=value*. Thus:

```
TERM=vt100 cmd args
```

and

```
(export TERM; TERM=vt100; cmd args)
```

are equivalent (as far as the above execution of *cmd* is concerned).

If the **-k** flag is set, *all* parameter assignment arguments are placed in the environment, even if they occur after the command name. The following first prints **a=b c** and then **c:**

```
echo a=b c
set -k
echo a=b c
```

This feature is intended for use with scripts written for early versions of the shell and its use in new scripts is strongly discouraged. It is likely to disappear someday.

Functions

The **function** reserved word, described in the *Commands* section above, is used to define shell functions. shell functions are read in and stored internally. Alias names are resolved when the function is read. Functions are executed like commands with the arguments passed as positional parameters. (See *Execution* below).

Functions execute in the same process as the caller and share all files and present working directory with the caller. Traps caught by the caller are reset to their default action inside the function. A trap condition that is not caught or ignored by the function causes the function to terminate and the condition to be passed on to the caller. A trap on **EXIT** set inside a function is executed after the function completes in the environment of the caller. Ordinarily, variables are shared between the calling program and the function. However, the **typeset** special command used within a function defines local variables whose scope includes the current function and all functions it calls.

The special command **return** is used to return from function calls. Errors within functions return control to the caller.

Function identifiers can be listed with the **-f** or **+f** option of the **typeset** special command. The text of functions will also be listed with **-f**. Function can be undefined with the **-f** option of the **unset** special command.

Ordinarily, functions are unset when the shell executes a shell script. The **-xf** option of the **typeset** command allows a function to be exported to scripts that are executed without a separate invocation of the shell. Functions that need to be defined across separate invocations of the shell should be specified in the **ENV** file with the **-xf** option of **typeset**.

Execution

If the command name matches one of the *Special Commands* listed below, it is executed within the current shell process. Next, the command name is checked to see if it matches one of the user defined functions. If it does, the positional parameters are saved and then reset to the arguments of the *function* call. When the *function* completes or issues a **return**, the positional parameter list is restored and any trap set on **EXIT** within the function is executed. The value of a *function* is the value of the last command executed. A function is also executed in the current shell process. If a command name is not a *special command* or a user defined *function*, a process is created and an

attempt is made to execute the command via *exec* (S).

The shell parameter **PATH** defines the search path for the directory containing the command. Alternative directory names are separated by a colon (:). The default path is **/bin:/usr/bin:** (specifying **/bin**, **/usr/bin**, and the current directory in that order). The current directory can be specified by two or more adjacent colons, or by a colon at the beginning or end of the path list. If the command name contains a / then the search path is not used. Otherwise, each directory in the path is searched for an executable file. If the file has execute permission but is not a directory or an **a.out** file, it is assumed to be a file containing shell commands. A sub-shell is spawned to read it. All non-exported aliases, functions, and named parameters are removed in this case. A parenthesized command is executed in a sub-shell without removing non-exported quantities.

Command Re-entry

The text of the last **HISTSIZE** (default 128) commands entered from a terminal device is saved in a *history* file. The file **$HOME/.sh_history** is used if the **HISTFILE** variable is not set or is not writable. A shell can access the commands of all *interactive* shells which use the same named **HISTFILE**. The special command **fc** is used to list or edit a portion of this file. The portion of the file to be edited or listed can be selected by number or by giving the first character or characters of the command. A single command or range of commands can be specified. If you do not specify an editor program as an argument to **fc** then the value of the parameter **FCEDIT** is used. If **FCEDIT** is not defined then **/bin/ed** is used. The edited command(s) is printed and re-executed upon leaving the editor. The editor name - is used to skip the editing phase and to re-execute the command. In this case a substitution parameter of the form *old=new* can be used to modify the command before execution. For example, if **r** is aliased to '**fc -e -**' then typing '**r bad=good c**' will re-execute the most recent command which starts with the letter **c**, replacing the first occurrence of the string **bad** with the string **good**.

In-line Editing Options

Normally, each command line entered from a terminal device is simply typed followed by a new-line ('RETURN' or 'LINE FEED'). If any of the **emacs**, **gmacs**, or **vi** options are active, the user can edit the command line. To be in either of these edit modes **set** the corresponding option. An editing option is automatically selected each time the **VISUAL** or **EDITOR** variable is assigned a value ending in either of these option names.

The editing features require that the user's terminal accept 'RETURN' as carriage return without line feed and that a space (' ') must overwrite the current character on the screen.

The editing modes implement a concept where the user is looking through a window at the current line. The window width is the value of **COLUMNS** if it is defined, otherwise 80. If the line is longer than the window width minus two, a mark is displayed at the end of the window to notify the user. As the cursor moves and reaches the window boundaries the window will be centered about the cursor. The mark is a > (<, *) if the line extends on the right (left, both) side(s) of the window.

The search commands in each edit mode provide access to the history file. Only strings are matched, not patterns, although a leading ^ in the string restricts the match to begin at the first character in the line.

Emacs Editing Mode

This mode is entered by enabling either the *emacs* or *gmacs* option. The only difference between these two modes is the way they handle **^T**. To edit, the user moves the cursor to the point needing correction and then inserts or deletes characters or words as needed. All the editing commands are control characters or escape sequences. The notation for control characters is caret (^) followed by the character. For example, **^F** is the notation for control **F**. This is entered by depressing 'f' while holding down the 'CTRL' (control) key. The 'SHIFT' key is *not* depressed. (The notation **^?** indicates the DEL (delete) key.)

The notation for escape sequences is **M-** followed by a character. For example, **M-f** (pronounced Meta f) is entered by depressing ESC followed by 'f'. (**M-F** would be the notation for ESC followed by 'SHIFT' (capital) 'F'.)

All edit commands operate from any place on the line (not just at the beginning). Neither the "RETURN" nor the "LINE FEED" key is entered after edit commands except when noted.

^F	Move cursor forward (right) one character.
M-f	Move cursor forward one word. (The emacs editor's idea of a word is a string of characters consisting of only letters, digits and underscores.)
^B	Move cursor backward (left) one character.
M-b	Move cursor backward one word.
^A	Move cursor to start of line.
^E	Move cursor to end of line.
^]*char*	Move cursor forward to character *char* on current line.
M-^]*char*	Move cursor back to character *char* on current line.
^X^X	Interchange the cursor and mark.
erase	(User defined erase character as defined by the *stty*(C) command, usually **^H** or **#**.) Delete previous character.
^D	Delete current character.

M-d	Delete current word.
M-^H	(Meta-backspace) Delete previous word.
M-h	Delete previous word.
M-^?	(Meta-DEL) Delete previous word (if your interrupt character is **^?** (DEL, the default) then this command will not work).
^T	Transpose current character with next character in *emacs* mode. Transpose two previous characters in *gmacs* mode.
^C	Capitalize current character.
M-c	Capitalize current word.
M-l	Change the current word to lower case.
^K	Delete from the cursor to the end of the line. If preceded by a numerical parameter whose value is less than the current cursor position, then delete from given position up to the cursor. If preceded by a numerical parameter whose value is greater than the current cursor position, then delete from cursor up to given cursor position.
^W	Kill from the cursor to the mark.
M-p	Push the region from the cursor to the mark on the stack.
kill	(User defined kill character as defined by the *stty* command, usually **^U** or **@**.) Kill the entire current line. If two *kill* characters are entered in succession, all kill characters from then on cause a line feed (useful when using paper terminals).
^Y	Restore last item removed from line. (Yank item back to the line.)
^L	Line feed and print current line.
^@	(Null character) Set mark.
M-*space*	(Meta space) Set mark.
^J	(New line) Execute the current line.
^M	(Return) Execute the current line.
eof	End-of-file character, normally **^D**, is processed as an End-of-file only if the current line is null.
^P	Fetch previous command. Each time **^P** is entered the previous command back in time is accessed. Moves back one line when not on the first line of a multi-line command.
M-<	Fetch the least recent (oldest) history line.
M->	Fetch the most recent (youngest) history line.
^N	Fetch next command line. Each time **^N** is entered the next command line forward in time is accessed.
^R*string*	Reverse search history for a previous command line containing *string*. If a parameter of zero is given, the search is forward. *String* is terminated by a "RETURN" or "NEW LINE". If string is preceded by a ^, the matched line must begin with *string*. If *string* is omitted, then the next command line containing the most recent *string* is accessed. In this case a parameter of zero reverses the direction of the search.
^O	Operate - Execute the current line and fetch the next line relative to current line from the history file.

M-*digits* (Escape) Define numeric parameter, the digits are taken as a parameter to the next command. The commands that accept a parameter are **^F**, **^B**, *erase*, **^C**, **^D**, **^K**, **^R**, **^P**, **^N**, **^]**, **M-.**, **M-^]**, **M-_**, **M-b**, **M-c**, **M-d**, **M-f**, **M-h** **M-l** and **M-^H**.

M-*letter* Soft-key - Your alias list is searched for an alias by the name *_letter* and if an alias of this name is defined, its value will be inserted on the input queue. The *letter* must not be one of the above meta-functions.

M-]*letter* Soft-key - Your alias list is searched for an alias by the name *__letter* (two underscores followed by *letter*) and if an alias of this name is defined, its value will be inserted on the input queue. This can be used to program functions keys on many terminals.

M-. The last word of the previous command is inserted on the line. If preceded by a numeric parameter, the value of this parameter determines which word to insert rather than the last word.

M- Same as **M-.**.

M-* Attempt file name generation on the current word. An asterisk is appended if the word doesn't match any file or contain any special pattern characters.

M-ESC File name completion. Replaces the current word with the longest common prefix of all filenames matching the current word with an asterisk appended. If the match is unique, a / is appended if the file is a directory and a space is appended if the file is not a directory.

M-= List files matching current word pattern if an asterisk were appended.

^U Multiply parameter of next command by 4.

**** Escape next character. Editing characters, the user's erase, kill and interrupt (normally **^?**) characters may be entered in a command line or in a search string if preceded by a \. The \ removes the next character's editing features (if any).

^V Display version of the shell.

M-# Insert a # at the beginning of the line and execute it. This causes a comment to be inserted in the history file.

Vi Editing Mode

There are two typing modes. Initially, when you enter a command you are in the *input* mode. To edit, the user enters *control* mode by typing ESC and moves the cursor to the point needing correction and then inserts or deletes characters or words as needed. Most control commands accept an optional repeat *count* prior to the command.

When in vi mode on most systems, canonical processing is initially enabled and the command will be echoed again if the speed is 1200 baud or greater and it contains any control characters or less than one second has elapsed since the prompt was printed. The ESC character

terminates canonical processing for the remainder of the command and the user can then modify the command line. This scheme has the advantages of canonical processing with the type-ahead echoing of raw mode.

If the option **viraw** is also set, the terminal will always have canonical processing disabled.

" *Input Edit Commands"*

By default the editor is in input mode.

erase	(User defined erase character as defined by the stty command, usually **^H** or **#**.) Delete previous character.
^W	Delete the previous blank separated word.
^D	Terminate the shell.
^V	Escape next character. Editing characters, the user's erase or kill characters may be entered in a command line or in a search string if preceded by a **^V**. The **^V** removes the next character's editing features (if any).
\	Escape the next *erase* or *kill* character.

" *Motion Edit Commands"*

These commands will move the cursor.

[*count*]**l**	Cursor forward (right) one character.
[*count*]**w**	Cursor forward one alpha-numeric word.
[*count*]**W**	Cursor to the beginning of the next word that follows a blank.
[*count*]**e**	Cursor to end of word.
[*count*]**E**	Cursor to end of the current blank delimited word.
[*count*]**h**	Cursor backward (left) one character.
[*count*]**b**	Cursor backward one word.
[*count*]**B**	Cursor to preceding blank separated word.
[*count*]**|**	Cursor to column *count*.
[*count*]**f***c*	Find the next character *c* in the current line.
[*count*]**F***c*	Find the previous character *c* in the current line.
[*count*]**t***c*	Equivalent to **f** followed by **h**.
[*count*]**T***c*	Equivalent to **F** followed by **l**.
[*count*]**;**	Repeats *count* times, the last single character find command, **f**, **F**, **t**, or **T**.
[*count*]**,**	Reverses the last single character find command *count* times.
0	Cursor to start of line.
^	Cursor to first non-blank character in line.
$	Cursor to end of line.

" *Search Edit Commands"*

These commands access your command history.

[*count*]**k**	Fetch previous command. Each time **k** is entered the previous command back in time is accessed.

[*count*]- Equivalent to **k**.

[*count*]**j** Fetch next command. Each time **j** is entered the next command forward in time is accessed.

[*count*]+ Equivalent to **j**.

[*count*]**G** The command number *count* is fetched. The default is the least recent history command.

/string Search backward through history for a previous command containing *string*. *String* is terminated by a "RETURN" or "NEW LINE". If string is preceded by a ^, the matched line must begin with *string*. If *string* is null the previous string will be used.

?*string* Same as / except that search will be in the forward direction.

n Search for next match of the last pattern to / or **?** commands.

N Search for next match of the last pattern to / or **?**, but in reverse direction. Search history for the *string* entered by the previous / command.

" *Text Modification Edit Commands"*

These commands will modify the line.

a Enter input mode and enter text after the current character.

A Append text to the end of the line. Equivalent to **$a**.

[*count*]**c***motion*
c[*count*]*motion*
Delete current character through the character that *motion* would move the cursor to and enter input mode. If *motion* is **c**, the entire line will be deleted and input mode entered.

C Delete the current character through the end of line and enter input mode. Equivalent to **c$**.

S Equivalent to **cc**.

D Delete the current character through the end of line. Equivalent to **d$**.

[*count*]**d***motion*
d[*count*]*motion*
Delete current character through the character that *motion* would move to. If *motion* is **d** , the entire line will be deleted.

i Enter input mode and insert text before the current character.

I Insert text before the beginning of the line. Equivalent to **0i**.

[*count*]**P** Place the previous text modification before the cursor.

[*count*]**p** Place the previous text modification after the cursor.

R Enter input mode and replace characters on the screen with characters you type overlay fashion.

[*count*]**r***c* Replace the *count* character(s) starting at the current cursor position with *c*, and advance the cursor.

[*count*]**x** Delete current character.
[*count*]**X** Delete preceding character.
[*count*]**.** Repeat the previous text modification command.
[*count*]**~** Invert the case of the *count* character(s) starting at the current cursor position and advance the cursor.
[*count*]**_** Causes the *count* word of the previous command to be appended and input mode entered. The last word is used if *count* is omitted.
***** Causes an * to be appended to the current word and file name generation attempted. If no match is found, it rings the bell. Otherwise, the word is replaced by the matching pattern and input mode is entered.
**** Filename completion. Replaces the current word with the longest common prefix of all filenames matching the current word with an asterisk appended. If the match is unique, a / is appended if the file is a directory and a space is appended if the file is not a directory.

" *Other Edit Commands*"

Miscellaneous commands.
[*count*]**y***motion*
y[*count*]*motion*
Yanks current character through character that *motion* would move the cursor to and puts them into the delete buffer. The text and cursor are unchanged.
Y Yanks from current position to end of line. Equivalent to **y$**.
u Undo the last text modifying command.
U Undo all the text modifying commands performed on the line.
[*count*]**v** Returns the command **fc -e ${VISUAL:-${EDITOR:-vi}}** *count* in the input buffer. If *count* is omitted, then the current line is used.
^L Line feed and print current line. Has effect only in control mode.
^J (New line) Execute the current line, regardless of mode.
^M (Return) Execute the current line, regardless of mode.
Sends the line after inserting a # in front of the line. Useful for causing the current line to be inserted in the history without being executed.
= List the file names that match the current word if an asterisk were appended it.
@*letter* Your alias list is searched for an alias by the name _*letter* and if an alias of this name is defined, its value will be inserted on the input queue for processing.

Special Commands

The following simple-commands are executed in the shell process. Input/Output redirection is permitted. Unless otherwise indicated, the output is written on file descriptor 1 and the exit status, when there is no syntax error, is zero. Commands that are preceded by one or two † are treated specially in the following ways:

1. Parameter assignment lists preceding the command remain in effect when the command completes.
2. I/O redirections are processed after parameter assignments.
3. Errors cause a script that contains them to abort.
4. Words, following a command preceded by †† that are in the format of a parameter assignment, are expanded with the same rules as a parameter assignment. This means that tilde substitution is performed after the = sign and word splitting and file name generation are not performed.

† **:** [*arg* ...]
The command only expands parameters.

† **.***file* [*arg* **...**]
(period-space-file) Read the complete *file* then execute the commands. The commands are executed in the current shell environment. The search path specified by **PATH** is used to find the directory containing *file*. If any arguments *arg* are given, they become the positional parameters. Otherwise the positional parameters are unchanged. The exit status is the exit status of the last command executed.

†† **alias** [**-tx**] [*name*[=*value*]] ...
Alias with no arguments prints the list of aliases in the form *name=value* on standard output. An *alias* is defined for each name whose *value* is given. A trailing space in *value* causes the next word to be checked for alias substitution. The **-t** flag is used to set and list tracked aliases. The value of a tracked alias is the full pathname corresponding to the given *name*. The value becomes undefined when the value of **PATH** is reset but the aliases remained tracked. Without the **-t** flag, for each *name* in the argument list for which no *value* is given, the name and value of the alias is printed. The **-x** flag is used to set or print exported aliases. An exported alias is defined for scripts invoked by name. The exit status is non-zero if a *name* is given, but no value, for which no alias has been defined.

† **break** [*n*]
Exit from the enclosing **for**, **while**, **until**, or **select** loop, if any. If *n* is specified then break *n* levels.

† **continue** [*n*]
Resume the next iteration of the enclosing **for**, **while**, **until**, or **select** loop. If *n* is specified then resume at the *n*-th enclosing loop.

cd [*arg*]
cd *old new*
This command can be in either of two forms. In the first form it changes the current directory to *arg*. If *arg* is - the directory is changed to the previous directory. The shell parameter **HOME** is the default *arg*. The parameter **PWD** is set to the current directory. The shell parameter **CDPATH** defines the search path for the directory containing *arg*. Alternative directory names are separated by a colon (**:**). The default path is **<null>** (specifying the current directory). Note that the current directory is specified by a null path name, which can appear immediately after the equal sign or between the colon delimiters anywhere else in the path list. If *arg* begins with a / then the search path is not used. Otherwise, each directory in the path is searched for *arg*.

The second form of **cd** substitutes the string *new* for the string *old* in the current directory name, **PWD** and tries to change to this new directory.

The **cd** command may not be executed by *rksh*.

echo [*arg* ...]
See *echo*(C) for usage and description.

† **eval** [*arg* ...]
The arguments are read as input to the shell and the resulting command(s) executed.

† **exec** [*arg* ...]
If *arg* is given, the command specified by the arguments is executed in place of this shell without creating a new process. Input/output arguments may appear and affect the current process. If no arguments are given the effect of this command is to modify file descriptors as prescribed by the input/output redirection list. In this case, any file descriptor numbers greater than 2 that are opened with this mechanism are closed when invoking another program.

† **exit** [*n*]
Causes the shell to exit with the exit status specified by *n*. If *n* is omitted then the exit status is that of the last command executed. An end-of-file will also cause the shell to exit except for a shell which has the *ignoreeof* option (See **set** below) turned on.

†† **export** [*name*[=*value*]] ...
The given *name*s are marked for automatic export to the *environment* of subsequently-executed commands.

fc [**-e** *ename*] [**-nlr**] [*first* [*last*]]
fc -e - [*old=new*] [*command*]
In the first form, a range of commands from *first* to *last* is selected from the last **HISTSIZE** commands that were typed at the terminal. The arguments *first* and *last* may be specified as a number or

as a string. A string is used to locate the most recent command starting with the given string. A negative number is used as an offset to the current command number. If the flag **-l**, is selected, the commands are listed on standard output. Otherwise, the editor program *ename* is invoked on a file containing these keyboard commands. If *ename* is not supplied, then the value of the parameter **FCEDIT** (default /bin/ed) is used as the editor. When editing is complete, the edited command(s) is executed. If *last* is not specified then it will be set to *first*. If *first* is not specified the default is the previous command for editing and -16 for listing. The flag **-r** reverses the order of the commands and the flag **-n** suppresses command numbers when listing. In the second form the *command* is re-executed after the substitution *old=new* is performed.

getopts *optstring name* [*arg* ...]
Checks *arg* for legal options. If *arg* is omitted, the positional parameters are used. An option argument begins with a + or a -. An option not beginning with + or - or the argument -- ends the options. *optstring* contains the letters that *getopts* recognizes. If a letter is followed by a **:**, that option is expected to have an argument. The options can be separated from the argument by blanks.

getopts places the next option letter it finds inside variable *name* each time it is invoked with a + prepended when *arg* begins with a +. The index of the next *arg* is stored in **OPTIND**. The option argument, if any, gets stored in **OPTARG**.

A leading **:** in *optstring* causes **getopts** to store the letter of an invalid option in **OPTARG**, and to set *name* to **?** for an unknown option and to **:** when a required option is missing. Otherwise, **getopts** prints an error message. The exit status is non-zero when there are no more options.

kill [*-sig*] *job* ...
kill -l
Sends either the TERM (terminate) signal or the specified signal to the specified jobs or processes. Signals are either given by number or by names (as given in **/usr/include/signal.h**, stripped of the prefix "SIG"). If the signal being sent is TERM (terminate) or HUP (hangup), then the job or process will be sent a CONT (continue) signal if it is stopped. The argument *job* can be the process id of a process that is not a member of one of the active jobs. In the second form, **kill -l**, the signal numbers and names are listed.

let *arg* ...
Each *arg* is a separate *arithmetic expression* to be evaluated. See *Arithmetic Evaluation* above, for a description of arithmetic expression evaluation.

The exit status is 0 if the value of the last expression is non-zero, and 1 otherwise.

† **newgrp** [*arg* ...]
Equivalent to **exec /bin/newgrp** *arg* ....

print [**-Rnprsu**[*n*]] [*arg* ...]
The shell output mechanism. With no flags or with flag **-** or **--** the arguments are printed on standard output as described by *echo*(C). In raw mode, **-R** or **-r**, the escape conventions of *echo* are ignored. The **-R** option will print all subsequent arguments and options other than **-n**. The **-p** option causes the arguments to be written onto the pipe of the process spawned with **|&** instead of standard output. The **-s** option causes the arguments to be written onto the history file instead of standard output. The **-u** flag can be used to specify a one digit file descriptor unit number *n* on which the output will be placed. The default is 1. If the flag **-n** is used, no **newline** is added to the output.

pwd
Equivalent to **print -r - $PWD**

read [**-prsu**[*n*]] [*name*?*prompt*] [*name* ...]
The shell input mechanism. One line is read and is broken up into fields using the characters in **IFS** as separators. In raw mode, **-r,** a \ at the end of a line does not signify line continuation. The first field is assigned to the first *name*, the second field to the second *name*, etc., with leftover fields assigned to the last *name*. The **-p** option causes the input line to be taken from the input pipe of a process spawned by the shell using **|&**. If the -s flag is present, the input will be saved as a command in the history file. The flag **-u** can be used to specify a one digit file descriptor unit to read from. The file descriptor can be opened with the **exec** special command. The default value of *n* is 0. If *name* is omitted then **REPLY** is used as the default *name*. The exit status is 0 unless an end-of-file is encountered. An end-of-file with the **-p** option causes cleanup for this process so that another can be spawned. If the first argument contains a **?**, the remainder of this word is used as a *prompt* on standard error when the shell is interactive. The exit status is 0 unless an end-of-file is encountered.

†† **readonly** [*name*[=*value*]] ...
The given *names* are marked readonly and these names cannot be changed by subsequent assignment.

† **return** [*n*]
Causes a shell *function* to return to the invoking script with the return status specified by *n*. If *n* is omitted then the return status is that of the last command executed. If **return** is invoked while not in a *function* or a **.** script, then it is the same as an **exit**.

set [**±aefhknopstuvx**] [**±o** *option*]... [**±A** *name*] [*arg* ...]
The flags for this command have meaning as follows:

-A Array assignment. Unset the variable *name* and assign values sequentially from the list *arg*. If **+A** is used, the variable *name* is not unset first.

-a All subsequent parameters that are defined are automatically exported.

-e If a command has a non-zero exit status, execute the **ERR** trap, if set, and exit. This mode is disabled while reading profiles.

-f Disables file name generation.

-h Each command becomes a tracked alias when first encountered.

-k All parameter assignment arguments are placed in the environment for a command, not just those that precede the command name.

-n Read commands and check them for syntax errors, but do not execute them. Ignored for interactive shells.

-o The following argument can be one of the following option names:

allexport
Same as **-a**.

errexit Same as **-e**.

bgnice All background jobs are run at a lower priority. This is the default mode.

emacs Puts you in an *emacs* style in-line editor for command entry.

gmacs Puts you in a *gmacs* style in-line editor for command entry.

ignoreeof
The shell will not exit on end-of-file. The command **exit** must be used.

keyword Same as **-k**.

markdirs
All directory names resulting from file name generation have a trailing / appended.

noclobber
Prevents redirection > from truncating existing files. Require >| to truncate a file when turned on.

noexec Same as **-n**.

noglob Same as **-f**.

nolog Do not save function definitions in history file.

nounset Same as **-u**.

privileged
Same as **-p**.

trackall Same as **-h**.

verbose Same as **-v**.

vi Puts you in insert mode of a *vi* style in-line editor until you hit escape character **033**. This puts you in move mode. A return sends the line.

viraw Each character is processed as it is typed in *vi* mode.

xtrace Same as **-x**. If no option name is supplied then the current option settings are printed.

-p Disables processing of the **$HOME/.profile** file and uses the file **/etc/suid_profile** instead of the **ENV** file. This mode is on whenever the effective uid (gid) is not equal to the real uid (gid). Turning this off causes the effective uid and gid to be set to the real uid and gid.

-s Sort the positional parameters lexicographically.

-t Exit after reading and executing one command.

-u Treat unset parameters as an error when substituting.

-v Print shell input lines as they are read.

-x Print commands and their arguments as they are executed.

- Turns off **-x** and **-v** flags and stops examining arguments for flags.

-- Do not change any of the flags; useful in setting **$1** to a value beginning with **-**. If no arguments follow this flag then the positional parameters are unset.

Using **+** rather than **-** causes these flags to be turned off. These flags can also be used upon invocation of the shell. The current set of flags may be found in **$-**. Unless **-A** is specified, the remaining arguments are positional parameters and are assigned, in order, to **$1 $2** .... If no arguments are given then the names and values of all named parameters are printed on the standard output. If the only argument is **+**, the names of all named parameters are printed.

† **shift** [*n*]
The positional parameters from **$***n***+1** ... are renamed **1 ...**, default *n* is 1. The parameter *n* can be any arithmetic expression that evaluates to a non-negative number less than or equal to **$#**.

† **times**
Print the accumulated user and system times for the shell and for processes run from the shell.

† **trap** [*arg*] [*sig*] ...
arg is a command to be read and executed when the shell receives signal(s) *sig*. (Note that *arg* is scanned once when the trap is set and once when the trap is taken.) Each *sig* can be given as a number or as the name of the signal. Trap commands are executed in order of signal number. Any attempt to set a trap on a signal that was ignored on entry to the current shell is ineffective. If *arg* is omitted or is **-**, then all trap(s) *sig* are reset to their original values. If *arg* is the null string then this signal is ignored by the shell and by the commands it invokes. If *sig* is **ERR** then *arg* will be executed whenever a command has a non-zero exit status. If *sig* is **DEBUG** then *arg* will be executed after each command. If *sig* is **0** or **EXIT** and the **trap** statement is executed inside the body of a function, then the command *arg* is executed after the function

completes. If *sig* is **0** or **EXIT** for a **trap** set outside any function then the command *arg* is executed on exit from the shell. The **trap** command with no arguments prints a list of commands associated with each signal number.

†† **typeset** [**±LRZfilrtux**[*n*]] [*name*[=*value*]]...
Sets attributes and values for shell parameters. When invoked inside a function, a new instance of the parameter *name* is created. The parameter value and type are restored when the function completes. The following list of attributes may be specified:

-L Left justify and remove leading blanks from *value*. If *n* is non-zero it defines the width of the field, otherwise it is determined by the width of the value of first assignment. When the parameter is assigned to, it is filled on the right with blanks or truncated, if necessary, to fit into the field. Leading zeros are removed if the **-Z** flag is also set. The **-R** flag is turned off.

-R Right justify and fill with leading blanks. If *n* is non-zero it defines the width of the field, otherwise it is determined by the width of the value of first assignment. The field is left filled with blanks or truncated from the end if the parameter is reassigned. The **-L** flag is turned off.

-Z Right justify and fill with leading zeros if the first non-blank character is a digit and the **-L** flag has not been set. If *n* is non-zero it defines the width of the field, otherwise it is determined by the width of the value of first assignment.

-f The names refer to function names rather than parameter names. No assignments can be made and the only other valid flags are **-t**, **-u** and **-x**. The flag **-t** turns on execution tracing for this function. The flag **-u** causes this function to be marked undefined. The **FPATH** variable will be searched to find the function definition when the function is referenced. The flag **-x** allows the function definition to remain in effect across shell procedures invoked by name.

-i Parameter is an integer. This makes arithmetic faster. If *n* is non-zero it defines the output arithmetic base, otherwise the first assignment determines the output base.

-l All upper-case characters converted to lower-case. The upper-case flag, **-u** is turned off.

-r The given *names* are marked readonly and these names cannot be changed by subsequent assignment.

-t Tags the named parameters. Tags are user definable and have no special meaning to the shell.

-u All lower-case characters are converted to upper-case characters. The lower-case flag, **-l** is turned off.

-x The given *names* are marked for automatic export to the *environment* of subsequently-executed commands.

Using + rather than - causes these flags to be turned off. If no *name* arguments are given but flags are specified, a list of *names* (and optionally the *values*) of the *parameters* which have these flags set is printed. (Using + rather than - keeps the values from being printed.) If no *names* and flags are given, the *names* and

attributes of all *parameters* are printed.

ulimit [**-HS**] [*limit*]
Display or set the limit on the number of 512-byte blocks on files written by child processes (files of any size may be read). The limit is set when *limit* is specified. The value of *limit* can be a number or the value **unlimited**. The **H** and **S** flags specify whether the hard limit or the soft limit is set. A hard limit cannot be increased once it is set. A soft limit can be increased up to the value of the hard limit. If neither the **H** or **S** options is specified, the limit applies to both. The current limit is printed when *limit* is omitted. In this case the soft limit is printed unless **H** is specified.

umask [*mask*]
The user file-creation mask is set to *mask* (see *umask*(C)). *mask* can either be an octal number or a symbolic value as described in *chmod*(C). If a symbolic value is given, the new umask value is the complement of the result of applying *mask* to the complement of the previous umask value. If *mask* is omitted, the current value of the mask is printed.

unalias *name* ...
The parameters given by the list of *name*s are removed from the *alias* list.

unset [**-f**] *name* ...
The parameters given by the list of *name*s are unassigned, i.e., their values and attributes are erased. Readonly variables cannot be unset. If the flag, **-f**, is set, then the names refer to *function* names. Unsetting **ERRNO**, **LINENO**, **MAILCHECK**, **OPTARG**, **OPTIND**, **RANDOM**, **SECONDS**, **TMOUT**, and _ causes removes their special meaning even if they are subsequently assigned to.

† **wait** [*job*]
Wait for the specified *job* and report its termination status. If *job* is not given then all currently active child processes are waited for. The exit status from this command is that of the process waited for.

whence [**-pv**] *name* ...
For each *name*, indicate how it would be interpreted if used as a command name.

The flag, **-v**, produces a more verbose report.

The flag, **-p**, does a path search for *name* even if name is an alias, a function, or a reserved word.

Invocation

If the shell is invoked by *exec*(S), and the first character of argument

zero (**$0**) is **-**, then the shell is assumed to be a *login* shell and commands are read from **/etc/profile** and then from either **.profile** in the current directory or **$HOME/.profile**, if either file exists. Next, commands are read from the file named by performing parameter substitution on the value of the environment parameter **ENV** if the file exists. If the **-s** flag is not present and *arg* is, then a path search is performed on the first *arg* to determine the name of the script to execute. The script *arg* must have read permission and any *setuid* and *setgid* settings will be ignored. Commands are then read as described below; the following flags are interpreted by the shell when it is invoked:

-c *string* If the **-c** flag is present then commands are read from *string*.

-s If the **-s** flag is present or if no arguments remain then commands are read from the standard input. shell output, except for the output of the *Special commands* listed above, is written to file descriptor 2.

-i If the **-i** flag is present or if the shell input and output are attached to a terminal (as told by *ioctl*(S)) then this shell is *interactive*. In this case TERM is ignored (so that **kill 0** does not kill an interactive shell) and INTR is caught and ignored (so that **wait** is interruptible). In all cases, QUIT is ignored by the shell.

-r If the **-r** flag is present the shell is a restricted shell.

The remaining flags and arguments are described under the **set** command above.

rksh Only

rksh is used to set up login names and execution environments whose capabilities are more controlled than those of the standard shell. The actions of *rksh* are identical to those of *ksh*, except that the following are disallowed:

changing directory (see *cd*(C)),
setting the value of **SHELL**, **ENV**, or **PATH**,
specifying path or command names containing /,
redirecting output (>, >| , <> , and >>).

The restrictions above are enforced after **.profile** and the **ENV** files are interpreted.

When a command to be executed is found to be a shell procedure, *rksh* invokes *ksh* to execute it. Thus, it is possible to provide to the end-user shell procedures that have access to the full power of the standard shell, while imposing a limited menu of commands; this scheme assumes that the end-user does not have write and execute permissions in the same directory.

The net effect of these rules is that the writer of the **.profile** has complete control over user actions, by performing guaranteed setup actions and leaving the user in an appropriate directory (probably *not* the login directory).

The system administrator often sets up a directory of commands (example: **/usr/rbin**) that can be safely invoked by *rksh*.

Diagnostics

Errors detected by the shell, such as syntax errors, cause the shell to return a non-zero exit status. Otherwise, the shell returns the exit status of the last command executed (see also the **exit** command above). If the shell is being used non-interactively then execution of the shell file is abandoned. Run time errors detected by the shell are reported by printing the command or function name and the error condition. If the line number that the error occurred on is greater than one, then the line number is also printed in square brackets ([ ]) after the command or function name.

Files

/etc/passwd
/etc/profile
/etc/suid_profile
$HOME/.profile
/tmp/sh*
/dev/null

See Also

cat(C), cd(C), chmod(C), cut(C), echo(C), env(C), newgrp(C), paste(C), stty(C), test(C), umask(C), vi(C), dup(S), exec(S), fork(S), ioctl(S), lseek(S), pipe(S), signal(S), umask(S), ulimit(S), wait(S), rand(S), a.out(F), profile(M), environ(M).

Notes

If a command which is a *tracked alias* is executed, and then a command with the same name is installed in a directory in the search path before the directory where the original command was found, the shell will continue to *exec* the original command. Use the **-t** option of the **alias** command to correct this situation.

Some very old shell scripts contain a ^ as a synonym for the pipe character (|).

Using the **fc** built-in command within a compound command will cause the whole command to disappear from the history file.

The built-in command **.***file* reads the whole file before any commands are executed. Therefore, **alias** and **unalias** commands in the file will not apply to any functions defined in the file.

Traps are not processed while a job is waiting for a foreground process. Thus, a trap on **CHLD** won't be executed until the foreground job terminates.

Name

last - indicate last logins of users and teletypes

Syntax

last [**-n** limit] [**-l** tty] [**-v**] [name]

Description

Last checks the *wtmp* file, which records all logins and logouts for information about a user, a tty line or any group of users and lines. Arguments specify a user name and/or tty.

last -l tty01 root

would list all "root" sessions as well as all sessions on **/dev/tty01**. *last* prints the sessions of the specified users and ttys, including login name, the line used, the device name, the process ID, plus start time and elapsed time.

last with no arguments prints a record of all logins and logouts, in reverse order.

The options behave as follows:

-n *limit*
limits the report to n lines.

-l *line*
specifies the tty.

-v prints header (verbose option).

Files

/etc/wtmp	login data base

See Also

finger(C), utmp(M), accton(ADM), acctcom(ADM), acct(F)

Name

line - Reads one line.

Syntax

line

Description

line copies one line (up to a newline) from the standard input and writes it on the standard output. It returns an exit code of 1 on end-of-file and always prints at least a newline. It is often used within shell files to read from the user's terminal.

See Also

gets(CP), sh(C)

Name

ln - Makes a link to a file.

Syntax

ln file1 file2
ln file1 ... directory

Description

A link is a directory entry referring to a file; the same file (together with its size, all its protection information, etc). may have several links to it. There is no way to distinguish a link to a file from its original directory entry. Any changes to the file are effective independent of the name by which the file is known.

In the first case, *ln* creates a link to the existing file, *file1*. The *file2* argument is a new name referring to the same file contents as *file1*.

In the second case, *directory* is the location of a directory into which one or more links are created with corresponding file names.

You cannot link directories or link across filesystems.

See Also

cp(C), mv(C), rm(C)

Name

lock - Locks a user's terminal.

Syntax

lock [**-v**] [-number]

Description

lock requests a password from the user, requests it again for verification, then locks the terminal until the password is reentered. If a *-number* is specified in the *lock* command, the terminal is automatically logged out and made available to another user after that number of minutes has passed.

This command uses the file */etc/default/lock*. This file has two entries:

DEFLOGOUT = *number*
MAXLOGOUT = *number*

DEFLOGOUT specifies the default time in minutes a terminal will remain locked before the user is logged out. This default value is overridden if the *-number* option is used on the command line. If DEFLOGOUT and *-number* are not specified, the MAXLOGOUT value is used.

MAXLOGOUT is the maximum number of minutes a user is permitted to lock a terminal. If a user attempts to lock a terminal for longer than this time, *lock* will issue a warning to the user that it is using the system maximum time limit. If DEFLOGOUT and *-number* and MAXLOGOUT are not specified, users are not logged out.

DEFLOGOUT and MAXLOGOUT are configured by the system administrator to reflect the demand for terminals at the site.

The lock may be terminated by killing the lock process. Only the superuser and the user who invoked *lock* may do so.

Options

-number Sets the time limit for lock to *number* of minutes, instead of the system default.

-v Specifies verbose operation.

Files

/etc/default/lock

Notes

The file */etc/default/lock* is shipped with the following default values:

DEFLOGOUT = 30
MAXLOGOUT = 60

Name

logname - Gets login name.

Syntax

logname

Description

logname returns the user's login name as found in */etc/utmp*. If no login name is found, *logname* returns the user's user ID number.

See Also

env(C), id(C), getlogin(S), getuid(S), login(M), logname(S)

Name

lp, lpr, cancel - Send/cancel requests to lineprinter.

Syntax

lp [options...][name...]
lpr [options...][name...]
cancel [request ID s] [printers]

Description

lp causes the named files and associated information (collectively called a "request") to be printed by a lineprinter. *lp* and *lpr* are equivalent commands and may be used interchangeably. If no file names are mentioned, the standard input is assumed. The file name - stands for the standard input and may be supplied on the command line in conjunction with named *files*. The order in which *files* appear is the same order in which they will be printed.

lp associates a unique request ID with each request and prints it on the standard output. This request ID can be used later to cancel (see *cancel*) or find the status of the request (see *lpstat*(C)).

The following options to *lp* may appear in any order and may be intermixed with file names:

-c Makes copies of the *files* to be printed immediately when *lp* is invoked. Normally, *files* will not be copied, but will be linked whenever possible. If the **-c** option is not given, then the user should be careful not to remove any of the *files* before the request has been printed in its entirety; any changes made to the named *files* after the request is made but before it is printed will be reflected in the printed output.

-d*dest* Chooses *dest* as the printer or class of printers to do the printing. If *dest* is a printer, then the request will be printed only on that specific printer. If *dest* is a class of printers, then the request will be printed on the first available printer that is a member of the class. Under certain conditions (for example, printer unavailability or file space limitation), requests for specific destinations may not be accepted (see *accept*(C) and *lpstat*(C)). By default, *dest* is taken from the environment variable **LPDEST** (if it is set). Otherwise, a default destination (if one exists) for the computer system is used. Destination names vary between systems (see *lpstat*(C)).

-m Sends mail (see *mail*(C)) after the files have been printed. By default, no mail is sent upon normal completion of the print request.

-n*number* Prints *number* of copies of the output. The default is one.

-o*option* Specifies printer-dependent or class-dependent *options*. Several such *options* may be collected by specifying the **-o** keyletter more than once. For more information about what is valid for *options*, see *lpadmin*(ADM).

-r Removes file after sending it.

-s Suppresses messages from *lp*(C) such as "request id is ...".

-t*title* Prints *title* on the banner page of the output.

-T Local printing option. Sends print job to printer attached to the terminal.

-w Writes a message on the user's terminal after the *files* have been printed. If the user is not logged in, then mail is sent instead.

The file **/etc/default/lpd** contains the setting of the variable BANNERS, whose value is the number of pages printed as a banner identifying each printout. This is normally set to either 0 or 1.

Cancel cancels line printer requests that were made by the *lp*(C) command. The command line arguments may be either request IDs (as returned by *lp*(C)) or *printer* names (for a complete list, use *lpstat*(C)). Specifying a request ID cancels the associated request even if it is currently printing. Specifying a *printer* cancels the request which is currently printing on that printer. In either case, the cancellation of a request that is currently printing frees the printer to print its next available request. User identification and accounting data spool area contains BANNERS setting.

Files

/etc/passwd
/usr/spool/lp/*
/etc/default/lpd

See Also

enable(C), lpstat(C), mail(C), accept(C), lpadmin(ADM), lpsched(ADM)

Notes

The file's directory and all directories in the path must also be publicly readable. The following are three possible workarounds:

pr *filename* | lp

cat *filename* | lp

lp -c *filename*

Name

lprint - print to a printer attached to the user's terminal

Syntax

lprint [-] *file*

Description

lprint(C) accepts a filename to print or - to read from the keyboard. If the terminal has local printing abilities, it will then print the file to a printer attached to the printer port of the terminal.

This command uses the file **/etc/termcap**.

Options

- Tells *lprint* to use the standard input for printing.

Files

/etc/termcap

Notes

The only terminals currently supported with entries in /etc/termcap are Tandy's DT-100 and DT-1, and Hewlett-Packard's HP-92.

To add attached printer capability to the termcap file for a different terminal, add entries for PN (start printing) and PS (end printing) with the appropriate control or escape characters for your terminal.

Terminal communications parameters (such as baud rate and parity) must be set up on the terminal by the user.

See Also

termcap (M), "Using Printers" in the *XENIX System Administrator's Guide.*

Name

lpstat - prints lineprinter status information

Syntax

lpstat [options ...]

Description

lpstat prints information about the current status of the lineprinter system.

If no *options* are given, then *lpstat* prints the status of all requests made to *lp*(C) by the user. Any arguments that are not *options* are assumed to be request IDs (as returned by *lp*). *lpstat* prints the status of these requests. *Options* may appear in any order and may be repeated and intermixed with other arguments. Some of the following options may be followed by *list* which can be in one of two forms: a list of items separated from one another by a comma, or a list of items enclosed in double quotes and separated from one another by a comma and/or one or more spaces. For example:

-u"user1, user2, user3"

The omission of a *list* following such options causes all information relevant to the option to be printed, for example:

lpstat -o

prints the status of all output requests.

-a[*list*] Prints acceptance status (with respect to *lp*) of destinations for requests. *List* is a list of intermixed printer names and class names.

-c[*list*] Prints class names and their members. *List* is a list of class names.

-d Prints the system default destination for *lp*.

-o[*list*] Prints the status of output requests. *List* is a list of intermixed printer names, class names, and request IDs.

-p[*list*] Prints the status of printers. *List* is a list of printer names.

-r Prints the status of the lineprinter scheduler, *lpsched*.

-s Prints a status summary, including the status of the lineprinter scheduler, the system default destination, Prints a status summary, including the system default destination, a list of class names and their members, and a list of printers and their associated devices.

-t Prints all status information.

-u[*list*] Prints status of output requests for users. *List* is a list of login names.

-v[*list*] Prints the names of printers and the pathnames of the devices associated with them. *List* is a list of printer names.

Files

/usr/spool/lp/*

See Also

enable(C), lp(C)

Name

ls, lc, l - Gives information about contents of directories.

Syntax

ls [**-ACFRabcdfgilmnopqrstux**] [names]
lc [**-1ACFRabcdfgilmnopqrstux**] [names]
l [**-ACFRabcdfgilmnopqrstu**] [names]

Description

For each directory named, *ls* lists the contents of that directory; for each file named, *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, file arguments are processed before directories and their contents.

There are three major listing formats. The default format is to list one entry per line, the **-C** and **-x** options enable multi-column formats, and the **-m** option enables stream output format in which files are listed across the page, separated by commas. In order to determine output format 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 *termcap* 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.

There are many options:

-A List all entries. Entries whose name begin with a period (.) are listed. Does not list current directory (.) and directory above (..).

-a Lists all entries. Entries whose name begin with a period (.) are listed.

-R Recursively lists subdirectories encountered.

-d If an argument is a directory, lists only its name (not its contents); often used with **-l** to get the status of a directory.

-C Multi-column output with entries sorted down the columns.

-x Multi-column output with entries sorted across rather than down the page.

-m Stream output format.

-l Lists 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 will contain the major and minor device numbers, rather than a size.

-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 **-l**, except that the group is not printed.

-g The same as **-l**, except that the owner is not printed.

-r Reverses the order of sort to get reverse alphabetic or oldest first, as appropriate.

-t Sorts by time modified (latest first) instead of by name.

-u Uses time of last access instead of last modification for sorting use with the **-t** option.

-c Uses time of last modification of the inode (file created, mode changed, etc.) for sorting use with **-t** option.

-p Puts a slash (/) after each filename if that file is a directory.

-F Puts a slash (/) after each filename if that file is a directory and puts an asterisk (*) after each filename if that file is executable.

-b Forces printing of non-graphic characters to be in the octal \ddd notation.

-q Forces printing of non-graphic characters in file names as the character (?).

-i For each file, prints the inode number in the first column of the report.

-s Gives size in blocks, including indirect blocks, for each entry.

-f Forces each argument to be interpreted as a directory and lists 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.

The mode printed under the **-l** option consists of 11 characters. The first character is:

- If the entry is an ordinary file.

d If the entry is a directory.

b If the entry is a block special file.

c If the entry is a character special file.

p If the entry is a named pipe.

s If the entry is a semaphore.

m If the entry is a shared data (memory) file.

The next 9 characters are interpreted as 3 sets of 3 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 3 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.

The permissions are indicated as follows:

r If the file is readable.

w If the file is writable.

x If the file is executable.

- If the indicated permission is *not* granted.

The group-execute permission character is given as **s** if the file has set-group-ID mode; likewise, the user-execute permission character is given as **s** if the file has set-user-ID mode. The last character of the mode (normally **x** or **-**) is **t** if the 1000 (octal) bit of the mode is on. See *chmod*(C) for the meaning of this mode. The indications for set-ID and the 1000 bit of the mode are capitalized 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.

Files

/etc/passwd	Gets user IDs for ls -l and ls -o
/etc/group	Gets group IDs for ls -l and ls -g
/etc/termcap	Gets terminal information

See Also

chmod(C), coltbl(M), find(C), l(C), lc(C), locale(M), termcap(F)

Notes

Sorts according to the collating sequenced defined by the locale.

Newline and tab are considered printing characters in filenames.

Unprintable characters in filenames may confuse the columnar output options.

This utility reports sizes in 512 byte blocks.

Name

mail - Sends, reads or disposes of mail.

Syntax

mail [[**-u** user] [**-f** mailbox]] [**-e**] [**-R**] [**-i**] [users ...]

mail [**-s** subject] [**-i**] [user ...]

Description

mail is a mail processing system that supports composing of messages, and sending and receiving of mail between multiple users. When sending mail, a *user* is the name of a user or of an alias assigned to a machine or to a group of users.

Options include:

-u *user*
Tells *mail* to read the system mailbox belonging to the specified *user*.

-f *mailbox*
Tells *mail* to read the specified *mailbox* instead of the default user's system mailbox.

-e Allows escapes from compose mode when input comes from a file.

-R Makes the mail session "read-only" by preventing alteration of the mailbox being read. Useful when accessing system-wide mailboxes.

-i Tells *mail* to ignore interrupts sent from the terminal. This is useful when reading or sending mail over telephone lines where "noise" may produce unwanted interrupts.

-s *subject*
Specifies *subject* as the text of the *Subject:* field for the message being sent.

Sending mail

To send a message to one or more other people, invoke *mail* with arguments which are the names of people to send to. You are then expected to type in your message, followed by a Ctrl-D at the beginning of a line.

Reading Mail

To read mail, invoke *mail* with no arguments. This will check your mail out of the system-wide directory so that you can read and dispose of the messages sent to you. A message header is printed out for each message in your mailbox. The current message is initially the last numbered message and can be printed using the **print** command (which can be abbreviated **p**). You can move among the messages much as you move between lines in *ed,* with the commands + and - moving backwards and forwards, and simple numbers typing the addressed message.

If new mail arrives during the mail session, you can read in the new messages with the **restart** command.

Note that you can configure your environment so that you are notified whenever new mail is sent to you. To do so, you would have to set the **MAIL** environment variable if you are using the Bourne shell or the **mail** shell variable if you are using the C-shell. For more information, see "The Shell" chapter of the *XENIX User's Guide* and csh(C) in the *XENIX User's Reference.*

Disposing of Mail

After examining a message, you can **delete** (**d**) the message or **reply** (**r**) to it. Deletion causes the *mail* program to forget about the message. This is not irreversible, the message can be **undeleted** (**u**) by giving its number, or the *mail* session can be aborted by giving the **exit** (**x**) command. Deleted messages will, however, disappear.

Specifying Messages

Commands such as **print** and **delete** often can be given a list of message numbers as arguments to apply to a number of messages at once. Thus "delete 1 2" deletes messages 1 and 2, while "delete 1-5" deletes messages 1 through 5. The special name "*" addresses all messages, and "$" addresses the last message; thus the command **top** which prints the first few lines of a message could be used in "top *" to print the first few lines of all messages.

Replying to or Originating Mail

You can use the **reply** command to set up a response to a message, sending it back to the person who sent it. Then you can enter in the text of the reply, and press Ctrl-D to send it. While you are composing a message, *mail* treats lines beginning with a tilde (~) as special. For instance, typing "~m" alone on a line, places a copy of the current message into the response, right shifting it by one tabstop. Other escapes set up subject fields, add and delete recipients to the message, and allow you to escape to an editor to revise the message or to a shell

to run some commands. (These options are given in the summary below.)

Ending a Mail Session

You can end a *mail* session with the **quit** (**q**) command. Messages that have been examined go to your *mbox* file unless they have been deleted, in which case they are discarded. Unexamined messages go back to the post office. The **-f** option causes *mail* to read in the contents of your *mbox* (or the specified file) for processing; when you **quit**, *mail* writes undeleted messages back to this file. The **-i** option causes *mail* to ignore interrupts.

Using Aliases and Distribution Lists

It is also possible to create a personal distribution list. For instance, you can send mail to "cohorts" and have it go to a group of people. Such lists can be defined by placing a line like

alias cohorts bill bob barry bobo betty beth bobbi

in the file *.mailrc* in your home directory. The current list of such aliases can be displayed by the **alias (a)** command in *mail*. System-wide distribution lists can be created by editing /usr/lib/mail/aliases, see *aliases* (M); these are kept in a slightly different syntax. In mail you send, personal aliases will be expanded in mail sent to others so that they will be able to **reply** to the recipients. System-wide *aliases* are not expanded when the mail is sent, but any reply returned to the machine will have the system-wide alias expanded.

mail has a number of options which can be **set** in the *.mailrc* file to alter its behavior; thus "set askcc" enables the "askcc" feature. (These options are summarized below.)

Summary

Each mail command is entered on a line by itself, and may take arguments following the command word. The command need not be entered in its entirety; the first command which matches the typed prefix is used. For the commands that take message lists as arguments; if no message list is given, then the next message forward that satisfies the command's requirements is used. If there are no messages forward of the current message, the search proceeds backwards, and if there are no messages at all, *mail* types "No applicable messages" and aborts the command.

- Goes to the previous message and prints it out. If given a numeric argument *n*, goes to the *n*th previous message and prints it.

+	Goes to the next message and prints it out. If given a numeric argument *n*, goes to the *n*th next message and prints it.
RETURN	Goes to the next message and prints it out.
?	Prints a brief summary of commands.
!	Executes the shell command which follows.
=	Prints out the current message number.
^	Prints out the first message.
$	Prints out the last message.
alias	(**a**) With no arguments, prints out all currently-defined aliases. With one argument, prints out that alias. With more than one argument, adds the users named in the second and later arguments to the alias named in the first argument.
Alias *users*	Prints system-wide list of aliases for users. At least one user must be specified.
cd	(**c**) Changes the user's working directory to that specified, if given. If no directory is given, then changes to the user's login directory.
delete	(**d**) Takes a list of messages as an argument and marks them all as deleted. Deleted messages are not retained in the system mailbox after a quit, nor are they available to any command other than the *undelete* command.
dp	Deletes the current message and prints the next message. If there is no next message, *mail* says "no more messages."
echo *path*	Expands shell metacharacters.
edit	(**e**) Takes a list of messages and points the text editor at each one in turn. On return from the editor, the message is read back in.
exit	(**x**) Effects an immediate return to the shell without modifying the user's system mailbox, his *mbox* file, or his edit file in **-f**.
file	(**fi**) Prints the name of the file mail is reading. If it is a mailbox, the name of the owner is returned.

forward (**f**) Forwards the current message to the named users. Current message is indented within forwarded message.

Forward (**F**) Forwards the current message to the named users. Current message is *not* indented within forwarded message.

headers (**h**) Lists the current range of headers, which is an 18 message group. If a "+" argument is given, then the next 18 message group is printed, and if a "-" argument is given, the previous 18 message group is printed. Both "+" and "-" may take a number to view a particular window. If a message-list is given, it prints the specified headers.

hold (**ho**) Takes a message list and marks each message therein to be saved in the user's system mailbox instead of in *mbox*. Use only when the switch *autombox* is set. Does not override the **delete** command.

list Prints list of **mail** commands.

lpr (**l**) Prints out each message in a message-list on the lineprinter.

mail (**m**) Takes as arguments login names and distribution group names and sends mail to those people.

mbox (**mb**) Marks messages in a message list so that they are saved in the user mailbox after leaving mail.

move *mesg-list mesg-num*
Places the messages specified in *mesg-list* after the message specified in *mesg-num*. If *mesg-num* is 0, *mesg-list* moves to the top of the mailbox.

next (**n** like + or RETURN) Goes to the next message in sequence and prints it. With an argument list, types the next matching message.

print (**p**) Prints out each message in a message-list on the terminal display.

quit (**q**) Terminates the session, retaining all undeleted, unsaved messages in the system mailbox and removing all other messages. Messages marked with a star (*) are saved; messages marked with an "M" are saved in the user mailbox. If new mail has arrived during the session, the message "You have new mail" is given. If given while editing a mailbox file with the **-f** flag, then the mailbox file is rewritten. The user returns to the shell, unless the rewrite of the mailbox file fails, in

which case the user can escape with the **exit** command.

reply (**r**) Takes a message list and sends mail to each message author. The default message must not be deleted.

Reply (**R**) Takes a message list and sends mail to each message author *and each member of the message* just like the **mail** command. The default message must not be deleted.

restart Reads in messages that arrived during the current mail session.

save (**s**) Takes a message list and a filename and appends each message in turn to the end of the file. The filename, in quotation marks, followed by the line count and character count is echoed on the user's terminal.

set (**se**) With no arguments, prints all variable values. Otherwise, sets option. Arguments are of the form "option=value" or "option".

shell (**sh**) Invokes an interactive version of the shell.

size (**si**) Takes a message list and prints out the size in characters of each message.

source (**so**) Reads mail commands from the file given as its only argument.

string *string mesg-list*
Searches for *string* in *mesg-list*. If no *mesg-list* is specified, all undeleted messages are searched. Case is ignored in search.

top (**t**) Takes a message list and prints the top few lines of each. The number of lines printed is controlled by the variable **toplines** and defaults to six.

undelete (**u**) Takes a message list and marks each one as *not* being deleted.

unset (**uns**) Takes a list of option names and discards their remembered values; the inverse of **set**.

visual (**v**) Takes a message list and invokes vi on each message.

whois Looks up a list of target mail recipients and prints the real names or descriptions of each recipient. If the first character of the first argument is alphabetic, the

arguments are looked up without change. Otherwise, the arguments are assumed to be a message list, in the format specified in the *Mail User's Guide*. For each message in the list, the "From" person is extracted from the header and added to the list of users to be searched.

If a target mail recipient contains a machine and user name, nothing is printed. If it is a private alias, "private alias" is printed. If it is a global alias, the name or description of the recipient is printed (contents of the $n field in the alias file). If all of the above fail, the user is looked up in /etc/passwd; if the user is a local user, "local user" is printed. Finally, if none of the above tests and searches succeed, "unknown" is printed.

write *filename*
(**w**) Saves the body of the message in the named file.

Here is a summary of the compose escapes, which are used when composing messages to perform special functions. Compose escapes are only recognized at the beginning of lines.

~~*string* Inserts the string of text in the message prefaced by a single tilde (~). If you have changed the escape character, then you should double that character instead.

~**?** Prints out help for compose escapes.

~. Same as Ctrl-D on a new line.

~**!***cmd* Executes the indicated shell command, then returns to the message.

~|*cmd* Pipes the message through the command as a filter. If the command gives no output or terminates abnormally, retains the original text of the message.

~_ *mail-command*
Executes a mail command, then returns to compose mode.

~: *mail-command*
Executes a mail command, then returns to compose mode.

~**alias** Prints list of private aliases

~**alias** *aliasname*
Prints names included in private *aliasname*.

~Alias Performs aliasing by first examining private aliases and then system-wide aliases using all three global alias files (aliases.hash, faliases, and maliases). Only the final result is printed (non-local mail recipients will have the complete delivery path printed). The user list is taken from header fields.

~Alias *users* Performs aliasing by first examining private aliases and then system-wide aliases using all three global alias files (aliases.hash, faliases, and maliases). Only the final result is printed (non-local mail recipients will have the complete delivery path printed). At least one user must be specified.

~b *name ...* Adds the given names to the list of blind carbon copy recipients.

~c *name ...* Adds the given names to the list of carbon copy recipients.

~cc *name ...* Same as ~c above.

~d Reads the file *dead.letter* from your home directory into the message.

~e Invokes the text editor on the message collected so far. After the editing session is finished, you may continue appending text to the message.

~h Edits the message header fields by typing each one in turn and allowing the user to append text to the end or modify the field with the current terminal erase and kill characters.

~m *mesg-list* Reads the named messages into the message buffer, shifted right one tab. If no messages are specified, reads the current message.

~M *mesg-list* Reads the named messages into the message buffer, with no indentation. If no messages are specified, reads the current message.

~p Prints out the messages collected so far, prefaced by the message header fields.

~Print Prints the real names or descriptions (in parentheses) after each recipient in a header field.

~q Aborts the message being sent, copying the message to *dead.letter* in your home directory if **save** is set.

~r *filename* Reads the named file into the message buffer.

~**Return** *name*
Adds the given names to the Return-receipt-to field.

~s *string* Causes the named string to become the current subject field.

~t *name ...* Adds the given names to the direct recipient list.

~v Invokes a visual editor (defined by the VISUAL option) on the message buffer. After you quit the editor, you may resume appending text to the end of your message.

~w *filename* Writes the body of the message to the named file.

Options are controlled with the **set** and **unset** commands. An option may be either a switch, in which case it is either on or off, or a string, in which case the actual value is of interest. The switch options include the following:

askcc Causes you to be prompted for additional carbon copy recipients at the end of each message. Responding with a newline indicates your satisfaction with the current list.

asksubject Causes *mail* to prompt you for the subject of each message you send. If you respond with simply a newline, no subject field is sent.

autombox Causes all examined messages to be saved in the user mailbox unless deleted or saved.

autoprint Causes the **delete** command to behave like **dp** - thus, after deleting a message, the next one will be entered automatically.

chron Causes messages to be displayed in chronological order.

dot Permits use of dot (.) as the end of file character when composing messages.

execmail Causes the underbar prompt to return before *mail* is finished being sent. This frees the user to continue while *mail* performs mailing functions in background.

ignore Causes interrupt signals from your terminal to be ignored and echoed as at-signs (@).

mchron Causes messages to be listed in numerical order (most recently received first), but displayed in chronological order.

metoo Usually, when a group is expanded that contains the sender, the sender is removed from the expansion. Setting this option causes the sender to be included in the group.

nosave Prevents aborted messages from being appended to the file *dead.letter* in your home directory on receipt of two interrupts (or a ~**q**).

quiet Suppresses the printing of the version header when first invoked.

verify Causes each target mail recipient to be verified in the manner described in the **whois** command. This option permits errors made while composing messages to be corrected or ignored.

The following options have string values:

EDITOR Pathname of the text editor to use in the **edit** command and ~e escape. If not defined, then a default editor (*/bin/ed*) is used.

SHELL Pathname of the shell to use in the **!** command and the ~! escape. A default shell (*/bin/sh*) is used if this option is not defined.

VISUAL Pathname of the text editor (*/bin/vi*) to use in the **visual** command and ~v escape.

escape If defined, the first character of this option gives the character to use in the place of the tilde (~) to denote escapes.

page=*n* Specifies the number of lines (*n*) to be printed in a "page" of text when displaying messages.

record If defined, gives the pathname of the file used to record all outgoing mail. If not defined, then outgoing mail is not saved.

toplines If defined, gives the number of lines of a message to be printed out with the **top** command; normally, the first six lines are printed.

Files

/usr/spool/mail/*	System mailboxes
$HOME/dead.letter	File where undeliverable mail is deposited
$HOME/mbox	Your old mail
$HOME/.mailrc	File giving initial mail commands
/usr/lib/mail/aliases	System-wide aliases
/usr/lib/mail/aliases.hash	System-wide alias database
/usr/lib/mail/faliases	Forwarding aliases for the local machine
/usr/lib/mail/maliases	Machine aliases
/usr/lib/mail/mailhelp.cmd	Help file
/usr/lib/mail/mailhelp.esc	Help file
/usr/lib/mail/mailhelp.set	Help file
/usr/lib/mail/mailrc	System initialization file (defaults)
/usr/bin/mail	The mail command

See Also

aliases(M), aliashash(ADM), netutil(ADM)
The "Mail" chapter in the *XENIX User's Guide*.

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Name

man - Prints reference pages in this guide.

Syntax

man [**-afbcw**] [**-t***proc*] [**-p***pager*] [**-d***dir*] [**-T***term*] [*section*] [*title*]

Description

The *man* program locates and prints the named *title* from the designated *section* in the *XENIX Reference*. For historical reasons, "page" is often used as a synonym for "entry" in this context.

Since XENIX commands are given in lowercase, the *title* is always entered in lowercase. If no *section* is specified, the whole guide is searched for *title* and the first occurrence of it is printed. You can search for a group of *sections* by separating the section names with colons (:) on the command line.

The options and their meanings are:

-a "All" mode. Displays all matching titles. Incompatible with **f** mode.

-f "First" mode. Displays only the first matching title. Incompatible with **a** mode. This is the default mode for *man*.

-b Leaves blank lines in output. *nroff*(CT) pads entries with blank lines for line printer purposes. *man* normally filters out these excess blank lines. Normally, *man* does not display more than 2 consecutive blank lines. The **-b** flag leaves blank lines in the CRT output.

-c Causes *man* to invoke *col*(CT). Note that **col** is invoked automatically by *man* unless *term* is one of the following: **300**, **300s**, **450**, **37**, **4000a**, **382**, **4014**, **tek**, **1620**, and **X**.

-w Prints on the standard output only the *pathnames* of the entries.

-t*proc* Indicates that if an unprocessed manual page is available, it is to be passed to *proc* for formatting. *proc* can be any command script in **/usr/man/bin** or an absolute filename of a text processing program elsewhere on the system, for example **/bin/nroff**.

The scripts in **/usr/man/bin** invoke the actual processing programs with the correct flags and arguments. The default processor is **/usr/man/bin/nr**, which invokes **/bin/nroff** and produces output that safely prints on any terminal. The text is also preprocessed by *eqn*(CT) and *tbl*(CT) as a default.

-p*pager* Selects paging program *pager* to display the entry. Paging systems such as *more*(C), *pg*(C), *cat*(C), or any custom pagers that you may have are valid arguments for this flag. The default pager, *pg*(C), is set in **/etc/default/man**.

-d*dir* Specifies directory *dir* to be added to the search path for entries. You can specify several directories to be searched for entries by separating the directory names with colons (:) on the command line.

-T*term* Format the entry and pass the given *term* value to the processing program, then print it on the standard output (usually, the terminal); *term* is the terminal type (see *term*(M) and the explanation below); for a list of the recognized values of *term*, type **help term2**. The default value of *term* is **450**.

Section Names

The names and general descriptions of the available manual sections are:

C	Commands
M	Miscellaneous
F	File Formats
HW	Hardware Dependent
CT	Text Processing Commands
S	Subroutines and Libraries
CP	Programming Commands
DOS	DOS Subroutines and Libraries
UCB	University of California, Berkeley, Utilities
LOCAL	Local utilities for your system

You can add other section names as you desire. Each new section, however, must follow the standard section directory structure. The UCB and LOCAL directories are shipped to you without contents, as no LOCAL or UCB manual pages are included with XENIX.

/usr/man Directory Structure

The source files for the *man* program are kept in the directory **/usr/man**. Each *man* section is comprised of two directories, and there is a directory called *bin* for programs and shell scripts related to *man*. There is also an index file called *index* in **/usr/man**. This index is a list of all XENIX commands and their sections.

Each manual section has two directories in **/usr/man**. These directories are called *man* and *cat*, plus the name of the section as a suffix. For example, the **C** manual section is comprised of two directories, **man.C** and **cat.C**, both located in **/usr/man**.

The unprocessed source text is in the **man** directory and the printable processed output is in the **cat** directory. When a title is requested, both directories are checked. The most recent copy of the manual page is used as the current copy. If the most recent title is in the source text directory and it is processed by the default processor with the default terminal type, a display copy of the output is placed in the **cat** directory for future use. Note that a file that must be processed takes longer to appear on the screen than a display copy.

Environment Variables

There is a shell environment variable for use with the *man* utility. This variable is called **MANPATH** and it is used to change or augment the path *man* searches for entries. Multiple directories set with this variable must be delimited by colon characters (:). If the **MANPATH** environment variable is present, the directories are searched in the order that they appear. **/usr/man** must appear in the **MANPATH** list to be included. If you set this environment variable, it supercedes the **MANPATH** entry in the **/etc/default/man** file. Alternate subdirectories are expected to have the same form as the default directories in **/usr/man**.

/etc/default/man

There is a file called **man** in the **/etc/default** directory that contains the default settings for the *man* utility. The following options are set in **/etc/default/man**:

```
PAGER=pg

MANPATH=/usr/man

TERM=lp

ORDER=C:S:CP:CT:M:F:HW:DOS:UCB:LOCAL

MODE=FIRST

PROC=nr
```

You can select a different paging system, search path, terminal type, search order, mode, and processor for the *man* system by changing the information in this file.

To change the search order for manual sections, edit the list following the **ORDER** variable. Be certain the section names are separated with colons (:). Section names not present in **ORDER** are searched in

arbitrary order after those specified in **/etc/default/man**.

Creating New Manual Entries

You can create new manual pages for utilities and scripts that you have developed. Use an existing manual page as an example of manual page structure. Use the *man* macros to format your manual page. For more information, refer to the *nroff*(CT) manual page.

You must be logged in as root (the "Super-User") to place a new manual page in your **/usr/man** directory structure. Place your new page in **/usr/man/man.LOCAL** while logged in as root and view it using the *man* command, since only root has write permission for the catable directories. Once *man* has produced the catable output, any user can view the new page in the same manner as any other on line manual page.

Additionally, you can create your own custom sections by creating another manual directory and putting it in the **MANPATH**. For example, if subdirectories **man.X** and **cat.X** are present, then *man* recognizes that **X** is a valid manual section.

If you wish to use another text processing program (such as *troff*(CT)) to process your custom manual pages, use the **-t***proc* flag of *man*. *proc* can be any shell script in **/usr/man/bin**. To place a catable copy of the manual page in the **cat** directory, use the *tee*(C) command to send the output to a file, as well as to the standard output. Your command should have the form:

man -t*proc filename* | **tee** *pathname*

In the above example, *proc* is the text processing script, *filename* is the manual page source file, and *pathname* is the path of the directory for the catable output.

Custom manual sections can have an index, if the format is the same as the index in **/usr/man**. *man* uses the index to locate multiple commands that are listed on the same page as well as commands that have pages in several different sections.

The man Macro Package

The *man* macro package is located in **/usr/lib/macros/an**. There are 15 basic macros in the package. Here is a table of the macros and brief descriptions of their functions:

Macro	Description
.TH *title*	Title Heading
.SH *title*	Section Heading
.SS *title*	Subsection Heading
.SM *text*	Reduce Point Size
.PP	New Paragraph
.IP	Indented Paragraph
.HP	Hanging Paragraph
.TP	Tagged Paragraph
.DA *date*	Date of Document
.RS *n*	Relative Indent
.RE	Release Relative Indent
.I *text*	Italic Font
.B *text*	Bold Font
.R *text*	Roman Font
.PM	Proprietary Mark (copyright)
.PM	Proprietary Mark (copyright)

See Also

eqnchar(CT), nroff(CT), tbl(CT), troff(CT), environ(M), term(CT).

Notes

All entries are supposed to be reproducible either on a typesetter or on a terminal. However, on a terminal some information, such as *eqn*(CT) and *tbl*(CT) output, is either lost or approximated as it cannot be exactly reproduced.

The *man* macros, *nroff*(CT), *troff*(CT), and other (CT) commands are components of the Text Processing System.

Name

mesg - Permits or denies messages sent to a terminal.

Syntax

mesg [**n**] [**y**]

Description

mesg with argument **n** forbids messages via *write*(C) by revoking nonuser write permission on the user's terminal. *mesg* with argument **y** reinstates permission. All by itself, *mesg* reports the current state without changing it.

Files

/dev/tty*

See Also

write(C)

Diagnostics

Exit status is 0 if messages are receivable, 1 if not, 2 on error.

Name

mkdir - Makes a directory.

Syntax

mkdir dirname ...

Description

mkdir creates directories. The standard entries "dot" (.), for the directory itself, and "dot dot" (..), for its parent, are made automatically.

mkdir requires write permission in the parent directory. The permissions assigned to the new directory are modified by the current file creation mask set by *umask* (C).

See Also

rmdir(C), umask(C)

Diagnostics

mkdir returns exit code 0 if all directories were successfully made; otherwise, it prints a diagnostic and returns nonzero.

Name

mknod - Builds special files.

Syntax

/etc/mknod name [**c**] [**b**] major minor

/etc/mknod name **p**

/etc/mknod name **s**

/etc/mknod name **m**

Description

mknod makes a directory entry and corresponding inode for a special file. The first argument is the *name* of the entry. In the first case, the second argument is **b** if the special file is block-type (disks, tape) or **c** if it is character-type (other devices). The last two arguments are numbers specifying the *major* device type and the *minor* device (e.g., unit, drive, or line number), which may be either decimal or octal.

The assignment of major device numbers is specific to each system. Major device numbers can be found in the system source file **c.c**.

mknod can also be used to create named pipes with the **p** option; semaphores with the **s** option; and shared data (memory) with the **m** option.

Only the super-user can use the first form of the syntax.

System Compatibility

The **s** and **m** options can only be used to create XENIX version 3.0 semaphores and shared data, not XENIX System V semaphores and shared data.

See Also

mknod(S)

Name

mnt - mount a filesystem

Syntax

/etc/mnt [**-urat**] [directory]

/etc/umnt *directory*

Description

mnt allows users other than the super-user to access the functionality of the *mount*(ADM) command to mount selected filesystems. The super-user can define how and when a filesystem mount is permitted via special entries in the */etc/default/filesys* file.

The filesystem requirements are the same as defined for *mount*(ADM).

umnt removes the removable filesystem previously mounted at the mount point *directory* .

mnt is invoked from */etc/rc* with the **-r** and possibly the **-a** flag to mount filesystems when the system comes up multi-user. The **-a** flag is used when the system has autobooted. Neither of these flags should be specified during normal use.

The **-t** flag displays the contents of /etc/default/filesys.

The **-u** flag forces *mnt* to behave like *umnt*.

Options

The following options can be defined in the */etc/default/filesys* entry for a filesystem:

bdev=/dev/*device*	Name of block device associated with the filesystem.
cdev=/dev/*device*	Name of character (raw) device associated with the filesystem.
mountdir=/*directory*	The directory the filesystem is to be mounted on.
desc=*name*	A string describing the filesystem.

passwd=*string* An optional password prompted for at mount request time. Cannot be a simple string; must be in the format of /etc/passwd. (See **Notes.**)

fsck=**yes, no, dirty, prompt**
If "yes" or "no", tells explicitly whether or not to run *fsck*. If "dirty", *fsck* is run only if the filesystem requires cleaning. If "prompt", the user is prompted for a choice. If no entry is given, the default value is "dirty".

fsckflags=*flags* Any flags to be passed to *fsck*.

rcfsck=**yes, no, dirty, prompt**
Similar to fsck entry, but only applies when the **-r** flag is passed.

maxcleans=*n* The number of times to repeat cleaning of a dirty filesystem before giving up. If undefined, default is 4.

mount=**yes, no, prompt**
If "yes" or "no", users are allowed or disallowed to mount the filesystem, respectively. If "prompt", the user is queried to mount the filesystem.

rcmount=**yes, no, prompt**
If "yes", the filesystem is mounted by */etc/rc* when the system comes up multiuser. If "no", the filesystem is never mounted by */etc/rc*. With "prompt", a query is displayed at boot time to mount the filesystem.

mountflags=*flags* Any flags to be passed to *mount*.

prep=**yes, no, prompt** Indicates whether any prepcmd entry should always be executed, never executed, or executed as specified by the user.

prepcmd=*command* An arbitrary shell command to be invoked immediately following password check and prior to running *fsck*.

init=**yes, no, prompt** Indicates whether an initcmd entry should always be executed, never be executed, or executed as specified by user.

initcmd=*command* An optional, arbitrary shell command to be invoked immediately following a successful mount.

Any entries containing spaces, tabs, or newlines must be contained in double quotes (").

The only mandatory entries in */etc/default/filesys* are **bdev** and **mountdir**. The **prepcmd** and **initcmd** options can be used to execute another command before or after mounting the filesystem. For example, **initcmd** could be defined to send mail to root whenever a given filesystem is mounted.

When invoked without arguments, *mnt* attempts to mount all filesystems that have the entries **mount=yes** or **mount=prompt**.

Examples

The following is a sample */etc/default/filesys* file:

```
bdev=/dev/root  cdev=/dev/rroot  mountdir=/  \
desc="The Root Filesystem"  rcmount=no  mount=no

bdev=/dev/u  cdev=/dev/ru  mountdir=/u  rcmount=yes  \
fsckflags=-y  desc="The User Filesystem"

bdev=/dev/x  cdev=/dev/rx  mountdir=/u  rcmount=no  \
mount=yes  fsckflags=-y  desc="The Extra Filesystem"
```

Of the examples above, only */x* is mountable by the user.

Files

/etc/default/filesys	Filesystem data

See Also

mount(ADM), default(M)

Diagnostics

mnt will fail if the filesystem to be mounted is currently mounted under another name.

Busy filesystems cannot be dismounted with *umnt*. A filesystem is busy if it contains an open file or if a user's present working directory resides within the filesystem.

Notes

Some degree of validation is done on the filesystem, however it is generally unwise to mount corrupt filesystems.

In order to create a password for a filesystem, you must create a dummy account in */etc/passwd* and define a password for it. You can then edit the */etc/passwd* file and transfer the encrypted password into the password entry for the filesystem in */etc/default/filesys*.

Name

more - Views a file one screen full at a time.

Syntax

more [**-cdflrsuvw**] [*-n*] [+linenumber] [+/pattern] [name ...]

Description

This filter allows examination of a continuous text one screen full at a time. It normally pauses after each full screen, displaying:

--More--

at the bottom of the screen. If the user then presses a carriage return, one more line is displayed. If the user presses the SPACE bar, another full screen is displayed. Other possibilities are described below.

The command line options are:

-n An integer which is the size (in lines) of the window which *more* will use instead of the default.

-c *more* draws each page by beginning at the top of the screen and erasing each line just before it draws on it. This avoids scrolling the screen, making it easier to read while *more* is writing. This option is ignored if the terminal does not have the ability to clear to the end of a line.

-d *more* prompts with the message "Hit space to continue, Rubout to abort" at the end of each full screen. This is useful if *more* is being used as a filter in some setting, such as a class, where many users may be inexperienced.

-f This option causes *more* to count logical, rather than screen lines. That is, long lines are not folded. This option is recommended if *nroff* output is being piped through *ul,* since the latter may generate escape sequences. These escape sequences contain characters that would ordinarily occupy screen positions, but do not print when they are sent to the terminal as part of an escape sequence. Thus *more* may think that lines are longer than they actually are and fold lines erroneously.

-l Does not treat Ctrl-L (form feed) specially. If this option is not given, *more* pauses after any line that contains a Ctrl-L, as if the end of a full screen has been reached. Also, if a file begins with a form feed, the screen is cleared before the file is printed.

-r Causes carriage returns to be printed as "^M".

-s Squeezes multiple blank lines from the output, producing only one blank line. Especially helpful when viewing *nroff* output, this option maximizes the useful information present on the screen.

-u Normally, *more* handles underlining, such as that produced by *nroff* in a manner appropriate to the particular terminal: if the terminal can perform underlining or has a stand-out mode, *more* outputs appropriate escape sequences to enable underlining or stand-out mode for underlined information in the source file. The **-u** option suppresses this processing.

-v Normally, *more* ignores control characters that it does not interpret in some way. The *-v* option causes these to be displayed as ^*C* where *C* is the corresponding printable ASCII character. Non-printing non-ASCII characters (with the high bit set) are displayed in the format M-*C*, where *C* is the corresponding character without the high bit set. If output is not going to a terminal, *more* does not interpret control characters.

-w Normally, *more* exits when it comes to the end of its input. With *-w* however, *more* prompts and waits for any key to be struck before exiting.

+*linenumber*
Starts up at *linenumber*.

+/*pattern*
Starts up two lines before the line containing the regular expression *pattern*.

more looks in the file **/etc/termcap** to determine terminal characteristics, and to determine the default window size. On a terminal capable of displaying 24 lines, the default window size is 22 lines.

more looks in the environment variable *MORE* to preset any flags desired. For example, if you prefer to view files using the **-c** mode of operation, the shell command "MORE=-c" in the **.profile** file causes all invocations of *more* to use this mode.

If *more* is reading from a file, rather than a pipe, a percentage is displayed along with the "--More--" prompt. This gives the fraction of the file (in characters, not lines) that has been read so far.

Other sequences which may be entered when *more* pauses, and their effects, are as follows (*i* is an optional integer argument, defaulting to 1 where not specified otherwise):

i <space>
Displays *i* more lines, (or another full screen if no argument is given).

i Ctrl-D
Displays 11 more lines (a "scroll"). If *i* is given, then the scroll size is set to *i*.

i d Same as Ctrl-D.

i z Same as entering a space except that *i*, if present, becomes the new window size.

i s Skips *i* lines and displays a full screen of lines.

i f Skips *i* full screens and displays a full screen of lines.

q or Q
Exits from *more*.

= Displays the current line number.

v Starts up the screen editor *vi* at the current line. Note that *vi* may not be available with your system. Also, this sequence does not work if the input is piped through *more*.

h or ?
Help command; Gives a description of all the *more* commands.

i /*expr*
Searches for the *i* th occurrence of the regular expression *expr*. If there are less than *i* occurrences of *expr*, and the input is a file (rather than a pipe), then the position in the file remains unchanged. Otherwise, a full screen is displayed, starting two lines before the place where the expression was found. The user's erase and kill characters may be used to edit the regular expression. Erasing back past the first column cancels the search command.

i n Searches for the *i* th occurrence of the last regular expression entered.

' (Single quotation mark) Goes to the point from which the last search started. If no search has been performed in the current file, this command goes back to the beginning of the file.

!*command*
Invokes a shell with *command*. The characters % and ! in "command" are replaced with the current filename and the previous shell command respectively. If there is no current filename, % is not expanded. The sequences "\%" and "\!" are replaced by "%" and "!" respectively.

i :n
Skips to the *i* th next file given in the command line (skips to last file if *i* doesn't make sense).

i :p
Skips to the *i* th previous file given in the command line. If this command is given in the middle of printing out a file, *more* goes back to the beginning of the file. If *i* doesn't make sense, *more* skips back to the first file. If *more* is not reading from a file, the bell rings and nothing else happens.

:f Displays the current filename and line number.

:q or :Q
Exits from *more* (same as q or Q).

. Repeats the previous command.

The commands take effect immediately. It is not necessary to enter a carriage return. Up to the time when the command character itself is given, the user may enter the line kill character to cancel the numerical argument being formed. In addition, the user may enter the erase character to redisplay the "--More--(*xx*%)" message.

The terminal is set to *noecho* mode by this program so that the output can be continuous. What you enter will not show on your terminal, except for the slash (/) and exclamation (!) commands.

If the standard output is not a teletype, *more* acts just like *cat,* except that a header is printed before each file (if there is more than one).

A sample usage of *more* in previewing *nroff* output would be

```
nroff -ms +2 doc.n | more -s
```

Files

/etc/termcap	Terminal data base
/usr/lib/more.help	Help file

See Also

csh(C), sh(C), environ(M)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

The *vi* and *help* options may not be available.

Before displaying a file, *more* attempts to detect whether it is a non-printable binary file such as a directory or executable binary image. If *more* concludes that a file is unprintable, it refuses to print it. However, *more* cannot detect all possible kinds of non-printable files.

Name

mv - Moves or renames files and directories.

Syntax

mv [**-f**] file1 file2

mv [**-f**] file ... directory

Description

mv moves (changes the name of) *file1* to *file2*.

If *file2* already exists, it is removed before *file1* is moved. If *file2* has a mode which forbids writing, *mv* prints the mode (see *chmod*(S)) and reads the standard input to obtain a line. If the line begins with **y**, the move takes place; if not, *mv* exits.

In the second form, one or more *files* are moved to the *directory* with their original filenames.

No questions are asked when the **-f** option is given (**y** is assumed).

mv refuses to move a file onto itself.

mv can only rename directories, not physically move them. *mvdir*(ADM) should be used to move directories within a filesystem.

See Also

cp(C), chmod(S), copy(C)

Notes

If *file1* and *file2* lie on different filesystems, *mv* must copy the file and delete the original. In this case the owner name becomes that of the copying process and any linking relationship with other files is lost.

Name

newform - Changes the format of a text file.

Syntax

newform [**-i**tabspec] [**-o**tabspec] [**-l**n] [**-b**n] [**-e**n] [**-c**char] [**-p**n] [**-a**n] [**-f**] [**-s**] [file ...]

Description

newform reads lines from the named *files*, or the standard input if no input file is named, and reproduces the lines on the standard output. Lines are reformatted in accordance with command line options in effect.

Except for **-s**, command line options may appear in any order, may be repeated, and may be intermingled with *files*. Command line options are processed in the order typed. This means that option sequences like "**-e**15 **-l**60" will yield results different from "**-l**60 **-e**15". Options are applied to all *files* on the command line.

-i*tabspec* Input tab specification: expands tabs to spaces, according to the tab specifications given. *Tabspec* recognizes all tab specification forms described below. In addition, *tabspec* may be **--**, in which *newform* assumes that the tab specification is to be found in the first line read from the standard input. If no *tabspec* is given, *tabspec* defaults to **-8**. A *tabspec* of **-0** expects no tabs; if any are found, they are treated as **-1**.

-o*tabspec* Output tab specification: replaces spaces by tabs, according to the tab specifications given. The tab specifications are the same as for **-i***tabspec*. If no *tabspec* is given, *tabspec* defaults to **-8**. A *tabspec* of **-0** means that no spaces will be converted to tabs on output.

-l*n* Sets the effective line length to *n* characters. If *n* is not typed, **-l** defaults to 72. The default line length without the **-l** option is 80 characters. Note that tabs and backspaces are considered to be one character (use **-i** to expand tabs to spaces).

-b*n* Truncates *n* characters from the beginning of the line when the line length is greater than the effective line length (see **-l***n*). The default is to truncate the number of characters necessary to obtain the effective line length. The default value is used when **-b** with no *n* is used. This option can be used to delete the sequence numbers from a COBOL program as follows:

```
newform -l1 -b7 file-name
```

The option **-l1** must be used to set the effective line length shorter than any existing line in the file so that the **-b** option is activated.

-e*n* Truncates *n* characters from the end of the line.

-c*k* Changes the prefix/append character to *k*. Default character for *k* is a space (see options **-p** and **-a**).

-p*n* Prefixes *n* characters (see **-c***k*) to the beginning of a line when the line length is less than the effective line length. The default is to prefix the number of characters necessary to obtain the effective line length.

-a*n* Appends *n* characters to the end of a line. The default is to append the number of characters necessary to get the effective line length.

-f Writes the tab specification format line on the standard output before any other lines are output. The tab specification format line which is printed will correspond to the format specified in the *last* **-o** option. If no **-o** option is specified, the line which is printed will contain the default specification of **-8**.

-s Shears off leading characters on each line up to the first tab and places up to 8 of the sheared characters at the end of the line. If more than 8 characters (not counting the first tab) are sheared, the eighth character is replaced by a * and any characters to the right of it are discarded. The first tab is always discarded.

An error message and program exit will occur if this option is used on a file without a tab on each line. The characters sheared off are saved internally until all other options specified are applied to that line. The characters are then added at the end of the processed line.

Tabs

Four types of tab specification are accepted for *tabspec*: "canned," repetitive, arbitrary, and file. The lowest column number is 1. For

tabs, column 1 always refers to the leftmost column on a terminal, even one whose column markers begin at 0, e.g. the DASI 300, DASI 300S, and DASI 450.

The "canned" tabs are given as *-code* where *code* (and its meaning) is from the following list:

-a 1,10,16,36,72
Assembler, IBM S/370, first format

-a2 1,10,16,40,72
Assembler, IBM S/370, second format

-c 1,8,12,16,20,55
COBOL, normal format

-c2 1,6,10,14,49
COBOL compact format (columns 1-6 omitted). Using this code, the first typed character corresponds to card column 7, one space gets you to column 8, and a tab reaches column 12. Files using this tab setup should include a format specification as follows:

<:t-c2 m6 s66 d:>

-c3 1,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,67
COBOL compact format (columns 1-6 omitted), with more tabs than COBOL **-c2**. This is the recommended format for COBOL. The appropriate format specification is:

<:t-c3 m6 s66 d:>

-f 1,7,11,15,19,23
FORTRAN

-p 1,5,9,13,17,21,25,29,33,37,41,45,53,57,61
PL/I

-s 1,10,55
SNOBOL

-u 1,12,20,44
UNIVAC 1100 Assembler

In addition to these "canned" formats, three other types exist:

-n A repetitive specification requests tabs at columns 1+*n*, 1+2*n*, etc. Note that such a setting leaves a left margin of *n* columns on TermiNet terminals *only*. Of particular importance is the value **-8**: this represents the XENIX system "standard" tab setting, and is the most likely tab setting to found at a terminal. It is required for use with *nroff*(CT) **-h** option for high-speed output. Another

special case is the value **-0**, implying no tabs at all.

n1,n2,... The arbitrary format permits the user to type any chosen set of number, separated by commas, in ascending order. Up to 40 numbers are allowed. If any number (except the first one) is preceded by a plus sign, it is taken as an increment to be added to the previous value. Thus, the tab lists 1,10,20,30 and 1,10,+10,+10 are considered identical.

- *-file*

If the name of a file is given, *newform* reads the first line of the file, searching for a format specification. If it finds one there, it sets the tab stops according to it, otherwise it sets them as **-8**. This type of specification may be used to make sure that a tabbed file is printed with correct tab settings.

Any of the following may be used also; if a given flag occurs more than once, the last value given takes effect:

-T*type*

newform usually needs to know the type of terminal in order to set tabs and always needs to know the type to set margins. *type* is a name listed in *term*(CT). If no **-T** flag is supplied, *newform* searches for the **$TERM** value in the *environment* (see *environ*(M)). If no *type* can be found, *newform* tries a sequence that will work for many terminals.

+m*n* The margin argument may be used for some terminals. It causes all tabs to be moved over *n* columns by making column *n*+1 the left margin. If **+m** is given without a value of *n*, the value assumed is 10. For a TermiNet, the first value in the tab list should be 1, or the margin will move even further to the right. The normal (leftmost) margin on most terminals is obtained by **+m0**. The margin for most terminals is reset only when the **+m** flag is given explicitly.

Example

In the following example, *newform* converts a file named *text* with leading digits, one or more tabs, and text on each line to a file beginning with the text and the leading digits placed at the end of each line in column 73 (**-s** option). All tabs after the first one are expanded to spaces (**-i** option). To reach the line length of 72 characters (**-l** option), spaces are appended to each line up to column 72 (**-a** option) or lines are truncated at column 72 (**-e** option). To reformat the sample file **text** in this manner, enter:

newform -s -i -l -a -e text

Exit Codes

0 - normal execution
1 - for any error

See Also

csplit(C)

Diagnostics

All diagnostics are fatal.

usage: ...	*newform* was called with a bad option.
not -s format	There was no tab on one line.
can't open file	Self-explanatory.
internal line too long	A line exceeds 512 characters after being expanded in the internal work buffer.
tabspec in error	A tab specification is incorrectly formatted, or specified tab stops are not ascending.
tabspec indirection illegal	A *tabspec* read from a file (or standard input) may not contain a *tabspec* referencing another file (or standard input).

Notes

newform normally only keeps track of physical characters; however, for the **-i** and **-o** options, *newform* will keep track of backspaces in order to line up tabs in the appropriate logical columns.

newform will not prompt the user if a *tabspec* is to be read from the standard input (by use of **-i,--** or **-o--**).

If the **-f** option is used, and the last **-o** option specified was "-o--" , and was preceded by either "-o--" or a "-i--" , the tab specification format line will be incorrect.

Name

newgrp - Logs user into a new group.

Syntax

newgrp [group]

Description

newgrp changes the group identification of its caller. The same person remains logged in, and the current directory is unchanged, but calculations of access permissions to files are performed with respect to the new group ID.

newgrp without an argument changes the group identification to the group in the password file. This changes the caller's group identification back to the original group. When most users log in, they are members of the group named **group.**

If a group has a password, any user can become a member of that group by entering the password when prompted by *newgrp*. If a group does not have a password, a user can become a member of it only if the user is listed in **/etc/group** as a member of the group. Therefore, group security is stronger if group passwords are not used.

Files

/etc/group

/etc/passwd

See Also

login(M), group(F), passwd(F)

Notes

A password must be added to the **/etc/group** file manually; see *group*(F) for details. The *newgrp* command executes, but does not fork, a new shell. If your login shell is a C shell and you invoke *newgrp* , you will have to press CTRL-D when you wish to log out. Typing the *csh* (C) *logout* command will result in an error message. Note also that the *newgrp* command causes the *csh* history list to start again at 1.

Name

news - Print news items.

Syntax

news [**-a**] [**-n**] [**-s**] [items]

Description

news is used to keep the user informed of current events. By convention, these events are described by files in the directory **/usr/news**.

When invoked without arguments, *news* prints the contents of all current files in **/usr/news**, most recent first, with each preceded by an appropriate header. *news* stores the "currency" time as the modification date of a file named **.news_time** in the user's home directory (the identity of this directory is determined by the environment variable **$HOME**); only files more recent than this currency time are considered "current."

The **-a** option causes *news* to print all items, regardless of currency. In this case, the stored time is not changed.

The **-n** option causes *news* to report the names of the current items without printing their contents, and without changing the stored time.

The **-s** option causes *news* to report how many current items exist, without printing their names or contents, and without changing the stored time.

All other arguments are assumed to be specific news items that are to be printed.

If the INTERRUPT key is struck during the printing of a news item, printing stops and the next item is started. Another INTERRUPT within one second of the first causes the program to terminate.

Files

/usr/news/*
$HOME/.news_time

See Also

profile(M), environ(M).

Notes

This is not an interface for USENET news.

Name

nice - Runs a command at a different priority.

Syntax

nice [-increment] command [arguments]

Description

nice executes *command* with a lower CPU scheduling priority. Priorities range from 0 to 39, where 0 is the highest priority and 39 is the lowest. By default, commands have a "nice value" of 20. If an **-increment** argument is given where *increment* is in the range 1-19, *increment* is added to the default priority of 20 to produce a numerically higher priority, meaning a *lower* scheduling priority. If no *increment* is given, an increment of 10 to produce a priority of 30 is assumed.

The super-user may run commands with priority *higher* than normal by using a double negative increment. For example, an argument of **--10** would decrement the default to produce a nice value of 10, which is a higher scheduling priority than the default of 20.

See Also

nohup(C), csh(C), nice(S)

Diagnostics

nice returns the exit status of the subject command.

Notes

An *increment* larger than 19 is equivalent to 19.

Note also that this description of *nice* applies only to programs run under the Bourne Shell. The C-Shell has its own *nice* command, which is documented in csh(C).

Name

nl - Adds line numbers to a file.

Syntax

nl [**-h**type] [**-b**type] [**-f**type] [-vstart#] [**-i**incr] [**-p**] [**-l**num] [**-s**sep] [**-w**width] [**-n**format] file

Description

nl reads lines from the named *file*, or the standard input if no *file* is named, and reproduces the lines on the standard output. Lines are numbered on the left in accordance with the command options in effect.

nl views the text it reads in terms of logical pages. Line numbering is reset at the start of each logical page. A logical page consists of a header, a body, and a footer section. Empty sections are valid. Different line numbering options are independently available for header, body, and footer (e.g. no numbering of header and footer lines while numbering blank lines only in the body).

The start of logical page sections is signaled by input lines containing nothing but the following combinations of backslashes (\) and colons (:):

Page Section	*Line Contents*
Header	\:\:\:
Body	\:\:
Footer	\:

Unless signaled otherwise, *nl* assumes the text being read is in a single logical page body.

Command options may appear in any order and may be intermingled with an optional filename. Only one file may be named. The options are:

-b*type* Specifies which logical page body lines are to be numbered. Recognized *types* and their meaning are: **a**, number all lines; **t**, number lines with printable text only; **n**, no line numbering; **p***string*, number only lines that contain the regular expression specified in *string*. Default *type* for logical page body is **t** (text lines numbered).

-h*type* Same as **-b***type* except for header. Default *type* for logical page header is **n** (no lines numbered).

-f*type* Same as **-b***type* except for footer. Default for logical page footer is **n** (no lines numbered).

-p Does not restart numbering at logical page delimiters.

-v*start#* *Start#* is the initial value used to number logical page lines. Default is **1**.

-i*incr* *Incr* is the increment value used to number logical page lines. Default is **1**.

-s*sep* *Sep* is the character(s) used in separating the line number and the corresponding text line. Default *sep* is a tab.

-w*width* *Width* is the number of characters to be used for the line number. Default *width* is **6**.

-n*format* *Format* is the line numbering format. Recognized values are: **ln**, left justified, leading zeroes suppressed; **rn**, right justified, leading zeroes suppressed; **rz**, right justified, leading zeroes kept. Default *format* is **rn** (right justified).

-l*num* *Num* is the number of blank lines to be considered as one. For example, **-l2** results in only the second adjacent blank being numbered (if the appropriate **-ha**, **-ba**, and/or **-fa** option is set). Default is **1**.

See Also

pr(C)

Name

nm - Prints name list.

Syntax

nm [**-acgnoOprsSuv**] [+offset] [file ...]

Description

nm prints the name list (symbol table) of each object *file* in the argument list. If an argument is an archive, a listing for each object file in the archive will be produced. *nm* works transparently on COFF files and XENIX generated object files. *nm* translates all possible COFF symbols into standard XENIX object symbols.

If no *file* is given, the symbols in **a.out** are listed.

Each symbol name is preceded by its value in hexadecimal (blanks if undefined) and one of the letters **U** (undefined), **A** (absolute), **T** (text segment symbol), **D** (data segment symbol), **B** (bss segment symbol), S (segment name), **C** (common symbol), **K** (8086 common segment), or **S** (segment name). If the symbol table is in segmented format, symbol values are displayed as **segment:offset**. If the symbol is local (non-external), the type letter is in lowercase. The output is sorted alphabetically.

Options are:

-a Attempt to print the namelist of all modules in an archive library. Normally, *nm* silently ignores any library members which are not valid object modules. Using this option causes *nm* to report an error for all such modules. Note that the first member in any library which has been processed by *ranlib*(C) is called __ __.SYMDEF and is not a valid object module, thus the **-a** option will always produce at least one error message when used on such a library.

-c Print only C program symbols (symbols which begin with '_') as they appeared in the C program.

-g Print only global (external) symbols.

-n Sort numerically rather than alphabetically.

-o Prepend file or archive element name to each output line rather than only once.

-O Print symbol values in octal.

-p Don't sort; print in symbol-table order.

-r Sort in reverse order.

-s Sort by size of symbol and display each symbol's size instead of value. The last symbol in each text or data segment may be assigned a size of 0. This implies the **-n** option.

-S Switch the display format. If the symbol table is in segmented format, print values in non-segmented format. If not segmented, print values in segmented format. Segment offsets in 386 object modules and executable files are 32 bits rather than 16 bits.

-u Print only undefined symbols.

-v Also describe the object file and symbol table format.

Files

a.out

See Also

ar(C), ar(F), a.out(F)

Name

nohup - Runs a command immune to hangups and quits.

Syntax

nohup command [arguments]

Description

nohup executes *command* with hangups and quits ignored. If output is not redirected by the user, it will be sent to **nohup.out**. If **nohup.out** does not have write permission in the current directory, output is redirected to **$HOME/nohup.out**.

See Also

nice(C), signal(S)

Name

od - Displays files in octal format.

Syntax

od [**-bcdox**] [file] [[+]offset[**.**][**b**]]

Description

od displays *file* in one or more formats as selected by the first argument. If the first argument is missing, **-o** is the default. The meanings of the format options are:

-b Interprets bytes in octal.

-c Interprets bytes in ASCII. Certain nongraphic characters appear as C escapes: null=**\0**, backspace=**\b**, form feed=**\f**, newline=**\n**, return=**\r**, tab=**\t**; others appear as 3-digit octal numbers.

-d Interprets words in decimal.

-o Interprets words in octal.

-x Interprets words in hex.

The *file* argument specifies which file is to be displayed. If no file argument is specified, the standard input is used.

The offset argument specifies the offset in the file where displaying is to start. This argument is normally interpreted as octal bytes. If **.** is appended, the offset is interpreted in decimal. If **b** is appended, the offset is interpreted in blocks. If the file argument is omitted, the offset argument must be preceded by +.

The display continues until end-of-file.

See Also

hd(C), adb(CP)

Name

pack, pcat, unpack - Compresses and expands files.

Syntax

pack [-] name ...

pcat name ...

unpack name ...

Description

pack attempts to store the specified files in a compressed form. Wherever possible, each input file *name* is replaced by a packed file *name*.**z** with the same access modes, access and modified dates, and the owner of *name*. If *pack* is successful, *name* will be removed. Packed files can be restored to their original form using *unpack* or *pcat*.

pack uses Huffman (minimum redundancy) codes on a byte-by-byte basis. If the - argument is used, an internal flag is set that causes *pack* to display information about the file compression. Additional occurrences of - in place of *name* will cause the internal flag to be set and reset.

The amount of compression obtained depends on the size of the input file and the character frequency distribution. Because a decoding tree forms the first part of each **.z** file, it is usually not worthwhile to pack files smaller than three blocks, unless the character frequency distribution is very scattered, which may occur with printer plots or pictures.

Typically, text files are reduced to 60-75% of their original size. Load modules, which use a larger character set and have a more uniform distribution of characters, show little compression, the packed versions being about 90% of the original size.

pack returns a value that is the number of files that it failed to compress.

No packing will occur if:

- The file appears to be already packed
- The filename has more than 12 characters

- The file has links
- The file is a directory
- The file cannot be opened
- No disk storage blocks will be saved by packing
- A file called *name*.**z** already exists
- The **.z** file cannot be created
- An I/O error occurred during processing

The last segment of the filename must contain no more than 12 characters to allow space for the appended **.z** extension. Directories cannot be compressed.

Pcat does for packed files what *cat*(C) does for ordinary files. The specified files are unpacked and written to the standard output. Thus to view a packed file named *name*.**z** use:

```
pcat name.z
```

or just:

```
pcat name
```

To make an unpacked copy, say *nnn*, of a packed file named *name*.**z** without destroying *name*.**z**, enter the command:

```
pcat name >nnn
```

Pcat returns the number of files it was unable to unpack. Failure may occur if:

- The filename (exclusive of the **.z**) has more than 12 characters
- The file cannot be opened
- The file does not appear to be the output of *pack*

unpack expands files created by *pack*. For each file *name* specified in the command, a search is made for a file called *name*.**z** (or just *name*, if *name* ends in **.z**). If this file appears to be a packed file, it is replaced by its expanded version. The new file has the **.z** suffix stripped from its name, and has the same access modes, access and modification dates, and owner as those of the packed file.

unpack returns a value that is the number of files it was unable to unpack. Failure may occur for the same reasons that it may in *pcat*, as well as in a file where the "unpacked" name already exists, or if the unpacked file cannot be created.

Name

passwd - Changes login password.

Syntax

passwd name

Description

This command changes (or installs) a password associated with the login *name*.

The program prompts for the old password (if any) and then for the new one (twice). The user must supply these. Passwords can be of any reasonable length, but only the first eight characters of the password are significant. The minimum number of characters allowed in a new password is determined by the PASSLENGTH variable. Although the minimum can be 3, a minimum of 5 characters is strongly recommended since passwords shorter than this are much easier to guess or discover by trial and error.

Only the owner of the name or the super-user may change a password; the owner must prove he knows the old password. Only the super-user can create a null password.

The password file is not changed if the new password is the same as the old password, or if the password has not "aged" sufficiently. See *passwd*(F).

The minimum length of a legal password, and the minimum and maximum number of weeks used in password aging are specified in **/etc/default/passwd** by the variables PASSLENGTH, MINWEEKS and MAXWEEKS. If not explicitly set, the default values for these variables are:

```
PASSLENGTH=5
MINWEEKS=2
MAXWEEKS=4
```

MINWEEKS and MAXWEEKS values must be in the range 0 to 63. If PASSLENGTH is not in the range 3 to 8, it is set to 5.

Notes

When a user changes his or her password, that user's group becomes the group assigned to */etc/passwd*. This can be verified by entering the following command after successfully using *passwd*:

```
1 /etc/passwd
```

Files

/etc/default/passwd
/etc/passwd

See Also

default(F), login(M), passwd(F), pwadmin(ADM)

NAME

pax - Portable archive exchange.

Syntax

pax [**-cimopuvy**] [**-f** *archive*] [**-s** *replstr*] [**-t** *device*] [*pattern...*]

pax -r [**-cimnopuvy**] [**-f** *archive*] [**-s** *replstr*] [**-t** *device*] [*pattern...*]

pax -w [**-adimuvy**] [**-b** *blocking*] [**-f** *archive*] [**-s** *replstr*] [**-t** *device*] [**-x***format*] [*pathname...*]

pax -rw [**-ilmopuvy**] [**-s** *replstr*] [*pathname...*] directory

Description

pax reads and writes archive files which conform to the **Archive/Interchange File Format** specified in *IEEE Std. 1003.1-1988*. *pax* can also read, but not write, a number of other file formats in addition to those specified in the **Archive/Interchange File Format** description. Support for these traditional file formats, such as V7 *tar* and System V binary *cpio* format archives, is provided for backward compatibility and to maximize portability.

pax will also support traditional *cpio* and System V *tar* interfaces if invoked with the name "cpio" or "tar" respectively. See the *cpio*(C) or *tar*(C) manual pages for more details.

Combinations of the **-r** and **-w** command line arguments specify whether *pax* will read, write or list the contents of the specified archive, or move the specified files to another directory.

The command line arguments are:

-w writes the files and directories specified by *pathname* operands to the standard output together with the pathname and status information prescribed by the archive format used. A directory *pathname* operand refers to the files and (recursively) subdirectories of that directory. If no *pathname* operands are given, then the standard input is read to get a list of pathnames to copy, one pathname per line. In this case, only those pathnames appearing on the standard input are copied.

-r *pax* reads an archive file from the standard input. Only files with names that match any of the *pattern* operands are selected for extraction. The selected files are conditionally created and copied relative to the current directory tree, subject to the options described below. By default, the owner and group of selected files will be that of the invoking process, and the

permissions and modification times will be the sames as those in the archive.

The supported archive formats are automatically detected on input. The default output format is *ustar*, but may be overridden by the **-x** *format* option described below.

-rw *pax* reads the files and directories named in the *pathname* operands and copies them to the destination *directory*. A directory *pathname* operand refers to the files and (recursively) subdirectories of that directory. If no *pathname* operands are given, the standard input is read to get a list of pathnames to copy, one pathname per line. In this case, only those pathnames appearing on the standard input are copied. The directory named by the *directory* operand must exist and have the proper permissions before the copy can occur.

If neither the **-r** or **-w** options are given, then *pax* will list the contents of the specified archive. In this mode, *pax* lists normal files one per line, hard link pathnames as

pathname == linkname

and symbolic link pathnames (if supported by the implementation) as

pathname -> linkname

where *pathname* is the name of the file being extracted, and *linkname* is the name of a file which appeared earlier in the archive.

If the **-v** option is specified, then *pax* list normal pathnames in the same format used by the *ls* utility with the **-l** option. Hard links are shown as

<ls -l listing> == linkname

and symbolic links (if supported) are shown as

<ls -l listing> -> linkname

pax is capable of reading and writing archives which span multiple physical volumes. Upon detecting an end of medium on an archive which is not yet completed, *pax* will prompt the user for the next volume of the archive and will allow the user to specify the location of the next volume.

Options

The following options are available:

-a The files specified by *pathname* are appended to the specified archive.

-b *blocking* Block the output at *blocking* bytes per write to the archive file. A **k** suffix multiplies *blocking* by 1024, a **b** suffix multiplies *blocking* by 512 and a **m** suffix multiplies *blocking* by 1048576 (1 megabyte). If not specified, *blocking* is automatically determined on input and is ignored for **-rw.**

-c Complement the match sense of the the *pattern* operands.

-d Intermediate directories not explicitly listed in the archive are not created. This option is ignored unless the **-r** option is specified.

-f *archive* The *archive* option specifies the pathname of the input or output archive, overriding the default of standard input for **-r** or standard output for **-w**.

-i Interactively rename files. Substitutions specified by **-s** options (described below) are performed before requesting the new file name from the user. A file is skipped if an empty line is entered and *pax* exits with an exit status of 0 if **EOF** is encountered.

-l Files are linked rather than copied when possible.

-m File modification times are not retained.

-n When **-r** is specified, but **-w** is not, the *pattern* arguments are treated as ordinary file names. Only the first occurrence of each of these files in the input archive is read. The **pax** utility exits with a zero exit status after all files in the list have been read. If one or more files in the list is not found, **pax** writes a diagnostic to standard error for each of the files and exits with a non-zero exit status. the file names are compared before any of the **-i**, **-s**, or **-y** options are applied.

-o Restore file ownership as specified in the archive. The invoking process must have appropriate privileges to accomplish this.

-p Preserve the access time of the input files after they have been copied.

-s *replstr* File names are modified according to the substitution expression using the syntax of *ed(C)* as shown:

-s */old/new/*[gp]

Any non null character may be used as a delimiter (a / is used here as an example). Multiple **-s** expressions may be specified; the expressions are applied in the order specified terminating with the first successful substitution. The optional trailing **p** causes successful mappings to be listed on standard error. The optional trailing **g** causes the *old* expression to be replaced each time it occurs in the source string. Files that substitute to an empty string are ignored both on input and output.

-t *device* The *device* option argument is an implementation-defined identifier that names the input or output archive device, overriding the default of standard input for **-r** and standard output for **-w**.

-u Copy each file only if it is newer than a pre-existing file with the same name. This implies **-a**.

-v List file names as they are encountered. Produces a verbose table of contents listing on the standard output when both **-r** and **-w** are omitted, otherwise the file names are printed to standard error as they are encountered in the archive.

-x *format* Specifies the output archive *format*. The input format, which must be one of the following, is automatically determined when the **-r** option is used. The supported formats are:

cpio The extended *CPIO* interchange format specified in **Extended CPIO Format in** *IEEE Std. 1003.1-1988*.

ustar The extended *TAR* interchange format specified in **Extended TAR Format in** *IEEE Std. 1003.1-1988*. This is the default archive format.

-y Interactively prompt for the disposition of each file. Substitutions specified by **-s** options (described above) are performed before prompting the user for disposition. **EOF** or an input line starting with the character **q** caused *pax* to exit. Otherwise, an input line starting with anything other than **y** causes the file to be ignored. This option cannot be used in conjunction with the **-i** option.

Only the last of multiple **-f** or **-t** options take effect.

When writing to an archive, the standard input is used as a list of pathnames if no *pathname* operands are specified. The format is one pathname per line. Otherwise, the standard input is the archive file, which is formatted according to one of the specifications in **Archive/Interchange File format** in *IEEE Std. 1003.1-1988*, or some

other implementation-de fined format.

The user ID and group ID of the process, together with the appropriate privileges, affect the ability of *pax* to restore ownership and permissions attributes of the archived files. (See *format-reading utility* in **Archive/Interchange File Format** in *IEEE Std. 1003.1-1988*.)

The options **-a**, **-c**, **-d**, **-i**, **-l**, **-p**, **-t**, **-u**, and **-y** are provided for functional compatibility with the historical *cpio* and *tar* utilities. The option defaults were chosen based on the most common usage of these options, therefore, some of the options have meanings different than those of the historical commands.

Operands

The following operands are available:

directory The destination directory pathname for copies when both the **-r** and **-w** options are specified. The directory must exist and be writable before the copy or and error results.

pathname A file whose contents are used instead of the files named on the standard input. When a directory is named, all of its files and (recursively) subdirectories are copied as well.

pattern A *pattern* is given in the standard shell pattern matching notation. The default if no *pattern* is specified is *, which selects all files.

Examples

The following command

```
pax -w -f /dev/rmt0 .
```

copies the contents of the current directory to tape drive 0.

The commands

```
mkdir newdir
cd olddir
pax -rw . newdir
```

copies the contents of *olddir* to *newdir* .

The command

```
pax -r -s ',//*usr//*,,' -f pax.out
```

reads the archive **pax.out** with all files rooted in "/usr" in the archive extracted relative to the current directory.

Files

/dev/tty	used to prompt the user for information when the **-i** or **-y** options are specified.

See Also

cpio(C), find(C), pcpio(C), tar(C), tar(F)

Diagnostics

pax will terminate immediately, without processing any additional files on the command line or in the archive.

pax will exit with one of the following values:

0 All files in the archive were processed successfully.

>0 *pax* aborted due to errors encountered during operation.

Notes

Special permissions may be required to copy or extract special files.

Device, user ID, and group ID numbers larger than 65535 cause additional header records to be output. These records are ignored by some historical version of *cpio(C)* and *tar(C)*.

The archive formats described in **Archive/Interchange File Format** have certain restrictions that have been carried over from historical usage. For example, there are restrictions on the length of pathnames stored in the archive.

When getting an "ls -l" style listing on *tar* format archives, link counts are listed as zero since the *ustar* archive format does not keep link count information.

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NAME

pcpio - Copy file archives in and out.

Syntax

pcpio -o[Bacv]
pcpio -i[Bcdfmrtuv] [*pattern...*]
pcpio -p[adlmruv] *directory*

Description

The **pcpio** utility produces and reads files in the format specified by the **cpio Archive/Interchange File Format** specified in *IEEE Std. 1003.1-1988*.

The **pcpio -i** (copy in) utility extracts files from the standard input, which is assumed to be the product of a previous **pcpio -o .** Only files with names that match *patterns* are selected. Multiple *patterns* may be specified and if no *patterns* are specified, the default for *patterns* is selecting all files. The extracted files are conditionally created and copied into the current directory, and possibly any levels below, based upon the options described below and the permissions of the files will be those of the previous **pcpio -o .** The owner and group of the files will be that of the current user unless the user has appropriate privileges, which causes **pcpio** to retains the owner and group of the files of the previous **pcpio -o .**

The **pcpio -p** (pass) utility reads the standard input to obtain a list of path names of files that are conditionally created and copied into the destination *directory* based upon the options described below.

If an error is detected, the cause is reported and the **pcpio** utility will continue to copy other files. **pcpio** will skip over any unrecognized files which it encounters in the archive.

The following restrictions apply to the **pcpio** utility:

1 Pathnames are restricted to 256 characters.

2 Appropriate privileges are required to copy special files.

3 Blocks are reported in 512-byte quantities.

Options

The following options are available:

-B Input/output is to be blocked 5120 bytes to the record. Can only be used with **pcpio -o** or **pcpio -i** for data that is directed to or from character special files.

-a Reset access times of input files after they have been copied. When the **-l** option is also specified, the linked files do not have their access times reset. Can only be used with **pcpio -o** or **pcpio -i .**

-c Write header information in ASCII character for for portability. Can only be used with **pcpio -i** or **pcpio -o .** Note that this option should always be used to write portable files.

-d Creates directories as needed. Can only be used with **pcpio -i** or **pcpio -p .**

-f Copy in all files except those in *patterns* . Can only be used with **pcpio -i .**

-l Whenever possible, link files rather than copying them. Can only be used with **pcpio -p .**

-m Retain previous modification times. This option is ineffective on directories that are being copied. Can only be used with **pcpio -i** or **pcpio -p .**

-r Interactively rename files. The user is asked whether to rename *pattern* each invocation. Read and write permissions for **/dev/tty** are required for this option. If the user types a null line, the file is skipped. Should only be used with **pcpio -i** or **pcpio -o .**

-t Print a table of contents of the input. No files are created. Can only be used with **pcpio -i .**

-u Copy files unconditionally; usually an older file will not replace a new file with the same name. Can only be used with **pcpio -i** or **pcpio -p .**

-v Verbose: cause the names of the affected files to be printed. Can only be used with **pcpio -i .** Provides a detailed listing when used with the **-t** option.

Operands

The following operands are available:

patterns Simple regular expressions given in the name-generating notation of the shell.

directory The destination directory.

Exit Status

The **pcpio** utility exits with one of the following values:

0 All input files were copied.

2 The utility encountered errors in copying or accessing files or directories. An error will be reported for nonexistent files or directories, or permissions that do not allow the user to access the source or target files.

It is important to use the **-depth** option of the **find** utility to generate pathnames for **pcpio .** This eliminates problems **pcpio** could have trying to create files under read-only directories.

The following command:

```
ls | pcpio -o > ../newfile
```

copies out the files listed by the **ls** utility and redirects them to the file **newfile .**

The following command:

```
cat newfile | pcpio -id "memo/al" "memo/b*"
```

uses the output file **newfile** from the **pcpio -o** utility, takes those files that match the patterns **memo/al** and **memo/b* ,** creates the directories below the current directory, and places the files in the appropriate directories.

The command

```
find . -depth -print | pcpio -pdlmv newdir
```

takes the file names piped to it from the **find** utility and copies or links those files to another directory named **newdir ,** while retaining the modification time.

Files

/dev/tty — used to prompt the user for information when the **-i** or **-r** options are specified.

See Also

find(C), pax(C), tar(C), tar(F)

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Name

pg - Paginates display for soft-copy terminals.

Syntax

pg [- number] [**-p** string] [**-cefns**] [+ linenumber] [+/ pattern /]
[files ...]

Description

The *pg* command is a filter which allows the examination of *files* one screenful at a time on a soft-copy terminal. (The dash (-) command line option and/or NULL arguments indicate that *pg* should read from the standard input.) Each screenful is followed by a prompt. If you press the RETURN key, another page is displayed; other possibilities are listed below. This command is different from previous paginators because it allows you to back up and review something that has already passed.

To determine terminal attributes, *pg* scans the *termcap*(M) data base for the terminal type specified by the environment variable **TERM**. If **TERM** is not defined, the terminal type **dumb** is assumed.

The command line options are:

-number Specifies the size (in lines) of the window that *pg* is to use instead of the default. (On a terminal containing 24 lines, the default window size is 23.)

-p *string* Causes *pg* to use *string* as the prompt. If the prompt string contains a "%d", the first occurrence of "%d" in the prompt will be replaced by the current page number when the prompt is issued. The default prompt string is a colon (:).

-c Homes the cursor and clears the screen before displaying each page. This option is ignored if **cl** is not defined for this terminal type in the *termcap*(M) data base.

-e Causes *pg not* to pause at the end of each file.

-f Inhibits *pg* from splitting lines. In the absence of the **-f** option, *pg* splits lines longer than the screen width, but some sequences of characters in the displayed text (for example, escape sequences for underlining) give undesirable results.

-n Normally, commands must be terminated by pressing the RETURN key (ASCII newline character). This option causes an automatic end of command as soon as a command letter is entered.

-s Causes *pg* to display all messages and prompts in standout mode (usually inverse video).

+linenumber Starts up at *linenumber*.

+/pattern/ Starts up at the first line containing the regular expression pattern.

The responses that may be entered when *pg* pauses can be divided into three categories: those that cause further perusal, those that search, and those that modify the perusal environment.

Commands which cause further perusal normally take a preceding *address* (an optionally signed number indicating the point from which further text should be displayed). *pg* interprets this *address* in either pages or lines depending on the command. A signed *address* specifies a point relative to the current page or line, and an unsigned *address* specifies an address relative to the beginning of the file. Each command has a default address if no address is provided.

The perusal commands and their defaults are as follows:

(+1)RETURNkey
Causes one page to be displayed. The *address* is specified in pages.

(+1) **l**
With a signed *address*, causes *pg* to simulate scrolling the screen, forward or backward, the number of lines specified. With an unsigned *address* this command displays a full screen of text beginning at the specified line.

(+1) **d** or **Ctrl-D**
Simulates scrolling half a screen forward or backward.

The following perusal commands take no *address*:

. or **Ctrl-L**
Causes the current page of text to be redisplayed.

$ Displays the last windowfull of text in the file. Use with caution when the input is a pipe.

The following commands are available for searching for text patterns in the text. The regular expressions described in *ed*(C) are available. They must always be terminated by a newline character, even if the *-n* option is specified.

i/*pattern*/
Search forward for the *i*th (default *i*=1) occurrence of *pattern*. Searching begins immediately after the current page and continues to the end of the current file, without wrap-around.

i^*pattern*^
i?*pattern*?
Search backwards for the *i*th (default *i*=1) occurrence of *pattern*. Searching begins immediately before the current page and continues to the beginning of the current file, without wrap-around. The caret (^) notation is useful for terminals which will not properly handle the question mark (?).

After searching, *pg* displays the line found at the top of the screen. You can modify this by appending **m** or **b** to the search command to leave the line found in the middle or at the bottom of the window from now on. Use the suffix **t** to restore the original situation.

The following commands modify the environment of perusal:

*i***n** Begins perusing the *i*th next file in the command line. The default value of *i* is 1.

*i***w** Displays another window of text. If *i* is present, set the window size to *i*.

s*filename*
Saves the input in the named file. Only the current file being perused is saved. The white space between the **s** and *filename* is optional. This command must always be terminated by a newline character, even if the *-n* option is specified.

h Help displays abbreviated summary of available commands.

q or **Q** Quit *pg*.

!*command*
command is passed to the shell, whose name is taken from the **SHELL** environment variable. If this is not available, the default shell is used. This command must always be terminated by a newline character, even if the *-n* option is specified.

At any time when output is being sent to the terminal, the user can press the quit key (normally Ctrl-\) or the INTERRUPT (BREAK) key. This causes *pg* to stop sending output, and display the prompt. The user may then enter one of the above commands in the normal manner. Unfortunately, some output is lost when this is done, because any characters waiting in the terminal's output queue are flushed when the quit signal occurs.

If the standard output is not a terminal, then *pg* acts just like *cat*(C), except that a header is printed before each file (if there is more than one).

Example

To use *pg* to read system news, enter:

```
news | pg -p "(Page %d):"
```

Files

/etc/termcap	Terminal information data base
/tmp/pg*	Temporary file when input is from a pipe

See Also

ed(C), grep(C), termcap(M)

Notes

If terminal tabs are not set every eight positions, undesirable results may occur.

When using *pg* as a filter with another command that changes the terminal I/O options terminal settings may not be restored correctly.

While waiting for terminal input, *pg* responds to BREAK and DEL by terminating execution. Between prompts, however, these signals interrupt *pg*'s current task and place you in prompt mode. Use these signals with caution when input is being read from a pipe, since an interrupt is likely to terminate the other commands in the pipeline.

The **z** and **f** commands used with *more* are available, and the final slash (/), caret (^), or question mark (?) may be omitted from the searching commands.

Name

pr - Prints files on the standard output.

Syntax

pr [options] [files]

Description

pr prints the named files on the standard output. If *file* is **-**, or if no files are specified, the standard input is assumed. By default, the listing is separated into pages, each headed by the page number, date and time, and the name of the file.

By default, columns are of equal width, separated by at least one space; lines which do not fit are truncated. If the **-s** option is used, lines are not truncated and columns are separated by the separation character.

If the standard output is associated with a terminal, error messages are withheld until *pr* has completed printing.

Options may appear singly or combined in any order. Their meanings are:

+*k* Begins printing with page *k* (default is 1).

-*k* Produces *k*-column output (default is 1). The options **-e** and **-i** are assumed for multicolumn output.

-a Prints multicolumn output across the page.

-m Merges and prints all files simultaneously, one per column (overrides the **-***k*, and **-a** options).

-d Double-spaces the output.

-e*ck* Expands *input* tabs to character positions *k*+1, 2**k*+1, 3**k*+1, etc. If *k* is 0 or is omitted, default tab settings at every 8th position are assumed. Tab characters in the input are expanded into the appropriate number of spaces. If *c* (any nondigit character) is given, it is treated as the input tab character (default for *c* is the tab character).

-i*ck* In *output*, replaces whitespace wherever possible by inserting tabs to character positions *k*+1, 2**k*+1, 3**k*+1, etc. If *k* is 0 or is omitted, default tab settings at every 8th position are assumed. If *c* (any nondigit character) is given, it is treated as the output tab character (default for *c* is the tab character).

-n*ck* Provides *k*-digit line numbering (default for *k* is 5). The number occupies the first *k*+1 character positions of each column of normal output or each line of **-m** output. If *c* (any nondigit character) is given, it is appended to the line number to separate it from whatever follows (default for *c* is a tab).

-w*k* Sets the width of a line to *k* character positions (default is 72 for equal-width multicolumn output, no limit otherwise).

-o*k* Offsets each line by *k* character positions (default is 0). The number of character positions per line is the sum of the width and offset.

-l*k* Sets the length of a page to *k* lines (default is 66).

-h Uses the next argument as the header to be printed instead of the filename.

-p Pauses before beginning each page if the output is directed to a terminal (*pr* will ring the bell at the terminal and wait for a carriage return).

-f Uses the form feed character for new pages (default is to use a sequence of linefeeds). Pauses before beginning the first page if the standard output is associated with a terminal.

-r Prints no diagnostic reports on failure to open files.

-t Prints neither the 5-line identifying header nor the 5-line trailer normally supplied for each page. Quits printing after the last line of each file without spacing to the end of the page.

-s*c* Separates columns by the single character *c* instead of by the appropriate number of spaces (default for *c* is a tab).

Examples

The following prints *file1* and *file2* as a double-spaced, three-column listing headed by "file list":

```
pr -3dh "file list" file1 file2
```

The following writes **file1** on **file2**, expanding tabs to columns 10, 19, 28, 37, . . . :

```
pr -e9 -t <file1 >file2
```

See Also

cat(C)

Name

ps - Reports process status.

Syntax

ps [options]

Description

ps prints certain information about active processes. Without *options*, information is printed about processes associated with the current terminal. Otherwise, the information that is displayed is controlled by the following *options*:

-e Prints information about all processes.

-d Prints information about all processes, except process group leaders.

-a Prints information about all processes, except process group leaders and processes not associated with a terminal.

-f Generates a *full* listing. (Normally, a short listing containing only process ID, terminal ("tty") identifier, cumulative execution time, and the command name is printed.) See below for meaning of columns in a full listing.

-l Generates a *long* listing. See below.

-c *corefile* Uses the file *corefile* in place of **/dev/mem**.

-s *swapdev* Uses the file *swapdev* in place of **/dev/swap**. This is useful when examining a *corefile*.

-n *namelist* The argument is taken as the name of an alternate *namelist* (**/xenix** is the default).

-t *tlist* Restricts listing to data about the processes associated with the terminals given in *tlist*, where *tlist* can be in one of two forms: a list of terminal identifiers separated from one another by a comma, or a list of terminal identifiers enclosed in double quotes and separated from one another by a comma and/or one or more spaces.

-p *plist* Restricts listing to data about processes whose process ID numbers are given in *plist*, where *plist* is in the same format as *tlist*.

-u *ulist* Restricts listing to data about processes whose user ID numbers or login names are given in *ulist*, where *ulist* is in the same format as *tlist*. In the listing, the numerical user ID is printed unless the **-f** option is used, in which case the login name is printed.

-g *glist* Restricts listing to data about processes whose process groups are given in *glist*, where *glist* is a list of process group leaders and is in the same format as *tlist*.

The column headings and the meaning of the columns in a *ps* listing are given below; the letters **f** and **l** indicate the option (*full* or *long*) that causes the corresponding heading to appear; **all** means that the heading always appears. Note that these two options only determine what information is provided for a process; they do *not* determine which processes will be listed.

F (l) A status word consisting of flags associated with the process. Each flag is associated with a bit in the status word. These flags are added to form a single octal number. Process flag bits and their meanings are:

01	in core;
02	system process;
04	locked in core (e.g., for physical I/O);
10	being swapped;
20	being traced by another process.

S (l) The state of the process:

0	non-existent;
S	sleeping;
W	waiting;
R	running;
I	intermediate;
Z	terminated;
T	stopped;
B	waiting.

UID (f,l) The user ID number of the process owner; the login name is printed under the **-f** option. Login names are truncated after 7 characters.

PID (all) The process ID of the process; it is possible to kill a process if you know this number.

PPID (f,l) The process ID of the parent process.

C (f,l) Processor utilization for scheduling.

STIME (f) Starting time of the process.

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

NI	(l)	Nice value; used in priority computation.
ADDR	(l)	The memory address of the process, if resident; otherwise, the disk address.
SZ	(l)	The size in blocks of the core image of the process, but not including the size of text shared with other processes. Since this size includes the current size of the stack, it will vary as the stack size varies.
WCHAN	(l)	The event for which the process is waiting or sleeping; if blank, the process is running.
TTY	(all)	The controlling terminal for the process.
TIME	(all)	The cumulative execution time for the process.
CMD	(all)	The command name; the full command name and its arguments are printed under the **-f** option. A process that has exited and has a parent, but has not yet been waited for by the parent, is marked **<defunct>**.

Under the **-f** option, *ps* tries to determine the command name and arguments given when the process was created by examining memory or the swap area. Failing this, the command name, as it would appear without the **-f** option, is printed in square brackets.

Files

/xenix	system namelist
/dev/mem	memory
/dev	searched to find swap device and terminal ("tty") names.

See Also

kill(C), nice(C)

Notes

Things can change while *ps* is running; the picture it gives is only a close approximation to reality.

Some data printed for defunct processes are irrelevant.

Name

pstat - Reports system information.

Syntax

pstat [**-aixpf**] [**-u** ubase] [**-c** corefile] [**-n** namelist] [file]

Description

pstat interprets the contents of certain system tables. *pstat* searches for these tables in **/dev/mem** and **/dev/kmem**.

Options

The available options are as follows:

-a Under **-p**, describe all process slots rather than just active ones.

-i Print the inode table with these headings:

LOC The core location of this table entry.

FLAGS Miscellaneous state variables encoded thus:

- L Locked
- U Update time
- A Access time must be corrected
- M File system is mounted here
- W Wanted by another process (L flag is on)
- T Contains a text (executable image) file
- C Changed time must be corrected

CNT Number of open file table entries for this inode.

DEV Major and minor device number of file system in which this inode resides.

INO I-number within the device.

MODE Mode bits, see *chmod*(S).

NLK Number of links to this inode.

UID User ID of owner.

SIZ/DEV Number of bytes in an ordinary file, or major and minor device of special file.

-x Prints the text (executable code segment) table with these headings (XENIX-286 only):

LOC The core location of this table entry.

FLAGS Miscellaneous state variables encoded thus:

- T *ptrace*(S) in effect
- W Text not yet written on swap device

L Loading in progress
K Locked
w Wanted (L flag is on)

DADDR Disk address in swap, measured in multiples of BSIZE bytes.

CADDR Core address, measured in units of memory management resolution.

SIZE Size of text segment, measured in units of memory management resolution.

IPTR Core location of corresponding inode.

CNT Number of processes using this text segment.

CCNT Number of processes in core using this text segment.

-p Prints process table for active processes with these headings:

LOC The core location of this table entry.

S Run state encoded thus:
0 No process
1 Waiting for some event
3 Runnable
4 Being created
5 Being terminated
6 Stopped under trace

F Miscellaneous state variables, ORed together:
01 Loaded
02 The scheduler process
04 Locked
010
Swapped out
020
Traced
040
Used in tracing
0100
Locked in by *lock*(S).

PRI Scheduling priority, see *nice*(S).

SIGNAL Signals received (signals 1-16 coded in bits 0-15).

UID Real user ID.

TIM Time resident in seconds; times over 127 coded as 127.

CPU Weighted integral of CPU time, for scheduler.

NI Nice level, see *nice*(S).

PGRP Process number of root of process group (the opener of the controlling terminal).

PID The process ID number.

PPID The process ID of parent process.

ADDR1, ADDR2
If in core, the physical page frame numbers of the u-area of the process. These numbers can be translated into the addresses of the u-area, which is split and stored in two pages. If swapped out,

the position in the swap area is measured in multiples of BSIZE bytes.

WCHAN
: Wait channel number of a waiting process.

LINK
: Link pointer in list of runnable processes.

TEXTP
: If text is pure, pointer to location of text table entry (286 only).

INODP
: Pointer to location of shared inode (386 only).

CLKT
: Countdown for *alarm*(S) measured in seconds.

-t
: Print table for terminals with these headings:

  RAW
  : Number of characters in raw input queue.

  CAN
  : Number of characters in canonicalized input queue.

  OUT
  : Number of characters in output queue.

  IMODE
  : Corresponds to c_iflag field in termio structure, see *tty*(M).

  OMODE
  : Corresponds to c_oflag field in termio structure, see *tty*(M).

  CMODE
  : Corresponds to c_cflag field in termio structure, see *tty*(M).

  LMODE
  : Corresponds to c_lflag field in termio structure, see *tty*(M).

  ADDR
  : Physical device address.

  DEL
  : Number of delimiters (newlines) in canonicalized input queue.

  COL
  : Calculated column position of terminal.

  STATE
  : Miscellaneous state variables:
    W waiting for open to complete
    O open
    S has special (output) start routine
    C carrier is on
    B busy doing output
    A process is awaiting output
    X open for exclusive use
    H hangup on close

  PGRP
  : Process group for controlling terminal.

-f
: Print the open file table with these headings:

  LOC
  : The core location of this table entry.

  FLG
  : Miscellaneous state variables:
    R Open for reading
    W Open for writing
    P Pipe

  CNT
  : Number of processes that know this open file.

  INO
  : The location of the inode table entry for this file.

  OFFS
  : The file offset, see *lseek*(S).

-u *ubase*
: Print information about a user process. *ubase* is the hexadecimal location of the process in main memory. The address can be obtained by using the long listing (**-l** option) of the *ps*(C) command.

-c *corefile*
Use the file *corefile* in place of **/dev/kmem.**
-n *namelist*
Use the file *namelist* as an alternate namelist in place of **/xenix.**
file Source or tables as an alternate to **/dev/mem.**

Files

/xenix Namelist

/dev/mem Default source of tables

See Also

ps(C), stat(S), filesystem(F)

Name

ptar - Process tape archives.

Syntax

ptar -c[**bfvw**] *device block filename...*
ptar -r[**bvw**] *device block* [*filename...*]
ptar -t[**fv**] *device*
ptar -u[**bvw**] *device block*
ptar -x[**flmovw**] *device* [*filename...*]

Description

Tar reads and writes archive files which conform to the **Archive/Interchange File Format** specified in *IEEE Std. 1003.1-1988*.

Options

The following options are available:

-c Creates a new archive; writing begins at the beginning of the archive, instead of after the last file.

-r Writes names files to the end of the archive.

-t Lists the names of all of the files in the archive.

-u Causes named files to be added to the archive if they are not already there, or have been modified since last written into the archive. This implies the **-r** option.

-x Extracts named files from the archive. If a named file matches a directory whose contents had been written onto the archive, that directory is recursively extracted. If a named file in the archive does not exist on the system, the file is create with the same mode as the one in the archive, except that the set-user-id and get-group-id modes are not set unless the user has appropriate privileges.

If the files exist, their modes are not changed except as described above. The owner, group and modification time are restored if possible. If no *filename* argument is given, the entire contents of the archive is extracted. Note that if several files with the same name are in the archive, the last one will overwrite all earlier ones.

-b Causes *ptar* to use the next argument on the command line as the blocking factor for tape records. The default is 1; the maximum is 20. This option should only be used with raw magnetic tape archives. Normally, the block size is determined automatically when reading tapes.

-f Causes *ptar* to use the next argument on the command line as the name of the archive instead of the default, which is usually a tape drive. If - is specified as a filename *ptar* writes to the standard output or reads from the standard input, whichever is appropriate for the options given. Thus, *ptar* can be used as the head or tail of a pipeline.

-l Tells *ptar* to report if it cannot resolve all of the links to the files being archived. If **-l** is not specified, no error messages are written to the standard output. This modifier is only valid with the **-c**, **-r** and **-u** options.

-m Tells *ptar* not to restore the modification times. The modification time of the file will be the time of extraction. This modifier is invalid with th **-t** option.

-o Causes extracted files to take on the user and group identifier of the user running the program rather than those on the archive. This modifier is only valid with the **-x** option.

-v Causes *ptar* to operate verbosely. Usually, *ptar* does its work silently, but the **v** modifier causes it to print the name of each file it processes, preceded by the option letter. With the **-t** option, **v** gives more information about the archive entries than just the name.

-w Causes *ptar* to print the action to be taken, followed by the name of the file, and then wait for the user's confirmation. If a word beginning with **y** is given, the action is performed. Any other input means "no". This modifier is invalid with the **-t** option.

Files

/dev/tty used to prompt the user for information when the **-i** or **-y** options are specified.

See Also

cpio(C), dd(C), find(C), pax(C), pcpio(C)

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Name

pwcheck - Checks password file.

Syntax

pwcheck [file]

Description

pwcheck scans the password file and checks for any inconsistencies. The checks include validation of the number of fields, login name, user ID, group ID, and whether the login directory and optional program name exist. The default password file is **/etc/passwd**.

Files

/etc/passwd

See Also

grpcheck(C), group(F), passwd(F)

Name

pwd - Prints working directory name.

Syntax

pwd

Description

pwd prints the pathname of the working (current) directory.

See Also

cd(C)

Diagnostics

"Cannot open .." and "Read error in .." indicate possible file system trouble. In such cases, see the XENIX *System Administrator's Guide* for information on fixing the file system.

Name

quot - Summarizes file system ownership.

Syntax

quot [option] ... [filesystem]

Description

quot prints the number of blocks in the named *filesystem* currently owned by each user. If no *filesystem* is named, the file systems given in **/etc/mnttab** are examined.

The following options are available:

-n Processes standard input. This option makes it possible to produce a list of all files and their owners with the following command:

```
ncheck filesystem | sort +0n | quot -n filesystem
```

-c Prints three columns giving file size in blocks, number of files of that size, and cumulative total of blocks in that size or smaller file. Data for files of size greater than 499 blocks are included in the figures for files of exactly size 499.

-f Prints a count of the number of files as well as space owned by each user.

Files

/etc/passwd	Gets user names
/etc/mnttab	Contains list of mounted file systems

See Also

cmchk(C), du(C), ls(C), machine(M)

Notes

Holes in files are counted as if they actually occupied space. Blocks are reported in 512 byte blocks. See also *Notes* under *mount*(ADM).

Name

random - Generates a random number.

Syntax

random [-s] [scale]

Description

random generates a random number on the standard output. and returns the number as its exit value. By default, this number is either 0 or 1 (i.e., *scale* is 1 by default). 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, 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(S)

Notes

This command does not perform any floating point computations.

random uses the time of day as a seed.

ranlib - Converts archives to random libraries.

Syntax

ranlib archive...

Description

ranlib converts each *archive* to a form which can be loaded more rapidly by the loader, by adding a table of contents named **__.SYMDEF** to the beginning of the archive. It uses *ar*(C) to reconstruct the archive, so sufficient temporary file space must be available in the file system containing the current directory.

See Also

ld(CP), ar(C), copy(C), settime(ADM)

Notes

Failure to process a library with *ranlib*, or failure to reprocess a library with *ranlib*, will cause *ld* to fail. Because generation of a library by *ar* and randomization by *ranlib* are separate, phase errors are possible. The loader *ld* warns when the modification date of a library is more recent than the creation of its dictionary; but this means you get the warning even if you only copy the library.

Name

rcp - Copies files across XENIX micnet networks.

Syntax

rcp [options] [srcmachine:]srcfile [destmachine:]destfile

Description

rcp copies files between systems in a Micnet network. The command copies the *srcmachine:srcfile* to *destmachine:destfile* , where *srcmachine*: and *destmachine*: are optional names of systems in the network, and *srcfile* and *destfile* are pathnames of files. If a machine name is not given, the name of the current system is assumed. If - is given in place of *srcfile*, *rcp* uses the standard input as the source. Directories named on the destination machine must have write permission, and directories and files named on a remote source machine must have read permission.

The available options are:

-m
Mails and reports completion of the command, whether there is an error or not.

-u [*machine*:]*user*
Any mail goes to the named *user* on *machine*. The default *machine* is the machine on which the *rcp* command is completed or on which an error was detected. If an alias for *user* exists in the system alias files on that *machine*, the mail will be redirected to the appropriate mailbox(es). Since system alias files are usually identical throughout the network, any specified *machine* will most likely be overridden by the aliasing mechanism. To prevent aliasing, *user* must be escaped with at least two \ characters (at least four if given as a shell command).

rcp is useful for transferring small numbers of files across the network. The network consists of daemons that periodically awaken and send files from one system to another. The network must be installed using *netutil* (ADM) before *rcp* can be used.

Also, to enable transfer of files from a remote system, either:

This line should be in */etc/default/micnet* on the systems in the network:

```
rcp=/usr/bin/rcp
```

Or, these lines should be in that file:

```
executeall
execpath=PATH=path
```

where *path* must contain */usr/bin*.

Example

```
rcp -m machine1:/etc/mnttab  /tmp/vtape
```

See Also

mail(C), micnet(F), netutil(ADM), remote(C)

Diagnostics

If an error occurs, mail is sent to the user.

Notes

Full pathnames must be specified for remote files.

rcp handles binary data files transparently, no extra options or protocols are needed to handle them. Wildcards are not expanded on the remote machine.

Name

remote - Executes commands on a remote XENIX system over a micnet network.

Syntax

remote [-] [-f file] [-m] [-u user] machine
command [arguments]

Description

remote is a limited networking facility that permits execution of XENIX commands across serial lines. Commands on any connected system may be executed from the host system using *remote*. A command line consisting of *command* and any blank-separated *arguments* is executed on the remote *machine*. A machine's name is located in the file **/etc/systemid**. Note that wild cards are *not* expanded on the remote machine, so they should not be specified in *arguments*. The optional **-m** switch causes mail to be sent to the user telling whether the command is successful.

The available options follow:

- A dash signifies that standard input is used as the standard input for *command* on the remote *machine*. Standard input comes from the local host and not from the remote machine.

-f *file* Use the specified *file* as the standard input for *command* on the remote *machine*. The *file* exists on the local host and not on the remote machine.

-m Mails the user to report completion of the command. By default, mail reports only errors.

-u *user* Any mail goes to the named *user* on *machine*. The default *machine* is the machine on which an error was detected, or on which the *remote* command was completed. The mail will be redirected to the appropriate mailbox(es), if an alias for *user* exists in the system alias files on that *machine* . Since system alias files are usually identical throughout the network, any specified *machine* will most likely be overridden by the aliasing mechanism. To prevent aliasing, *user* must be escaped with at least two \ characters (at least four if given as a shell command).

Before *remote* can be successfully used, a network of systems must first be set up and the proper daemons initialized using *netutil* (ADM). Also, entries for the command to be executed using *remote* must be added to the */etc/default/micnet* files on each remote machine.

Example

The following command executes an *ls* command on the directory **/tmp** of the machine *machine1* :

```
remote machine1 ls /tmp
```

See Also

rcp(C), mail(C), netutil(ADM), micnet(F)

Notes

The *mail* command uses the equivalent of *remote* to send mail between machines.

Name

rm, rmdir - Removes files or directories.

Syntax

rm [**-fri**] file ...

rmdir dir ...

Description

rm removes the entries for one or more files from a directory. If an entry was the last link to the file, the file is destroyed. Removal of a file requires write permission in its directory, but neither read nor write permission on the file itself.

If a file has no write permission and the standard input is a terminal, its permissions are printed and a line is read from the standard input. If that line begins with **y**, the file is deleted, otherwise the file remains. No questions are asked when the **-f** option is given or if the standard input is not a terminal.

If a designated file is a directory, an error comment is printed unless the optional argument **-r** has been used. In that case, *rm* recursively deletes the entire contents of the specified directory, and the directory itself.

If the **-i** (interactive) option is in effect, *rm* asks whether to delete each file, and if the **-r** option is in effect, whether to examine each directory.

The special option "--" can be used to delimit options. For example, a file named "-f" could not be removed by *rm* because the hyphen is interpreted as an option; the command **rm -f** would do nothing, since no file is specified. Using **rm -- -f** removes the file successfully.

rmdir removes empty directories.

Diagnostics

Generally self-explanatory. It is forbidden to remove the file **..** to avoid the consequences of inadvertently doing something like:

```
rm -r .*
```

It is also forbidden to remove the root directory of a given file system.

No more than 17 levels of subdirectories can be removed using the **-r** option.

Name

rsh - Invokes a restricted shell (command interpreter).

Syntax

rsh [flags] [name [arg1 ...]]

Description

rsh is a restricted version of the standard command interpreter *sh*(C). It is used to set up login names and execution environments whose capabilities are more controlled than those of the standard shell. The actions of *rsh* are identical to those of *sh*, except that changing directory with *cd*, setting the value of $PATH, using command names containing slashes, and redirecting output using > and >> are all disallowed.

When invoked with the name **-rsh**, *rsh* reads the user's **.profile** (from **$HOME/.profile**). It acts as the standard *sh* while doing this, except that an interrupt causes an immediate exit, instead of causing a return to command level. The restrictions above are enforced after **.profile** is interpreted.

When a command to be executed is found to be a shell procedure, *rsh* invokes *sh* to execute it. Thus, it is possible to provide to the end user shell procedures that have access to the full power of the standard shell, while restricting him to a limited menu of commands; this scheme assumes that the end user does not have write and execute permissions in the same directory.

The net effect of these rules is that the writer of the **.profile** has complete control over user actions, by performing guaranteed setup actions, then leaving the user in an appropriate directory (probably *not* the login directory).

rsh is actually just a link to *sh* and any *flags* arguments are the same as for *sh*(C).

The system administrator often sets up a directory of commands that can be safely invoked by *rsh*.

Notes

Simply making a user's login shell *rsh* does not necessarily make the account safe from a security standpoint.

See Also

sh(C), profile(M)

Name

sdiff - Compares files side-by-side.

Syntax

sdiff [options ...] file1 file2

Description

sdiff uses the output of *diff*(C) to produce a side-by-side listing of two files indicating those lines that are different. Each line of the two files is printed with a blank gutter between them if the lines are identical, a < in the gutter if the line only exists in *file1*, a > in the gutter if the line only exists in *file2*, and a | for lines that are different.

For example:

```
x       |       y
a               a
b       <
c       <
d               d
        >       c
```

The following options exist:

-w *n* Uses the next argument, *n*, as the width of the output line. The default line length is 130 characters.

-l Only prints the left side of any lines that are identical.

-s Does not print identical lines.

-o *output* Uses the next argument, *output*, as the name of a third file that is created as a user-controlled merging of *file1* and *file2*. Identical lines of *file1* and *file2* are copied to *output*. Sets of differences, as produced by *diff*(C), are printed; where a set of differences share a common gutter character. After printing each set of differences, *sdiff* prompts the user with a **%** and waits for one of the following user-typed commands:

l Appends the left column to the output file

r Appends the right column to the output file

s Turns on silent mode; does not print identical lines

v Turns off silent mode

e l
Calls the editor with the left column

e r
Calls the editor with the right column

e b
Calls the editor with the concatenation of left and right

e Calls the editor with a zero length file

q Exits from the program

On exit from the editor, the resulting file is concatenated on the end of the *output* file.

See Also

diff(C), ed(C)

Name

sed - Invokes the stream editor.

Syntax

sed [**-n**] [**-e** script] [**-f** sfile] [files]

Description

sed copies the named *files* (standard input default) to the standard output, edited according to a script of commands. The **-e** option causes the script to be read literally from the next argument, which is usually quoted to protect it from the shell. The **-f** option causes the script to be taken from file *sfile*; these options accumulate. If there is just one **-e** option and no **-f** options, the flag **-e** may be omitted. The **-n** option suppresses the default output. A script consists of editing commands, one per line, of the following form:

[address [, address]] function [arguments]

In normal operation, *sed* cyclically copies a line of input into a *pattern space* (unless there is something left after a D command), applies in sequence all commands whose *addresses* select that pattern space, and at the end of the script copies the pattern space to the standard output (except under **-n**) and deletes the pattern space.

A semicolon (;) can be used as a command delimiter.

Some of the commands use a *hold space* to save all or part of the *pattern space* for subsequent retrieval.

An *address* is either a decimal number that counts input lines cumulatively across files, a $ that addresses the last line of input, or a context address, i.e., a */regular expression/* in the style of *ed*(C) modified as follows:

- In a context address, the construction *\?regular expression?*, where *?* is any character, is identical to */regular expression/*. Note that in the context address **\xabc\xdefx**, the second **x** stands for itself, so that the regular expression is **abcxdef**.

- The escape sequence **\n** matches a newline *embedded* in the pattern space.

- A period **.** matches any character except the *terminal* newline of the pattern space.

- A command line with no addresses selects every pattern space.

- A command line with one address selects each pattern space that matches the address.

- A command line with two addresses separated by a comma selects the inclusive range from the first pattern space that matches the first address through the next pattern space that matches the second. (If the second address is a number less than or equal to the line number first selected, only one line is selected.) Thereafter, the process is repeated, looking again for the first address.

Editing commands can be applied only to nonselected pattern spaces by use of the negation function **!** (below).

In the following list of functions, the maximum number of permissible addresses for each function is indicated in parentheses.

The *text* argument consists of one or more lines, all but the last of which end with backslashes to hide the newlines. Backslashes in text are treated like backslashes in the replacement string of an **s** command, and may be used to protect initial blanks and tabs against the stripping that is done on every script line. The *rfile* or *wfile* argument must terminate the command line and must be preceded by exactly one blank. Each *wfile* is created before processing begins. There can be at most 10 distinct *wfile* arguments.

(1) **a**
text
: Appends *text*, placing it on the output before reading the next input line.

(2) **b** *label*
: Branches to the **:** command bearing the *label*. If *label* is empty, branches to the end of the script.

(2) **c**
text
: Changes text by deleting the pattern space and then appending *text*. With 0 or 1 address or at the end of a 2-address range, places *text* on the output and starts the next cycle.

(2) **d**
: Deletes the pattern space and starts the next cycle.

(2) **D**
: Deletes the initial segment of the pattern space through the first newline and starts the next cycle.

(2) **g**
: Replaces the contents of the pattern space with the contents of the hold space.

(2) **G**
: Appends the contents of the hold space to the pattern space.

(2) **h** Replaces the contents of the hold space with the contents of the pattern space.

(2) **H** Appends the contents of the pattern space to the hold space.

(1) **i**
text Insert. Places *text* on the standard output.

(2) **l** Lists the pattern space on the standard output with nonprinting characters spelled in two-digit ASCII and long lines folded.

(2) **n** Copies the pattern space to the standard output. Replaces the pattern space with the next line of input.

(2) **N** Appends the next line of input to the pattern space with an embedded newline. (The current line number changes.)

(2) **p** Prints (copies) the pattern space on the standard output.

(2) **P** Prints (copies) the initial segment of the pattern space through the first newline to the standard output.

(1) **q** Quits *sed* by branching to the end of the script. No new cycle is started.

(2) **r** *rfile* Reads the contents of *rfile* and places them on the output before reading the next input line.

(2)**s**/*regular expression*/*replacement*/*flags*
Substitutes the *replacement* string for instances of the *regular expression* in the pattern space. Any character may be used instead of /. For a more detailed description, see *ed*(C). *Flags* is zero or more of:

n **n**=1-512. Substitute for just the nth occurrence of the *regular expression*.

g Globally substitutes for all nonoverlapping instances of the *regular expression* rather than just the first one.

p Prints the pattern space if a replacement was made.

w *wfile*
Writes the pattern space to *wfile* if a replacement was made.

(2) **t** *label* Branches to the colon (**:**) command bearing *label* if any substitutions have been made since the most recent reading of an input line or execution of a **t** command. If *label* is empty, **t** branches to the end of the script.

(2) **w** *wfile* Writes the pattern space to *wfile*.

(2) **x** Exchanges the contents of the pattern and hold spaces.

(2) **y**/*string1* /*string2* /
Replaces all occurrences of characters in *string1* with the corresponding characters in *string2*. The lengths of *string1* and *string2* must be equal.

(2)**!** *function*
Applies the *function* (or group, if *function* is **{**) only to lines *not* selected by the address(es).

(0) **:** *label* This command does nothing; it bears a *label* for **b** and **t** commands to branch to.

(1) = Places the current line number on the standard output as a line.

(2) **{** Executes the following commands through a matching **}** only when the pattern space is selected.

(0) An empty command is ignored.

See Also

awk(C), ed(C), grep(C)

Notes

This command is explained in detail in *XENIX Text Processing Guide*.

Name

setcolor, setcolour - Set screen color.

Syntax

setcolor -[nbrgopc] argument [argument]

Description

setcolor allows the user to set the screen color on a color screen. Both foreground and background colors can be set independently in a range of 16 colors. **setcolor** can also set the reverse video and graphics character colors. **setcolor** with no arguments produces a usage message that displays all available colors, then resets the screen to its previous state.

For example, the following strings are possible colors.

blue	magenta	brown	black
lt_blue	lt_magenta	yellow	gray
cyan	white	green	red
lt_cyan	hi_white	lt_green	lt_red

The following flags are available. In the arguments below, "color" is taken from the above list.

-n Set the screen to "normal" white characters on black background.

color [*color*]
Set the foreground to the first color. Sets background to second color if a second color choice is specified.

-b *color*
Set the background to the specified color.

-r *color* [*color*]
Set the foreground reverse video characters to the first color. Set reverse video characters' background to second color.

-g *color* [*color*]
Set the foreground graphics characters to the first color. Set graphics characters' background to second color.

-o Set the color of the screen border (overscan region). This option applies only to CGA adapters.

-p pitch duration
Set the pitch and duration of the bell. Pitch is the period in microseconds, and duration is measured in fifths of a second. When using this option, a control-G (bell) must be echoed to the screen for the command to work. For example:

```
setcolor -p 2500 2
echo ^G
```

-c*first last*
Set the first and last scan lines of the cursor. (For more information see *screen*(HW).)

Notes

The ability of *setcolor* to set any of these described functions is ultimately dependent on the ability of devices to support them. *setcolor* emits an escape sequence that may or may not have an effect on monochrome devices.

Occasionally changing the screen color can help prolong the life of your monitor.

See Also

screen(HW), console(HW)

Name

setkey - Assigns the function keys.

Syntax

setkey *keynum string*

Description

The **setkey** command assigns the given ANSI *string* to be the output of the computer function key given by *keynum*. For example, the command:

```
setkey 1 date
```

assigns the string "date" as the output of function key 1. The *string* can contain control characters, such as a newline character, and should be quoted to protect it from processing by the shell. For example, the command:

```
setkey 2 "pwd ; lc\n"
```

assigns the command sequence "pwd ; lc" to function key 2. Notice how the newline character is embedded in the quoted string. This causes the commands to be carried out when function key 2 is pressed. Otherwise, the Enter key would have to be pressed after pressing the function key, as in the previous example.

Files

/bin/setkey

See Also

keyboard(HW)

Notes

setkey works only on the *console* keyboard.

The string mapping table is where the function keys are defined. It is an array of 512 bytes (typedef *strmap_t*) where null terminated strings can be put to redefine the function keys. The first null terminated string is assigned to the first string key, the second to the second string key, and so on. There is one string mapping table per multiscreen.

Although the size of the **setkey** string mapping table is 512 bytes, there is a limit of 30 characters that can be assigned to any individual function key.

Assigning more than 512 characters to the string mapping table causes the function key buffer to overflow. When this happens, the sequences sent by the arrow keys are overwritten, effectively disabling them. Once the function key buffer overflows, the only way to enable the arrow keys is to reboot the system.

The table below lists the *keynum* values for the function keys:

Function key	*keynum*
F1	1
F2	2
F3	3
F4	4
F5	5
F6	6
F7	7
F8	8
F9	9
F10	10
F11	11
F12	12
Shift-F1	13
Shift-F2	14
Shift-F3	15
Shift-F4	16
Shift-F5	17
Shift-F6	18
Shift-F7	19
Shift-F8	20
Shift-F9	21
Shift-F10	22
Shift-F11	23
Shift-F12	24
Ctrl-F1	25
Ctrl-F2	26
Ctrl-F3	27
Ctrl-F4	28
Ctrl-F5	29
Ctrl-F6	30
Ctrl-F7	31
Ctrl-F8	32
Ctrl-F9	33

Function key	*keynum*
Ctrl-F10	34
Ctrl-F11	35
Ctrl-F12	36
Ctrl-Shift-F1	37
Ctrl-Shift-F2	38
Ctrl-Shift-F3	39
Ctrl-Shift-F4	40
Ctrl-Shift-F5	41
Ctrl-Shift-F6	42
Ctrl-Shift-F7	43
Ctrl-Shift-F8	44
Ctrl-Shift-F9	45
Ctrl-Shift-F10	46
Ctrl-Shift-F11	47
Ctrl-Shift-F12	48

Numeric Key-Pad	*keynum*
7	49
8	50
9	51
-	52
4	53
5	54
6	55
+	56
1	57
2	58
3	59
0	60

Name

sh - Invokes the shell command interpreter.

Syntax

sh [**-aceiknrstuvx**] [args]

Description

The shell is the standard command programming language that executes commands read from a terminal or a file. See *Invocation* below for the meaning of arguments to the shell.

Commands

A *simple-command* is a sequence of nonblank *words* separated by *blanks* (a *blank* is a tab or a space). The first word specifies the name of the command to be executed. Except as specified below, the remaining words are passed as arguments to the invoked command. The command name is passed as argument 0 (see *exec*(S)). The *value* of a simple-command is its exit status if it terminates normally, or (octal) 1000+*status* if it terminates abnormally. See *signal*(S) for a list of status values.

A *pipeline* is a sequence of one or more *commands* separated by a vertical bar (|). (The caret (^), is an obsolete synonym for the vertical bar and should not be used in a pipeline; scripts that use a caret to represent a pipe will be incompatible with *ksh*(C).) The standard output of each command but the last is connected by a *pipe*(S) to the standard input of the next command. Each command is run as a separate process; the shell waits for the last command to terminate.

A *list* is a sequence of one or more pipelines separated by **;**, **&**, **&&**, or **||** , and optionally terminated by **;** or **&** . Of these four symbols, **;** and **&** have equal precedence, which is lower than that of **&&** and **||**. The symbols **&&** and **||** also have equal precedence. A semicolon (**;**) causes sequential execution of the preceding pipeline; an ampersand (**&**) causes asynchronous execution of the preceding pipeline (i.e., the shell does *not* wait for that pipeline to finish). The symbol **&&** (**||**) causes the *list* following it to be executed only if the preceding pipeline returns a zero (nonzero) exit status. An arbitrary number of newlines may appear in a *list*, instead of semicolons, to delimit commands.

A *command* is either a simple-command or one of the following commands. Unless otherwise stated, the value returned by a command is that of the last simple-command executed in the command:

for *name* [**in** *word* ...]
do
list
done

Each time a **for** command is executed, *name* is set to the next *word* taken from the **in** *word* list. If **in** *word* is omitted, then the **for** command executes the **do** *list* once for each positional parameter that is set (see *Parameter Substitution* below). Execution ends when there are no more words in the list.

case *word* **in**
[*pattern* [| *pattern*] ...) *list*
;;] ...
esac

A **case** command executes the *list* associated with the first *pattern* that matches *word*. The form of the patterns is the same as that used for filename generation (see *Filename Generation* below).

if *list* **then**
list
[**elif** *list* **then**
list]
[**else** *list*]
fi

The *list* following **if** is executed and, if it returns a zero exit status, the *list* following the first **then** is executed. Otherwise, the *list* following **elif** is executed and, if its value is zero, the *list* following the next **then** is executed. Failing that, the **else** *list* is executed. If no **else** *list* or **then** *list* is executed, then the **if** command returns a zero exit status.

while *list*
do
list
done

A **while** command repeatedly executes the **while** *list* and, if the exit status of the last command in the list is zero, executes the **do** *list*; otherwise the loop terminates. If no commands in the **do** *list* are executed, then the **while** command returns a zero exit status; **until** may be used in place of **while** to negate the loop termination test.

(*list*)
Executes *list* in a subshell.

{*list*;}
list is simply executed.

name () {*list;*}
Define a function which is referenced by *name*. The body of functions is the *list* of commands between { and }. Execution of functions is described later (see *Execution.*)

The following words are recognized only as the first word of a command and when not quoted:

if then else elif fi case esac for while until do done { }

Comments

A word beginning with # causes that word and all the following characters up to a newline to be ignored.

Command Substitution

The standard output from a command enclosed in a pair of grave accents (``) may be used as part or all of a word; trailing newlines are removed.

No interpretation is done on the command string before the string is read, except to remove backslashes (\) used to escape other characters. Backslashes may be used to escape grave accents (`) or other backslashes and are removed before the command string is read. Escaping grave accents allows nested command substitution. If the command substitution lies within a pair of double quotes (" ` ...` "), backslashes used to escape a double quote (\") will be removed; otherwise, they will be left intact.

If a backslash is used to escape a newline character, both the backslash and the newline are removed (see the section on "Quoting"). In addition, backslashes used to escape dollar signs (\$) are removed. Since no interpretation is done on the command string before it is read, inserting a backslash to escape a dollar sign has no effect. Backslashes that precede characters other than \, `, ", **newline**, and $ are left intact.

Parameter Substitution

The character $ is used to introduce substitutable *parameters*. There are two types of parameters, positional and keyword. If *parameter* is a digit, it is a positional parameter. Positional parameters may be assigned values by **set**. Keyword parameters, (also known as variables) may be assigned values by writing:

name=value [*name=value*] ...

Pattern-matching is not performed on *value*. There cannot be a function and a variable with the same name.

${*parameter***}**
A *parameter* is a sequence of letters, digits, or underscores (a *name*), a digit, or any of the characters *****, **@**, **#**, **?**, **-**, **$**, and **!**. The value, if any, of the parameter is substituted. The braces are required only when *parameter* is followed by a letter, digit, or underscore that is not to be interpreted as part of its name. A *name* must begin with a letter or underscore. If *parameter* is a digit then it is a positional parameter. If *parameter* is ***** or **@**, then all the positional parameters, starting with **$1**, are substituted (separated by spaces). Parameter **$0** is set from argument zero when the shell is invoked.

${*parameter***:-***word***}**
If *parameter* is set and is not a null argument, substitute its value; otherwise substitute *word*.

${*parameter***:=***word***}**
If *parameter* is not set or is null, then set it to *word*; the value of the parameter is then substituted. Positional parameters may not be assigned to in this way.

${*parameter***:?***word***}**
If *parameter* is set and is not a null argument, substitute its value; otherwise, print *word* and exit from the shell. If *word* is omitted, the message "parameter null or not set" is printed.

${*parameter***:+***word***}**
If *parameter* is set and is not a null argument, substitute *word*; otherwise substitute nothing. In the above, *word* is not evaluated unless it is to be used as the substituted string, so that in the following example, **pwd** is executed only if **d** is not set or is null:

```
echo ${d:-`pwd`}
```

If the colon (**:**) is omitted from the above expressions, then the shell only checks whether *parameter* is set.

The following parameters are automatically set by the shell:

The number of positional parameters in decimal

- Flags supplied to the shell on invocation or by the **set** command

? The decimal value returned by the last synchronously executed command

$ The process number of this shell

! The process number of the last background command invoked

The following parameters are used by the shell:

CDPATH
Defines search path for the *cd* command. See the section *Special Commands*, "cd".

HOME
The default argument (home directory) for the *cd* command

PATH
The search path for commands (see *Execution* below)

MAIL
If this variable is set to the name of a mail file, then the shell informs the user of the arrival of mail in the specified file

MAILCHECK
This parameter specifies how often (in seconds) the shell will check for the arrival of mail in the files specified by the **MAILPATH** or **MAIL** parameters. The default value is 600 seconds (10 minutes). If set to 0, the shell will check before each prompt.

MAILPATH
A colon (**:**) separated list of file names. If this parameter is set, the shell informs the user of the arrival of mail in any of the specified files. Each file name can be followed by **%** and a message that will be printed when the modification time changes. The default message is *you have mail.*

PS1
Primary prompt string, by default "**$** "

PS2
Secondary prompt string, by default "**>** "

IFS
Internal field separators, normally **space**, **tab**, and **newline**

SHELL
When the shell is invoked, it scans the environment (see *Environment* below) for this name. If it is found and there is an 'r' in the file name part of its value, the shell becomes a restricted shell.

The shell gives default values to **PATH**, **PS1**, **PS2**, and **IFS**, while **HOME** and **MAIL** are not set at all by the shell (although **HOME** *is* set by *login*(M)).

Blank Interpretation

After parameter and command substitution, the results of substitution are scanned for internal field separator characters (those found in **IFS**) and split into distinct arguments where such characters are found. Explicit null arguments (**""** or **''**) are retained. Implicit null arguments (those resulting from *parameters* that have no values) are removed.

Filename Generation

Following substitution, each command *word* is scanned for the characters *****, **?**, and **[**. If one of these characters appears, the word is regarded as a *pattern*. The word is replaced with alphabetically sorted filenames that match the pattern. If no filename is found that matches the pattern, the word is left unchanged. The character **.** at the start of a filename or immediately following a /, as well as the character / itself, must be matched explicitly. These characters and their matching patterns are:

***** Matches any string, including the null string.

? Matches any single character.

[...]
Matches any one of the enclosed characters. A pair of characters separated by - matches any character lexically between the pair, inclusive. If the first character following the opening bracket ([) is an exclamation mark (!), then any character not enclosed is matched.

Quoting

The following characters have a special meaning to the shell and cause termination of a word unless quoted:

; & ( ) | ^ < > newline space tab

A character may be *quoted* (i.e., made to stand for itself) by preceding it with a \. The pair **\newline** is ignored. All characters enclosed between a pair of single quotation marks (**''**), except a single quotation mark, are quoted. Inside double quotation marks (**""**), parameter and command substitution occurs and \ quotes the characters \, `, ", and **$**. **"$*"** is equivalent to **"$1 $2 ..."**, whereas **"$@"** is equivalent to **"$1" "$2" ...**

Prompting

When used interactively, the shell prompts with the value of **PS1** before reading a command. If at any time a newline is typed and

further input is needed to complete a command, the secondary prompt (i.e., the value of **PS2**) is issued.

Spelling Checker

When using *cd*(C) the shell checks spelling. For example, if you change to a different directory using *cd* and misspell the directory name, the shell responds with an alternative spelling of an existing directory. Enter "y" and press RETURN (or just press RETURN) to change to the offered directory. If the offered spelling is incorrect, enter "n", then retype the command line. In this example the user input is boldfaced:

```
$ cd /usr/spol/uucp
cd /usr/spool/uucp? y
ok
```

Input/Output

Before a command is executed, its input and output may be redirected using a special notation interpreted by the shell. The following may appear anywhere in a simple-command or may precede or follow a *command*. They are *not* passed on to the invoked command; substitution occurs before *word* or *digit* is used:

<*word*	Use file *word* as standard input (file descriptor 0).
>*word*	Use file *word* as standard output (file descriptor 1). If the file does not exist, it is created; otherwise, it is truncated to zero length.
>>*word*	Use file *word* as standard output. If the file exists, output is appended to it (by first seeking the end-of-file); otherwise, the file is created.
<<[-]*word*	The shell input is read up to a line that is the same as *word*, or to an end-of-file. The resulting document becomes the standard input. If any character of *word* is quoted, no interpretation is placed upon the characters of the document; otherwise, parameter and command substitution occurs, (unescaped) **\newline** is ignored, and \ must be used to quote the characters \, **$**, `, and the first character of *word*. If **-** is appended to <<, all leading tabs are stripped from *word* and from the document.
<&*digit*	The standard input is duplicated from file descriptor *digit* (see *dup*(S)). Similarly for the standard output using >.

<&- The standard input is closed. Similarly for the standard output using **>**.

If one of the above is preceded by a digit, the file descriptor created is that specified by the digit (instead of the default 0 or 1). For example:

... 2>&1

creates file descriptor 2 that is a duplicate of file descriptor 1.

If a command is followed by **&**, the default standard input for the command is the empty file **/dev/null**. Otherwise, the environment for the execution of a command contains the file descriptors of the invoking shell as modified by input/output specifications.

Environment

The *environment* (see *environ*(M)) is a list of name-value pairs that is passed to an executed program in the same way as a normal argument list. The shell interacts with the environment in several ways. On invocation, the shell scans the environment and creates a parameter for each name found, giving it the corresponding value. Executed commands inherit the same environment. If the user modifies the values of these parameters or creates new ones, none of these affect the environment unless the **export** command is used to bind the shell's parameter to the environment. The environment seen by any executed command is composed of any unmodified name-value pairs originally inherited by the shell, minus any pairs removed by **unset**, plus any modifications or additions, all of which must be noted in **export** commands.

The environment for any *simple-command* may be augmented by prefixing it with one or more assignments to parameters. Thus:

TERM=wy60 cmd args

and

(export TERM; TERM=wy60; cmd args)

are equivalent (as far as the above execution of *cmd* is concerned).

If the **-k** flag is set, *all* keyword arguments are placed in the environment, even if they occur after the command name.

Signals

The INTERRUPT and QUIT signals for an invoked command are ignored if the command is followed by **&**; otherwise signals have the values inherited by the shell from its parent, with the exception of

signal 11. See the **trap** command below.

Execution

Each time a command is executed, the above substitutions are carried out. If the command name does not match a *Special Command*, but matches the name of a defined function, the function is executed in the shell process (note how this differs from the execution of shell procedures). The positional parameters **$1, $2**, ... are set to the arguments of the function. If the command name matches neither a *Special Command* nor the name of a defined function, a new process is created and an attempt is made to execute the command via *exec* (S).

The shell parameter **PATH** defines the search path for the directory containing the command. Alternative directory names are separated by a colon (**:**). The default path is **:/bin:/usr/bin** (specifying the current directory, **/bin**, and **/usr/bin**, in that order). Note that the current directory is specified by a null pathname, which can appear immediately after the equal sign or between the colon delimiters anywhere else in the path list. If the command name contains a /, then the search path is not used. Otherwise, each directory in the path is searched for an executable file. If the file has execute permission but is not an **a.out** file, it is assumed to be a file containing shell commands. A subshell (i.e., a separate process) is spawned to read it. A parenthesized command is also executed in a subshell.

Shell procedures are often used by users running the **csh**. However, if the first character of the procedure is a # (comment character), **csh** assumes the procedure is a **csh** script, and invokes */bin/csh* to execute it. Always start **sh** procedures with some other character if **csh** users are to run the procedure at any time. This invokes the standard shell */bin/sh*.

The location in the search path where a command was found is remembered by the shell (to help avoid unnecessary *execs* later). If the command was found in a relative directory, its location must be re-determined whenever the current directory changes. The shell forgets all remembered locations whenever the **PATH** variable is changed or the **hash -r** command is executed (see **hash** in next section).

Special Commands

Input/output redirection is permitted for these commands:

: No effect; the command does nothing. A zero exit code is returned.

. *file*
Reads and executes commands from *file* and returns. The search path specified by **PATH** is used to find the directory containing *file*.

break [*n*]
Exits from the enclosing **for**, **while**, or **until** loop, if any. If *n* is specified, it breaks *n* levels.

continue [*n*]
Resumes the next iteration of the enclosing **for**, **while**, or **until** loop. If *n* is specified, it resumes at the *n*-th enclosing loop.

cd [*arg*]
Changes the current directory to *arg*. The shell parameter **HOME** is the default *arg*. The shell parameter **CDPATH** defines the search path for the directory containing *arg*. Alternative directory names are separated by a colon (:). The default path is <null> (specifying the current directory). Note that the current directory is specified by a null path name, which can appear immediately after the equal sign or between the colon delimiters anywhere else in the path list. If *arg* begins with a /, the search path is not used. Otherwise, each directory in the path is searched for *arg*.

If the shell is reading its commands from a terminal, and the specified directory does not exist (or some component cannot be searched), spelling correction is applied to each component of *directory*, in a search for the "correct" name. The shell then asks whether or not to try and change directory to the corrected directory name; an answer of *n* means "no", and anything else is taken as "yes".

echo [arg]
Writes arguments separated by blanks and terminated by a newline on the standard output. Arguments may be enclosed in quotes. Quotes are required so that the shell correctly interprets these special escape sequences:

\b Backspace

\c Prints line without newline.

\f Form feed

\n Newline

\r Carriage return

\t Tab

\v Vertical tab

\\ Backslash

\n The 8-bit character whose ASCII code is the 1, 2 or 3-digit octal number *n* which must start with a zero

eval [*arg* ...]
The arguments are read as input to the shell and the resulting command(s) executed.

exec [*arg* ...]
The command specified by the arguments is executed in place of this shell without creating a new process. Input/output arguments may appear and, if no other arguments are given, cause the shell input/output to be modified.

exit [*n*]
Causes the shell to exit with the exit status specified by *n*. If *n* is omitted, the exit status is that of the last command executed. An end-of-file will also cause the shell to exit.

export [*name* ...]
The given *name*s are marked for automatic export to the *environment* of subsequently executed commands. If no arguments are given, a list of all names that are exported in this shell is printed.

getopts
Used in shell scripts to support command syntax standards (see *intro*(C)); it parses positional parameters and checks for legal options. See *getopts*(C) for usage and description.

hash [**-r**] [*name* ...]
For each *name*, the location in the search path of the command specified by *name* is determined and remembered by the shell. The **-r** option causes the shell to forget all remembered locations. If no arguments are given, information about remembered commands is presented. *Hits* is the number of times a command has been invoked by the shell process. *Cost* is a measure of the work required to locate a command in the search path. There are certain situations which require that the stored location of a command be recalculated. Commands for which this will be done are indicated by an asterisk (*) adjacent to the *hits* information. *Cost* will be incremented when the recalculation is done.

newgrp [*arg* ...]
Equivalent to **exec newgrp** *arg* ...

pwd
Print the current working directory. See *pwd*(C) for usage and description.

read [*name* ...]
One line is read from the standard input and the first word is assigned to the first *name*, the second word to the second *name*, etc., with leftover words assigned to the last *name*. The return code is 0 unless an end-of-file is encountered.

readonly [*name* ...]
The given *name*s are marked *readonly* and the values of these *name*s may not be changed by subsequent assignment. If no arguments are given, a list of all *readonly* names is printed.

return [*n*]
Causes a function to exit with the return value specified by *n*. If *n* is omitted, the return status is that of the last command executed.

set [**-aefhknuvx** [*arg* ...]]

-a Mark variables which are modified or created for export.

-e If the shell is noninteractive, exits immediately if a command exits with a nonzero exit status.

-f Disables file name generation.

-h Locates and remembers function commands as functions are defined (function commands are normally located when the function is executed). For example, **/bin/tty** would be added to the hash table if, say, showtty( ) { tty } is declared. If **-h** was unset, it would not be added to the hash table until showtty is called.

-k Places all keyword arguments in the environment for a command, not just those that precede the command name.

-n Reads commands but does not execute them.

-u Treats unset variables as an error when substituting.

-v Prints shell input lines as they are read.

-x Prints commands and their arguments as they are executed. Although this flag is passed to subshells, it does not enable tracing in those subshells.

-- Does not change any of the flags; useful in setting $1 to -.

Using + rather than - causes these flags to be turned off. These flags can also be used upon invocation of the shell. The current set of flags may be found in **$-**. The remaining arguments are positional parameters and are assigned, in order, to **$1**, **$2**, ... If no arguments are given, the values of all names are printed.

shift [*n*]
The positional parameters from **$2** ... are renamed **$1** ... If *n* is specified, shift them by places. **shift** is the only way to access positional parameters above **$9**.

test
Evaluates conditional expressions. See *test*(C) for usage and description.

times
Prints the accumulated user and system times for processes run from the shell.

trap [*arg*] [*n*] ...
arg is a command to be read and executed when the shell receives signal(s) *n*. (Note that *arg* is scanned once when the trap is set and once when the trap is taken.) Trap commands are executed in order of signal number. The highest signal number allowed is 16. Any attempt to set a trap on a signal that was ignored on entry to the current shell is ineffective. An attempt to trap on signal 11 (memory fault) produces an error. If *arg* is absent, all trap(s) *n* are reset to their original values. If *arg* is the null string, this signal is ignored by the shell and by the commands it invokes. If *n* is 0, the command *arg* is executed on exit from the shell. The **trap**

command with no arguments prints a list of commands associated with each signal number.

type [*name* ...]
For each *name*, indicate how it would be interpreted if used as a command name.

ulimit [*n*]
imposes a size limit of *n* blocks on files written by the shall and its child processes (files of any size may be read). Any user may decrease the file size limit, but only the super-user (root) can increase the limit. With no argument, the current limit is printed.

unset [*name* ...]
For each *name*, remove the corresponding variable or function. The variables **PATH, PS1, PS2, MAILCHECK** and **IFS** cannot be unset.

umask [*ooo*]
The user file-creation mask is set to the octal number *ooo* where *o* is an octal digit (see *umask*(C)). If *ooo* is omitted, the current value of the mask is printed.

wait [*n*]
Waits for the specified process to terminate, and reports the termination status. If *n* is not given, all currently active child processes are waited for. The return code from this command is always 0.

Invocation

If the shell is invoked through *exec* (S) and the first character of argument 0 is **-**, commands are initially read from **/etc/profile** and then from **$HOME/.profile**, if such files exist. Thereafter, commands are read as described below, which is also the case when the shell is invoked as **/bin/sh**. The flags below are interpreted by the shell on invocation only; note that unless the **-c** or **-s** flag is specified, the first argument is assumed to be the name of a file containing commands, and the remaining arguments are passed as positional parameters to that command file:

-c *string* If the **-c** flag is present, commands are read from *string*.

-s If the **-s** flag is present or if no arguments remain, commands are read from the standard input. Any remaining arguments specify the positional parameters. Shell output is written to file descriptor 2.

-t If the **-t** flag is present, a single command is read and executed, and the shell exits. This flag is intended for use by C programs only and is not useful interactively.

-i If the **-i** flag is present or if the shell input and output are attached to a terminal, this shell is *interactive*. In this case, TERMINATE is ignored (so that **kill 0** does not kill an interactive shell) and INTERRUPT is caught and ignored (so that **wait** is interruptible). In all cases, QUIT

is ignored by the shell.

-r If the **-r** flag is present, the shell is a restricted shell (see *rsh*(C)).

The remaining flags and arguments are described under the **set** command above.

Exit Status

Errors detected by the shell, such as syntax errors, cause the shell to return a nonzero exit status. If the shell is being used noninteractively, execution of the shell file is abandoned. Otherwise, the shell returns the exit status of the last command executed. See the **exit** command above.

Files

/etc/profile	system default *profile*
$HOME/.profile	read by login shell at login
/tmp/sh*	temporary file for <<
/dev/null	source of empty file

See Also

cd(C), env(C), login(M), newgrp(C), rsh(C), test(C), umask(C), dup(S), exec(S), fork(S), pipe(S), signal(S), umask(S), wait(S), a.out(F), profile(M), environ(M)

Notes

If << is used to provide standard input to an asynchronous process invoked by **&**, the shell gets mixed up about naming the input document; a garbage file **/tmp/sh*** is created and the shell complains about not being able to find that file by another name.

If a command is executed, and a command with the same name is installed in a directory in the search path before the directory where the original command was found, the shell will continue to *exec* the original command. Use the **hash** command to correct this situation.

If you move the current directory or one above it, **pwd** may not give the correct response. Use the **cd** command with a full path name to correct this situation.

When a *sh*(C) user logs in, the system reads and executes commands in */etc/profile* before executing commands in the user's *$HOME/.profile*. You can, therefore, modify the environment for all *sh*(C) users on the system by editing */etc/profile*.

The shell doesn't treat the high (eighth) bit in the characters of a command line argument specially, nor does it strip the eighth bit from the characters of error messages. Previous versions of the shell used the eighth bit as a quoting mechanism.

Existing programs that set the eighth bit of characters in order to quote them as part of the shell command line should be changed to use of the standard shell quoting mechanisms (see the section on "Quoting").

Words used to filenames in input/output redirection are not interpreted for filename generation (see the section on "File Name Generation"). For example, **cat file1 > a*** will create a file named **a***.

Because commands in pipelines are run as separate processes, variables set in a pipeline have no effect on the parent shell.

If you get the error message:
    fork failed - too many processes
try using the *wait*(C) command to clean up your background processes. If this doesn't help, the system process table is probably full or you have too many active foreground processes (there is a limit to the number of processes that can associated with your login, and to the number the system can keep track of). These limits are associated with the kernel parameters NPROC and MAXUPRC.

Warnings

Not all processes of a 3- or more-stage pipeline are children of the shell, and thus cannot be waited for.

For **wait** *n*, if *n* is not an active process id, all your shell's currently active background processes are waited for and the return code will be zero.

Name

shl - Shell layer manager

Syntax

shl

Description

shl allows a user to interact with more than one shell from a single terminal. The user controls these shells, known as *layers*, using the commands described below.

The *current layer* is the layer that can receive input from the keyboard. Other layers attempting to read from the keyboard are blocked. Output from multiple layers is multiplexed onto the terminal. To have the output of a layer blocked when it is not current, the *stty*(C) option **loblk** may be set within the layer.

The *stty* character **swtch** (set to ^Z if NUL) is used to switch control to *shl* from a layer. *shl* has its own prompt, >>>, to help distinguish it from a layer.

A *layer* is a shell that has been bound to a virtual tty device (**/dev/sxt???**). The virtual device can be manipulated like a real tty device using *stty*(C) and *ioctl*(S). Each layer has its own process group id.

Definitions

A *name* is a sequence of characters delimited by a blank, tab or newline. Only the first eight characters are significant. The *names* **(1)** through **(7)** cannot be used when creating a layer. They are used by *shl* when no name is supplied. They may be abbreviated to just the digit.

Commands

The following commands may be issued from the *shl* prompt level. Any unique prefix is accepted.

create *name*
Create a layer called *name* and make it the current layer. If no argument is given, a layer will be created with a name of the form *(#)* where # is the last digit of the virtual device bound to the layer. The shell prompt variable **PS1** is set to the name of the layer followed by a space, or, if superuser, the name followed by a sharp (#)

and a space. A maximum of seven layers can be created.

block *name* [*name* ...]
For each *name*, block the output of the corresponding layer when it is not the current layer. This is equivalent to setting the *stty* option **loblk** within the layer.

delete *name name* ...
For each *name*, delete the corresponding layer. All processes in the process group of the layer are sent the SIGHUP signal (see *signal*(2)).

help (or **?**)
Print the syntax of the *shl* commands.

layers -l *name* ...
For each *name*, list the layer name and its process group. The **-l** option produces a *ps*(1)-like listing. If no arguments are given, information is presented for all existing layers.

resume *name*
Make the layer referenced by *name* the current layer. If no argument is given, the last existing current layer will be resumed.

toggle
Resume the layer that was current before the last current layer.

unblock *name* [*name* ...]
For each *name*, do not block the output of the corresponding layer when it is not the current layer. This is equivalent to setting the *stty* option **loblk** within the layer.

quit
Exit *shl*. All layers are sent the SIGHUP signal.

name
Make the layer referenced by *name* the current layer.

Files

/dev/sxt???	Virtual tty devices
$SHELL	Variable containing path name of the shell to use (default is /bin/sh).

See Also

ioctl(S), mkdev(ADM), sh(C), signal(S), stty(C), sxt(M)

Note

It is inadvisable to kill *shl*.

If *shl* does not run properly on a particular terminal, you may have to set **istrip** for that terminal's line by entering the following command at the terminal:

stty istrip

By default, XENIX is configured for one shell layer session at a time. To increase this single session limit, enter the command:

mkdev shl

This executes a script which prompts you for the number of sessions desired. The script also allows you to relink the kernel. The new session limit becomes effective after the kernel is rebooted. (For more information, see *mkdev*(ADM).)

Name

size - Prints the size of an object file.

Syntax

size [object ...]

Description

size prints the (decimal) number of bytes required by the text, data, and bss portions, and their sum in decimal and hexadecimal, of each object-file argument. If no file is specified, **a.out** is used.

See Also

a.out(F)

Name

sleep - Suspends execution for an interval.

Syntax

sleep time

Description

sleep suspends execution for *time* seconds. It is used to execute a command after a certain amount of time as in:

```
(sleep 105; command)&
```

or to execute a command every so often, as in:

```
while true
do
        command
        sleep 37
done
```

See Also

alarm(S), sleep(S)

Notes

It is recommended that *time* be less than 65536 seconds.

Name

sort - Sorts and merges files.

Syntax

sort [**-cmu**] [**-o**output] [**-y**kmem] [**-z**recsz] [**-dfiMnr**] [**-b**] [**-tx**] [+pos1] [-pos2] [files]

Description

sort sorts lines of all the named files together and writes the result on the standard output. The standard input is read if - is used as a file name or if no input files are named.

Comparisons are based on one or more sort keys extracted from each line of input. By default, there is one sort key, the entire input line, and ordering is determined by the collating sequence defined by the locale (see *locale* (M)).

The following options alter the default behavior:

-c Check that the input file is sorted according to the ordering rules; give no output unless the file is out of sort.

-m Merge only, the input files are already sorted.

-u Unique: suppress all but one in each set of lines having equal keys. This option can result in unwanted characters placed at the end of the sorted file.

-o*output*
The argument given is the name of an output file to use instead of the standard output. This file may be the same as one of the inputs. There may be optional blanks between **-o** and *output*.

-y*kmem*
The amount of main memory used by the sort has a large impact on its performance. Sorting a small file in a large amount of memory is a waste. If this option is omitted, *sort* begins using a system default memory size, and continues to use more space as needed. If this option is presented with a value, *kmem*, *sort* will start using that number of kilobytes of memory, unless the administrative minimum or maximum is violated, in which case the corresponding extremum will be used. Thus, **-y**0 is guaranteed to start with minimum memory. By convention, **-y** (with no argument) starts with maximum memory.

-z*recsz*

Causes *sort* to use a buffer size of *recsz* bytes for the merge phase. Input lines longer than the buffer size will cause *sort* to terminate abnormally. Normally, the size of the longest line read during the sort phase is recorded and this maximum is used as the record size during the merge phase, eliminating the need for the **-z** option. However, when the sort phase is omitted (**-c** or **-m** options) a system default buffer size is used, and if this is not large enough, the **-z** option should be used to prevent abnormal termination.

The following options override the default ordering rules.

-d "Dictionary" order: only letters, digits and blanks (spaces and tabs) are significant in comparisons. Dictionary order is defined by the locale setting (see *locale* (M)).

-f Fold lower case letters into upper case. Conversion between lowercase and uppercase letters are governed by the locale setting (see *locale* (M)).

-i Ignore non-printable characters in non-numeric comparisons. Non-printable characters are defined by the locale setting (see *locale* (M)).

-M Compare as months. The first three non-blank characters of the field are folded to upper case and compared so that "JAN" < "FEB" < ... < "DEC". Invalid fields compare low to "JAN". The **-M** option implies the **-b** option (see below).

-n An initial numeric string, consisting of optional blanks, an optional minus sign, and zero or more digits with optional decimal point, is sorted by arithmetic value. The **-n** option implies the **-b** option (see below). Note that the **-b** option is only effective when restricted sort key specifications are in effect.

-r Reverse the sense of comparisons.

When ordering options appear before restricted sort key specifications, the requested ordering rules are applied globally to all sort keys. When attached to a specific sort key (described below), the specified ordering options override all global ordering options for that key.

The notation *+pos1 -pos2* restricts a sort key to one beginning at *pos1* and ending at *pos2*. The characters at positions *pos1* and *pos2* are included in the sort key (provided that *pos2* does not precede *pos1*). A missing *-pos2* means the end of the line.

Specifying *pos1* and *pos2* involves the notion of a field (a minimal sequence of characters followed by a field separator or a newline). By default, the first blank (space or tab) of a sequence of blanks acts as the field separator. All blanks in a sequence of blanks are considered to be part of the next field; for example, all blanks at the beginning of a line are considered to be part of the first field. The treatment of field separators can be altered using the options:

-t*x* Use *x* as the field separator character; *x* is not considered to be part of a field (although it may be included in a sort key). Each occurrence of *x* is significant (e.g., *xx* delimits an empty field).

-b Ignore leading blanks when determining the starting and ending positions of a restricted sort key. If the **-b** option is specified before the first *+pos1* argument, it will be applied to all *+pos1* arguments. Otherwise, the **b** flag may be attached independently to each *+pos1* or *-pos2* argument (see below).

Pos1 and *pos2* each have the form *m.n* optionally followed by one or more of the flags **b**, **d**, **f**, **i**, **n**, or **r**. A starting position specified by *+m.n* is interpreted to mean the *n*+1st character in the *m*+1st field. A missing *.n* means .0, indicating the first character of the *m*+1st field. If the **b** flag is in effect, *n* is counted from the first non-blank in the *m*+1st field; *+m*.0**b** refers to the first non-blank character in the *m*+1st field.

A last position specified by *-m.n* is interpreted to mean the *n*th character (including separators) after the last character of the *m*th field. A missing *.n* means .0, indicating the last character of the *m*th field. If the **b** flag is in effect, *n* is counted from the last leading blank in the *m*+1st field; *-m*.1**b** refers to the first non-blank in the *m*+1st field.

When there are multiple sort keys, later keys are compared only after all earlier keys compare equal. Lines that otherwise compare equal are ordered with all bytes significant.

Examples

Sort the contents of *infile* with the second field as the sort key:

```
sort +1 -2 infile
```

Sort, in reverse order, the contents of *infile1* and *infile2*, placing the output in *outfile* and using the first character of the second field as the sort key:

```
sort -r -o outfile +1.0 -1.2 infile1 infile2
```

Sort, in reverse order, the contents of *infile1* and *infile2* using the first non-blank character of the second field as the sort key:

```
sort -r +1.0b -1.1b infile1 infile2
```

Print the password file (*passwd*(F)) sorted by the numeric user ID (the third colon-separated field):

```
sort -t: +2n -3 /etc/passwd
```

Print the lines of the already sorted file *infile*, suppressing all but the first occurrence of lines having the same third field (the options **-um** with just one input file make the choice of a unique representative from a set of equal lines predictable):

```
sort -um +2 -3 infile
```

Files

/usr/tmp/stm???

See Also

coltbl(M), comm(C), join(C), locale(M), uniq(C)

Diagnostics

Comments and exits with non-zero status for various trouble conditions (e.g., when input lines are too long), and for disorders discovered under the **-c** option. When the last line of an input file is missing a **newline** character, *sort* appends one, prints a warning message, and continues.

Name

split - Splits a file into pieces.

Syntax

split [*-n*] [file [name]]

Description

split reads *file* and writes it in as many *n*-line pieces as necessary (default 1000), onto a set of output files. The name of the first output file is *name* with **aa** appended, and so on lexicographically. If no output name is given, **x** is default.

If no input file is given, or if a dash (**-**) is given instead, the standard input file is used.

See Also

bfs(C), csplit(C)

Name

strings - Find the printable strings in an object file.

Syntax

strings [**-**] [**-o**] [*-number*] filename ...

Description

strings looks for ASCII strings in a binary file. A string is any sequence of four or more printing characters ending with a newline or a null character. Unless the **-** flag is given, *strings* only looks in the initialized data space of object files. If the **-o** flag is given, then each string is preceded by its decimal offset in the file. If the *-number* flag is given then *number* is used as the minimum string length rather than 4.

strings is useful for identifying random object files and many other things.

See Also

hd(C), od(C)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Name

stty - Sets the options for a terminal.

Syntax

stty [**-a**] [**-g**] [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. With the **-a** option, *stty* reports all of the option settings; with the **-g** option, it reports current settings in a form that can be used as an argument to another *stty* command. Detailed information about the modes listed in the first four groups may be found in *termio*(M). *options* in the last group are implemented using *options* in the previous groups. Refer to *vidi*(C) for hardware specific information that describes control modes for the video monitor and other display devices.

Common Control Modes

parenb (-parenb)
Enables (disables) parity generation and detection.

parodd (-parodd)
Selects odd (even) parity.

cs5 cs6 cs7 cs8
Selects character size (see *tty*(M)).

0 Hangs up phone line immediately.

50 75 110 134 150 200 300 600
1200 1800 2400 4800 9600 exta extb
Sets terminal baud rate to the number given, if possible. **exta** and **extb** are not defined for the built-in serial driver, but are often used by 3rd-party serial port drivers to specify 19200 and 38400 bits per second.

hupcl (-hupcl)
Hangs up (does not hang up) phone connection on last close.

hup (-hup)
Same as **hupcl (-hupcl)**.

cstopb (-cstopb)
Uses two(one) stop bits per character.

cread (-cread)
Enables (disables) the receiver.

clocal (-clocal)
Assumes a line without (with) modem control.

ctsflow (-ctsflow)
Enables CTS protocol for a modem line.

rtsflow (-rtsflow)
Enables RTS signaling for a modem line.

Input Modes

ignbrk (-ignbrk)
Ignores (does not ignore) break on input.

brkint (-brkint)
Signals (does not signal) INTERRUPT on break.

ignpar (-ignpar)
Ignores (does not ignore) parity errors.

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

parmrk (-parmrk)
Marks (does not mark) parity errors (see *tty*(M)).

inpck (-inpck)
Enables (disables) input parity checking.

istrip (-istrip)
Strips (does not strip) input characters to 7 bits.

inlcr (-inlcr)
Maps (does not map) NL to CR on input.

igncr (-igncr)
Ignores (does not ignore) CR on input.

icrnl (-icrnl)
Maps (does not map) CR to NL on input.

iuclc (-iuclc)
Maps (does not map) uppercase alphabetics to lowercase on input.

ixon (-ixon)
Enables (disables) START/STOP output control. Output is stopped by sending an ASCII DC3 and started by sending an ASCII DC1.

ixany (-ixany)
Allows any character (only DC1) to restart output.

ixoff (-ixoff)
Requests that the system send (not send) START/STOP characters when the input queue is nearly empty/full.

Output Modes

opost (-opost)
Post-processes output (does not post-process output; ignores all other output modes).

olcuc (-olcuc)
Maps (does not map) lowercase alphabetics to uppercase on output.

onlcr (-onlcr)
Maps (does not map) NL to CR-NL on output.

ocrnl (-ocrnl)
Maps (does not map) CR to NL on output.

onocr (-onocr)
Does not (does) output CRs at column zero.

onlret (-onlret)
On the terminal NL performs (does not perform) the CR function.

ofill (-ofill)
Uses fill characters (uses timing) for delays.

ofdel (-ofdel)
Fill characters are DELETEs (NULs).

cr0 cr1 cr2 cr3
Selects style of delay for RETURNs (see *tty* (M)).

nl0 nl1
Selects style of delay for LINEFEEDs (see *tty* (M)).

tab0 tab1 tab2 tab3
Selects style of delay for horizontal TABs (see *tty* (M)).

bs0 bs1
Selects style of delay for BACKSPACEs (see *tty* (M)).

ff0 ff1
Selects style of delay for FORMFEEDs (see *tty* (M)).

vt0 vt1
Selects style of delay for Vertical TABs (see *tty* (M)).

Local Modes

isig (-isig)
Enables (disables) the checking of characters against the special control characters INTERRUPT and QUIT.

icanon (-icanon)
Enables (disables) canonical input (ERASE and KILL processing).

xcase (-xcase)
Canonical (unprocessed) upper/lowercase presentation.

echo (-echo)
Echoes back (does not echo back) every character typed.

echoe (-echoe)
Echoes (does not echo) ERASE character as a SPACEBAR string. Note: this mode will erase the ERASE 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.

echok (-echok)
Echoes (does not echo) NL after KILL character.

lfkc (-lfkc)
The same as **echok (-echok)**; obsolete.

echonl (-echonl)
Echoes (does not echo) NL.

noflsh (-noflsh)
Disables (enables) flush after INTERRUPT or QUIT.

Control Assignments

control-character c
set *control-character* to *c*, where *control-character* is **erase**, **kill**, **intr**, **quit**, **swtch**, **eof**, or **eol**. 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.

min *i*, **time** *i* (0<*i*<127)
When **-icanon** is set, and one character has been received, read requests are not satisfied until at least **min** characters have been received or the timeout value **time** has expired and one character has been received. See *tty*(C).

line *i*
Sets the line discipline to *i* ($0 < i < 127$).

Combination Modes

evenp or **parity**
Enables **parenb** and **cs7**.

oddp
Enables **parenb**, **cs7**, and **parodd**.

-parity, **-evenp**, or **-oddp**
Disables **parenb**, and sets **cs8**.

raw (**-raw** or **cooked**)
Enables (disables) raw input and output (no ERASE, KILL, INTERRUPT, QUIT, EOF, EOL, or output post-processing).

nl (**-nl**)
Unsets (sets) **icrnl**, **onlcr**. In addition **-nl** unsets **inlcr**, **igncr**, **ocrnl**, and **onlret**.

lcase (**-lcase**)
Sets (unsets) **xcase**, **iuclc**, and **olcuc**.

LCASE (**-LCASE**)
Same as **lcase** (**-lcase**).

tabs (**-tabs** or **tab3**)
Preserves (expands to spaces) tabs when printing.

ek Resets ERASE and KILL characters back to normal CTRL-H and CTRL-U .

sane
Resets all modes to some reasonable values. Useful when a terminal's settings have been hopelessly scrambled.

term
Sets all modes suitable for the terminal type, TERM.

See Also

console(M), ioctl(S), vidi(C), tty(M), termio(M)

Notes

Many combinations of options make no sense, but no checking is performed.

Name

su - Makes the user a super-user or another user.

Syntax

su [**-**] [name [arg ...]]

Description

su allows you to become another user without logging off. The default user *name* is **root** (i.e., super-user).

To use *su*, the appropriate password must be supplied (unless you are already a super-user). If the password is correct, *su* will execute a new shell with the real and effective user ID set to that of the specified user. The new shell will be the optional program named in the shell field of the specified user's password file (**/bin/sh** if none is specified (see *sh*(C)). To restore normal user ID privileges, press **EOF** (Ctrl-D) to the new shell.

Any additional arguments given on the command line are passed to the program invoked as the shell. When using programs like *sh*(C), an *arg* of the form **-c** *string* executes *string* via the shell and an arg of **-r** gives the user a restricted shell.

The following statements are true only if the optional program named in the shell field of the specified user's password file entry is like *sh*(C). If the first argument to *su* is a **-**, the environment is changed to what would be expected if the user actually logged in as the specified user. This is done by invoking the program used as the shell with an *arg0* value whose first character is **-**, thus causing first the system's profile (**/etc/profile**) and then the specified user's profile (**.profile** in the new HOME directory) to be executed. Otherwise, the environment is passed along with the possible exception of **$PATH**, which is set to **/bin:/etc:/usr/bin** for **root**. Note that if the optional program used as the shell is **/bin/sh**, the user's **.profile** can check *arg0* for **-sh** or **-su** to determine if it was invoked by *login*(M) or *su*(C), respectively. If the user's program is other than **/bin/sh**, then **.profile** is invoked with an *arg0* of *-program* by both *login*(M) and *su*(C).

The file **/etc/default/su** can be used to control several aspects of how *su* is used. Several entries can be placed in **/etc/default/su**:

SULOG Name of log file to record all attempts to use *su*. Usually **/usr/adm/sulog**. If not set, no logfile is kept. (See example below.)

PATH The PATH environment variable to set for non-root users. If not set, it defaults to ":/bin:/usr/bin". The current PATH environment variable is ignored.

SUPATH When invoked by root, the path is set by default to "/bin:/usr/bin:/etc", unless this variable is defined. The current PATH is ignored.

CONSOLE Attempts to use *su* are logged to the named *file*, independently of SULOG.

For example, if you want to log all attempts by users to become root, create the file **/etc/default/su**. In this file, place a string similar to SULOG=/usr/adm/sulog. This causes all attempts by any user to switch user IDs to be recorded in the file **/usr/adm/sulog.** This filename is arbitrary. The *su* logfile records the original user, the UID of the su attempt, and the time of the attempt. If the attempt is successful, a plus sign (+) is placed on the line describing the attempt. A minus sign (-) indicates an unsuccessful attempt.

Examples

To become user **bin** while retaining your previously exported environment, enter:

```
su bin
```

To become user **bin** but change the environment to what would be expected if **bin** had originally logged in, enter:

```
su - bin
```

To execute *command* with the temporary environment and permissions of user **bin**, enter:

```
su - bin -c "command args"
```

Files

/etc/passwd	The system password file
/etc/default/su	Optional file containing control options
/etc/profile	The system profile
$HOME/.profile	The user profile

See Also

env(C), environ(M), login(M), passwd(F), profile(M), sh(C)

Name

sum - Calculates checksum and counts blocks in a file.

Syntax

sum [**-r**] file

Description

sum calculates and prints a 16-bit checksum for the named file, and also prints the number of blocks in the file. It is typically used to look for bad spots, or to validate a file communicated over a transmission line. The option **-r** causes an alternate algorithm to be used in computing the checksum.

See Also

cmchk(C), machine(M), wc(C)

Diagnostics

"Read error" is indistinguishable from end-of-file on most devices; check the block count.

Notes

This utility uses 1024-byte blocks.

Name

tail - Delivers the last part of a file.

Syntax

tail [±[number][**lbc**] [**-f**]] [file]

Description

tail copies the named file to the standard output beginning at a designated place. If no file is named, the standard input is used.

Copying begins at distance *+number* from the beginning, or *-number* from the end of the input (if *number* is null, the value 10 is assumed). *Number* is counted in units of lines, blocks, or characters, according to the appended option **l**, **b**, or **c**. When no units are specified, counting is by lines.

With the **-f** ("follow") option, if the input file is not a pipe, the program will not terminate after the last line of the input file has been copied, but will enter an endless loop, wherein it sleeps for a second and then attempts to read and copy further records from the input file. Thus it may be used to monitor the growth of a file that is being written by some other process. For example, the command:

```
tail -f file
```

will print the last ten lines of *file*, followed by any lines that are appended to *file* between the time *tail* is initiated and killed.

See Also

dd(C)

Notes

Tails relative to the end of the file are kept in a buffer, and thus are limited in length. Unpredictable results can occur if character special files are "tailed".

Name

tape, mcart - Magnetic tape maintenance program.

Syntax

tape [**-csf8i**] [**-a** arg] command [device]

mcart command [device]

Description

tape sends commands to and receives status from the tape subsystem. *tape* can communicate with QIC-02 cartridge tape drives, SCSI tape drives, and QIC-40, QIC-80 and Irwin mini-cartridge tape drives. (The *mcart* program is automatically invoked by *tape* when options specific to the Irwin driver are used.)

tape reads **/etc/default/tape** to find the default device name for sending commands and receiving status. For example, the following line in **/etc/default/tape** will cause *tape* to communicate with the QIC-02 cartridge tape device:

```
device = /dev/xct0
```

If a device name is specified on the command line, it overrides the default device. *tape* queries the device to determine its device type. If the device does not respond to the query, for example if the cartridge tape driver is from an earlier release, *tape* will print a warning message and assume the device is a QIC-02 cartridge tape.

You can explicitly specify the type of the device by using the device type flags, as follows:

-c	QIC-02 cartridge tape
-s	SCSI tape
-f	QIC-40 mini-cartridge tape
-8	QIC-80 mini-cartridge tape
-i	Irwin mini-cartridge tape

The **-a** flag allows you to pass an argument to commands that can use them. The only command that currently can take an argument is the **format** command, and a **format** argument is only valid with QIC-40 and QIC-80 tape drives.

The following commands can be used with the various tape drivers supported under XENIX. The letters following each description indicate which drivers support each command:

A	All drivers
C	QIC-02 cartridge tape driver
S	SCSI tape driver
F	QIC-40 and QIC-80 mini-cartridge tape drivers
I	Irwin mini-cartridge tape driver

amount
Report amount of data in current or last transfer. (C,S,F)

erase
Erase and retension the tape cartridge. (C,S,F)

load
Loads the tape cartridge. (S)

reset
Reset tape controller and tape drive. Clears error conditions and returns tape subsystem to power-up state. (C,S,F)

reten
Retension tape cartridge. Should be used periodically to remedy slack tape problems. Tape slack can cause an unusually large number of tape errors. (A)

rewind
Rewind to beginning of tape. (A)

status
The status output looks like this:

```
status:        status message
soft errors:   n
underruns:     m
```

status message is a report of the current status of the drive; "no cartridge," "write protected," or "beginning of tape" are typical status messages.

soft errors is the number of recoverable errors that occurred during the last tape operation. A recoverable error is one which is correctable by the drive or controller. An example of a non-recoverable "hard" error is an attempt to write to a write-protected cartridge. Note that if the number of soft errors greatly exceeds the manufacturer's specifications, the drive may require service or replacement, or you may be using defective tape.

underruns is the number of times the tape drive had to stop and restart due to tape buffer underflows. Underruns are not errors, but an indication that the data transfer did not occur at the drive's maximum data transfer rate. The number of underruns can be affected by system load. (C,S,F)

unload
Unloads the tape cartridge. (S)

format
Format the tape cartridge. Floppy controller-based tapes must be formatted before they can be used. This command takes approximately one minute per megabyte of tape capacity. If an argument is provided with the **-a** flag, the number of tracks specified by the argument will be formatted. Only even numbers less than or equal to the number of tracks on the tape are allowed. (See **tape**(HW) for more information.) If no argument is given, the entire tape will be formatted. Preformatted tapes are available and are highly recommended. They are more reliable than user-formatted tapes. Before reformatting a used tape, it must be erased with a bulk eraser. Proper use of a bulk eraser is essential; refer to the documentation for your bulk eraser before attempting to use it. (F,I)

getbb
Prints a list of bad tape blocks detected during the last tape operation. This listing can be saved in a file for use by the **putbb** command. (F)

putbb
Reads a list of bad tape blocks from the standard input and adds them to the bad block table on the tape. The format expected by **putbb** is the same as generated by the **getbb** command. (F)

rfm
Wind tape forward to the next file mark. (C,S)

wfm
Write a file mark at the current tape position. (C,S)

Irwin-specific Commands

The following commands are all specific to Irwin drives.

drive
displays information about the Irwin driver and the tape drive. An example display is:

```
Special file: /dev/rctmini
Driver version: 1.0.6a
Drive type: 285XL
Drive firmware: A0
Controller type: SYSFDC
Unit select (0-3): 3
```

Special file is the name of the special file used to access the driver.

Driver version is the version of the driver linked with the kernel.

Drive type is an "equivalent" tape drive model number as determined by the MC driver. Since the exact model number of the tape drive depends on the drive's form factor and whether the drive is mounted in its own cabinet, the equivalent model number may not be the exact model of the installed tape drive. The following is a list of equivalent drives:

110: 110, 310, 410
120[XL]: 120, 220, 320, 420, 720, 2020
125: 125, 225, 325, 425, 725
145[XL]: 145, 245, 345, 445, 745, 2040
165: 165, 265, 465, 765
285XL: 285, 485, 785, 2080
287XL: 287, 487, 787, 2120

The brackets in the 120[XL] and 145[XL] mean the letters "XL" may or may not be present. When the letters "XL" appear, the drive is capable of servo writing extra long (i.e., 307.5 foot DC2120) tapes.

Note: When this field displays "125/145," either a 125 drive or an early model 145 drive with a DC1000 is present, the driver can't distinguish between the two. A 125 drive will only accept a DC1000 cartridge (a DC2000 or DC2120 will not fit). A 145 drive will accommodate DC1000, DC2000, or DC2120 cartridges.

Drive firmware is the firmware part number and revision level. This line is present only for drives which report this information.

Controller type: is a mnemonic for the floppy controller to which the tape drive is attached:

Mnemonic	Description
SYSFDC	System floppy controller
ALTFDC	Alternate floppy controller
4100MC	Irwin 4100MC Micro Channel controller
4100MCB	Second 4100MC Micro Channel controller
4100	Irwin 4100 PC Bus controller
4100B	Second 4100 PC Bus controller

Unit select (0-3) gives the controller's unit select, in the range 0 through 3. The unit select selects the drive.

info
displays Irwin cartridge information. For example:

```
Cartridge state: Formatted
Cartridge format: 145
Write protect slider position: RECORD
```

Cartridge state is the current state of the cartridge's format.

Cartridge format indicates the format on the cartridge's tape. The format is given in a code which is the same as the drive model on which the cartridge was originally formatted (see **drive** and *tape*(HW) for details). When the cartridge is blank, the code has the format which would be applied by the **format** command.

Write protect slider position is RECORD or PROTECT.

capacity
cartridge capacity in 512-byte blocks.

kapacity
cartridge capacity in 1024-byte blocks.

These two commands give the total usable data storage capacity of a formatted tape cartridge. Variations in cartridge capacity are due to differing numbers of bad blocks.

Files

/dev/rStp0	/dev/rct0	/dev/erct0	/dev/rmc1
/dev/nrStp0	/dev/nrct0	/dev/xct0	/dev/mcdaemon
/dev/xStp0	/dev/rct2	/dev/rctmini	
/dev/rft0	/dev/nrct2	/dev/xctmini	
/dev/xft0	/dev/xct0	/dev/rmc0	

/etc/default/tape

Include files:

/usr/include/sys/tape.h
/usr/include/sys/ct.h
/usr/include/sys/ft.h
/usr/include/sys/ir.h

See Also

backup(ADM), cpio(C), dd(C), restore(ADM), tape(HW), tar(C), mcdaemon(F)

Notes

See *tape*(HW) and your *Release Notes* for a list of supported tape drives.

The **amount** and **reset** commands can be used while the tape is busy with other operations. All other commands wait until the currently executing command has been completed before proceeding.

When you are using the non-rewinding tape device or the *tape* commands **rfm** and **wfm**, the tape drive light remains on after the command has been completed, indicating that more operations may be performed on the tape. The *tape* **rewind** command may be used to clear this condition.

For more information on devicefiles, (listed above), see the *tape*(HW) manual page.

The **amount** command doesn't work with QIC-40 mini-cartridge tape devices.

Name

tapedump - dumps magnetic tape to output file.

Syntax

tapedump [**-a**|**-e**] [**-o**|**-h**] [**-btsn***num*] *tape_device output_file*

Description

tapedump dumps the contents of magnetic tapes according to the options specified. Options include conversion from input format to user specified output format, specification of input and output block-size, and the ability to specify that the dump begin at a specific start block on the tape and proceed for a specified number of blocks.

Options

Option	Value
tape_device	The input tape device.
-a	Convert from EBCDIC input to ASCII output.
-e	Convert from ASCII input to EBCDIC output.
-o	Display tape output in octal format.
-h	Display tape output in hexadecimal format.
-b *num*	skips *n* input records before starting dump.
-t *num*	Specify which tape file to begin dump from, where *num* is the tape file sequence number.
-s *num*	Specify tape block address from which to start dump.
-n *num*	Specify dump of only *num* blocks.
output_file	The output filename; standard output is the default.

Examples

This command reads a tape starting at block 400 and outputs the results in hexadecimal format into a user specified file called **/tmp/hex.dump**:

tapedump -b*400* **-h** */dev/rct0 /tmp/hexdump*

This command reads an EBCDIC tape and converts the standard output to ASCII:

tapedump -a */dev/rct0*

See Also

sysadmsh(ADM), dd(C), hd(C), od(C), tape(C)

Notes

The output file may be specified to be another tape device.

Name

tar - Archives files.

Syntax

tar [key] [files]

Description

tar saves and restores files to and from an archive medium, which is typically a storage device such as floppy disk or tape, or a regular file. Its actions are controlled by the *key* argument. The *key* is a string of characters containing at most one function letter and possibly one or more function modifiers. Valid function letters are **c**, **t**, **x**, and **e**. Other arguments to the command are *files* (or directory names) specifying which files are to be backed up or restored. In all cases, appearance of a directory name refers to the files and (recursively) subdirectories of that directory. The **r** and **u** options cannot be used with tape devices.

The function portion of the key is specified by one of the following letters:

r The named *files* are written to the end of an existing archive.

x The named *files* are extracted from the archive. If a named file matches a directory whose contents had been written onto the archive, this directory is (recursively) extracted. The owner, modification time, and mode are restored (if possible). If no *files* argument is given, the entire contents of the archive are extracted. Note that if several files with the same name are on the archive, the last one overwrites all earlier ones.

t The names of the specified files are listed each time that they occur on the archive. If no *files* argument is given, all the names on the archive are listed.

u The named *files* are added to the archive if they are not already there, or if they have been modified since last written on that archive.

c Creates a new archive; writing begins at the beginning of the archive, instead of after the last file.

The following characters may be used in addition to the letter that selects the desired function:

0,...,9999
This modifier selects the drive on which the archive is mounted. The default is found in the file **/etc/default/tar**.

v Normally, *tar* does its work silently. The **v** (verbose) option causes it to display the name of each file it treats, preceded by the function letter. With the **t** function, **v** gives more information about the archive entries than just the name.

w Causes *tar* to display the action to be taken, followed by the name of the file, and then wait for the user's confirmation. If a word beginning with **y** is given, the action is performed. Any other input means "no".

f Causes *tar* to use the next argument as the name of the archive instead of the default device listed in **/etc/default/tar**. If the name of the file is a dash (**-**), *tar* writes to the standard output or reads from the standard input, whichever is appropriate. Thus, *tar* can be used as the head or tail of a pipeline. *tar* can also be used to move hierarchies with the command:

cd fromdir; tar cf - **.** | (cd todir; tar xf -)

b Causes *tar* to use the next argument as the blocking factor for archive records. The default is 1, the maximum is 20. This option should only be used with raw magnetic tape archives (see **f** above). The block size is determined automatically when reading tapes (key letters **x** and **t**).

F Causes *tar* to use the next argument as the name of a file from which succeeding arguments are taken.

l Tells *tar* to display an error message if it cannot resolve all of the links to the files being backed up. If **l** is not specified, no error messages are displayed.

m Tells *tar* to not restore the modification times. The modification time of the file is the time of extraction.

k Causes *tar* to use the next argument as the size of an archive volume in kilobytes. The minimum value allowed is 250. Very large files are split into "extents" across volumes. When restoring from a multivolume archive, *tar* only prompts for a new volume if a split file has been partially restored. To override the value of **k** in the **default** file, specify **k** as 0 on the command line.

e Prevents files from being split across volumes (tapes or floppy disks). If there is not enough room on the present volume for a given file, *tar* prompts for a new volume. This is only valid when the **k** option is also specified on the command line.

n Indicates the archive device is not a magnetic tape. The **k** option implies this. Listing and extracting the contents of an archive are sped because *tar* can seek over files it wishes to skip. Sizes are printed in kilobytes instead of tape blocks.

p Indicates that files are extracted using their original permissions. It is possible that a non-super-user may be unable to extract files because of the permissions associated with the files or directories being extracted.

A Suppresses absolute filenames. Any leading "/"characters are removed from filenames. During extraction arguments given should match the relative (rather than the absolute) pathnames. With the **c**, **r**, **u** options the **A** option can be used to inhibit putting leading slashes in the archive headers.

q During extraction, causes *tar* to exit immediately after each file on the command line has been extracted, rather than continuing to look for additional files of the same name.

tar reads **/etc/default/tar** to obtain default values for the device, blocking factor, volume size, and the device type (tape or non-tape). If no numeric key is specified on the command, *tar* looks for a line in the **default** file beginning with the string *archive=*. Following this pattern are 4 blank separated strings indicating the values for the device, blocking factor, volume size and device type, in that order. A volume size of '0' indicates infinite volume length. This entry should be modified to reflect the size of the tape volumes used.

For example, the following is the default device entry from **/etc/default/tar :**

```
archive=/dev/fd096ds15 10 1200 n
```

The *n* in the last field means that this device is not a tape. Use *y* for tape devices. Any default value may be overridden on the command line. The numeric keys (by default 0-7) select the line from the default value beginning with *archive#=*, where # is the numeric key. When the **f** key letter is specified on the command line, the entry *"archivef="* is used. In this case, the default file entry must still contain 4 strings, but the first entry (specifying the device) is not significant. The default file **/etc/default/tar** need not exist if a device is specified on the command line.

Notes

A critical consideration when creating a tar volume involves the use of absolute or relative pathnames. Consider the following *tar* command examples, as executed from the directory **/u/target**:

```
tar cv /u/target/arrow

tar cv arrow
```

The first command creates a tar volume with the *absolute* pathname: /u/target/arrow. The second yields a tar volume with a *relative* pathname: ./arrow. (The **./** is implicit and shown here as an example; **./** should not be specified when retrieving the file from the archive.) When restored, the first example results in the file **arrow** being written to the directory /u/target (if it exists and you have write permission) no matter what your working directory. The second example simple writes the file **arrow** to your present working directory.

Absolute pathnames specify the location of a file in relation to the root directory (/); relative pathnames are relative to the current directory. This must be taken into account when making a tar tape or disk. Backup volumes use absolute pathnames so that they can be restored to the proper directory. Use relative pathnames when creating a tar volume where absolute pathnames are unnecessary.

Examples

If the name of a floppy disk device is **/dev/fd1**, then a tar format file can be created on this device by entering:

```
assign /dev/fd
tar cvfk /dev/fd1 360 files
```

where *files* are the names of files you want archived and 360 is the capacity of the floppy disk in kilobytes. Note that arguments to key letters are given in the same order as the key letters themselves, thus the **fk** key letters have corresponding arguments **/dev/fd1** and **360**. Note that if a *file* is a directory, the contents of the directory are recursively archived. To display a listing of the archive, enter:

```
tar tvf /dev/fd1
```

At some later time you will likely want to extract the files from the archive floppy. You can do this by entering:

```
tar xvf /dev/fd1
```

The above command extracts all files from the archive, using the exact same pathnames as used when the archive was created. Because of this behavior, it is normally best to save archive files with relative pathnames rather than absolute ones, since directory permissions may not let you read the files into the absolute directories specified. (See

the **A** flag under *Options*.)

In the above examples, the **v** verbose option is used simply to confirm the reading or writing of archive files on the screen. Also, a normal file could be substituted for the floppy device **/dev/fd1** shown in the examples.

Files

/etc/default/tar	Default devices, blocking and volume sizes, device type
/tmp/tar*	

Diagnostics

Displays an error message about bad key characters and archive read/write errors.

Displays an error message if not enough memory is available to hold the link tables.

Notes

There is no way to ask for the *n*th occurrence of a file.

tar does not verify the selected media type.

The **u** option can be slow.

The limit on filename length is 100 characters.

When archiving a directory that contains subdirectories, *tar* will only access those subdirectories that are within 17 levels of nesting. Subdirectories at higher levels will be ignored after *tar* displays an error message.

When using *tar* with a raw device, specify the block size with the **b** option as a multiple of 1K. For example, to use a 9K block size, enter:

```
tar cvfb /dev/rfd0 18 file
```

Do not enter:

```
tar xfF - -
```

This would imply taking two things from the standard input at the same time.

Use error-free floppy disks for best results with *tar*.

Name

tee - Creates a tee in a pipe.

Syntax

tee [**-i**] [**-a**] [**-u**] [file] ...

Description

tee transcribes the standard input to the standard output and makes copies in the *files*. The **-i** option ignores interrupts; the **-a** option causes the output to be appended to the *files* rather than overwriting them. The **-u** option causes the output to be unbuffered.

Examples

The following example illustrates the creation of temporary files at each stage in a pipeline:

```
grep ABC | tee ABC.grep | sort | tee ABC.sort | more
```

This example shows how to tee output to the terminal screen:

```
grep ABC | tee /dev/tty | sort | uniq >final.file
```

Name

test - Tests conditions.

Syntax

test expr

[expr]

Description

test evaluates the expression *expr*, and if its value is true, returns a zero (true) exit status; otherwise, *test* returns a nonzero exit status if there are no arguments. 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.
-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.
-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. Possible null length strings must be enclosed in double quotation marks (").
-n *s1*	True if the length of string *s1* is nonzero. Possible null length strings must be enclosed in double quotation marks (").

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**.

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 that all the operators and flags are separate arguments to *test*. Notice also, that parentheses are meaningful to the shell and, therefore, must be escaped.

See Also

find(C), sh(C)

Notes

In the second form of the command (that is, the one that uses [ ], rather than the word *test*), the square brackets must be delimited by blanks. That form of the command also requires that the expression *s1* = *s2* contain a space on each side of the "=" and *s1 != s2 contain a space before the "!" and after the "=".*

Name

tic - Terminfo compiler.

Syntax

tic [**-v** [*n*] [**-p** permlist]] file ...

Description

tic translates terminfo files from the source format into the compiled format. The results are placed in the directory **/usr/lib/terminfo.**

If the environment variable TERMINFO is set, the results are placed there instead of **/usr/lib/terminfo.**

The **-v** (verbose) option causes *tic* to output trace information showing its progress. If the optional digit *n* is appended, the level of verbosity can be increased.

The **-p** option directs *tic* to create a permissions file **permlist** for use with *fixperm*(ADM).

tic compiles all terminfo descriptions in the given files. When a **use=** field is discovered, *tic* first searches the current file and then the master file **./terminfo.src.**

Some limitations: the total size of a description cannot exceed 4096 bytes; the name field cannot exceed 128 bytes.

Files

/usr/lib/terminfo/*/* -Compiled terminal capability database.

See Also

terminfo(M), terminfo(S), terminfo(F), tid(C)

Notes

Use of the **-p** option is not recommended. The functionality may change in future versions of XENIX.

Name

tid - Terminfo decompiler.

Syntax

tid [*term*]

Description

tid decompiles the description of terminal *term* originally compiled by *tic* (C). If *term* is not specified, the setting of the **TERM** environment variable is used.

Files

/usr/lib/terminfo/*/* - Compiled terminal descriptions.

See Also

tic(C), terminfo(F), terminfo(M).

Notes

The output of *tid* is not acceptable input to *tic*; a great deal of editing is required.

Name

touch - Updates access and modification times of a file.

Syntax

touch [**-amc**] [mmddhhmm[yy]] files

Description

touch causes the access and modification times of each argument to be updated. If no time is specified (see *date*(C)) the current time is used. The first *mm* refers to the month, *dd* refers to the day, *hh* refers to the hour, the second *mm* refers to the minute, and *yy* refers to the year. The **-a** and **-m** options cause touch to update only the access or modification times respectively (default is **-am**). The **-c** option silently prevents *touch* from creating the file if it did not previously exist.

The return code from *touch* is the number of files for which the times could not be successfully modified (including files that did not exist and were not created).

See Also

date(C), utime(S)

Name

tput - Queries the terminfo database.

Syntax

tput [**-T***type*] attribute

Description

The command *tput* uses the terminfo database to make the values of terminal-dependent *attributes* available to the shell. *tput* outputs a string if the terminal *attribute* is of type string, or an integer if the *attribute* is of type integer. If the *attribute* is of type Boolean, *tput* simply sets the exit code (0 for true if the terminal has the capability, 1 for false if it does not) and produces no output.

The **-T** flag indicates the type of the terminal. Normally this option is unnecessary, as the default is taken from the environment variable **TERM**.

attribute is the terminal capability name from the terminfo database.

Examples

tput clear	Echo clear-screen sequence for the current terminal.
tput cols	Print the number of columns for the current terminal.
tput -Tvt100 cols	Print the number of columns for the vt100 terminal.
bold=‘tput smso‘ **offbold=‘tput rmso‘**	Set the shell variables “bold” to begin standout mode sequence and “offbold” to end standout mode sequence for the current terminal. This might be followed by a prompt, such as: echo "${bold}Name: ${offbold}\c"
tput hc	Set exit code to indicate if the current terminal is a hardcopy terminal.

Files

/usr/lib/terminfo/*/* -Compiled terminal capability database.

See Also

terminfo(M), terminfo(S), tic(C), stty(C)

Notes

If the *attribute* is of type boolean, a value of 0 is returned for TRUE and a value of 1 for FALSE.

If the *attribute* is of type string or integer, a value of 0 is returned upon successful completion. Any other value returned indicates an error. For example, the specification of a bad *attribute* (any capability name that is not found in the terminfo database) produces an error.

Name

tr - Translates characters.

Syntax

tr [**-cds**] [string1 [string2]]

Description

tr copies the standard input to the standard output with substitution or deletion of selected characters. Input characters found in *string1* are mapped into the corresponding characters of *string2*. Any combination of the options **-cds** may be used:

-c Complements the set of characters in *string1* with respect to the universe of characters whose ASCII codes are 001 through 377 octal

-d Deletes all input characters in *string1*

-s Squeezes all strings of repeated output characters that are in *string2* to single characters

The following abbreviation conventions may be used to introduce ranges of characters or repeated characters into the strings:

[a-z] Stands for the string of characters whose ASCII codes run from character **a** to character **z**, inclusive.

[a*n] Stands for *n* repetitions of **a**. If the first digit of *n* is **0**, *n* is considered octal; otherwise, *n* is taken to be decimal. A zero or missing *n* is taken to be huge; this facility is useful for padding *string2*.

The escape character \ may be used as in the shell to remove special meaning from any character in a string. In addition, \ followed by 1, 2, or 3 octal digits, stands for the character whose ASCII code is given by those digits.

The following example creates a list of all the words in *file1*, one per line in *file2*, where a word is taken to be a maximal string of alphabetics. The strings are quoted to protect the special characters from interpretation by the shell; 012 is the ASCII code for newline:

```
tr -cs "[A-Z][a-z]" "[\012*]" <file1 >file2
```

See Also

ed(C), sh(C), ascii(M)

Notes

tr won't handle ASCII NUL in *string1* or *string2*; always deletes NUL from input.

Name

translate - translates files from one format to another

Syntax

translate option [infile] [outfile]

Description

translate translates files according to the options specified. Translation is done according to the options defined below.

format is assumed to be a file in the directory **/usr/lib/mapchan/translate** if a full pathname is not provided.

translate uses standard input and standard output unless otherwise specified via the optional filename arguments.

Options

-ea	From EBCDIC to ASCII.
-ae	From ASCII to EBCDIC.
-fe *format*	From a user defined format to EBCDIC format.
-fa *format*	From a user defined format to ASCII format.
-ef *format*	From EBCDIC format to a user defined format.
-af *format*	From ASCII format to a user defined format.
-bm	From binary/object code to mailable ASCII *uuencode* format.
-mb	From mailable ASCII *uuencode* format to original binary.

Files

/usr/lib/mapchan/translate/*

See Also

uuencode(C), dd(C), mapchan(M), sysadmsh(ADM)

Notes

The **-bm** and **-mb** options are, for example, used to translate executable object code format to ASCII for transfer across communications networks.

The syntax for the user defined format file is the same as the syntax for the mapping files for *mapchan*(M) and *trchan*.

Use **dd** to convert character and file formats (especially tapes) to the format specified. Example:

```
dd if=/dev/rmt0 of=outfile ibs=800 cbs=80 conv=ascii,lcase
```

This command reads an EBCDIC tape, blocked ten 80-byte EBCDIC card images per record, into the ASCII file *outfile*. For more information on conversion options, refer to *dd*(C).

Name

true - Returns with a zero exit value.

Syntax

true

Description

true does nothing except return with a zero exit value. *false* (C), *true*'s counterpart, does nothing except return with a nonzero exit value. *true* is typically used in shell procedures such as:

```
while true
do
        command
done
```

See Also

sh(C), false (C)

Diagnostics

true has exit status zero.

Name

tset - Sets terminal modes.

Syntax

tset [**-**] [**-hrsuIQS**] [**-e**[c]] [**-E**[c]] [**-k**[c]]
[**-m** [ident] [test baudrate]:type] [type]

Description

tset causes terminal dependent processing such as setting erase and kill characters, setting or resetting delays, and the like. It is driven by the **/etc/ttytype** and **/etc/termcap** files.

The type of terminal is specified by the *type* argument. The type may be any type given in **/etc/termcap.** If *type* is not specified, the terminal type is the value of the environment variable TERM, unless the **-h** flag is set or any **-m** argument is given. In this case, the type is read from **/etc/ttytype** (the port name to terminal type database). The port name is determined by a *ttyname*(S) call on the diagnostic output. If the port is not found in **/etc/ttytype** the terminal type is set to *unknown.*

Ports for which the terminal type is indeterminate are identified in **/etc/ttytype** as *dialup, plugboard,* etc. The user can specify how these identifiers should map to an actual terminal type. The mapping flag, **-m,** is followed by the appropriate identifier (a four-character or longer substring is adequate), an optional test for baud rate, and the terminal type to be used if the mapping conditions are satisfied. If more than one mapping is specified, the first correct mapping prevails. A missing identifier matches all identifiers. Baud rates are specified as with stty(C), and are compared with the speed of the diagnostic output. The test may be any combination of: **>, =, <, @,** and **!.** (Note: **@** is a synonym for = and **!** inverts the sense of the test. Remember that escape characters are meaningful to the shell.)

If the *type* as determined above begins with a question mark, the user is asked if he really wants that type. A null response means to use that type; otherwise, another type can be entered which will be used instead. (The question mark must be escaped to prevent filename expansion by the shell.)

tset is most useful when included in the **.login** (for *csh*(C)) or **.profile** (for *sh*(C)) file executed automatically at login, with **-m** mapping used to specify the terminal type you most frequently dial in on.

Options

-e [*c*]
This option sets the erase character to the named character, *c*, with *c* defaulting to Ctrl-H.

-E [*c*]
This flag is identical to **-e** except that it only operates on terminals that can backspace.

-k [*c*]
This option sets the kill character to the named character, *c*, with *c* defaulting to Ctrl-U. In all of these flags, "^X" where X is any character is equivalent to Ctrl-X .

- This option prints the terminal type on the standard output; this can be used to get the terminal type by entering:

```
set termtype = `tset -`
```

If no other options are given, *tset* operates in "fast mode" and *only* outputs the terminal type, bypassing all other processing.

-h Forces *tset* to search **/etc/ttytype** for information and to overlook the environment variable, **TERM**.

-s This option outputs "setenv" commands (if your default shell is *csh*(C) or "export" and assignment commands (if your default shell is *sh*(C));

For the **-s** option with the Bourne or Korn shell, enter:

```
tset -s ... > /tmp/tset$$
. ./tmp/tset$$
rm /tmp/tset$$
```

-S This option only outputs the strings to be placed in the environment variables.

If you are using csh, enter:

```
set noglob
set term=(`tset -S ....`)
setenv TERM $term[1]
setenv TERMCAP "$term[2]"
unset term
unset noglob
```

-r This option displays the terminal type on the diagnostic output.

-Q This option suppresses displaying the "Erase set to" and "Kill set to" messages.

-I This option suppresses outputting the terminal initialization strings.

-m[*ident*][*test baudrate*]:*type*
Allows a user to specify how a given serial port is is to be mapped to an actual terminal type. The option applies to any serial port in **/etc/ttytype** whose type is indeterminate (e.g., *dialup*, etc.). The *type* specifies the terminal type to be used, and *ident* identifies the name of the indeterminate type to be matched. If no *ident* is given, all indeterminate types are matched. The *test baudrate* defines a test to be performed on the serial port before the type is assigned. The *baudrate* must be as defined in *stty*(C). The *test* may be any combination of: >, =, <, @, and !. If the *type* begins with a question mark, the user is asked if he really wants that type. A null response means to use that type; otherwise, another type can be entered which will be used instead. The question mark must be escaped to prevent filename expansion by the shell. If more than one **-m** option is given, the first correct mapping prevails.

tset is most useful when included in the **.login** [for *csh*(C)] or **.profile** [for *sh*(C)] file executed automatically at login, with **-m** mapping used to specify the terminal type you most frequently dial in on.

Examples

tset gt42

Sets the terminal type to gt42.

tset -mdialup\>300:adm3a -mdialup:dw2 -Qr -e#

If the entry in **/etc/ttytype** corresponding to the login port is "dialup", and the port speed is greater than 300 baud, set the terminal type to adm3a. If the **/etc/ttytype** entry is "dialup" and the port speed is less than or equal to 300 baud, set the terminal type to dw2. Set the erase character to "#", and display the terminal type (but not the erase character) on standard error.

tset -m dial:ti733 -m plug:\?hp2621 -m unknown:\? -e -k^U

If the **/etc/ttytype** entry begins with "dial", the terminal type becomes ti733. If the entry begins with "plug", *tset* prompts with:

TERM = (hp2621)

Enter the correct terminal type if it is different than that shown. If the entry is "unknown", *tset* prompts with:

TERM = (unknown)

In any case, erase is set to the terminal's backspace character, the

kill character is set to Ctrl-U, and the terminal type is displayed on standard error.

Files

/etc/ttytype	Port name to terminal type map database
/etc/termcap	Terminal capability database

See Also

tty(M), termcap(M), stty(C)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Name

tty - Gets the terminal's name.

Syntax

tty [**-s**]

Description

The *tty* command prints the pathname of the user's terminal on the standard output. The **-s** option inhibits printing, allowing you to test just the exit code.

Exit Codes

0 if the standard input is a terminal, 1 otherwise.

Diagnostics

not a tty	If the standard input is not a terminal and **-s** is not specified

Name

umask - Sets file-creation mode mask.

Syntax

umask [ooo]

Description

The user file-creation mode mask is set to *ooo*. The three octal digits refer to read/write/execute permissions for *owner*, *group*, and *others*, respectively. Only the low-order 9 bits of *cmask* and the file mode creation mask are used. The value of each specified digit is "subtracted" from the corresponding "digit" specified by the system for the creation of any file (see *umask*(S) or *creat*(S)). This is actually a binary masking operation, and thus the name "umask". In general, binary ones remove a given permission, and zeros have no effect at all. For example, **umask 022** removes *group* and *others* write permission (files normally created with mode 777 become mode 755 ; files created with mode 666 become mode 644).

If *ooo* is omitted, the current value of the mask is printed.

umask is recognized and executed by the shell. By default, login shells have a umask of 022.

See Also

chmod(C), sh(C), chmod(S), creat(S), umask(S)

Name

uname - Prints the name of the current XENIX system.

Syntax

uname [**-snrmvdupX**]

Description

uname prints the current system name of the XENIX system on the standard output file. It is primarily used to determine which system you are using. The options cause selected information returned by *uname*(S) to be printed:

-s Prints the system name (default).

-n Prints the nodename (the nodename may be a name that the system is known by to a communications network).

-r Prints the operating system release.

-m Manufacturer: prints original supplier (number) of XENIX system.

-v Prints the operating system version.

-d Distributor: prints OEM (number) for the system.

-u Prints user serial number.

-p Prints processor of the machine.

-a Prints all the above information.

-X Prints all the above information, plus OEM number, kernel ID, bus type, serial number, processor, license (2-user or unlimited), origin number, and number of CPUs.

Notes

The **-m**, **-d**, **-X** options apply only to XENIX-386 distributions.

See Also

uname(S)

Name

uniq - Reports repeated lines in a file.

Syntax

uniq [**-udc** [+n] [-n]] [input [output]]

Description

uniq reads the *input* file and compares adjacent lines. In the normal case, the second and succeeding copies of repeated lines are removed; the remainder is written on the output file. *Input* and *output* should always be different. Note that repeated lines must be adjacent in order to be found; see *sort*(C). If the **-u** flag is used, just the lines that are not repeated in the original file are output. The **-d** option specifies that one copy of just the repeated lines is to be written. The normal mode output is the union of the **-u** and **-d** mode outputs.

The **-c** option supersedes **-u** and **-d** and generates an output report in default style but with each line preceded by a count of the number of times it occurred.

The *n* arguments specify skipping an initial portion of each line in the comparison:

-n The first *n* fields together with any blanks before each are ignored. A field is defined as a string of nonspace, nontab characters separated by tabs and spaces from its neighbors.

+n The first *n* characters are ignored. Fields are skipped before characters.

See Also

comm(C), sort(C)

Name

units - Converts units.

Syntax

units

Description

units converts quantities expressed in various standard scales to their equivalents in other scales. It works interactively in this fashion:

```
You have: inch
You want: cm
        * 2.540000e+00
        / 3.937008e-01
```

A quantity is specified as a multiplicative combination of units optionally preceded by a numeric multiplier. Numbers are displayed in scientific notation; powers are indicated by suffixed positive integers, division is shown by the usual sign:

```
You have: 15 lbs force/in2
You want: atm
        * 1.020689e+00
        / 9.797299e-01
```

units only does multiplicative scale changes; thus it can convert Kelvin to Rankine, but not Centigrade to Fahrenheit. Most familiar units, abbreviations, and metric prefixes are recognized, as well as the following:

pi Ratio of circumference to diameter

c Speed of light

e Charge on an electron

g Acceleration of gravity

force Same as **g**

mole
Avogadro's number

water
Pressure head per unit height of water

au Astronomical unit

Pound is not recognized as a unit of mass; **lb** is. Compound names are run together, (e.g. **lightyear**). British units that differ from their US counterparts are prefixed with "br". For a complete list of units, enter:

cat /usr/lib/unittab

Files

/usr/lib/unittab

Name

uptime - Displays information about system activity.

Syntax

uptime

Description

uptime prints the current time of day, the length of time the system has been up, the number of users logged onto the system, and load averages. Load averages are the number of processes in the run queue averaged over 1, 5, and 15 minutes. All of this information is also contained in the first line of the *w*(C) command.

See Also

w(C)

Name

usemouse - Maps mouse input for use with non-mouse based programs.

Syntax

usemouse [**-f** conffile] [**-t** type] [**-h** horiz_sens] [**-v** vert_sens] [**-c** cmd] [**-b**] parameters

Description

This utility allows you to use a mouse with any program that would otherwise accept only keyboard input.

For example, you can use a mouse with *vi*(C) to move the cursor around the screen and generate your most commonly used *vi* commands. The *usemouse*(C) command translates mouse input into specific keystrokes required by a program. You can use any of several predefined mouse keystroke sets (called maps) that correspond to different popular programs. You can also define your own maps with keystrokes that match different mouse movements and mouse buttons.

Options

The options are:

-f conffile
The **-f** flag may be used to select an alternate configuration file. The alternate configuration file, *conffile*, should use the format of **/etc/default/usemouse** and be entered as an absolute pathname on the command line. For example:

usemouse -f /u/daniel/mouseconf

is the correct form to specify an alternate configuration file. The **-f** and **-t** flags are mutually exclusive.

-t type
The **-t** flag may be used to select a predefined configuration file. *type* can be the name of any file in **/usr/lib/mouse**, such as *vi*, *rogue*, or any others the system administrator chooses to place there. These files are identical in format to **/etc/default/usemouse**.

-h horiz_sens
Defines the horizontal sensitivity. Horizontal mouse movements smaller than this threshold are ignored. Mouse movements that are multiples of this value generate multiple strings. The sensitivity

defaults to 5 units. The minimum value is 1 unit, and the maximum is 100 units. The lower the value, the more sensitive your mouse is to motion. Note that setting a high value may cause your mouse to behave as though it is not functioning, due to the large motion required to generate a signal.

-v vert_sens
Defines the vertical sensitivity. Vertical mouse movements smaller than this threshold are ignored. Mouse movements that are multiples of this value generate multiple strings. The sensitivity defaults to 5 units. The minimum value is 1 unit, and the maximum is 100 units. The lower the value, the more sensitive your mouse is to motion. Note that setting a high value may cause your mouse to behave as though it is not functioning, due to the large motion required to generate a signal.

-c cmd
This option selects a command for *usemouse* to run. This defaults to the shell specified in the SHELL environment variable. If SHELL is unspecified, **/bin/sh** is used. Note that the command given with this flag can contain blank spaces if the entire command is placed within double quotes. For example:

usemouse -c "vi /etc/termcap"

-b Suppresses bell (^G) for the duration of mouse usage. Useful with *vi*(C).

parameters
These are name=value pairs indicating what ASCII string to insert into the tty input stream, when the given event is received. Valid parameters include:

rbu=*string*	String to generate on right button up
rbd=*string*	String to generate on right button down
mbu=*string*	String to generate on middle button up
mbd=*string*	String to generate on middle button down
lbu=*string*	String to generate on left button up
lbd=*string*	String to generate on left button down
rt=*string*	String to generate on mouse right
lt=*string*	String to generate on mouse left
up=*string*	String to generate on mouse up
dn=*string*	String to generate on mouse down
ul=*string*	String to generate on mouse up-left
ur=*string*	String to generate on mouse up-right
dr=*string*	String to generate on mouse down-right
dl=*string*	String to generate on mouse down-left
hsens=*num*	Sensitivity to horizontal motion

vsens=*num*	Sensitivity to vertical motion
bells=*yes/no*	Whether to remove ^G characters

Parameters may be specified in any order. They may contain octal escapes. They may be quoted with single or double quotes if they contain blank spaces. Any parameters may be omitted and their value, if any, is taken from the configuration file.

The usemouse(C) Command

To start using the mouse with a text program, enter the command:

usemouse

This command sets the mouse for use with the default map, which is found in **/etc/default/mouse**. Alternate map files can be found in the directory **/usr/lib/mouse**. You can create your own alternate map files and place them in this directory or in your own custom map file directory. The default map file has the following values:

Mouse	Keystroke
Left Button	*vi* top of file (1G) command
Middle Button	*vi* delete character (x) command
Right Button	*vi* bottom of file (G) command
Up	Up Arrow Key
Down	Down Arrow Key
Left	Left Arrow Key
Right	Right Arrow Key
Up and Left	not defined
Up and Right	not defined
Down and Left	not defined
Down and Right	not defined
Bells	no

Invoking the *usemouse* command without specifying any options makes the mouse ready for use with a wide variety of programs or applications. Invoking *usemouse* with no options causes the mouse to use the default keystroke map. Invoking the mouse in this way creates a new command shell. You can continue to use the mouse for the duration of the shell. To terminate **usemouse**, simply enter Ctrl-D.

You can also invoke *usemouse* for the duration of a specific command:

usemouse -c *command*

This puts you in the program specified by *command* using the mouse. When you leave the program, mouse input is terminated.

Using the Mouse with Specific Programs

You can use any of several predefined maps that are set up specifically for use with different programs. (These maps are found in **/usr/lib/mouse**.) For example:

usemouse -t vi

This invokes the *vi*-specific map, which includes mapping the traditional **h-j-k-l** direction keys to the mouse movements. The terminal bell is automatically silenced by the *vi* map entry **bells=no**. This is done to prevent the bell being activated continuously when the user generates a spurious command with the mouse. (There is also a **-b** option that can be used on the *usemouse* command line to do the same thing.)

You can combine a command with a selected map file by putting both on the command line. For example:

usemouse -t vi -c vi *filename*

This invokes the *vi* map along with the command; when you quit out of *vi* the mouse disengages.

Setting Up Abbreviated (Aliased) Mouse Commands

If you plan to use the mouse frequently, you can substitute short, easy to use commands that will call up the longer command lines. This is known as command aliasing.

Specifying Map Keystrokes on the Command Line

You can also specify the characters to be generated by mouse motions on the *usemouse* command line. You can specify button actions or motion actions to supplement or replace a definition from a map file. For example, assume you want to use the default *usemouse* file, but you want to redefine the middle mouse button **mbd** (middle button down) as the *vi* "i" (insert) instead of the "x" (delete character) command. The following command line does this:

usemouse -c vi mbd=i

The mouse operations are defined by a series of acronyms that are the same as used in the actual map file:

Parameter	Mouse Operation	Default
rbu	right button up	not used
rbd	right button down	1G
mbu	middle button up	not used
mbd	middle button down	x
lbu	left button up	not used
lbd	left button down	G
ul	mouse up-left	\033[A\033[C
ur	mouse up-right	\033[A\033[D
dr	mouse down-left	\033[B\033[C
dl	mouse down-right	\033[B\033[D
rt	mouse right	\033[C
lt	mouse left	\033[D
up	mouse up	\033[A
dn	mouse down	\033[B
hsens	horiz. sensitivity	5
vsens	vert. sensitivity	5

Creating Customized Maps

You can create your own personal map files for use with the mouse. The easiest way to do this is to copy the default map in **/etc/default/usemouse** and edit it. You can use quoted strings or the octal sequences found in the *ascii*(M) page. The mouse direction/button parameters are defined in the *usemouse* table above. For example, after placing a customized file, **mine**, in your home directory, you would invoke the following command to use it with the program *prog*:

usemouse -f mine -c prog

How usemouse Works

usemouse merges data from a mouse into the input stream of a tty. The mouse data is translated to arrow keys or any other arbitrary ASCII strings. Mouse movements up, down, left right, up-left, up-right, down-left, and down-right, as well as individual up and down button transitions, are programmable. This permits the mouse to be used with programs that are not designed to accept mouse input.

By default, the *usemouse* utility gets value configurations from the file **/etc/default/usemouse .**

After running the utility, provided a mouse is available, the user will be running a command with mouse motions and button events translated to ASCII strings and merged into their tty input stream. By default, the command is a shell.

Files

/dev/mouse	Directory for mouse-related special device files.
/dev/mouse/bus[0-1]	Bus mouse device files.
/dev/mouse/vpix[0-1]	vpix-mouse device files.
/dev/mouse/microsoft_ser	Microsoft serial mouse device files.
/dev/mouse/logitech_ser	Logitech serial mouse device files.
/dev/mouse/mousesys_ser	Mousesys serial mouse device files.
/dev/mouse/ttyp[0-7]	Special pseudo-tty files for mouse input.
/dev/mouse/ptyp[0-7]	Special pseudo-tty files for mouse input.
/etc/default/usemouse	Default map file for mouse-generated characters.
/usr/lib/event/devices	File containing device information for mice.
/usr/lib/event/ttys	File listing ttys eligible to use mice.
/usr/lib/mouse/*	Alternate map files for mice.

See Also

mouse(HW)

Name

uucp, uulog, uuname - UNIX-to-UNIX system copy

Syntax

uucp [options] source-files destination-file
uulog [options] **-s**system
uulog [options] system
uulog [options] **-f**system
uuname [**-l**] [**-c**]

Description

uucp

uucp copies files named by the *source-file* arguments to the *destination-file* argument. A file name may be a path name on your machine, or may have the form:

system-name!path-name

where *system-name* is taken from a list of system names that *uucp* knows about. The *system-name* may also be a list of names such as

system-name!system-name!...!system-name!path-name

in which case an attempt is made to send the file via the specified route, to the destination. Care should be taken to ensure that intermediate nodes in the route are willing to forward information (see *Warnings* restrictions).

The shell metacharacters **?**, ***** and **[...]** appearing in *path-name* will be expanded on the appropriate system. These characters may need to be escaped to prevent expansion by the local shell.

Path names may be one of:

(1) a full path name;

(2) a path name preceded by *~user* where *user* is a login name on the specified system and is replaced by that user's login directory;

(3) a path name preceded by *~/destination* where *destination* is appended to **/usr/spool/uucppublic**; (NOTE: This destination will be treated as a file name unless more than one file is being transferred by this request or the destination is already a directory. To ensure that it is a directory, follow the destination with a '/'. For example ~/dan/ as the destination will

make the directory /usr/spool/uucppublic/dan if it does not exist and put the requested file(s) in that directory).

(4) anything else is prefixed by the current directory.

If the result is an erroneous path name for the remote system the copy will fail. If the *destination-file* is a directory, the last part of the *source-file* name is used.

uucp preserves execute permissions across the transmission and gives 0666 read and write permissions (see *chmod*(C)).

The following options are interpreted by *uucp*:

-c Do not copy local file to the spool directory for transfer to the remote machine (default).

-C Force the copy of local files to the spool directory for transfer.

-d Make all necessary directories for the file copy (default).

-f Do not make intermediate directories for the file copy.

-g*grade* *Grade* is a single letter/number; lower ascii sequence characters will cause the job to be transmitted earlier during a particular conversation.

-j Output the job identification ASCII string on the standard output. This job identification can be used by *uustat* to obtain the status or terminate a job.

-m Send mail to the requester when the copy is completed.

-n*user* Notify *user* on the remote system that a file was sent.

-r Do not start the file transfer, just queue the job.

-s*file* Report status of the transfer to *file*. Note that the *file* must be a full path name.

-x*debug_level*
Produce debugging output on standard output. The *debug_level* is a number between 0 and 9; higher numbers give more detailed information.

uulog

uulog queries a log file of *uucp* or *uuxqt* transactions in a file

/usr/spool/uucp/.Log/uucico/*system* or **/usr/spool/uucp/.Log/uuxqt/***system*.

The options cause *uulog* to print logging information:

-s*system* Print information about file transfer work involving system *sys*.

-f*system* Does a "tail **-f**" of the file transfer log for *system*. (You must press DELETE or BREAK to exit this function.)

Other options used in conjunction with the above:

-x Look in the *uuxqt* log file for the given system, instead of the *uucico* log file (default).

-number
Indicates that a "tail" command of *number* lines should be executed.

uuname

uuname lists the names of systems known to *uucp*. The **-c** option returns the names of systems known to *cu*. (The two lists are the same, unless your machine is using different *Systems* files for *cu* and *uucp*. See the *Sysfiles* file.) The **-l** option returns the local system name.

Files

/usr/spool/uucp spool directories
/usr/spool/uucppublic/*public directory for receiving and sending
/usr/lib/uucp/* other data and program files

See Also

mail(C), uustat(C), uux(C), uuxqt(C), chmod(S)

Warnings

The domain of remotely accessible files can (and for obvious security reasons, usually should) be severely restricted. You will very likely not be able to fetch files by path name; ask a responsible person on the remote system to send them to you. For the same reasons you will probably not be able to send files to arbitrary path names. As distributed, the remotely accessible files are those whose names begin **/usr/spool/uucppublic** (equivalent to ~/).

All files received by *uucp* will be owned by *uucp*.

The **-m** option will only work sending files or receiving a single file. Receiving multiple files specified by special shell characters **? * [...]** will not activate the **-m** option.

The forwarding of files through other systems may not be compatible with the older (non-HoneyDanBer) versions of *uucp*. If forwarding is used, all systems in the route must have the same version of *uucp*.

Notes

Protected files and files that are in protected directories that are owned by the requester can be sent by *uucp*. However, if the requester is root, and the directory is not searchable by "other" or the file is not readable by "other," the request will fail.

Name

uuencode, uudecode - encode/decode a binary file for transmission via mail

Syntax

uuencode [source] remotedest | **mail** sys1!sys2!..!decode
uudecode [file]

Description

uuencode and *uudecode* are used to send a binary file via uucp (or other) mail. This combination can be used over indirect mail links.

uuencode takes the named source file (default standard input) and produces an encoded version on the standard output. The encoding uses only printing ASCII characters, and includes the mode of the file and the *remotedest* for recreation on the remote system.

uudecode reads an encoded file, strips off any leading and trailing lines added by mailers, and recreates the original file with the specified mode and name.

The encode file has an ordinary text form and can be edited by any text editor to change the mode or remote name.

See Also

uucp(C), uux(ADM), mail(C)

Restrictions

The file is expanded by 35% (3 bytes become 4 plus control information) causing it to take longer to transmit.

The user on the remote system who is invoking *uudecode* (often *uucp)* must have write permission on the specified file.

Name

uustat - uucp status inquiry and job control

Syntax

uustat [**-a**]
uustat [**-m**]
uustat [**-p**]
uustat [**-q**]
uustat [**-k**jobid]
uustat [**-r**jobid]
uustat [**-s**system] [**-u**user]

Description

uustat will display the status of, or cancel, previously specified *uucp* commands, or provide general status on *uucp* connections to other systems. Only one of the following options can be specified with *uustat* per command execution:

-a Output all jobs in queue.

-m Report the status of accessibility of all machines.

-p Execute a "ps -flp" for all the process-ids that are in the lock files.

-q List the jobs queued for each machine. If a status file exists for the machine, its date, time and status information are reported. In addition, if a number appears in () next to the number of **C** or **X** files, it is the age in days of the oldest **C./X.** file for that system. The Retry field represents the number of hours until the next possible call. The Count is the number of failure attempts. NOTE: for systems with a moderate number of outstanding jobs, this could take 30 seconds or more of real-time to execute. As an example of the output produced by the **-q** option:

```
eagle    3C      04/07-11:07     NO DEVICES AVAILABLE
mh3bs3   2C      07/07-10:42     SUCCESSFUL
```

The above output tells how many command files are waiting for each system. Each command file may have zero or more files to be sent (zero means to call the system and see if work is to be done). The date and time refer to the previous interaction with the system followed by the status of the interaction.

-k*jobid* Kill the *uucp* request whose job identification is *jobid*. The killed *uucp* request must belong to the person issuing the *uustat* command unless one is the super-user.

-r*jobid* Rejuvenate *jobid*. The files associated with *jobid* are touched so that their modification time is set to the current time. This prevents the cleanup daemon from deleting the job until the jobs modification time reaches the limit imposed by the daemon.

Either or both of the following options can be specified with *uustat*:

-s*system* Report the status of all *uucp* requests for remote system *system*.

-u*user* Report the status of all *uucp* requests issued by *user*.

Output for both the **-s** and **-u** options has the following format:

```
eaglen0000   4/07-11:01:03  (POLL)
eagleN1bd7   4/07-11:07     S       eagle   dan   522 /usr/dan/A
eagleC1bd8   4/07-11:07     S       eagle   dan   59 D.3b2a12ce4924
             4/07-11:07     S       eagle   dan   rmail mike
```

With the above two options, the first field is the *jobid* of the job. This is followed by the date/time. The next field is either an 'S' or 'R' depending on whether the job is to send or request a file. This is followed by the user-id of the user who queued the job. The next field contains the size of the file, or in the case of a remote execution (*rmail* - the command used for remote mail), the name of the command. When the size appears in this field, the file name is also given. This can either be the name given by the user or an internal name (e.g., D.3b2a1ce4924) that is created for data files associated with remote executions (*rmail* in this example).
When no options are given, *uustat* outputs the status of all *uucp* requests issued by the current user.

Files

/usr/spool/uucp/* spool directories

See Also

uucp(C).

Name

uuto, uupick - public UNIX-to-UNIX system file copy

Syntax

uuto [options] source-files destination
uupick [**-s** system]

Description

uuto sends *source-files* to *destination*. *uuto* uses the *uucp*(C) facility to send files, while it allows the local system to control the file access. A source-file name is a path name on your machine. Destination has the form:

system!*user*

where *system* is taken from a list of system names that *uucp* knows about (see *uuname*). *User* is the login name of someone on the specified system.

Two *options* are available:

-p Copy the source file into the spool directory before transmission.
-m Send mail to the sender when the copy is complete.

The files (or sub-trees if directories are specified) are sent to **/usr/spool/uucppublic** on *system*. Specifically the files are sent to

/usr/spool/uucppublic/receive/*user*/*mysystem*/files.

The destined recipient is notified by *mail*(C) of the arrival of files.

uupick accepts or rejects the files transmitted to the user. Specifically, *uupick* searches **/usr/spool/uucppublic** for files destined for the user. For each entry (file or directory) found, the following message is printed on the standard output:

from *system*: [file *file-name*] [dir *dirname*] **?**

uupick then reads a line from the standard input to determine the disposition of the file:

<new-line> Go on to next entry.

d Delete the entry.

m [*dir*] Move the entry to named directory *dir*. If *dir* is not specified as a complete path name (in which $HOME is legitimate), a destination relative to the

current directory is assumed. If no destination is given, the default is the current directory.

a [*dir*] Same as **m** except moves all the files sent from *system*.

p Print the content of the file.

q Stop.

EOT (control-d) Same as **q**.

!*command* Escape to the shell to do *command*.

***** Print a command summary.

uupick invoked with the **-s***system* option will only search **/usr/spool/uucppublic** for files sent from *system*.

Files

/usr/spool/uucppublic public directory

See Also

mail(C), uucp(C), uustat(C), uux(C), uuclean(ADM).

Warnings

In order to send files that begin with a dot (e.g., .profile) the files must by qualified with a dot. For example: .profile, .prof*, .profil? are correct; whereas *prof*, ?profile are incorrect.

Name

uux - UNIX-to-UNIX system command execution

Syntax

uux [options] command-string

Description

uux will gather zero or more files from various systems, execute a command on a specified system and then send standard output to a file on a specified system.

NOTE: For security reasons, most installations limit the list of commands executable on behalf of an incoming request from *uux*, permitting only the receipt of mail (see *permissions*(F)). (Remote execution permissions are defined in **/usr/lib/uucp/Permissions**.)

The *command-string* is made up of one or more arguments that look like a shell command line, except that the command and file names may be prefixed by *system-name*!. A null *system-name* is interpreted as the local system.

File names may be one of

(1) a full path name;

(2) a path name preceded by ~*xxx* where *xxx* is a login name on the specified system and is replaced by that user's login directory;

(3) anything else is prefixed by the current directory.

As an example, the command

```
uux "!diff usg!/usr/dan/file1 pwba!/a4/dan/file2 > !~/dan/file.diff"
```

will get the *file1* and *file2* files from the "usg" and "pwba" machines, execute a *diff*(C) command and put the results in *file.diff* in the local **/usr/spool/uucppublic/dan** directory.

Any special shell characters such as **<>;|** should be quoted either by quoting the entire *command-string*, or quoting the special characters as individual arguments.

uux will attempt to get all files to the execution system. For files that are output files, the file name must be escaped using parentheses. For example, the command

uux a!tail b!/usr/file \(c!/usr/file\)

gets /usr/file from system "b" and sends it to system "a," performs a *tail* command on that file and sends the result of the *tail* command to system "c."

uux will notify you if the requested command on the remote system was disallowed. This notification can be turned off by the **-n** option. The response comes by remote mail from the remote machine.

The following *options* are interpreted by *uux*:

- The standard input to *uux* is made the standard input to the *command-string*.

-a*name* Use *name* as the user identification replacing the initiator user-id. (Notification will be returned to the user.)

-b Return whatever standard input was provided to the *uux* command if the exit status is non-zero.

-c Do not copy local file to the spool directory for transfer to the remote machine (default).

-C Force the copy of local files to the spool directory for transfer.

-g*grade* *Grade* is a single letter/number; lower ASCII sequence characters will cause the job to be transmitted earlier during a particular conversation.

-j Output the jobid ASCII string on the standard output which is the job identification. This job identification can be used by *uustat* to obtain the status or terminate a job.

-n Do not notify the user if the command fails.

-p Same as -: The standard input to *uux* is made the standard input to the *command-string*.

-r Do not start the file transfer, just queue the job.

-s*file* Report status of the transfer in *file*.

-x*debug_level*
Produce debugging output on the standard output. The *debug_level* is a number between 0 and 9; higher numbers give more detailed information.

-z Send success notification to the user.

Files

/usr/spool/uucp/*	spool directories
/usr/lib/uucp/Permissions	remote execution permissions
/usr/lib/uucp/*	other data and programs

See Also

mail(C), uucp(C), uustat(C).

Warnings

Only the first command of a shell pipeline may have a *system-name*!. All other commands are executed on the system of the first command. The use of the shell metacharacter * will probably not do what you want it to do. The shell tokens << and >> are not implemented.

The execution of commands on remote systems takes place in an execution directory known to the *uucp* system. All files required for the execution will be put into this directory unless they already reside on that machine. Therefore, the simple file name (without path or machine reference) must be unique within the *uux* request. The following command will NOT work:

```
uux "a!diff b!/usr/dan/xyz c!/usr/dan/xyz > !xyz.diff"
```

but the command

```
uux "a!diff a!/usr/dan/xyz c!/usr/dan/xyz > !xyz.diff"
```

will work. (If *diff* is a permitted command.)

Notes

Protected files and files that are in protected directories that are owned by the requester can be sent in commands using *uux*. However, if the requester is root, and the directory is not searchable by "other," the request will fail.

Name

vi, view, vedit - Invokes a screen-oriented display editor.

Syntax

vi [-option ...] [command ...] [filename ...]

view [-option ...] [command ...] [filename ...]

vedit [-option ...] [command ...] [filename ...]

Description

vi offers a powerful set of text editing operations based on a set of mnemonic commands. Most commands are single keystrokes that perform simple editing functions. *vi* displays a full screen "window" into the file you are editing. The contents of this window can be changed quickly and easily within *vi*. While editing, visual feedback is provided (the name vi itself is short for "visual").

The *view* command is the same as *vi* except that the read-only option (**-R**) is set automatically. The file cannot be changed with *view*.

The *vedit* command is the same as *vi* except for differences in the option settings. *vedit* uses **novice** mode, turns off the **magic** option, sets the option **report=1** and turns on the options **showmode** and **redraw**.

The **showmode** option informs the *vedit* user, in a message in the lower right hand corner of the screen, which mode is being used. For instance after the **ESC-i** command is used, the message reads "INSERT MODE".

Note that you can not set the **novice** option from within *vi* or *ex*. If you want to use the **novice** option you must use the *vedit* utility. (It is possible to set the **nonovice** option from within *vedit*.)

vi and the line editor *ex* are one and the same editor: the names *vi* and *ex* identify a particular user interface rather than any underlying functional difference. The differences in user interface, however, are quite striking. *ex* is a powerful line-oriented editor, similar to the editor *ed*. However, in both *ex* and *ed*, visual updating of the terminal screen is limited, and commands are entered on a command line. *vi*, on the other hand, is a screen-oriented editor designed so that what you see on the screen corresponds exactly and immediately to the contents of the file you are editing. In the following discussion, *vi* commands and options are printed in boldface type.

Options available on the *vi* command line include:

-x Encryption option; when used, the file will be encrypted as it is being written and will require an encryption key to be read. *vi* makes an educated guess to determine if a file is encrypted or not. See *crypt*(C).

-C Encryption option; the same as **-x** except that *vi* assumes files are encrypted.

-c *command*
Begin editing by executing the specified editor *command* (usually a search or positioning command).

-t *tag* Equivalent to an initial *tag* command; edits the file containing *tag* and positions the editor at its definition.

-r *file* Used in recovering after an editor or system crash, retrieves the last saved version of the named file.

-l Specific to editing LISP, this option sets the **showmatch** and **lisp** options.

-L List the names of all files saved as a result of an editor or system crash. Files may be recovered with the **-r** option.

-w*n* Sets the default window size to *n*. Useful on dialups to start in small windows.

-R Sets a read-only option so that files can be viewed but not edited.

The Editing Buffer

vi performs no editing operations on the file that you name during invocation. Instead, it works on a copy of the file in an "editing buffer."

When you invoke *vi* with a single filename argument, the named file is copied to a temporary editing buffer. The editor remembers the name of the file specified at invocation, so that it can later copy the editing buffer back to the named file. The contents of the named file are not affected until the changes are copied back to the original file.

Modes of Operation

Within *vi* there are three distinct modes of operation:

Command Mode	Within command mode, signals from the keyboard are interpreted as editing commands.
Insert Mode	Insert mode can be entered by typing any of the *vi* insert, append, open, substitute, change, or replace commands. Once in insert mode, letters typed at the keyboard are inserted into the editing buffer.
ex Escape Mode	The *vi* and *ex* editors are one and the same editor differing mainly in their user interface. In *vi* , commands are usually single keystrokes. In *ex*, commands are lines of text terminated by a RETURN. *vi* has a special "escape" command that gives access to many of these line-oriented *ex* commands. To use the *ex* escape mode, type a colon (:). The colon is echoed on the status line as a prompt for the *ex* command. An executing command can be aborted by pressing INTERRUPT. Most file manipulation commands are executed in *ex* escape mode (for example, the commands to read in a file and to write out the editing buffer to a file).

Special Keys

There are several special keys in *vi*. The following keys are used to edit, delimit, or abort commands and command lines.

ESC	Used to return to *vi* command mode or to cancel partially formed commands.
RETURN	Terminates *ex* commands when in *ex* escape mode. Also used to start a newline when in insert mode.
INTERRUPT	Often the same as the DEL or RUBOUT key on many terminals. Generates an interrupt, telling the editor to stop what it is doing. Used to abort any command that is executing.
/	Used to specify a string to be searched for. The slash appears on the status line as a prompt for a search string. The question mark (?) works exactly like the slash key, except that it is used to search backward in a file instead of forward.

: The colon is a prompt for an *ex* command. You can then type in any *ex* command, followed by an ESC or RETURN, and the given *ex* command is executed.

The following characters are special in insert mode:

BKSP Backs up the cursor one character on the current line. The last character typed before the BKSP is removed from the input buffer, but remains displayed on the screen.

Ctrl-U Moves the cursor back to the first character of the insertion and restarts insertion.

Ctrl-V Removes the special significance of the next typed character. Use Ctrl-V to insert control characters. Linefeed and Ctrl-J cannot be inserted in the text except as newline characters. Ctrl-Q and Ctrl-S are trapped by the operating system before they are interpreted by *vi*, so they too cannot be inserted as text.

Ctrl-W Moves the cursor back to the first character of the last inserted word.

Ctrl-T During an insertion, with the **autoindent** option set and at the beginning of the current line, entering this character will insert *shiftwidth* whitespace.

Ctrl-@ If entered as the first character of an insertion, it is replaced with the last text inserted, and the insertion terminates. Only 128 characters are saved from the last insertion. If more than 128 characters were inserted, then this command inserts no characters. A Ctrl-@ cannot be part of a file, even if quoted.

Starting and Exiting vi

To enter *vi*, enter:

vi	*Edits empty editing buffer*
vi file	*Edits named file*
vi +123 file	*Goes to line 123*
vi +45 file	*Goes to line 45*
vi +/word file	*Finds first occurrence of "word"*
vi +/tty file	*Finds first occurrence of "tty"*

There are several ways to exit the editor:

ZZ The editing buffer is written to the file *only* if any changes were made.

:x The editing buffer is written to the file *only* if any changes were made.

:q! Cancels an editing session. The exclamation mark (!) tells *vi* to quit unconditionally. In this case, the editing buffer is not written out.

vi Commands

vi is a visual editor with a window on the file. What you see on the screen is *vi*'s notion of what the file contains. Commands do not cause any change to the screen until the complete command is entered. Most commands may take a preceding count that specifies repetition of the command. This count parameter is not given in the following command descriptions, but is implied unless overridden by some other prefix argument. When *vi* gets an improperly formatted command, it rings a bell.

Cursor Movement

The cursor movement keys allow you to move your cursor around in a file. Note in particular the direction keys (if available on your terminal), the h, j, k, and l cursor keys, and SPACEBAR, BKSP, Ctrl-N, and Ctrl-P. These three sets of keys perform identical functions.

Forward Space - l, SPACEBAR, or right direction key

Syntax: **l**
SPACEBAR
right direction key

Function: Moves the cursor forward one character. If a count is given, move forward count characters. You cannot move past the end of the line.

Backspace - h, BKSP, or left direction key

Syntax: **h**
BKSP
left direction key

Function: Moves cursor backward one character. If a count is given, moves backward *count* characters. Note that you cannot move past the beginning of the current line.

Next Line - +, RETURN, j, . Ctrl-N, LF and Down Arrow Key"

Syntax: **+**
RETURN

Function: Moves the cursor down to the beginning of the next line.

Syntax: **j**
Ctrl-N
LF
down direction key

Function: Moves the cursor down one line, remaining in the same column. Note the difference between these commands and the preceding set of next line commands which move to the *beginning* of the next line.

Previous Line - k, Ctrl-P, and up direction key

Syntax: **k**
Ctrl-P
up direction key

Function: Moves the cursor up one line, remaining in the same column. If a count is given, the cursor is moved *count* lines.

Syntax: **-**

Function: Moves the cursor up to the beginning of the previous line. If a count is given, the cursor is moved up *count* lines.

Beginning of Line - 0 and ^

Syntax: **^**
0

Function: Moves the cursor to the beginning of the current line. Note that **0** always moves the cursor to the first character of the current line. The caret (^) works somewhat differently: it moves to the first character on a line that is not a tab or a space. This is useful when editing files that have a great deal of indentation, such as program texts.

End of Line - $

Syntax: **$**

Function: Moves the cursor to the end of the current line. Note that the cursor resides on top of the last character on the line. If a count is given, the cursor is moved forward *count*-1 lines to the end of the line.

Goto Line - G

Syntax: [*linenumber*]**G**

Function: Moves the cursor to the beginning of the line specified by *linenumber*. If no *linenumber* is given, the cursor moves to the beginning of the *last* line in the file. To find the line number of the current line, use Ctrl-G.

Column - |

Syntax: [*column*]**|**

Function: Moves the cursor to the column in the current line given by *column*. If no *column* is given, the cursor is moved to the first column in the current line.

Word Forward - w and W

Syntax: **w**
W

Function: Moves the cursor forward to the beginning of the next word. The lowercase **w** command searches for a word defined as a string of alphanumeric characters separated by punctuation or whitespace (i.e., tab, newline, or space characters). The uppercase **W** command searches for a word defined as a string of nonwhitespace characters.

Back Word - b and B

Syntax: **b**
B

Function: Moves the cursor backward to the beginning of a word. The lowercase **b** command searches backward for a word defined as a string of alphanumeric characters separated by punctuation or whitespace (i.e., tab, newline, or space characters). The uppercase **B** command searches for a word defined as a string of non-whitespace characters. If the cursor is already within a word, it moves backward to the beginning of that word.

End - e and E

Syntax: **e**
E

Function: Moves the cursor to the end of a word. The lowercase **e** command moves the cursor to the last character of a word, where a word is defined as a string of alphanumeric characters separated by punctuation or whitespace (i.e., tab, newline, or space characters). The uppercase **E** moves the cursor to the last character of a word where a word is defined as a string of nonwhitespace characters. If the cursor is already within a word, it moves to the end of that word.

Sentence - (and)

Syntax: (
)

Function: Moves the cursor to the beginning (left parenthesis) or end of a sentence (right parenthesis). A sentence is defined as a sequence of characters ending with a period (.), question mark (?), or exclamation mark (!), followed by either two spaces or a newline. A sentence begins on the first nonwhitespace character following a preceding sentence. Sentences are also delimited by paragraph and section delimiters. See below.

Paragraph - { and }

Syntax: }
{

Function: Moves the cursor to the beginning ({) or end (}) of a paragraph. A paragraph is defined with the *paragraphs* option. By default, paragraphs are delimited by the nroff macros ".IP", ".LP", ".P", ".QP", and ".bp". Paragraphs also begin after empty lines.

Section - [[and]]

Syntax:]]
[[

Function: Moves the cursor to the beginning ([[) or end (]]) of a section. A section is defined with the *sections* option. By default, sections are delimited by the nroff macros ".NH" and ".SH". Sections also start at formfeeds (Ctrl-L) and at lines beginning with a brace ({).

Match Delimiter - %

Syntax: **%**

Function: Moves the cursor to a matching delimiter, where a delimiter is a parenthesis, a bracket, or a brace. This is useful when matching pairs of nested parentheses, brackets, and braces.

Home - H

Syntax: [*offset*]**H**

Function: Moves the cursor to the upper left corner of the screen. Use this command to quickly move to the top of the screen. If an *offset* is given, the cursor is homed *offset*-1 number of lines from the top of the screen. Note that the command "dH" deletes all lines from the current line to the top line shown on the screen.

Middle Screen - M

Syntax: **M**

Function: Moves the cursor to the beginning of the screen's middle line. Use this command to quickly move to the middle of the screen from either the top or the bottom. Note that the command "dM" deletes from the current line to the line specified by the **M** command.

Lower Screen - L

Syntax: [*offset*]L

Function: Moves the cursor to the lowest line on the screen. Use this command to quickly move to the bottom of the screen. If an *offset* is given, the cursor is homed *offset*-1 number of lines from the bottom of the screen. Note that the command "dL" deletes all lines from the current line to the bottom line shown on the screen.

Previous Context - `` and ´´

Syntax: ´´
´*character*
``
`*character*

Function: Moves the cursor to previous context or to context marked with the **m** command. If the single quotation mark or back quotation mark is doubled, the cursor is moved to previous context. If a single character is given after either

quotation mark, the cursor is moved to the location of the specified mark as defined by the **m** command. Previous context is the location in the file of the last "nonrelative" cursor movement. The single quotation mark (´) syntax is used to move to the beginning of the line representing the previous context. The back quotation mark (`) syntax is used to move to the previous context *within* a line.

The Screen Commands

The screen commands are *not* cursor movement commands and cannot be used in delete commands as the delimiters of text objects. However, the screen commands do move the cursor and are useful in paging or scrolling through a file. These commands are described below:

Scroll- Ctrl-U and Ctrl-D

Syntax: [*size*]**Ctrl-U**
[*size*]**Ctrl-D**

Function: Scrolls the screen up a half window (Ctrl-U) or down a half window (Ctrl-D). If *size* is given, the scroll is *size* number of lines. This value is remembered for all later scrolling commands.

Page - Ctrl-F and Ctrl-B

Syntax: **Ctrl-F**
Ctrl-B

Function: Pages screen forward and backward. Two lines of continuity are kept between pages if possible. A preceding count gives the number of pages to move forward or backward.

Status - Ctrl-G

Syntax: **BELL**
Ctrl-G

Function: Displays *vi* status on status line. This gives you the name of the file you are editing, whether it has been modified, the current line number, the number of lines in the file, and the percentage of the file (in lines) that precedes the cursor.

Zero Screen - z

Syntax: [*linenumber*]**z**[*size*]**RETURN**
[*linenumber*]**z**[*size*]**.**
[*linenumber*]**z**[*size*]**-**

Function: Redraws the display with the current line placed at or "zeroed" at the top, middle, or bottom of the screen, respectively. If you give a *size*, the number of lines displayed is equal to *size*. If a preceding *linenumber* is given, the given line is placed at the top of the screen. If the last argument is a RETURN, the current line is placed at the top of the screen. If the last argument is a period (.), the current line is placed in the middle of the screen. If the last argument is a minus sign (-), the current line is placed at the bottom of the screen.

Redraw - Ctrl-R or Ctrl-L

Syntax: **Ctrl-R**
Ctrl-L
(Command depends on terminal type.)

Function: Redraws the screen. Use this command to erase any system messages or line noise that may scramble your screen. Note that system messages do not affect the file you are editing.

Text Insertion

The text insertion commands always place you in insert mode. Exit from insert mode is always done by pressing ESC. The following insertion commands are "pure" insertion commands; no text is deleted when you use them. This differs from the text modification commands, change, replace, and substitute, which delete and then insert text in one operation.

Insert - i and I

Syntax: **i**[*text*]**ESC**
I[*text*]**ESC**

Function: Insert *text* in editing buffer. The lowercase **i** command places you in insert mode. *Text* is inserted *before* the character beneath the cursor. To insert a newline, press a RETURN. Exit insert mode by typing the ESC key. The uppercase **I** command places you in insert mode, but begins text insertion at the beginning of the current line (at the first non-blank character), rather than before the cursor.

Append - a and A

Syntax: **a**[*text*]**ESC**
A[*text*]**ESC**

Function: Appends *text* to the editing buffer. The lowercase **a** command works exactly like the lowercase **i** command, except that text insertion begins after the cursor and not before. This is the one way to add text to the end of a line. The uppercase **A** command begins appending text at the end of the current line rather than after the cursor.

Open New Line - o and O

Syntax: **o**[*text*]**ESC**
O[*text*]**ESC**

Function: Opens a new line and inserts text. The lowercase **o** command opens a new line below the current line; uppercase **O** opens a new line *above* the current line. After the new line has been opened, both these commands work like the **I** command.

Text Deletion

Many of the text deletion commands use the SM d key as an operator. This operator deletes text objects delimited by the cursor and a cursor movement command. Deleted text is always saved away in a buffer. The delete commands are described below:

Delete Character - x and X

Syntax: **x**
X

Function: Deletes a character. The lowercase **x** command deletes the character beneath the cursor. With a preceding count, *count* characters are deleted to the right beginning with the character beneath the cursor. This is a quick and easy way to delete a few characters. The uppercase **X** command deletes the character just before the cursor. With a preceding count, *count* characters are deleted backward, beginning with the character just before the cursor.

Delete - d and D

Syntax: **d***cursor-movement*
dd
D

Function: Deletes a text object. The lowercase **d** command takes a *cursor-movement* as an argument. If the *cursor-movement* is an intraline command, deletion takes place from the cursor to the end of the text object delimited by the *cursor-movement*. Deletion forward deletes the character

beneath the cursor; deletion backward does not. If the *cursor-movement* is a multi-line command, deletion takes place from and including the current line to the text object delimited by the *cursor-movement*.

The **dd** command deletes whole lines. The uppercase **D** command deletes from and including the cursor to the end of the current line.

Deleted text is automatically pushed on a stack of buffers numbered 1 through 9. The most recently deleted text is also placed in a special delete buffer that is logically buffer 0. This special buffer is the default buffer for all (put) commands using the double quotation mark (") to specify the number of the buffer for delete, put, and yank commands. The buffers 1 through 9 can be accessed with the **p** and **P** (put) commands by appending the double quotation mark (") to the number of the buffer. For example:

"4p

puts the contents of delete buffer number 4 in your editing buffer just below the current line. Note that the last deleted text is "put" by default and does not need a preceding buffer number.

Text Modification

The text modification commands all involve the replacement of text with other text. This means that some text will necessarily be deleted. All text modification commands can be "undone" with the **u** command:

Undo - u and U

Syntax: **u**
U

Function: Undoes the last insert or delete command. The lowercase **u** command undoes the last insert or delete command. This means that after an insert, **u** deletes text; and after a delete, **u** inserts text. For the purposes of undo, all text modification commands are considered insertions.

The uppercase **U** command restores the current line to its state before it was edited, no matter how many times the current line has been edited since you moved to it.

Repeat - .

Syntax: **.**

Function: Repeats the last insert or delete command. A special case exists for repeating the **p** and **P** "put" commands. When these commands are preceded by the name of a delete

buffer, successive **u** commands display the contents of the delete buffers.

Change - c and C

Syntax: **c***cursor-movement text* **ESC**
C*text* **ESC**
cc*text* **ESC**

Function: Changes a text object and replaces it with *text* . Text is inserted as with the **i** command. A dollar sign ($) marks the extent of the change. The **c** command changes arbitrary text objects delimited by the cursor and a *cursor-movement* . **cc** affects whole lines while **C** affects from the cursor to the end of the line.

Replace - r and R

Syntax: **r***char*
R*text* **ESC**

Function: Overstrikes character or line with *char* or *text* , respectively. Use **r** to overstrike a single character and **R** to overstrike a whole line. A count multiplies the replacement text count times.

Substitute - s and S

Syntax: **s***text* **ESC**
S*text* **ESC**

Function: Substitutes current character or current line with *text*. Use **s** to replace a single character with new text. Use **S** to replace the current line with new text. If a preceding count is given, *text* substitutes for count number of characters or lines depending on whether the command is **s** or **S**, respectively.

Filter - !

Syntax: **!***cursor-movement cmd* **RETURN**

Function: Filters the text object delimited by the cursor and *cursor-movement* through the XENIX command, *cmd*. For example, the following command sorts all lines between the cursor and the bottom of the screen, substituting the designated lines with the sorted lines:

```
!Lsort
```

Arguments and shell metacharacters may be included as part of *cmd*; however, standard input and output are

always associated with the text object being filtered. !! affects the current line.

Join Lines - J

Syntax: **J**

Function: Joins the current line with the following line. If a *count* is given, *count* lines are joined.

Shift - < and >

Syntax: >[*cursor-movement*]
<[*cursor-movement*]
>>
<<

Function: Shifts text right (>) or left (<). Text is shifted by the value of the option *shiftwidth*, which is normally set to eight spaces. Both the > and < commands shift all lines in the text object delimited by the current line and *cursor-movement*. The >> and << commands affect whole lines. All versions of the command can take a preceding count that acts to multiply the number of objects affected.

Text Movement

The text movement commands move text in and out of the named buffers *a-z* and out of the delete buffers *1-9*. These commands either "yank" text out of the editing buffer and into a named buffer or "put" text into the editing buffer from a named buffer or a delete buffer. By default, text is put and yanked from the "unnamed buffer", which is also where the most recently deleted text is placed. Thus it is quite reasonable to delete text, move your cursor to the location where you want the deleted text placed, and then put the text back into the editing buffer at this new location with the **p** or **P** command.

The named buffers are most useful for keeping track of several chunks of text that you want to keep on hand for later access, movement, or rearrangement. These buffers are named with the letters *a* through *z*. To refer to one of these buffers (or one of the numbered delete buffers) in a command, use a quotation mark. For example, to yank a line into the buffer named *a*, enter:

"ayy

To put this text back into the file, enter:

"ap

If you delete text in the buffer named *A* rather than *a*, text is appended to the buffer named *a* (A and a refer to the same buffer but are handled differently).

Note that the contents of the named buffers are not destroyed when you switch files. Therefore, you can delete or yank text into a buffer, switch files, and then do a put. Buffer contents are *destroyed* when you exit the editor, so be careful.

Put - p and P

Syntax: ["*alphanumeric*]**p**
["*alphanumeric*]**P**

Function: Puts text from a buffer into the editing buffer. If no buffer name is specified, text is put from the unnamed buffer. The lowercase **p** command puts text either below the current line or after the cursor, depending on whether the buffer contains a partial line or not. The uppercase **P** command puts text either above the current line or before the cursor, again depending on whether the buffer contains a partial line or not.

Yank - y and Y

Syntax: ["*letter*]**y***cursor-movement*
["*letter*]**yy**
["*letter*]**Y**

Function: Copies text in the editing buffer to a named buffer. If no buffer name is specified, text is yanked into the unnamed buffer. If an uppercase *letter* is used, text is appended to the buffer and does not overwrite and destroy the previous contents. When a *cursor-movement* is given as an argument, the delimited text object is yanked. The **Y** and **yy** commands yank a single line, or, if a preceding count is given, multiple lines can be yanked.

Searching

The search commands search either forward or backward in the editing buffer for text that matches a given regular expression.

Search - / and ?

Syntax: /[*pattern*]/[*offset*]**RETURN**
/[*pattern*]**RETURN**
?[*pattern*]**?**[*offset*]**RETURN**
?[*pattern*]**RETURN**

Function: Searches forward (/) or backward (?) for *pattern*. A string is actually a regular expression. The trailing delimiter is not required. If no *pattern* is given, then the last *pattern* searched for is used. After the second delimiter, an *offset* may be given, specifying the beginning of a line relative to the line on which *pattern* was found. For example:

/word/-

finds the beginning of the line immediately preceding the line containing "word" and the following command:

/word/+2

finds the beginning of the line two lines after the line containing "word". See also the *ignorecase* and *magic* options.

Next String - n and N

Syntax: **n**
N

Function: Repeats the last search command. The **n** command repeats the search in the same direction as the last search command. The **N** command repeats the search in the opposite direction of the last search command.

Find Character - f and F

Syntax: **f***char*
F*char*
;
,

Function: Finds character *char* on the current line. The lowercase **f** searches forward on the line; the uppercase **F** searches backward. The semicolon (**;**) repeats the last character search. The comma (**,**) reverses the direction of the search.

To Character - t and T

Syntax: **t***char*
T*char*
;
,

Function: Moves the cursor up to but not on *char*. The semicolon (**;**) repeats the last character search. The comma (**,**) reverses the direction of the search.

Mark - m

Syntax: **m***letter*

Function: Marks a place in the file with a lowercase *letter*. You can move to a mark using the "to mark" commands described below. It is often useful to create a mark, move the cursor, and then delete from the cursor to the mark "a" with the following command:

d´a

To Mark - ´ and `

Syntax: ´*letter*
`*letter*

Function: Move to *letter*. These commands let you move to the location of a mark. Marks are denoted by single lowercase alphabetic characters. Before you can move to a mark, it must first be created with the **m** command. The back quotation mark (`) moves you to the exact location of the mark within a line; the forward quotation mark (´) moves you to the beginning of the line containing the mark. Note that these commands are also legal cursor movement commands.

Exit and Escape Commands

There are several commands that are used to escape from *vi* command mode and to exit the editor. These are described in the following section.

ex Escape - :

Syntax: **:**

Function: Enters *ex* escape mode to execute an *ex* command. The colon appears on the status line as a prompt for an *ex* command. You then can enter an *ex* command line terminated by either a RETURN or an ESC and the *ex* command will execute. You are then prompted to type RETURN to return to *vi* command mode. During the input of the *ex* command line or during execution of the *ex* command, you may press INTERRUPT to stop what you are doing and return to *vi* command mode.

Exit Editor - ZZ

Syntax: **ZZ**

Function: Exit *vi* and write out the file if any changes have been made. This returns you to the shell from which you started *vi*.

Quit to ex - Q

Syntax: **Q**

Function: Enters the *ex* editor. When you do this, you will still be editing the same file. You can return to *vi* by entering the *vi* command from *ex*.

ex Commands

Entering the colon (:) escape command when in command mode produces a colon prompt on the status line. This prompt is for a command available in the line-oriented editor, *ex*. In general, *ex* commands let you write out or read in files, escape to the shell, or switch editing files.

Many of these commands perform actions that affect the "current" file by default. The current file is normally the file that you named when you started *vi*, although the current file can be changed with the "file" command, **f**, or with the "next" command, **n**. In most respects, these commands are identical to similar commands for the editor, *ed*. All such *ex* commands are aborted by either RETURN or ESC. We shall use RETURN in our examples. Command entry is terminated by typing INTERRUPT.

Command Structure

Most *ex* command names are English words, and initial prefixes of the words are acceptable abbreviations. In descriptions, only the abbreviation is discussed, since this is the most frequently used form of the command. The ambiguity of abbreviations is resolved in favor of the more commonly used commands. As an example, the command **substitute** can be abbreviated **s** , while the shortest available abbreviation for the **set** command is **se.**

Most commands accept prefix addresses specifying the lines in the file that they are to affect. A number of commands also may take a trailing *count* specifying the number of lines to be involved in the command. Counts are rounded down if necessary. Thus, the command "10p" displays the tenth line in the buffer while "move 5" moves the current line after line 5.

Some commands take other information or parameters, stated after the command name. Examples might be option names in a **set** command, such as "set number", a filename in an **edit** command, a regular expression in a **substitute** command, or a target address for a **copy** command. For example:

```
1,5 copy 25
```

A number of commands have variants. The variant form of the command is invoked by placing an exclamation mark (!) immediately after the command name. Some of the default variants may be controlled by options; in this case, the exclamation mark turns off the meaning of the default.

In addition, many commands take flags, including the characters "p" and "l". A "p" or "l" must be preceded by a blank or tab. In this case, the command abbreviated by these characters is executed after the command completes. Since *ex* normally displays the new current line after each change, **p** is rarely necessary. Any number of plus (+) or minus (-) characters may also be given with these flags. If they appear, the specified offset is applied to the current line value before the printing command is executed.

Most commands that change the contents of the editor buffer give feedback if the scope of the change exceeds a threshold given by the **report** option. This feedback helps to detect undesirably large changes so that they may be quickly and easily reversed with the **undo** command. After commands with global effect, you will be informed if the net change in the number of lines in the buffer during this command exceeds this threshold.

Command Addressing

The following specifies the line addressing syntax for *ex* commands:

.	The current line. Most commands leave the current line as the last line which they affect. The default address for most commands is the current line, thus "." is rarely used alone as an address.
n	The *n*th line in the editor's buffer, lines being numbered sequentially from 1.
$	The last line in the buffer.
%	An abbreviation for "1,$", the entire buffer.
+*n* or -*n*	An offset, *n* relative to the current buffer line. The forms ".+3" "+3" and "+++" are all equivalent. If the current line is line 100 they all address line 103.

/pattern/ or **?***pattern***?**

Scan forward and backward respectively for a text matching the regular expression given by *pattern*. Scans normally wrap around the end of the buffer. If all that is desired is to print the next line containing *pattern*, the trailing slash (/) or question mark (?) may be omitted. If *pattern* is omitted or explicitly empty, the string matching the last specified regular expression is located. The forms "RETURN" and "?RETURN" scan using the last named regular expression. After a substitute, "RETURN" and "??RETURN" would scan using that substitute's regular expression.

´´ or ´*x*

Before each nonrelative motion of the current line dot (.), the previous current line is marked with a label, subsequently referred to with two single quotation marks (´´). This makes it easy to refer or return to this previous context. Marks are established with the *vi* **m** command, using a single lowercase letter as the name of the mark. Marked lines are later referred to with the following notation:

´*x*.

where *x* is the name of a mark.

Addresses to commands consist of a series of addresses, separated by a comma (,) or a semicolon (;). Such address lists are evaluated left to right. When addresses are separated by a semicolon (;) the current line (.) is set to the value of the previous addressing expression before the next address is interpreted. If more addresses are given than the command requires, all but the last one or two are ignored. If the command takes two addresses, the first addressed line must precede the second in the buffer. Null address specifications are permitted in a list of addresses, the default in this case is the current line "."; thus ",100" is equivalent to ".,100". It is an error to give a prefix address to a command which expects none.

Command Format

The following is the format for all *ex* commands:

[*address*] [*command*] [!] [*parameters*] [*count*] [*flags*]

All parts are optional depending on the particular command and its options. The following section describes specific commands.

Argument List Commands

The argument list commands allow you to work on a set of files, by remembering the list of filenames that are specified when you invoke *vi*. The **args** command lets you examine this list of filenames. The **file** command gives you information about the current file. The **n** (next) command lets you either edit the next file in the argument list or change the list. The **rewind** command lets you restart editing the files in the list. All of these commands are described below:

args — The members of the argument list are displayed, with the current argument delimited by brackets.
For example, a list might look like this:

file1 file2 [file3] file4 file5

The current file is *file3*.

f — Displays the current filename, whether it has been modified since the last **write** command, whether it is read-only, the current linenumber, the number of lines in the buffer, and the percentage of the buffer that you have edited. In the rare case that the current file is "[Not edited]", this is noted also; in this case you have to use **w!** to write to the file, since the editor is not sure that a **w** command will not destroy a file unrelated to the current contents of the buffer.

f *file* — The current filename is changed to *file* which is considered "[Not edited]".

n — The next file in the command line argument list is edited.

n! — This variant suppresses warnings about the modifications to the buffer not having been written out, discarding irretrievably any changes that may have been made.

n [+*command*] *filelist*
The specified *filelist* is expanded and the resulting list replaces the current argument list; the first file in the new list is then edited. If *command* is given (it must contain no spaces), then it is executed after editing the first such file.

rew — The argument list is rewound, and the first file in the list is edited.

rew! — Rewinds the argument list discarding any changes made to the current buffer.

If you use C-Shell and set the **prompt** variable to output a prompt for non-interactive shells, the prompt is interpreted as a filename when you use these commands. This causes unexpected problems. To avoid these problems, use the default **prompt** value as specified in */usr/lib/mkuser/mkuser.cshrc*.

Edit Commands

To edit a file other than the one you are currently editing, you will often use one of the variations of the **e** command.

In the following discussions, note that the name of the current file is always remembered by vi and is specified by a percent sign (%). The name of the *previous* file in the editing buffer is specified by a number sign (#).

The edit commands are described below:

e *file* — Used to begin an editing session on a new file. The editor first checks to see if the buffer has been modified since the last **w** command was issued. If it has been, a warning is issued and the command is aborted. The command otherwise deletes the entire contents of the editor buffer, makes the named file the current file, and displays the new filename. After ensuring that this file is sensible, (i.e., that it is not a binary file, directory, or a device), the editor reads the file into its buffer. If the read of the file completes without error, the number of lines and characters read is displayed on the status line. If none of these errors occurred, the file is considered edited. If the last line of the input file is missing the trailing newline character, it is supplied and a complaint issued. The current line is initially the first line of the file.

e! *file* — This variant form suppresses the complaint about modifications having been made and not written from the editor buffer, thus discarding all changes that have been made before editing the new file.

e *+n file* — Causes the editor to begin editing at line *n* rather than at the first line. The argument *n* may also be an editor command containing no spaces; for example, "+/pattern".

Ctrl-^ — This is a shorthand equivalent for ":e #RETURN", which returns to the previous position in the last edited file. If you do not want to write the file, you should use ":e! #RETURN" instead.

Write Commands

The write commands let you write out all or part of your editing buffer to either the current file or to some other file. These commands are described below:

w *file* Writes changes made back to *file*, displaying the number of lines and characters written. Normally, *file* is omitted and the buffer is written to the name of the current file. If *file* is specified, text is written to that file. The editor writes to a file only if it is the current file and is edited, or if the file does not exist. Otherwise, you must give the variant form **w!** to force the write. If the file does not exist it is created. The current filename is changed only if there is no current filename; the current line is never changed.

If an error occurs while writing the current and edited file, the editor displays:

No write since last change

even if the buffer had not previously been modified.

w>> *file* Appends the buffer contents at the end of an existing file. Previous file contents are not destroyed.

w! *name* Overrides the checking of the normal **write** command, and writes to any file that the system permits.

w !*command*

Writes the specified lines into *command*. A blank or tab before the exclamation mark is necessary. Note the difference in spacing between

w! *file*

which overrides checks and

w !*cmd*

which writes to a command. The output of this command is displayed on the screen and not inserted in the editing buffer.

Read Commands

The read commands let you read text into your editing buffer at any location you specify. The text you read in must be at least one line long, and can be either a file or the output from a command.

r *file* Places a copy of the text of the given file in the editing buffer after the specified line. If no file is given, the current filename is used. The current filename is not changed unless there is none, in which case the file becomes the current name. If the file buffer is empty and there is no current name, this is treated as an **e** command.

Address 0 is legal for this command and causes the file to be read at the beginning of the buffer. Statistics are given as for the **e** command when the **r** successfully terminates. After an **r** the current line is the last line read.

r !*command* Reads the output of *command* into the buffer after the specified line. A blank or tab before the exclamation mark (!) is mandatory.

Quit Commands

There are several ways to exit *vi*. Some abort the editing session, some write out the editing buffer before exiting, and some warn you if you decide to exit without writing out the buffer. All of these ways of exiting are described below:

q Exits *vi*. No automatic write of the editor buffer to a file is performed. However, *vi* displays a warning message if the file has changed since the last **w** command was issued, and does not quit. *vi* also displays a diagnostic if there are more files in the argument list left to edit. Normally, you will wish to save your changes, and you should enter a **w** command. If you wish to discard them, enter the **q!** command variant.

q! Quits from the editor, discarding changes to the buffer without complaint.

wq *name* Like a **w** and then a **q** command.

wq! *name* Overrides checking normally made before execution of the **w** command to any file. For example, if you own a file but do not have write permission turned on, the **wq!** allows you to update the file anyway.

x *name* If any changes have been made and not written, writes the buffer out and then quits. Otherwise, it just quits.

Global and Substitute Commands

The global and substitute commands allow you to perform complex changes to a file in a single command. Learning how to use these

commands is a must for an experienced *vi* user.

g/*pattern*/*cmds*

The **g** command has two distinct phases. In the first phase, each line matching *pattern* in the editing buffer is marked. Next, the given command list is executed with the current line, dot (.), initially set to each marked line.

The command list consists of the remaining commands on the current input line and may continue to multiple lines by ending all but the last such line with a backslash (\). This multiple-line option will not work from within *vi*, you must switch to *ex* to do it. The *vi* command "Q" can be used to exit to *ex* and the *ex* command "vi" returns to visual mode. If *cmds* (or the trailing slash (/) delimiter) is omitted, each line matching *pattern* is displayed.

The **g** command itself may not appear in *cmds*. The options **autoprint** and **autoindent** are inhibited during a global command and the value of the **report** option is temporarily infinite, in deference to a **report** for the entire global. Finally, the context mark (´) or (`) is set to the value of the current line (.) before the global command begins and is not changed during a global command.

The following global commands, most of them substitutions, cover the most frequent uses of the global command.

g/*s1*/**p** This command simply prints all lines that contain the string "s1" .

g/*s1*/**s**//*s2*/ This command substitutes the *first* occurrence of "s1" on all lines that contain it with the string "s2".

g/*s1*/**s**//*s2*/**g** This command substitutes all occurrences of "s1" with the string "s2". This includes multiple occurrences of "s1" on a line.

g/*s1*/**s**//*s2*/**gp** This command works the same as the preceding example, except that in addition, all changed lines are displayed on the screen.

g/*s1*/**s**//*s2*/**gc** This command prompts you to confirm that you want to make each substitution of the string "s1" with the string "s2". If you enter a Y , the given substitution is made, otherwise it is not.

g/*s0*/**s**/*s1*/*s2*/**g** This command marks all those lines that contain the string "s0", and then for those lines only, substitutes all occurrences of the string "s1" with "s2".

g!/*pattern*/*cmds* This variant form of **g** runs *cmds* at each line not matching *pattern*.

g/^/s// /g This command inserts blank spaces at the beginning of each line in a file.

s/*pattern*/*repl*/*options*
On each specified line, the first instance of text matching the regular expression *pattern* is replaced by the replacement text *repl*. If the **global** indicator option character **g** appears, all instances on a line are substituted. If the **confirm** indication character **c** appears, before each substitution the line to be substituted is printed on the screen with the string to be substituted marked with caret (^) characters. By entering Y , you cause the substitution to be performed; any other input causes no change to take place. After an **s** command, the current line is the last line substituted.

v/*pattern*/*cmds* A synonym for the **global** command variant **g!**, running the specified *cmds* on each line that does not match *pattern*.

Text Movement Commands

The text movement commands are largely superseded by commands available in *vi* command mode. However, the following two commands are still quite useful:

co *addr flags* A copy of the specified lines is placed after *addr*, which may be "0". The current line "." addresses the last line of the copy.

[*range*]**m***addr* The **m** command moves the lines specified by *range* after the line given by *addr*. For example, **m+** swaps the current line and the following line, since the default range is just the current line. The first of the moved lines becomes the current line (dot).

Shell Escape Commands

You will often want to escape from the editor to execute normal XENIX commands. You may also want to change your working directory so that your editing can be done with respect to a different working directory. These operations are described below:

cd *directory* The specified *directory* becomes the current directory. If no directory is specified, the current value of the *home* option is used as the target directory.

After a **cd** , the current file is not considered to have been edited so that write restrictions on preexisting files still apply.

sh A new shell is created. You may invoke as many commands as you like in this shell. To return to *vi*, enter a Ctrl-D to terminate the shell.

!*command* The remainder of the line after the exclamation (!) is sent to a shell to be executed. Within the text of *command* , the characters "*%*" and "#" are expanded as the filenames of the current file and the last edited file and the character "!" is replaced with the text of the previous command. Thus, in particular, "!!" repeats the last such shell escape. If any such expansion is performed, the expanded line is echoed. The current line is unchanged by this command.

If there has been "[No write]" of the buffer contents since the last change to the editing buffer, a diagnostic is displayed before the command is executed, as a warning. A single exclamation (!) is displayed when the command completes.

If you use C-Shell and set the **prompt** variable to output a prompt for non-interactive shells, the prompt is interpreted as an argument for *command* in shell escapes. This causes unexpected problems. To avoid these problems, use the default **prompt** value as specified in */usr/lib/mkuser/mkuser.cshrc*.

Other Commands

The following command descriptions explain how to use miscellaneous *ex* commands that do not fit into the above categories.

The **abbr**, **map**, and **set** commands can also be defined with the **EXINIT** environment variable, which is read by the editor each time it starts up. For more information, see *environ*(M). Alternatively, these commands can be placed in a **.exrc** file in your home directory, which the editor reads if **EXINIT** is not defined.

abbr Maps the first argument to the following string. For example, the following command

:abbr rainbow yellow green blue red

maps "rainbow" to "yellow green blue red". Abbreviations can be turned off with the **unabbreviate** command, as in:

:una rainbow

map, map! Maps any character or escape sequence to a command sequence. For example, the following command maps the CTRL-A key to a shell escape that runs the *clear*(C) command:

```
map ^A :!clear^M
```

To include the CTRL-A and CTRL-M characters in the mapping, you must use *vi*'s CTRL-V escape.

Characters mapped with **map** work in command mode, while characters mapped with **map!** work in insert mode. Characters mapped with **map!** cannot be unmapped using **unmap**.

nu Displays each specified line preceded by its buffer line number. The current line is left at the last line displayed. To get automatic line numbering of lines in the buffer, set the *number* option.

preserve The current editor buffer is saved as though the system had just crashed. This command is for use only in emergencies when a **w** command has resulted in an error and you do not know how to save your work.

= Displays the line number of the addressed line. The current line is unchanged.

recover *file*
Recovers *file* from the system save area. The system saves a copy of the editing buffer only if you have made changes to the file, the system crashes, or you execute a **preserve** command. When you use **preserve**, you are notified by mail when a file is saved.

set *argument*
With no arguments, **set** displays those options whose values have been changed from their defaults; with the argument **all**, it displays all of the option values.

Giving an option name followed by a question mark (?) causes the current value of that option to be displayed. The question mark is unnecessary unless the option is a Boolean value. Switch options are given values either with:

set *option*

to turn them on or:

set no*option*

to turn them off. String and numeric options are assigned with:

set *option*=value

More than one option can be given to *set*; all are interpreted from left to right. See "Options" for a complete list and descriptions.

tag *label* The focus of editing switches to the location of *label*. If necessary, *vi* will switch to a different file in the current directory to find *label*. If you have modified the current file before giving a **tag** command, you must first write it out. If you give another **tag** command with no argument, the previous *label* is used.

Similarly, if you press Ctrl-], *vi* searches for the word immediately after the cursor as a tag. This is equivalent to entering ":tag", the word following the cursor, and then pressing the RETURN key.

The tags file is normally created by a program such as **ctags,** and consists of a number of lines with three fields separated by blanks or tabs. The first field gives the name of the tag, the second the name of the file where the tag resides, and the third gives an addressing form which can be used by the editor to find the tag. This field is usually a contextual scan using /*pattern*/ to be immune to minor changes in the file. Such scans are always performed as if the **nomagic** option was set. The tag names in the tags file must be sorted alphabetically.

unmap Unmaps any character or escape sequence that has been mapped using the **map** command.

Options

There are a number of options that can be set to affect the *vi* environment. These can be set with the *ex* **set** command while editing, with the **EXINIT** environment variable, or in the *vi* start-up file, **.exrc**. This file normally sets the user's preferred options so that they do not need to be set manually each time you invoke *vi*.

The first thing that must be done before you can use *vi*, is to set the terminal type so that *vi* understands how to talk to the particular terminal you are using.

There are only two kinds of options: switch options and string options. A switch option is either on or off. A switch is turned off by prefixing the word *no* to the name of the switch within a **set** command. String options are strings of characters that are assigned values with the

syntax *option=string*. Multiple options may be specified on a line. *vi* options are listed below:

autoindent, ai default: **noai**
Can be used to ease the preparation of structured program text. For each line created by an append, change, insert, open, or substitute operation, *vi* looks at the preceding line to determine and insert an appropriate amount of indentation. To back the cursor up to the preceding tab stop, press Ctrl-D. The tab stops going backward are defined as multiples of the **shiftwidth** option. You cannot backspace over the indent, except by pressing Ctrl-D.

Specially processed in this mode is a line with no characters added to it, which turns into a completely blank line (the whitespace provided for the **autoindent** is discarded). Also, specially processed in this mode are lines beginning with a caret (^) and immediately followed by a Ctrl-D. This causes the input to be repositioned at the beginning of the line, but retains the previous indent for the next line. Similarly, a "0" followed by a Ctrl-D, repositions the cursor at the beginning without retaining the previous indent. **Autoindent** doesn't happen in global commands.

autoprint ap default: **ap**
Causes the current line to be displayed after each *ex* **copy, move,** or **substitute** command. This has the same effect as supplying a trailing "p" to each such command. **Autoprint** is suppressed in globals, and only applies to the last command on a line.

autowrite, aw default: **noaw**
Causes the contents of the buffer to be automatically written to the current file if you have modified it when you give a **next, rewind, tag,** or **!** command, or a Ctrl-^ (switch files) or Ctrl-] (goto tag) command.

beautify, bf default: **nobeautify**
Causes all control characters except tab, newline and formfeed to be discarded from the input. A complaint is registered the first time a backspace character is discarded. **Beautify** does not apply to command input.

directory, dir default: **dir=/tmp**
Specifies the directory in which *vi* places the editing buffer file. If the directory does not have write permission, the editor will exit abruptly when it fails to write to the buffer file.

edcompatible default: **noedcompatible**
Causes the presence or absence of **g** and **c** suffixes on substitute commands to be remembered, and to be toggled on and off by repeating the suffixes. The suffix **r** causes the substitution to be like the tilde (~) command, instead of like the ampersand command (**&**).

errorbells, eb default: **noeb**
Error messages are preceded by a bell. If possible, the editor always places the error message in inverse video instead of ringing the bell.

hardtabs, ht default: **ht=8**
Gives the boundaries on which terminal hardware tabs are set or on which tabs the system expands.

ignorecase, ic default: **noic**
Maps all uppercase characters in the text to lowercase in regular expression matching. In addition, all uppercase characters in regular expressions are mapped to lowercase except in character class specifications enclosed in brackets.

lisp default: **nolisp**
Autoindent indents appropriately for LISP code, and the ( ) { } [[and]] commands are modified to have meaning for LISP.

list default: **nolist**
All printed lines are displayed, showing tabs and end-of-lines.

magic default: **magic**
If **nomagic** is set, the number of regular expression metacharacters is greatly reduced, with only up-arrow (^) and dollar sign ($) having special effects. In addition, the metacharacters "~" and "&" in replacement patterns are treated as normal characters. All the normal metacharacters may be made **magic** when **nomagic** is set by preceding them with a backslash (\).

mesg default: **nomesg**
Causes write permission to be turned off to the terminal while you are in visual mode, if **nomesg** is set. This prevents people writing to your screen with the XENIX **write** command and scrambling your screen as you edit.

number, n default: **nonumber**
Causes all output lines to be printed with their line numbers.

open default: **open**
If set to **noopen**, the commands **open** and **visual** are not permitted from *ex*. This is set to prevent confusion resulting from accidental entry to open or visual mode.

optimize, opt default: **optimize**
Output of text to the screen is expedited by setting the terminal so that it does not perform automatic carriage returns when displaying more than one line of output, thus greatly speeding output on terminals without addressable cursors when text with leading whitespace is printed.

paragraphs, para default: **para =IPLPPPQPP TPbp**
Specifies paragraph delimiters for the { and } operations. The pairs of characters in the option's value are the names of the nroff macros that start paragraphs.

prompt default: **prompt**
ex input is prompted for with a colon (:). If **noprompt** is set, when *ex* command mode is entered with the **Q** command, no colon prompt is displayed on the status line.

redraw default: **noredraw**
The editor simulates (using great amounts of output), an intelligent terminal on a dumb terminal. Useful only at very high speed.

remap default: **remap**
If on, mapped characters are repeatedly tried until they are unchanged. For example, if *o* is mapped to *O* and *O* is mapped to *I*, *o* will map to *I* if remap is set, and to *O* if **noremap** is set.

report default: **report=5**
Specifies a threshold for feedback from commands. Any command that modifies more than the specified number of lines will provide feedback as to the scope of its changes. For global commands and the undo command, the net change in the number of lines in the buffer is presented at the end of the command. Thus notification is suppressed during a **g** command on the individual commands performed.

scroll default: **scroll=½ window**
Determines the number of logical lines scrolled when Ctrl-D is received from a terminal input in command mode, and the number of lines displayed by a command mode **z** command (double the value of *scroll*).

sections default: **sections**=SHNHH HU
Specifies the section macros for the [[and]] operations. The pairs of characters in the option's value are the names of the nroff macros that start sections.

shell, sh default: **sh**=/bin/sh
Gives the pathname of the shell forked for the shell escape command (!), and by the **shell** command. The default is taken from SHELL in the environment, if present.

shiftwidth, sw default:**sw**=8
Gives the width of a software tab stop, used in reverse tabbing with Ctrl-D when using **autoindent** to append text, and by the shift commands.

showmatch, sm default: **nosm**
When a) or } is typed, moves the cursor to the matching (or { for one second if this matching character is on the screen.

showmode default: **noshowmode**
Causes the message "INPUT MODE" to appear on the lower right corner of the screen when insert mode is activated.

slowopen default: **noslowopen**
Postpones update of the display during inserts.

tabstop, ts default: **ts**=8
The editor expands tabs in the input file to be on *n* boundaries for the purposes of display.

taglength, tl default: **tl**=0
The first *n* characters in a tag name are significant, but all others are ignored. A value of zero (the default) means that all characters are significant.

tags default: **tags**=tags /usr/lib/tags
A path of files to be used as tag files for the **tag** command. A requested tag is searched for in the specified files, sequentially. By default, files named *tags* are searched for in the current directory and in **/usr/lib**.

term default=value of shell TERM variable
The terminal type of the output device.

terse default: **noterse**
Shorter error diagnostics are produced for the experienced user.

timeout , to default: **noto**
Eliminates the 1 second time limit for **map**s (character mappings).

warn default: **warn**
Warn if there has been "[No write since last change]" before a shell escape command (**!**).

window default: **window** = speed dependent
This specifies the number of lines in a text window. The default is 8 at slow speeds (600 baud or less), 16 at medium speed (1200 baud), and the full screen (minus one line) at higher speeds.

w300, **w**1200, **w**9600
These are not true options but set **window** (above) only if the speed is slow (300), medium (1200), or high (9600), respectively.

wrapscan, ws default: **ws**
Searches, using the regular expressions in addressing, will wrap around past the end of the file.

wrapmargin, wm default: **wm=0**
Defines the margin for automatic insertion of newlines during text input. A value of zero specifies no wrap margin.

writeany, wa default: **nowa**
Inhibits the checks normally made before **write** commands, allowing a write to any file that the system protection mechanism will allow.

Regular Expressions

A regular expression specifies a set of strings of characters. A member of this set of strings is said to be "matched" by the regular expression. *vi* remembers two previous regular expressions: the previous regular expression used in a substitute command and the previous regular expression used elsewhere, referred to as the previous *scanning* regular expression. The previous regular expression can always be referred to by a null regular expression: e.g., "//" or "??".

The regular expressions allowed by *vi* are constructed in one of two ways depending on the setting of the **magic** option. The *ex* and *vi* default setting of **magic** gives quick access to a powerful set of regular expression metacharacters. The disadvantage of **magic** is that the user must remember that these metacharacters are **magic** and precede them with the backslash (\) to use them as "ordinary" characters. With **nomagic** set, regular expressions are much simpler, there being only two metacharacters. The power of the other metacharacters is still available by preceding the now ordinary character with a "\". Note that "\" is always a metacharacter. In this discussion, the magic option is assumed. With **nomagic** , the only special characters are the caret (^) at the beginning of a regular expression, the dollar sign ($) at the end of a regular expression, and the backslash (\). The tilde (~) and the ampersand (&) also lose their special meanings related to the replacement pattern of a substitute.

The following basic constructs are used to construct **magic** mode regular expressions.

char An ordinary character matches itself. Ordinary characters are any characters except a caret (^) at the beginning of a line, a dollar sign ($) at the end of line, an asterisk (*) as any character other than the first, and any of the following characters:

. \ [~

These characters must be preceded by a backslash (\) if they are to be treated as ordinary characters.

^ At the beginning of a pattern, forces the match to succeed only at the beginning of a line.

$ At the end of a regular expression, forces the match to succeed only at the end of the line.

. Matches any single character except the newline character.

\< Forces the match to occur only at the beginning of a "word"; that is, either at the beginning of a line, or just before a letter, digit, or underline and after a character not one of these.

\> Similar to "\<", but matching the end of a "word", i.e., either the end of the line or before a character which is not a letter, a digit, or the underline character.

[*string*]
Matches any single character in the class defined by *string*. Most characters in *string* define themselves. A pair of characters separated by a dash (-) in *string* defines the set of characters between the specified lower and upper bounds, thus "[a-z]" as a regular expression matches any single lowercase letter. If the first character of *string* is a caret (^) then the construct matches those characters which it otherwise would not. Thus "[^a-z]" matches anything but a lowercase letter or a newline. To place any of the characters caret, left bracket, or dash in *string* they must be escaped with a preceding backslash (\).

The concatenation of two regular expressions first matches the leftmost regular expression and then the longest string that can be recognized as a regular expression. The first part of this new regular expression matches the first regular expression and the second part matches the second. Any of the single character matching regular expressions mentioned above may be followed by an asterisk (*) to form a regular expression that matches zero or more adjacent occurrences of the characters matched by the prefixing regular expression. The tilde (~) may be used in a regular expression to match the text that defined the replacement part of the last **s** command. A regular expression may be enclosed between the sequences "\(" and "\)" to remember the text matched by the enclosed regular expression. This text can later be interpolated into the replacement text using the following notation:

digit

where *digit* enumerates the set of remembered regular expressions.

The basic metacharacters for the replacement pattern are the ampersand (&) and the tilde (~); these are given as "\&" and "\~" when **nomagic** is set. Each instance of the ampersand is replaced by the characters matched by the search pattern. In the replacement pattern, the tilde stands for the text of the previous replacement pattern.

Other metasequences possible in the replacement pattern are always introduced by a backslash (\). The sequence "*n*" is replaced by the text matched by the *n*th regular subexpression enclosed between "\(" and "\)". When nested, parenthesized subexpressions are present, *n* is determined by counting occurrences of "\(" starting from the left.

The sequences "\u" and "\l" cause the immediately following character in the replacement to be converted to uppercase or lowercase, respectively, if this character is a letter. The sequences "\U" and "\L" turn such conversion on, either until "\E" or "\e" is encountered, or until the end of the replacement pattern.

Files

/tmp	default directory where temporary work files are placed; it can be changed using the **directory** option (see the *ex*(C) **set** command.).
/usr/lib/terminfo/?/*	compiled terminal description database
/usr/lib/.COREterm/?/*	subset of compiled terminal description database

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

The **/usr/lib/ex3.7preserve** program can be used to restore *vi* buffer files that were lost as a result of a system crash. The program searches the **/tmp** directory for *vi* buffer files and places them in the directory **/usr/preserve**. The owner can retrieve these files using the **-r** option.

The **/usr/lib/ex3.7preserve** program must be placed in the system startup file, **/etc/rc**, before the command that cleans out the **/tmp** directory. See the XENIX *System Administrator's Guide* for more information on **/etc/rc**.

Two options, although they continue to be supported, have been replaced in the documentation by the options that follow the Command Syntax Standard (see *intro*(C)). A **-r** option that is not followed with an argument has been replaced by **-L** and *+command* has been replaced by **-c** *command*.

vi does not strip the high bit from 8 bit characters read in from text files, text insertion, and editing commands. It does not look for magic numbers of object files when reading in a text file. It also writes out text and displays text without stripping the high bit.

vi uses the **LC_CTYPE** environment variable to determine if a character is printable, displaying the octal codes of non-printable 8 bit characters. It also uses **LC_CTYPE** and **LANG** to convert between

upper and lowercase characters for the tilde command and for the **ignorecase** option.

When the percent sign (**%**) is used in a shell escape from *vi* via the exclamation mark (**!**) the **%** is replaced with the name of the file being edited. In previous versions of *vi*, each character in this replacement had the high bit set to 1 to quote it; in the current version of *vi* it is left alone.

Warnings

Tampering with the entries in **/usr/lib/.COREterm/?/*** or **/usr/lib/terminfo/?/*** (for example, changing or removing an entry) can affect programs such as *vi* that expect all entries to be present and correct. In particular, removing the "dumb" terminal entry may cause unexpected problems.

Software tabs using **^T** work only immediately after the **autoindent**.

Left and right shifts on intelligent terminals do not make use of insert and delete operations in the terminal.

Refer to the *crypt*(C) page for information about restrictions on the availability of encryption options.

Name

vidi - Sets the font and video mode for a video device.

Syntax

vidi [**-d**] [**-f** fontfile] font

vidi mode

Description

vidi has two functions: it loads/extracts a font or sets the video mode for the current standard input device. Without arguments, it lists all of the valid video mode and font commands.

Font Options

Some video cards support changeable character fonts. Available fonts are font8x8, font8x14, and font8x16. The font options are used as follows:

vidi *font*	loads *font* from **/usr/lib/vidi/***font*.
vidi -d *font*	writes *font* to the standard output.
vidi -d -f *font fontfile*	writes *font* to *fontfile*.
vidi -f *fontfile font*	loads *font* from *fontfile* instead of default directory.

Mode Options

vidi also sets the mode of the video adapter connected to the standard input. The modes are:

mono	move current screen to the monochrome adapter.
cga	move current screen to the Color Graphics adapter.
ega	move current screen to the Enhanced Graphics adapter.
vga	move current screen to the Video Graphics adapter.
internal	activate the internal monitor on portable with a plasma screen.

external activate the external monitor on portable with a plasma screen.

Text and Graphics Modes

The following tables list the available modes.

Text Modes				
Mode	Cols	Rows	Font	Adapter
c40x25	40	25	8x8	CGA (EGA VGA)
e40x25	40	25	8x14	EGA (VGA)
v40x25	40	25	8x16	VGA
m80x25	80	25	8x14	MONO (EGA_MONO VGA_MONO)
c80x25	80	25	8x8	CGA (EGA VGA)
em80x25	80	25	8x14	EGA_MONO (VGA_MONO)
e80x25	80	25	8x14	EGA (VGA)
vm80x25	80	25	8x16	VGA_MONO
v80x25	80	25	8x16	VGA
e80x43	80	43	8x14	EGA (VGA)

Graphics Modes			
Mode	Pixel Resolution	Colors	Adapter
mode5	320x200	4	CGA (EGA VGA)
mode6	640x200	2	CGA (EGA VGA)
modeD	320x200	16	EGA (VGA)
modeE	640x200	16	EGA (VGA)
modeF	640x350	2 (mono)	EGA (VGA)
mode10	640x350	16	EGA (VGA)
mode11	640x480	2	VGA
mode12	640x480	16	VGA
mode13	320x200	256	VGA

See Also

screen(HW)

Notes

The *internal* and *external* commands do not work with all types of portables.

Name

vmstat - Report paging and system statistics.

Syntax

vmstat [**-fs**] [**-n** namelist] [**-c** corefile] [**-l** lines] [interval [count]]

Description

vmstat reports some statistics kept by the system on processes, demand paging, and cpu and trap activity. Three types of reports are available:

(default)
A summary of the number of processes in various states, paging activity, system activity, and cpu cycle consumption.

-f Number of *fork*(S)'s done.

-s A verbose listing of paging and trap activity.

If no *interval* or *count* is specified, the totals since system bootup are displayed.

If an *interval* is given, the number of events that have occurred in the last *interval* seconds is shown. If no *count* is specified, this display is repeated forever every *interval* seconds. Otherwise, when a *count* is also specified, the information is displayed *count* times.

Other flags that may be specified include:

-c *corefile*
Uses the file *corefile* in place of **/dev/kmem**.

-n *namelist*
Use file *namelist* as an alternate symbol table instead of **/xenix**.

-l *lines*
For the default display, repeat the header every *lines* reports (default is **20**).

The fields in the default report are:

procs
The number of processes which are:

r In the run queue.

b Blocked waiting for resources.

w Swapped out.

These values always reflect the current situation, even if the totals since boot are being displayed.

paging
Reports on the performance of the demand paging system. Unless the totals since boot are being displayed, this information is averaged over the proceeding *interval* seconds:

si Number of processes swapped in.

so Number of processes swapped out.

ch Page cache hits.

cm
Page cache misses.

ffr Filesystem page reads.

swr
Swap area page reads.

sww
Swap area page writes.

rec
Number of pages reclaimed from the free list.

shf
Number of pages shared as copy-on-write after *fork*.

shc
Number of pages shared due to cache hits.

cpy
Number of shared pages copied.

pf Number of page faults.

system
Reports on the general system activity. Unless the totals since boot are being shown, these figures are averaged over the last *interval* seconds:

in Number of (non-clock) device interrupts.

sy Number of system calls.

cs Number of context switches.

cpu
Percentage of cpu cycles spent in various operating modes:

us User.

su System.

id Idle.

The **-f** and **-s** reports are a series of lines of the form:
number description
which means that *number* of the items described by *description* happened (either since boot or in the last *interval* seconds, as appropriate). These reports should be self-explanatory.

Files

/xenix
Default namelist.

/dev/kmem
Default source of statistics.

Notes

This utility is only available on XENIX-386 distributions.

See Also

fork(S), ps(C), pstat(C)

Name

vsh - menu driven visual shell

Syntax

vsh

Description

vsh is a highly interactive, visually oriented shell which eases many XENIX activities. The *vsh* features both standard and customizable XENIX command menus and on-line help. The *vsh* displays information and menus in windows on the screen. To enter *vsh,* simply enter:

vsh

from a shell prompt. *vsh* can also be made a user's default shell by changing their shell entry in **/etc/passwd** (the last colon-separated field). Help is available from all menus by typing the question mark character.

The very last line of the screen is a status line. The status line displays the current pathname, the date, time and operating system name. If you have new mail, the status line will indicate so. Above the status line is the message line, which displays messages, error or otherwise, from *vsh.*

A command menu is displayed at the bottom of the screen. The standard menu contains a range of commonly used XENIX commands. Above the command menu is the output window. This window contains a scrolling display of the output from commands. This window is not visible at start-up, but is displayed while running certain commands such as '='.

In the top of the screen is a window with a listing of the current working directory. To alter the size of this window, use the *Window* command from the main command menu. Items in the listing window may be selected using standard key commands (q.v.). Two special key commands are used with the listing window. The equals sign '=' ('SHOW') key, displays the contents of the currently selected file or directory. The minus sign '-' ('GOAWAY') key, returns you to the listing window.

Commands may be invoked in one of two ways. A command can be selected by pressing the first letter of its name. Alternatively, press the space bar. Each time the space bar is pressed, the next menu item is highlighted. This highlighting indicates that the command has been selected. Backspace moves to the previous selection.

Once a command is selected, press the return key. A menu is displayed which gives the valid arguments for the particular command. The default choice is shown in parentheses, e.g.:

recursive: Yes (No)

To send the output to another program, you may enter a vertical bar in the "output:" field of the commands' menu.

When the menu is filled in, press RETURN to start the command.

Main Menu Commands

The following menu options are available from the standard main menu. Certain sub-commands are available under the Options selection. These are described in the next section.

Copy
Copy a file to a new file. Copy the contents of a directory to a new directory.

Delete
Delete a file or directory.

Edit
Invoke an editor for a file. Default is the visual editor *vi*(C).

Help
Get help on diverse topics. A menu is displayed at the bottom of the screen of available help topics.

Mail
Send or read XENIX mail.

Name
Rename a directory or file.

Options
Perform various commands. See OPTIONS section.

Print
Print file or files on systems' lineprinter.

Quit
Quit the visual shell.

Run
Run a specified XENIX command or applications program.

View
View a specified file or directory listing. This file or directory listing will be displayed in the upper window. Use the *vsh* scrolling commands to move around (see KEY COMMANDS Section).

Window
Reset upper window 'redraw' characteristics and height.

Options Subcommand

The Options selection on the main menu has several important commands grouped under the selections Directory, Filesystem, Output, and Permissions. These are as follows:

Directory

Make
Make a directory under current working directory.

Usage
Display disk usage by number of blocks in current working directory.

Filesystem

Create
Create a filesystem.

FilesCheck
Check file system consistency.

Mount
Mount a file system on a specified mount-point.

SpaceFree
Report number of disk blocks available on all or some mounted file systems.

Unmount
Unmount specified file system if it is not currently busy.

Output

VShell
Echo vsh commands in output window (default).

XENIX
Echo actual XENIX commands in output window. For instance, if running "Options Filesystem FilesCheck", the command *fsck* will be displayed in the output window if "Options Output Xenix" is set.

Permissions

Change permissions on a file or directory.

Key Commands

The following keyboard commands allow editing of menus and fields, and give access to various vsh features.

<Ctrl-E>
Move the cursor up one line.

<Ctrl-X>
Move the cursor down one line.

<Ctrl-S>
Move the cursor left one character.

<Ctrl-D>
Move the cursor right one character.

<Ctrl-R><Ctrl-E>
Scroll page up.

<Ctrl-R><Ctrl-X>
Scroll page down.

<Ctrl-R><Ctrl-S>
Scroll page left.

<Ctrl-R><Ctrl-D>
Scroll page right.

<Ctrl-Q>
Home. Go to start of menu.

<Ctrl-Z>
End. Go to the end of menu.

<Ctrl-C>
Cancel. Stop present operation and return to the main command menu.

<RETURN>
Start the present command.

<TAB>, <Ctrl-I>, or <Ctrl-A>
Move to and select entire contents of next field in command line.

<SPACE>
Select next item in menu.

<BACKSPACE> or <Ctrl-H>
Select previous menu item. In editing command lists, deletes character. Replacement text may then be typed.

<Ctrl-Y> or <DEL>
Delete selected character.

<Ctrl-L>
Move to next character to right of current cursor position.

<Ctrl-K>
Move to next character to left of current cursor position.

<Ctrl-P>
Move to next word to right of current cursor position.

<Ctrl-O>
Move to next word to left of current cursor position.

? Help. Request information about the selected command or command in progress at the time of the request.

= Show. Display sub-directory listings and text files in directory listings. Display submenus for commands in main menu.

- Goaway. Return listing window to current or parent directory after a show command.

@ Display the Modify menu.

! Redraw the screen.

| Display filter menu.

Files

menu.def	standard menu definition file.
.mnu	extension for customized command menus.
/usr/lib/vsh/VSHELL.HPP	help file
/usr/lib/vsh/VSHELL.HPT	yet another help file

Notes

The use of wildcard characters (*, [,], and ?) to specify file names is not supported by *vsh*. (Wildcard characters are discussed in the *XENIX Tutorial*.)

The **swtch** character is reset by *vsh*. It is not possible to switch to the session manager, *shl*(C), while running *vsh*.

It is necessary to run *vsh* as superuser and select "help" in order to initialize the help files. If this is not done, help is not available.

Name

w - Displays information about who is on the system and what they are doing.

Syntax

w [**-hlqtw**] [**-n** namelist] [**-s** swapdev] [**-c** corefile] [**-u** utmpfile] [users...]

Description

w prints 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, the number of users logged onto the system, and load averages. Load averages are the number of processes in the run queue averaged over 1, 5, and 15 minutes.

The options are:

-h Don't print the heading or title lines.

-l Long format (default): For each user, *w* outputs the user's login name, the terminal or pseudo terminal the user is currently using, when the user logged onto the system, the number of minutes the user has been idle (how much time has expired since the user last typed anything), the CPU time used by all processes and their children attached to the terminal, the CPU time used by the currently active process, and the name and arguments of the currently active process.

-q Quick format: For each user, *w* outputs the user's login name, the terminal or pseudo terminal the user is currently using, the number of minutes the user has been idle, and the name of the currently active process.

-t Only the heading line is output (equivalent to *uptime*(C)).

-w Both the heading line and the summary of users is output.

-n*namelist*
The argument is taken as the name of an alternate *namelist* (*/xenix* is the default).

-s*swapdev*
Uses the file *swapdev* in place of */dev/swap*. This is useful when examining a *corefile*.

-c*corefile*
Uses the file *corefile* in place of */dev/kmem*.

-u*utmpfile*
The file *utmpfile* is used instead of */etc/utmp* as a record of who is currently logged in.

If any *users* are given, the user summary is restricted to reporting on those users.

Files

/xenix
/etc/utmp
/dev/kmem
/dev/swap

See Also

date(C), finger(C), ps(C), uptime(C), who(C), whodo(C)

Notes

The "currently active process" is only an approximation and is not always correct. Pipelines can produce strange results, as can some background processes. If *w* is completely unable to guess at the currently active process, it prints "-."

Name

wait - Awaits completion of background processes.

Syntax

wait

Description

Waits until all background processes started with an ampersand (**&**) have finished, and reports on abnormal terminations.

Because the *wait*(S) system call must be executed in the parent process, the shell itself executes *wait*, without creating a new process.

See Also

sh(C)

Notes

Not all the processes of a pipeline with three or more stages are children of the shell, and thus cannot be waited for.

Name

wc - Counts lines, words and characters.

Syntax

wc [**-lwc**] [names]

Description

wc counts lines, words and characters in the named files, or in the standard input if no *names* appear. It also keeps a total count for all named files. A word is a maximal string of characters delimited by spaces, tabs, or newlines.

The options **l**, **w**, and **c** may be used in any combination to specify that a subset of lines, words, and characters are to be reported. The default is **-lwc**.

When *names* are specified on the command line, they are printed along with the counts.

Name

what - Identifies files.

Syntax

what files

Description

what searches the given files for all occurrences of the pattern **@(#)** and prints out what follows until the first tilde (~), greater-than sign (>), new-line, backslash (\) or null character. The SCCS command *get*(CP) substitutes this string as part of the @(#) string.

For example, if the shell procedure in file **print** contains

```
# @(#)this is the print program
# @(#)syntax: print [files]
pr $* | lpr
```

then the command

```
what print
```

displays the name of the file **print** and the identifying strings in that file:

```
print:
        this is the print program
        syntax: print [files]
```

what is intended to be used with the *get*(CP) command, which automatically inserts identifying information, but it can also be used where the information is inserted manually.

See Also

admin(CP), get(CP)

Name

who - Lists who is on the system.

Syntax

who [**-uTlHqdtas**] [file]

who am i

who am I

Description

who can list the user's name, terminal line, login time, and the elapsed time since activity occurred on the line; it also lists the process ID of the command interpreter (shell) for each current XENIX system user. It examines the **/etc/utmp** file to obtain its information. If *file* is given, that file is examined. Usually, *file* will be **/etc/wtmp**, which contains a history of all the logins since the file was last created.

who with the **am i** or **am I** option identifies the invoking user.

Except for the default **-s** option, the general format for output entries is:

name [state] line time activity pid [comment] [exit]

With options, *who* can list logins, logoffs, reboots, and changes to the system clock, as well as other processes spawned by the *init* process. These options are:

-u This option lists only those users who are currently logged in. The *name* is the user's login name. The *line* is the name of the line as found in the directory **/dev**. The *time* is the time that the user logged in. The *activity* is the number of hours and minutes since activity last occurred on that particular line. A dot (.) indicates that the terminal has seen activity in the last minute and is therefore "current". If more than twenty-four hours have elapsed or the line has not been used since boot time, the entry is marked old. This field is useful when trying to determine whether a person is working at the terminal or not. The *pid* is the process ID of the user's shell. The *comment* is the comment field. It can contain information about where the terminal is located, the telephone number of the dataset, the type of terminal if hard-wired, etc.

-T This option is the same as the **-u** option, except that the *state* of the terminal line is printed. The *state* describes whether someone else can write to that terminal. A plus character (+)

appears if the terminal is writable by anyone; a minus character (-) appears if it is not. **Root** can write to all lines having a plus character (+) or a minus character (-) in the *state* field. If a bad line is encountered, a question mark (?) is displayed.

-l This option lists only those lines on which the system is waiting for someone to login. The *name* field is **LOGIN** in such cases. Other fields are the same as for user entries except that the *state* field does not exist.

-H This option displays column headings above the regular output.

-q This is a quick *who,* displaying only the names and the number of users currently logged on. When this option is used, all other options are ignored.

-d This option displays all processes that have expired and have not been respawned by *init*. The *exit* field appears for dead processes and contains the termination and exit values (as returned by *wait*(S)), of the dead process. This can be useful in determining why a process terminated.

-t This option indicates the last change to the system clock (via the *date*(C) command) by **root**. See *su*(C).

-a This option processes the **/etc/utmp** file or the named *file* with all options turned on.

-s This option is the default and lists only the *name*, *line*, and *time* fields.

Files

/etc/utmp
/etc/wtmp
/etc/ttys

See Also

date(C), login(M), mesg(C), su(C), utmp(F), ttys(F), wait(S)

Notes

The options **-A**, **-b**, **-p**, and **-r** are listed in the usage message and are accepted as legal options by *who* but do not do anything.

Name

whodo - Determines who is doing what.

Syntax

/etc/whodo

Description

whodo produces merged, reformatted, and dated output from the *who*(C) and *ps*(C) commands.

See Also

ps(C), who(C)

Name

write - Writes to another user.

Syntax

write user [tty]

Description

write copies lines from your terminal to that of another user. When first called, it sends the message:

Message from *your-logname your-tty* ...

The recipient of the message should write back at this point. Communication continues until an end-of-file is read from the terminal or an interrupt is sent. At that point, *write* displays:

(end of message)

on the other terminal and exits.

If you want to write to a user who is logged in more than once, the *tty* argument may be used to indicate the appropriate terminal.

Permission to write may be denied or granted by use of the *mesg*(C) command. At the outset, writing is allowed. Certain commands, in particular *nroff*(CT) and *pr*(C), disallow messages in order to prevent messy output.

If the character **!** is found at the beginning of a line, *write* calls the shell to execute the rest of the line as a command. Output from the command is sent to the terminal; it is not sent to remote users.

The following protocol is suggested for using *write*: when you first write to another user, wait for him or her to write back before starting to send. Each party should end each message with a distinctive signal (**(o)** for "over" is conventional), indicating that the other may reply; **(oo)** for "over and out" is suggested when conversation is to be terminated.

Files

/etc/utmp	To find user
/bin/sh	To execute !

See Also

hello(C), mail(C), mesg(C), who(C)

Name

xargs - Constructs and executes commands.

Syntax

xargs [flags] [command [initial-arguments]]

Description

xargs combines the fixed *initial-arguments* with arguments read from the standard input to execute the specified *command* one or more times. The number of arguments read for each *command* invocation and the manner in which they are combined are determined by the flags specified.

Command, which may be a shell file, is searched for using the shell **$PATH** variable. If *command* is omitted, **/bin/echo** is used.

Arguments read in from standard input are defined to be contiguous strings of characters delimited by one or more blanks, tabs, or newlines; empty lines are always discarded. Blanks and tabs may be embedded as part of an argument if escaped or quoted: Characters enclosed in quotes (single or double) are taken literally, and the delimiting quotes are removed. Outside of quoted strings, a backslash (\) will escape the next character.

Each argument list is constructed starting with the *initial-arguments*, followed by some number of arguments read from standard input (exception: see **-i** flag). Flags **-i**, **-l**, and **-n** determine how arguments are selected for each command invocation. When none of these flags are coded, the *initial-arguments* are followed by arguments read continuously from standard input until an internal buffer is full, and *command* is executed with the accumulated args. This process is repeated until there are no more args. When there are flag conflicts (e.g., **-l** vs. **-n**), the last flag has precedence. *Flag* values are:

-l*number* *Command* is executed for each *number* lines of nonempty arguments from the standard input. This is instead of the default single line of input for each *command*. The last invocation of *command* will be with fewer lines of arguments if fewer than *number* remain. A line is considered to end with the first newline *unless* the last character of the line is a blank or a tab; a trailing blank/tab signals continuation through the next nonempty line. If *number* is omitted, 1 is assumed. Option **-x** is forced.

-i*replstr* Insert mode: *command* is executed for each line from the standard input, taking the entire line as a single arg, inserting it in *initial-arguments* for each occurrence of *replstr*. A maximum of 5 arguments in *initial-arguments* may each contain one or more instances of *replstr*. Blanks and tabs at the beginning of each line are thrown away. Constructed arguments may not grow larger than 255 characters, and option **-x** is also forced. {} is assumed for *replstr* if not specified.

-n*number* Executes *command*, using as many standard input arguments as possible, up to the *number* of arguments maximum. Fewer arguments are used if their total size is greater than *size* characters, and for the last invocation if there are fewer than *number* arguments remaining. If option **-x** is also coded, each *number* of arguments must fit in the *size* limitation, or *xargs* terminates execution.

-t Trace mode: The *command* and each constructed argument list are echoed to file descriptor 2 just prior to their execution.

-p Prompt mode: The user is prompted whether to execute *command* at each invocation. Trace mode (**-t**) is turned on to display the command instance to be executed, followed by a **?...** prompt. A reply of **y** (optionally followed by anything), will execute the command; anything else, including a carriage return, skips that particular invocation of *command*.

-x Causes *xargs* to terminate if any argument list would be greater than *size* characters; **-x** is forced by the options **-i** and **-l**. When neither of the options **-i**, **-l**, or **-n** are coded, the total length of all arguments must be within the *size* limit.

-s*size* The maximum total size of each argument list is set to *size* characters; *size* must be a positive integer less than or equal to 470. If **-s** is not coded, 470 is taken as the default. Note that the character count for *size* includes one extra character for each argument and the count of characters in the command name.

-e*eofstr* *Eofstr* is taken as the logical end-of-file string. Underscore (_) is assumed for the logical **EOF** string if **-e** is not coded. **-e** with no *eofstr* coded turns off the logical **EOF** string capability (underscore is taken literally). *xargs* reads standard input until either end-of-file or the logical **EOF** string is encountered.

xargs terminates if it either receives a return code of **-1** from, or if it cannot execute, *command*. When *command* is a shell program, it should explicitly *exit* (see *sh*(C)) with an appropriate value to avoid accidentally returning with **-1**.

Examples

The following will move all files from directory $1 to directory $2, and echo each move command just before doing it:

```
ls $1 | xargs -i -t mv $1/{ } $2/{ }
```

The following will combine the output of the parenthesized commands onto one line, which is then echoed to the end of file *log*:

```
(logname; date; echo $0 $*) | xargs >>log
```

The user is prompted to enter which files in the current directory are to be printed and prints them one at a time:

```
ls | xargs -p -l lpr
```

Or many at a time:

```
ls | xargs -p -l | xargs lpr
```

The following will execute *diff*(C) with successive pairs of arguments originally entered as shell arguments:

```
echo $* | xargs -n2 diff
```

Name

yes - Prints string repeatedly.

Syntax

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. Useful in pipes to commands that prompt for input and require a "y" response for a yes. In this case, *yes* terminates when the command it pipes to terminates, so that no infinite loop occurs.

Contents

File Formats **(F)**

Name

intro - Introduction to file formats.

Description

This section outlines the formats of various files. Usually, these structures can be found in the directories **/usr/include** or **/usr/include/sys**.

Name

86rel - Intel 8086 Relocatable Format for Object Modules.

Syntax

#include <sys/relsym86.h>

Description

Intel 8086 Relocatable Format, or *86rel*, is the object module format generated by *masm*(CP), and the input format for the linker *ld*(CP). The include file **relsym86.h** specifies appropriate definitions to access *86rel* format files from C. For the technical details of the *86rel* format, see *Intel 8086 Object Module Format External Product Specification*.

An *86rel* consists of one or more variable length records. Each record has at least three fields: the record type, length, and checksum. The first byte always denotes the record type. There are thirty-one different record types. Only eleven are used by *ld*(CP) and *masm*(CP). The word after the first byte is the length of the record in bytes, exclusive of the first three bytes. Following the length word are typically one or more fields. Each record type has a specific sequence of fields, some of which may be optional or of varying length. The very last byte in each record is a checksum. The checksum byte contains the sum modulo 256 of all other bytes in the record. The sum modulo 256 of all bytes in a record, including the checksum byte, should equal zero.

With few exceptions, *86rel* strings are length prefixed and have no trailing null. The first byte contains a number between 0 and 40, which is the remaining length of the string in bytes. Although the Intel specification limits the character set to upper case letters, digits, and the characters "?", "@", ":", ".", and "_", *masm*(CP) uses the complete ASCII character set.

The Intel Object Module Format (OMF) specification uses the term "index" to mean a positive integer either in the range 0 to 127, or 128 to 32,768. This terminology is retained in this document and elsewhere in the *86rel* literature. An index has one or two bytes. If the first byte has a leading 0 bit, the index is assumed to have only one byte, and the remainder of the byte represents a positive integer between 0 and 127. If the second byte has a leading 1 bit, the index is assumed to take up two bytes, and the remainder of the word represents a positive integer between 128 and 32,768.

Following is a list of record types and the hexadecimal value of their first byte, as defined in **relsym86.h**.

```
#define MRHEADR     0x6e /*rel module header/*
#define MREGINT     0x70 /*register initialization*/
#define MREDATA     0x72 /*explicit (enumerated) data image*/
#define MRIDATA     0x74 /*repeated (iterated) data image*/
#define MOVLDEF     0x76 /*overlay definition*/
#define MENDREC     0x78 /*block or overlay end record*/
#define MBLKDEF     0x7a /*block definition*/
#define MBLKEND     0x7c /*block end*/
#define MDEBSYM     0x7e /*debug symbols*/
#define MTHEADR     0x80 /*module header,
                            /*usually first in a rel file*/
#define MLHEADR     0x82 /*link module header*/
#define MPEDATA     0x84 /*absolute data image*/
#define MPIDATA     0x86 /*absolute repeated (iterated)
                            *data image*/
#define MCOMENT     0x88 /*comment record*/
#define MMODEND     0x8a /*module end record*/
#define MEXTDEF     0x8c /*external definition*/
#define MTYPDEF     0x8e /*type definition*/
#define MPUBDEF     0x90 /*public definition*/
#define MLOCSYM     0x92 /*local symbols*/
#define MLINNUM     0x94 /*source line number*/
#define MLNAMES     0x96 /*name list record*/
#define MSEGDEF     0x98 /*segment definition*/
#define MGRPDEF     0x9a /*group definition*/
#define MFIXUPP     0x9c /*fix up previous data image*/
#define MNONE1      0x9e /*none*/
#define MLEDATA     0xa0 /*logical data image*/
#define MLIDATA     0xa2 /*logical repeated (iterated)
                            *data image*/
#define MLIBHED     0xa4 /*library header*/
#define MLIBNAM     0xa6 /*library names record*/
#define MLIBLOC     0xa8 /*library module locations*/
#define MLIBDIC     0xaa /*library dictionary*/
#define M386END     0x86 /*32 bit module end record*/
#define MPUB386     0x91 /*32 bit public definition*/
#define MLOC386     0x93 /*32 bit logical symbols*/
#define MLIN386     0x95 /*32 bit source line number*/
#define MSEG386     0x99 /*32 bit segment definition*/
#define MFIX386     0x9d /*fix up previous 32 bit data image*/
#define MLED386     0xa1 /*32 bit logical data image*/
#define MLID386     0xa3 /*32 bit logical repeated (iterated) data image*/
```

In the following discussion, the salient features of each record type are given. If the record is not used by either *masm*(CP) or *ld*(CP), it is not listed.

THEADR — The record type byte is 0x80. The THEADR record specifies the name of the source module at assembly-time (see Notes). The sole field is the T-MODULE NAME , which contains a length-prefixed string derived from the base name of the source module.

COMENT — The record type byte is 0x88. The COMENT record may contain a remark generated by the compiler system. *mams*(CP) inserts the string "XENIX 8086 ASSEMBLER ."

MODEND — The record type byte is 0x8a. The MODEND record terminates a module. It can specify whether the current module is to be used as the entry point to the linked executable. If the module is an entry point, the MODEND record can then specify the address of the entry point within the executable.

EXTDEF — The record type byte is 0x8c. The EXTDEF record contains the names and types of symbols defined in other modules by a PUBDEF record (see below). This corresponds to the C storage class "extern." The fields consist of one or more length-prefixed strings, each with a following type index. The indices reference a TYPDEF record seen earlier in the module. *masm*(CP) generates only one EXTDEF per exterior symbol.

TYPDEF — The record type byte is 0x8e. The TYPDEF record gives a description of the type (size and storage attributes) of an object or objects. This description can then be referenced by EXTDEF , PUBDEF , and other records.

PUBDEF — The record type byte is 0x90. The PUBDEF record gives a list of one or more names that may be referenced by other modules at link-time ("publics"). The list of names is preceded by a group and segment index, which reference the location of the start of the list of publics within the current segment and group. If the segment and group indices are zero, a frame number is given to provide an absolute address in the module. The list consists of one or more of length-prefixed strings, each associated with a 16-bit offset within the current segment and a type index referring to a TYPDEF .

LNAMES — The record type byte is 0x96. The LNAMES record gives a series of length-prefixed strings which are associated with name indices within the current module. Each name is indexed in sequence given starting with 1. The names may then be referenced

within the current module by successive SEGDEF and GRPDEF records to provide strings for segments, classes, overlays or groups.

SEGDEF — The record type byte is 0x98. The SEGDEF record provides an index to reference a segment, and information concerning segment addressing and attributes. This index may be used by other records to refer to the segment. The first word in the record after the length field gives information about the alignment, and about combination attributes of the segment. The next word is the segment length in bytes. Note that this restrains segments to a maximum 645,536 bytes in length. Following this word is an index (see above) for the segment. Lastly, the SEGDEF may optionally contain class and/or overlay index fields.

GRPDEF — The record type is 0x9a. The GRPDEF record provides a name to reference several segments. The group name is implemented as an index (see above).

FIXUPP — The record byte is 0x9c. The FIXUPP record specifies one or more load-time address modifications ("fixups"). Each fixup refers to a location in a preceding LEDATA (see below) record. The fixup is specified by four data; a location, a mode, a target and a frame. The frame and target may be specified explicitly or by reference to an already defined fixup.

LEDATA — The record type byte is 0xa0. This record provides a contiguous text or data image which the loader *ld*(CP) uses to construct a portion of an 8086 run-time executable. The image might require additional processing (see FIXUPP) before being loaded into the executable. The image is preceded by two fields, a segment index and an enumerated data offset. The segment index (see INDEX) specifies a segment given by a previously seen SEGDEF . The enumerated data offset (a word) specifies the offset from the start of this segment.

See Also

as(CP), ld(CP)

Notes

If you attempt to load a number of modules assembled under the same basename, the loader will try to put them all in one big segment. In 286 programs, segment size is limited to 64K. In a large program the resulting segment size can easily exceed 64K. A large model code executable results from the link of one or more modules, composed of segments that aggregate into greater than 64K of text.

Hence, be sure that the assembly-time name of the module has the same basename as the source. This can occur if the source module is preprocessed not by *cc*(CP), but, for example, by hand or shell script, prior to assembly. The following example is incorrect:

```
#incorrect
cc -E module1.c | filter > x.c
cc x.c
mv x.o module1.o
cc -E module2.c | filter > x.c
cc x.c
mv x.o module2.o
cc -E module3.c | filter > x.c
cc x.c
mv x.o module3.o
ld module1.o module2.o module3.o
```

To avoid this, each of the modules should have a unique name when assembled, as follows:

```
#correct
cc -E module1.c | filter > x.c
cc -S x.c
mv x.s module1.s
as module1.s
.
.
.
ld module1.o module2.o module3.o
```

Name

a.out - Format of assembler and link editor output.

Description

A.out is the output file of the assembler *masm* and the link editor *ld*. Both programs will make *a.out* executable if there were no errors in assembling or linking, and no unresolved external references.

The format of *a.out*, called the *x.out* or segmented *x.out* format, is defined by the files **/usr/include/a.out.h** and **/usr/include/sys/relsym.h**. The *a.out* file has the following general layout:

1. Header.
2. Extended header.
3. File segment table (for segmented formats).
4. Segments (Text, Data, Symbol, and Relocation).

In the segmented format, there may be several text and data segments, depending on the memory model of the program. Segments within the file begin on boundaries which are multiplies of 512 bytes as defined by the file's pagesize.

Format

```
/*
 *  The main and extended header structures.
 *  For x.out segmented (XE_SEG):
 *      1) fields marked with (s) must contain sums of xs_psize for
 *         non-memory images, or xs_vsize for memory images.
 *      2) the contents of fields marked with (u) are undefined.
 */

struct xexec {                  /* x.out header */
    unsigned short  x_magic;    /* magic number */
    unsigned short  x_ext;      /* size of header extension */
    long            x_text;     /* size of text segment (s) */
    long            x_data;     /* size of initialized data (s) */
    long            x_bss;      /* size of uninitialized data (s) */
    long            x_syms;         /* size of symbol table (s) */
    long            x_reloc;    /* relocation table length (s) */
    long            x_entry;    /* entry point, machine dependent */
```

```
    char        x_cpu;      /* cpu type & byte/word order */
    char        x_relsym;   /* relocation & symbol format (u) */
    unsigned short  x_renv;     /* run-time environment */
};


struct xext {                   /* x.out header extension */
    long        xe_trsize;      /* size of text relocation (s) */
    long        xe_drsize;      /* size of data relocation (s) */
    long        xe_tbase;       /* text relocation base (u) */
    long        xe_dbase;       /* data relocation base (u) */
    long        xe_stksize;     /* stack size (if XE_FS set) */
                /* the following must be present if XE_SEG */
    long        xe_segpos;      /* segment table position */
    long        xe_segsize;     /* segment table size */
    long        xe_mdtpos; /* machine dependent table position */
    long        xe_mdtsize;/* machine dependent table size */
    char        xe_mdttype;     /* machine dependent table type */
    char        xe_pagesize;    /* file pagesize, in multiples of 512 */
    char        xe_ostype;      /* operating system type */
    char        xe_osvers;      /* operating system version */
    unsigned short  xe_eseg;    /* entry segment, machine dependent */
    unsigned short  xe_sres;    /* reserved */
};


struct xseg {               /* x.out segment table entry */
    unsigned short  xs_type;    /* segment type */
    unsigned short  xs_attr; /* segment attributes */
    unsigned short  xs_seg;     /* segment number */
    char        xs_align;       /* log base 2 of alignment */
    char        xs_cres;        /* unused */
    long        xs_filpos;      /* file position */
    long        xs_psize;       /* physical size (in file) */
    long        xs_vsize;       /* virtual size (in core) */
    long        xs_rbase;       /* relocation base address/offset */
    unsigned short  xs_noff;/* segment name string table offset */
    unsigned short  xs_sres;/* unused */
    long        xs_lres;    /* unused */
};


struct xiter {              /* x.out iteration record */
    long        xi_size;    /* source byte count */
    long        xi_rep;     /* replication count */
    long        xi_offset;  /* destination offset in segment */
};
```

```
struct xlist {                  /* xlist structure for xlist(3). */
    unsigned short  xl_type;    /* symbol type */
    unsigned short  xl_seg;     /* file segment table index */
    long        xl_value;           /* symbol value */
    char        *xl_name;           /* pointer to asciz name */
};

struct aexec {                  /* a.out header */
    unsigned short  xa_magic;       /* magic number */
    unsigned short  xa_text;        /* size of text segment */
    unsigned short  xa_data;        /* size of initialized data */
    unsigned short  xa_bss;     /* size of uninitialized data */
    unsigned short  xa_syms;        /* size of symbol table */
    unsigned short  xa_entry;       /* entry point */
    unsigned short  xa_unused; /* not used */
    unsigned short  xa_flag;    /* relocation info stripped */
};


struct nlist {                  /* nlist structure for nlist(3). */
    char        n_name[8]; /* symbol name */
    int     n_type;         /* type flag */
    unsigned    n_value;        /* value */
};


struct bexec {              /* b.out header */
    long    xb_magic;  /* magic number */
    long    xb_text;    /* text segment size */
    long    xb_data;    /* data segment size */
    long    xb_bss; /* bss size */
    long    xb_syms;    /* symbol table size */
    long    xb_trsize;  /* text relocation table size */
    long    xb_drsize;  /* data relocation table size */
    long    xb_entry;   /* entry point */
};
```

See Also

masm(CP), ld(CP), nm(CP), strip(CP), xlist(S).

Name

acct - Format of per-process accounting file.

Description

Files produced as a result of calling *acct*(S) have records in the form defined by **<sys/acct.h>.**

In *ac_flag*, the AFORK flag is turned on by each *fork*(S) and turned off by an *exec*(S). The *ac_comm* field is inherited from the parent process and is reset by any *exec*. Each time the system charges the process with a clock tick, it also adds the current process size to *ac_mem* computed as follows:

(data size) + (text size) / (number of in-core processes using text)

The value of *ac_mem*/*ac_stime* can be viewed as an approximation to the mean process size, as modified by text-sharing.

See Also

acctcom(ADM), acct(S)

Notes

The *ac_mem* value for a short-lived command gives little information about the actual size of the command, because *ac_mem* may be incremented while a different command (e.g., the shell) is being executed by the process.

Name

ar - Archive file format.

Description

The archive command *ar* is used to combine several files into one. Archives are used mainly as libraries to be searched by the link editor *ld*(C).

A file produced by *ar* has a magic number at the start, followed by the constituent files, each preceded by a file header. The magic number is 0177545 octal (or 0xff65 hexadecimal). The header of each file is declared in **/usr/include/ar.h**.

Each file begins on a word boundary; a null byte is inserted between files if necessary. Nevertheless the size given reflects the actual size of the file exclusive of padding.

Notice there is no provision for empty areas in an archive file.

See Also

ar(CP), ld(CP)

Name

archive - Default backup device information.

Description

/etc/default/archive contains information on system default backup devices for use by *sysadmin*(ADM). The device entries are in the following format:

name=value [name=value] ...

value may contain white spaces if quoted, and newlines may be escaped with a backslash.

The following names are defined for */etc/default/archive*:

bdev	Name of the block interface device.
cdev	Name of the character interface device.
size	Size of the volume in either blocks or feet.
density	Volume density, such as 1600. If this value is missing or null, then *size* is in blocks; otherwise the *size* is in feet.
format	Command used to format the archive device.
blocking	Blocking factor.
desc	A description of the device, such as "Cartridge Tape."

See Also

sysadmin(ADM)

Name

backup - Incremental dump tape format.

Description

The *backup* and *restore* commands are used to write and read incremental dump magnetic tapes.

The backup tape 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.

The header record and the first record of each description have the format described by the structure included by:

#include <dumprestor.h>

Fields in the *dumprestor* structure are described below.

NTREC is the number of 512 byte blocks in a physical tape record. MLEN is the number of bits in a bit map word. MSIZ is the number of bit map words.

The TS_ entries are used in the *c_type* field to indicate what sort of header this is. The types and their meanings are as follows:

TS_TYPE	Tape volume label.
TS_INODE	A file or directory follows. The *c_dinode* field is a copy of the disk inode and contains bits telling what sort of file this is.
TS_BITS	A bit mask follows. This bit mask has one bit for each inode that was backed up.
TS_ADDR	A subblock to a file (*TS_INODE*). See the description of *c_count* below.
TS_END	End of tape record.
TS_CLRI	A bit mask follows. This bit mask contains one bit for all inodes that were empty on the file system when backed up.
MAGIC	All header blocks have this number in *c_magic*.
CHECKSUM	Header blocks checksum to this value.

The fields of the header structure are as follows:

c_type The type of the header.

c_date The date the backup was taken.

c_ddate The date the file system was backed up.

c_volume The current volume number of the backup.

c_tapea The current block number of this record. This is counting 512 byte blocks.

c_inumber The number of the inode being backed up if this is of type TS_INODE.

c_magic This contains the value MAGIC above, truncated as needed.

c_checksum This contains whatever value is needed to make the block sum to CHECKSUM.

c_dinode This is a copy of the inode as it appears on the file system.

c_count The following count of characters describes the file. A character is zero if the block associated with that character was not present on the file system; otherwise, the character is nonzero. If the block was not present on the file system no block was backed up and it is replaced as a hole in the file. If there is not sufficient space in this block to describe all of the blocks in a file, TS_ADDR blocks will be scattered through the file, each one picking up where the last left off.

c_addr This is the array of characters that is used as described above.

Each volume except the last ends with a tapemark (read as an end of file). The last volume ends with a TS_END block and then the tapemark.

The structure *idates* describes an entry of the file where backup history is kept.

See Also

backup(ADM), restore(ADM), filesystem(F)

Name

checklist - List of file systems processed by *fsck*.

Description

The **/etc/checklist** file contains a list of the file systems to be checked when *fsck* (ADM) is invoked without arguments. The list contains at most 15 **special file** names. Each **special file** name must be on a separate line and must correspond to a file system.

See Also

fsck(ADM)

Name

clock - The system real-time (time of day) clock.

Description

The **clock** file provides access to the battery-powered, real-time time of day clock. Reading this file returns the current time; writing to the file sets the current time. The time, 10 bytes long, has the following form:

MMddhhmmyy

where *MM* is the month, *dd* is the day, *hh* is the hour, *mm* is the minute, and *yy* is the last two digits of the year. For example, the time:

0826150385 is 15:03 on August 26, 1985.

Files

/dev/clock

See Also

setclock(ADM)

Notes

Not all computers have battery-powered real-time time of day clocks. Refer to your computer's hardware reference manual.

Name

core - Format of core image file.

Description

XENIX writes out a core image of a terminated process when any of various errors occur. See *signal*(S) for the list of reasons; the most common are memory violations, illegal instructions, bus errors, and user-generated quit signals. The core image is called *core* and is written in the process' working directory (provided it can be; normal access controls apply). A process with an effective user ID different from the real user ID will not produce a core image.

The first section of the core image is a copy of the system's per-user data for the process, including the registers as they were at the time of the fault. The size of this section depends on the parameter *usize*, which is defined in **/usr/include/sys/param.h**. The remainder represents the actual contents of the user's core area when the core image was written. If the text segment is read-only and shared, or separated from data space, it is not dumped.

The format of the information in the first section is described by the *user* structure of the system, defined in **/usr/include/sys/user.h**. The locations of registers, are outlined in **/usr/include/sys/reg.h**.

See Also

adb(CP), setuid(S), signal(S)

Name

cpio - Format of cpio archive.

Description

The *header* structure, when the **c** option is not used, is:

```
struct {
        short   h_magic,
                h_dev,
                h_ino,
                h_mode,
                h_uid,
                h_gid,
                h_nlink,
                h_rdev,
                h_mtime[2],
                h_namesize,
                h_filesize[2];
        char    h_name[h_namesize rounded to word];
} Hdr;
```

When the **c** option is used, the *header* information is described by the statement below:

```
sscanf(Chdr,"%6o%6o%6o%6o%6o%6o%6o%6o%11lo%6o%11lo%s",
        &Hdr.h_magic,&Hdr.h_dev,&Hdr.h_ino,&Hdr.h_mode,
        &Hdr.h_uid,&Hdr.h_gid,&Hdr.h_nlink,&Hdr.h_rdev,
        &Longtime,&Hdr.h_namesize,&Longfile,Hdr.h_name);
```

Longtime and *Longfile* are equivalent to *Hdr.h_mtime* and *Hdr.h_filesize*, respectively. The contents of each file is recorded in an element of the array of varying length structures, *archive*, together with other items describing the file. Every instance of *h_magic* contains the constant 070707 (octal). The items *h_dev* through *h_mtime* have meanings explained in *stat*(S). The length of the null-terminated pathname *h_name*, including the null byte, is given by *h_namesize*.

The last record of the *archive* always contains the name TRAILER!!!. Special files, directories, and the trailer are recorded with *h_filesize* equal to zero.

See Also

cpio(C), find(C), stat(S)

Name

default - Default program information directory.

Description

The files in the directory **/etc/default** contain the default information used by system commands such as **backup**(ADM) and **remote**(C). Default information is any information required by the command that is not explicitly given when the command is invoked.

The directory may contain zero or more files. Each file corresponds to one or more commands. A command searches a file whenever it has been invoked without sufficient information. Each file contains zero or more entries which define the default information. Each entry has the form:

keyword

or

keyword=value

where *keyword* identifies the type of information available and *value* defines its value. Both *keyword* and *value* must consist of letters, digits, and punctuation. The exact spelling of a *keyword* and the appropriate *values* depend on the command and are described with the individual commands.

Any line in a file beginning with a number sign (#) is considered a comment and is ignored.

Files

/etc/default/archive
/etc/default/backup
/etc/default/boot
/etc/default/cron
/etc/default/dumpdir
/etc/default/dumpsrv
/etc/default/filesys
/etc/default/format
/etc/default/login
/etc/default/lpd
/etc/default/man
/etc/default/mail
/etc/default/mapchan
/etc/default/micnet
/etc/default/mkuser
/etc/default/msdos

/etc/default/passwd
/etc/default/restor
/etc/default/su
/etc/default/tar
/etc/default/usemouse

See Also

archive(F), backup(ADM), boot(HW), cron(C), dos(C), dumpdir(ADM), filesys(F), login(M), lp(C), mapchan(M), mapchan(F), micnet(F), mkuser(ADM), pwadmin(ADM), remote(C), restore(ADM), su(C), sysadmin(ADM), tar(C)

Note

Not all commands use **/etc/default** files. Please refer to the manual page for a specific command to determine if **/etc/default** files are used, and what information is specified.

Name

devices - Format of UUCP devices file.

Description

The *Devices* file (**/usr/lib/uucp/Devices**) contains information for all the devices that can be used to establish a link to a remote computer. These devices include automatic call units, direct links, and network connections. This file works closely with the **Dialers**, **Systems**, and **Dialcodes** files.

Each entry in the *Devices* file has the following format:

type ttyline dialerline speed dialer-token

where:

type can contain one of two keywords (**direct** or **ACU**), the name of a Local Area Network switch, or a system name.

ttyline contains the device name of the line (port) associated with the *Devices* entry. For example, if the Automatic Dial Modem for a particular entry is attached to the **/dev/tty11** line, the name entered in this field is **tty11**.

dialerline is useful only for 801 type dialers, which do not contain a modem and must use an additional line. If you do not have an 801 dialer, enter a hyphen (-) as a placeholder.

speed is the speed or speed range of the device. It may contain an indicator for distinguishing different dialer classes.

dialer-token contains pairs of dialers and tokens. Each represents a dialer and an argument to be passed to it. The *dialer* portion can be the name of an automatic dial modem, or it may be a **direct** for a direct link device.

For best results, dialer programs are preferred over **Dialers** entries. The following entry is an example of an entry using a dialer binary:

```
ACU  ttynn  -  300-2400  /usr/lib/uucp/dialHA24
```

Note all lines must have at least 5 fields. Use "-" for unused fields. Types that appear in the 5th field must be either built-in functions (801, Sytek, TCP, Unetserver, DK) or standard functions whose name

appears in the first field in the **Dialers** file.

Two escape characters can be used in this file:

\D which means don't translate the phone /token

\T translate the phone /token using the Dialcodes file

Both refer to the phone number field in the **Systems** file (field 5). \D should always be used with entries in the **Dialers** file, since the **Dialers** file can contain a T to expand the number if necessary. \T should only be used with built-in functions that require expansion.

Note that if a phone number is expected and a \D or \T is not present a \T is used for a built-in, and \D is used for an entry referencing the **Dialers** file.

Examples

The following are examples of common **Devices** files.

Standard modem line

```
ACU tty00 - 1200 801
ACU tty00 - 1200 penril
or
ACU tty00 - 1200 penril \D
```

A direct line

This example will allow **cu -ltty00** to work. This entry could also be used for certain modems in manual mode.

```
Direct tty00 - 4800 direct
```

A ventel modem on a develcon switch

"vent" is the token given to the develcon to reach the ventel modem.

```
ACU tty00 - 1200 develcon vent ventel
ACU tty00 - 1200 develcon vent ventel \D
```

To reach a system on the local develcon switch

```
Develcon tty00 - Any develcon \D
```

A direct connection to a system

```
systemx tty00 - Any direct
```

STREAMS Network Examples

A STREAMS network that conforms to the AT&T Transport Interface with a direct connection to login service (i.e., without explicitly using the Network Listener Service dial script):

```
networkx,eg devicex - - TLIS \D
```

The **Systems** file entry looks like:

```
systemx Any networkx - addressx in:--in: nuucp word: nuucp
```

You must replace *systemx*, *networkx*, *addressx*, and *devicex* with system name, network name, network address and network device, respectively. For example, entries for machine "sffo" on a STARLAN NETWORK might look like:

```
sffoo Any STARLAN - sffoo in:--in: nuucp word: nuucp
```

and:

```
STARLAN,eg starlan - - TLIS \D
```

To use a STREAMS network that conforms to the AT&T Transport Interface and that uses the Network Listener Service dial script to negotiate for a server:

```
networkx,eg devicex - - TLIS \D nls
```

To use a non-STREAMS network that conforms to the AT&T Transport Interface and that uses the Network Listener Service dial script to negotiate for a server:

```
networkx,eg devicex - - TLI \D nls
```

See Also

uucico(ADM), uucp(C), uux(C), uuxqt(C), dialers(F)

Notes

Blank lines and lines that begin with a <space>, <tab>, or are ignored. protocols can be specified as a comma-subfield of the device type either in the **Devices** file (where device type is field 1) or in the **Systems** file (where it is field 3).

Name

dialcodes - Format of UUCP Dialcode abbreviations file.

Description

The **Dialcodes** file (**/usr/lib/uucp/Dialcodes**) contains the Dialcode abbreviations that can be used in the *Phone* field of the **Systems** file. This feature allows you to create a standard **Systems** file for distribution among several sites that have different phone systems and area codes.

If two remote sites in a network need to link with the same sites, but have different internal phone systems each site can share the same **Systems** file, but have different entries in a **Dialcodes** file. Each entry has the following format:

abb dial-seq

where:

abb is the abbreviation used in the **Systems** file *phone* field

dial-seq is the dial sequence that is passed to the dialer when that particular **Systems** file entry is accessed.

The following entry would be set up to work with a *phone* field in the *Systems* file such as *jt7867 :*

```
jt 9=847-
```

When the entry containing *jt7867* is encountered, the following sequence is sent to the dialer if the token in the dialer-token-pair is **\T** :

```
9=847-7867
```

The phone number is made up of an optional alphabetic abbreviation and a numeric part. If an abbreviation is used, it must be one that is listed in the *Dialcodes* file.

```
NY 9=1212555
```

See Also

uucico(ADM), uucp(C), uux(C), uuxqt(C), systems(F)

Name

dialers - Format of UUCP Dialers file.

Description

The **Dialers** file (**/usr/lib/uucp/Dialers**) specifies the initial conversation that must take place on a line before it can be made available for transferring data. This conversation is usually a sequence of ASCII strings that is transmitted and expected, and it is often used to dial a phone number using an ASCII dialer (such as the Automatic Dial Modem).

A modem that is used for dialing in and out may require a second **Dialers** entry. This is to reinitialize the line to dial-in after it has been used for dial-out. The name of the dial-in version of a dialer must begin with an ampersand. For example, the **Dialers** file contains a **hayes2400** and a **&hayes2400** entry.

The fifth field in a **Devices** file entry is an index into the **Dialers** file or a special dialer type. Here an attempt is made to match the fifth field in the **Devices** file with the first field of each **Dialers** file entry. In addition, each odd numbered **Devices** field starting with the seventh position is used as an index into the **Dialers** file. If the match succeeds, the **Dialers** entry is interpreted to perform the dialer negotiations. Each entry in the **Dialers** file has the following format:

dialer substitutions expect-send ...

The *dialer* field matches the fifth and additional odd numbered fields in the **Devices** file. The *substitutions* field is a translate string: the first of each pair of characters is mapped to the second character in the pair. This is usually used to translate = and - into whatever the dialer requires for "wait for dialtone" and "pause."

The remaining *expect-send* fields are character strings. Below are some character strings distributed with the UUCP package in the **Dialers** file.

Dialers file entries

```
penril      =W-P "" \d > s\p9\c )-W\p\r\ds\p9\c-) y\c : \E\TP > 9\c OK
ventel      =&-% "" \r\p\r\c $ <K\T%%\r>\c ONLINE!
hayes       =,-, "" \dAT\r\c OK\r \EATDT\T\r\c CONNECT
rixon       =&-% "" \d\r\r\c $ s9\c )-W\r\ds9\c-) s\c : \T\r\c $ 9\c LINE
vadic       =K-K "" \005\p *-\005\p-*\005\p-* D\p BER? \E\T\e \r\c LINE
develcon    "" "" \pr\ps\c est:\007 \E\D\e \007
micom       ""    "" \s\c NAME? \D\r\c GO
direct
att2212c    =+-,    "" \r\c :--: atol2=y,T\T\r\c red
att4000     =,-,    "" \033\r\r\c DEM: \033s0401\c \006 \033s0901\c \
              \006 \033s1001\c \006 \033s1102\c \006 \033dT\T\r\c \006
att2224     =+-,    "" \r\c :--: T\T\r\c red
nls           ""      "" NLPS:000:001:1\N\c
```

The meaning of some of the escape characters (those beginning with "\") used in the **Dialers** file are listed below:

\p	pause (approximately ¼ to ½ second)
\d	delay (approximately 2 seconds)
\D	phone number or token without **Dialcodes** translation
\T	phone number or token with **Dialcodes** translation
\K	insert a BREAK
\E	enable echo checking (for slow devices)
\e	disable echo checking
\r	carriage return
\c	no new-line or carriage return
\n	send new-line
\nnn	send octal number.

Additional escape characters that may be used are listed in the section discussing the **Systems** file.

The penril entry in the **Dialers** file is executed as follows. First, the phone number argument is translated, replacing any = with a **W** (wait for dialtone) and replacing any - with a **P** (pause). The handshake given by the remainder of the line works as follows:

""	Wait for nothing.
\d	Delay for 2 seconds.
>	Wait for a >.

`s\p9\c`	Send an **s**, pause for ½ second, send a **9**, send no terminating new-line
`)-W\p\r\ds\p9\c-)`	Wait for a **)**. If it is not received, process the string between the **-** characters as follows. Send a **W**, pause, send a carriage-return, delay, send an **s**, pause, send a **9**, without a new-line, and then wait for the **)**.
`y\c`	Send a **y**.
`:`	Wait for a **:**.
`\E\TP`	Enable echo checking. (From this point on, whenever a character is transmitted, it will wait for the character to be received before doing anything else.) Then, send the phone number. The **\T** means take the phone number passed as an argument and apply the **Dialcodes** translation and the modem function translation specified by field 2 of this entry. Then send a **P**.
`>`	Wait for a **>**.
`9\c`	Send a **9** without a new-line.
`OK`	Waiting for the string **OK**.

See Also

dial(ADM), uucico(ADM), uucp(C), uux(C), uuxqt(C), devices(F)

Notes

Dialer binaries (located in **/usr/lib/uucp**) are preferred over **Dialers** entries. Binaries are more reliable. Refer to the *dial* man page for more information on creating your own dialer binaries.

Name

dir - Format of a directory.

Syntax

#include <sys/dir.h>

Description

A directory behaves exactly like an ordinary file, except that no user may write into a directory. The fact that a file is a directory is indicated by a bit in the flag word of its inode entry (see *filesystem* (F)). The structure of a directory is given in the include file **/usr/include/sys/dir.h**.

By convention, the first two entries in each directory are"dot" (.) and "dotdot" (..). The first is an entry for the directory itself. The second is for the parent directory. The meaning of dotdot is modified for the root directory of the master file system; there is no parent, so dotdot has the same meaning as dot.

See Also

filesystem(F)

Name

filesys - Default information for mounting filesystems.

Description

/etc/default/filesys contains information for mounting filesystems in the following format:

name=value [name=value] ...

value may contain white spaces if quoted, and newlines may be escaped with a backslash.

mnt (see *mnt*(C)) and *sysadmin*(ADM) use the information in the */etc/default/filesys* when the system comes up multiuser. The following names are defined for */etc/default/filesys*:

bdev	Name of the block interface device.
cdev	Name of the character interface device.
size	Size in blocks.
mountdir	Directory on which the filesystem is mounted.
desc	A description of the filesystem. For example, "User filesystem."
mountflags	Any flags passed to the **mount**(ADM) command.
fsckflags	Any flags passed to the **fsck**(ADM) command.
rcmount	Whether or not to mount the filesystem when the system goes multiuser. Can be "yes", "no" or "prompt". If set to "prompt", you are prompted when it is time to mount the filesystem.

See Also

mount(ADM), mnt(C), sysadmin(ADM)

Name

filesystem - Format of a system volume.

Syntax

#include <sys/filsys.h>
#include <sys/types.h>
#include <sys/param.h>

Description

Every file system storage volume (for example, a hard disk) has a common format for certain vital information. Every such volume is divided into a certain number of 1024 byte blocks. Block 0 is unused and is available to contain a bootstrap program or other information.

Block 1 is the *super-block*. The format of a super-block is described in **/usr/include/sys/filesys.h**. In that include file, *S_isize* is the address of the first data block after the i-list. The i-list starts just after the super-block in block 2; thus the i-list is *s_isize*-2 blocks long. *S_fsize* is the first block not potentially available for allocation to a file. These numbers are used by the system to check for bad block numbers. If an "impossible" block number is allocated from the free list or is freed, a diagnostic is written on the console. Moreover, the free array is cleared so as to prevent further allocation from a presumably corrupted free list.

The free list for each volume is maintained as follows. The *s_free* array contains, in *s_free*[1], ..., *s_free*[*s_nfree*-1], up to 99 numbers of free blocks. *S_free*[0] is the block number of the head of a chain of blocks constituting the free list. The first short in each free-chain block is the number (up to 100) of free-block numbers listed in the next 100 longs of this chain member. The first of these 100 blocks is the link to the next member of the chain. To allocate a block: decrement *s_nfree*, and the new block is *s_free*[*s_nfree*]. If the new block number is 0, there are no blocks left, so give an error. If *s_nfree* becomes 0, read in the block named by the new block number, replace *s_nfree* by its first word, and copy the block numbers in the next 100 longs into the *s_free* array. To free a block, check if *s_nfree* is 100; if so, copy *s_nfree* and the *s_free* array into it, write it out, and set *s_nfree* to 0. In any event set *s_free*[*s_nfree*] to the freed block's number and increment *s_nfree*.

S_tfree is the total free blocks available in the file system.

S_ninode is the number of free i-numbers in the *s_inode* array. To allocate an inode: if *s_ninode* is greater than 0, decrement it and return *s_inode*[*s_ninode*]. If it was 0, read the i-list and place the numbers of all free inodes (up to 100) into the *s_inode* array, then try

again. To free an inode, provided *s_ninode* is less than 100, place its number into *s_inode*[*s_ninode*] and increment *s_ninode*. If *s_ninode* is already 100, do not bother to enter the freed inode into any table. This list of inodes only speeds up the allocation process. The information about whether the inode is really free is maintained in the inode itself.

S_tinode is the total free inodes available in the file system.

S_flock and *s_ilock* are flags maintained in the core copy of the file system while it is mounted and their values on disk are immaterial. The value of *s_fmod* on disk is also immaterial, and is used as a flag to indicate that the super-block has changed and should be copied to the disk during the next periodic update of file system information.

S_ronly is a read-only flag to indicate write-protection.

S_time is the last time the super-block of the file system was changed, and is a double precision representation of the number of seconds that have elapsed since 00:00 Jan. 1, 1970 (GMT). During a reboot, the *s_time* of the super-block for the root file system is used to set the system's idea of the time.

I-numbers begin at 1, and the storage for inodes begins in block 2. Also, inodes are 64 bytes long, so 16 of them fit into a block. Therefore, inode i is located in block $(i+31)/16$, and begins $64\times((i+31) \pmod{16})$ bytes from its start. Inode 1 is reserved for future use. Inode 2 is reserved for the root directory of the file system, but no other i-number has a built-in meaning. Each inode represents one file. For the format of an inode and its flags, see *inode*(F).

Files

/usr/include/sys/filsys.h

/usr/include/sys/stat.h

See Also

fsck(ADM), mkfs(ADM), inode(F)

Name

fstab - File system mount and check commands.

Description

fstab is an ASCII text file containing information that is passed to the *mount*(ADM) and *fsck*(ADM) commands that are executed from **/etc/rc**. A typical **/etc/fstab** file might look like this:

```
/dev/u          /u              fsckflags="-y -D"
/dev/archive    /archive        mountflags="-r" fsckflags="-f"
```

The first column lists the device to be mounted and the second column gives the mount point (directory) for the device.

The third column lists any optional flags. Optional flags are:

fsckflags	-	Flags that are passed to *fsck*.
mountflags	-	Flags that are passed to *mount*.
prompt	-	If set to "y", prompts whether or not to mount filesystem. Default is "n".

Comment lines start with a number sign (#).

See Also

fsck(ADM), mount(ADM)

Name

gettydefs - Speed and terminal settings used by getty.

Description

The **/etc/gettydefs** file contains information used by *getty* (M) to set up the speed and terminal settings for a line. It supplies information on what the *login* prompt should look like. It also supplies the speed to try next if the user indicates the current speed is not correct by typing a BREAK character.

Each entry in **/etc/gettydefs** has the following format:

label# initial-flags # final-flags # login-prompt #next-label [# log-in-program]

Each entry must be followed by a carriage return and a blank line. The various fields can contain quoted characters of the form **\b, \n, \c**, etc., as well as *\nnn*, where *nnn* is the octal value of the desired character. The various fields are:

label Identifies the **/etc/gettydefs** entry to *getty*. This could be a letter or number. The label corresponds to the line mode field in **/etc/ttys**. *Init* passes the line mode as an argument to *getty*.

initial-flags Sets the initial *ioctl* (S) settings if a terminal type is not specified to *getty*. The flags that *getty* understands are the same as the ones listed in *tty* (M). Normally only the speed flag is required in the *initial-flags*. *Getty* automatically sets the terminal to raw input mode and takes care of most of the other flags. The *initial-flag* settings remain in effect until *getty* executes *login* (M).

final-flags Sets the same values as the *initial-flags*. These flags are set just prior to *getty* executing *login-program*. The speed flag is again required. The composite flag **SANE** is a composite flag that sets the following *termio*(M) parameters:

modes set:
CREAD BRKINT IGNPAR ISTRIP ICRNL IXON ISIG ICANON ECHO ECHOK OPOST ONLCR

modes cleared:
CLOCAL IGNBRK PARMRK INPCK INLCR IUCLC IXOFF XCASE ECHOE ECHONL NOFLSH OLCUC OCRNL ONOCR ONLRET OFILL OFDEL NLDLY CRDLY TABDLY BSDLY VTDLY FFDLY

The other two commonly specified *final-flags* are **TAB3**, so that tabs are sent to the terminal as spaces, and **HUPCL**, so that the line is hung up on the final close.

login-prompt Contains login prompt message that greets users. Unlike the above fields where white space is ignored (a space, tab, or new-line), it is included in the *login-prompt* field. The '@' in the login-prompt field is expanded to the first line in **/etc/systemid** (unless the '@' is preceded by a '\'). Several character sequences are recognized, including:

\n	Linefeed
\r	Carriage return
\v	Vertical tab
nnn	(3 octal digits) Specify ASCII character
\t	Tab
\f	Form feed
\b	Backspace

next-label Identifies the next entry in *gettydefs* for *getty* to try if the current one is not successful. *Getty* tries the next label if a user presses the BREAK key while attempting to log in to the system. Groups of entries, for example, for dial-up lines or for TTY lines, should form a closed set so that *getty* cycles back to the original entry if none of the entries is successful. For instance, **2400** linked to **1200**, which in turn is linked to **300**, which finally is linked to **2400**.

login-program
The name of the program that actually logs the user onto XENIX. The default program is **/etc/login**. If preceded by the keyword **AUTO**, *getty* will not prompt for a username, but instead uses its first argument as the username and executes the *login-program* immediately.

If *getty* is called without a second argument, then the first entry of **/etc/gettydefs** is used, thus making the first entry of **/etc/gettydefs** the default entry. The first entry is also used if *getty* can not find the specified *label*. If **/etc/gettydefs** itself is missing, there is one entry built into the command which will bring up a terminal at **300** baud.

After modifying **/etc/gettydefs**, run it through *getty* with the check option to be sure there are no errors.

Files

/etc/gettydefs

See Also

stty(C), ioctl(S), getty(M), login(M)

Name

group - Format of the group file.

Description

group contains the following information for each group:

- Group name

- Encrypted password (optional)

- Numerical group ID

- Comma-separated list of all users allowed in the group

This is an ASCII file. The fields are separated by colons; each group is separated from the next by a newline. Here is an example file:

```
root:x:0:root
cron:x:1:cron
bin:x:3:bin,lp
uucp:x:4:uucp
asg:x:6:asg
sysinfo:x:10:uucp
network:x:12:network
lusers::100:sam,zursch,landy
cpo:CyTvnlPXjOp:50:forbin,kuprin,cleom
```

An x in the password field represents an unmatchable password; these groups are not normally joined. If the password field is empty, no password is demanded by the *newgrp*(C) command.

You can add a group password by creating a dummy user account and putting the encrypted password into the **/etc/group** file. (Be sure and remove the dummy account after you are finished.)

This file resides in directory **/etc**. Because of the encrypted passwords, it can and does have general read permission and can be used, for example, to map numerical group IDs to names.

Files

/etc/group

See Also

newgrp(C), passwd(C), passwd(F)

Name

inittab - Alternative login terminals file.

Description

telinit(ADM) reads *inittab* and converts it into a *ttys*(F)-format file. *init*(M) reads **/etc/ttys** to determine for which terminals logins are allowed.

Each line in *inittab* has the form:

id:*run-levels*:*action*:**/etc/getty** *tty mode*

id A one- to four-character name that uniquely identifies this line. It is recommended that if *tty* is **tty***xx* that the *id* then be "*xx*".

run-levels
A list of digits ranging from **0** to **6**. This list specifies which *telinit* states are concerned with this line. If the *run-levels* list is empty, then it is assumed to be "**0123456**" (all states).

action
Whether or not logins are allowed on *tty*:

off
Logins are not allowed in any of the listed *run-levels*.

respawn
Logins are allowed only in the listed *run-levels*.

ondemand
Identical to "**respawn**".

tty The filename of a character device special file. Only the filename is supplied; the path is assumed to be **/dev**.

mode
A single character supplied as an argument to the *getty*(M) program. It defines the line characteristics (such as the baud rate) for the terminal, and must match one of the names listed in **/etc/gettydefs**.

Exactly one space must separate *ttys* from ...:**/etc/getty** and from *mode*. No other spaces or tabs are allowed.

Files

/etc/inittab

See Also

disable(C), enable(C), init(M), getty(M), gettydefs(F), telinit(ADM), ttys(F)

Notes

inittab is provided for users more familiar with the *telinit* approach to terminal administration, as opposed to the standard XENIX *enable/disable* approach.

Name

inode - Format of an inode.

Syntax

#include <sys/types.h>
#include <sys/ino.h>

Description

An inode for a plain file or directory in a file system has the structure defined by **<sys/ino.h>**. For the meaning of the defined types *off_t* and *time_t* see *types*(F).

Files

/usr/include/sys/ino.h

See Also

stat(S), filesystem(F), types(F)

Name

mapchan - Format of tty device mapping files.

Description

mapchan configures the mapping of information input and output of XENIX.

Each unique *channel* map requires a multiple of 1024 bytes (a 1K buffer) for mapping the input and output of characters. No buffers are required if no *channels* are mapped. If control sequences are specified, an additional 1K buffer is required.

A method of sharing maps is implemented for *channels* that have the same map in place. Each additional, unique map allocates an additional buffer. The maximum number of map buffers available on a system is configured in the kernel, and is adjustable via the link kit **NEMAP** parameter (see *config*(ADM) and *configure*(ADM)). Buffers of maps no longer in use are returned for use by other maps.

Example of a Map File

The internal character set used by XENIX is defined by the right column of the input map, and the first column of the output map in place on that line. The default internal character set is the 8-bit ISO 8859/1 character set, which is also known as dpANS X3.4.2 and ISO/TC97/SC2. It supports the Latin alphabet and can represent most European languages.

Any character value not given is assumed to be a straight mapping, only the differences are shown in the *mapfile*. The left hand columns must be unique. More than one occurrence of any entry is an error. Right hand column characters can appear more than once. This is "many to one" mapping. Nulls can be produced with compose sequences or as part of an output string.

It is recommended that no mapping be enabled on the *channel* used to create or modify the mapping files. This prevents any confusion of the actual values being entered due to mapping. It is also recommended that numeric rather than character representations be used in most cases, as these are not likely to be subject to mapping. Use comments to identify the characters represented. Refer to the *ascii*(M) manual page and the hardware reference manual for the device being mapped for the values to assign.

```
#
# sharp/pound/cross-hatch is the comment character
# however, a quoted # ('#') is 0x23, not a comment
#
# beep, input, output, dead, compose and
# control are special keywords and should appear as shown.
#

        beep                    # sound the bell when errors occur
        input

        a b
        c d

        dead p
        q r                     # p followed by q yields r.
        s t                     # p followed by s yields t.

        dead u
        v w                     # u followed by v yields w.

        compose x               # x is the compose key (only one allowed).
        y z A
        B C D                   # x followed by B and C yields D.

        output
        e f                     # e is mapped to f.
        g h i j                 # g is mapped to hij - one to many.
        k l m n o               # k is mapped to lmno.

        control                 # The control sections must be last

        input
        E  1                    # The character E is followed by 1 more
                                  unmapped character

        output
        FG  2                   # The characters FG are followed by 2
                                  more unmapped characters
```

All of the single letters above preceding the "control" section must be in one of these formats:

```
56      # decimal
045     # octal
0xfa    # hexadecimal
'b'     # quoted char
'\076'  # quoted octal
'\x4a'  # quoted hex
```

All of the above formats are translated to single byte values.

The **control** sections (which must be the last in the file) contain specifications of character sequences which should be passed through to or from the terminal device without going through the normal *mapchan* processing. These specifications consist of two parts: a fixed

sequence of one or more defined characters indicating the start of a no-map sequence, followed by a number of characters of which the actual values are unspecified.

To illustrate this, consider a cursor-control sequence which should be passed directly to the terminal without being mapped. Such a sequence would typically begin with a fixed escape sequence instructing the terminal to interpret the following two characters as a cursor position; the values of the following two characters are variable, and depend on the cursor position requested. Such a control sequence would be specified as:

```
\E=   2                    # Cursor control: escape = <x> <y>
```

There are two subsections under **control**: the **input** section is used to filter data sent from the terminal to XENIX, and the **output** section is used to filter data sent from XENIX to the terminal. The two fields in each control sequence are separated by white space, that is the SPACE or TAB characters. Also the '#' (HASH) character introduces a comment, causing the remainder of the line to be ignored. Therefore, if any of these three characters are required in the specification itself, they should be entered using one of alternative means of entering characters, as follows:

^*x* The character produced by the terminal on pressing the CONTROL and *x* keys together.

\E or \e
The ESCAPE character, octal 033.

c Where *c* is one of b, f, l, n, r or t, produces BACKSPACE , FORM FEED , LINE FEED , NEWLINE , CARRIAGE RETURN or TAB characters respectively.

\0 Since the NULL character can not be represented, this sequence is stored as the character with octal value 0200, which behaves as a NULL on most terminals.

nn or *nnn*
Specifies the octal value of the character directly.

\ followed by any other character is interpreted as that character. This can be used to enter SPACE , TAB , or HASH characters.

Diagnostics

mapchan performs these error checks when processing the mapfile:

- More than one compose key.

- Characters mapped to more than one thing.
- Syntax errors in the byte values.
- Missing input or output keywords.
- Dead or compose keys also occurring in the input section.
- Extra information on a line.
- Mapping a character to null.
- Starting an output control sequence with a character that is already mapped.

If characters are displayed as the 7-bit value instead of the 8-bit value, use **stty -a** to verify that **-istrip** is set. Make sure **input** is mapping to the 8859 character set, **output** is mapping from the 8859 to the device display character set. **dead** and **compose** sequences are **input** mapping and should be going to 8859.

Files

/etc/default/mapchan
/usr/lib/mapchan/*

See Also

ascii(M), keyboard(HW), lp(C), lpadmin(ADM), mapchan(M), trchan(M), mapkey(M), parallel(HW), screen(HW), serial(HW), setkey(M), tty(M)

Notes

Some non-U.S. keyboards and display devices do not support characters commonly used by XENIX command shells and the C programming language. Do not attempt to use such devices for system administration tasks.

Not all terminals or printers can display all the characters that can be represented using this utility. Refer to the device's hardware manual for information on the capabilities of the peripheral device.

Warnings

Use of mapping files that specify a different "internal" character set per-channel, or a set other than the 8-bit ISO 8859 set supplied by default can cause strange side effects. It is especially important to

retain the 7-bit ASCII portion of the character set (see *ascii*(M)). XENIX utilities and applications assume these values. Media transported between machines with different internal code set mappings may not be portable as no mapping is performed on block devices, such as tape and floppy drives. *trchan* can be used to "translate" from one internal character set to another.

Do not set ISTRIP (see *stty*(C)) on channels that have mapping that includes eight bit characters.

Name

master - Master device information table.

Description

master contains device information used by *config* (ADM) to generate the configuration files. The file consists of 5 parts, each separated by a line with a dollar sign ($) in column 1.

- Part 1 contains device information.
- Part 2 contains the line discipline table.
- Part 3 contains names of devices that have aliases.
- Part 4 contains tunable parameter information.
- Part 5 contains the event devices table.

Any line with an asterisk (*) in column 1 is treated as a comment.

Part 1

This part contains definitions for the system devices. Each line has 14 fields with the fields delimited by tabs and/or blanks:

Field 1: Device name (8 chars. maximum).
Field 2: Number of interrupt vectors.
Field 3: Device mask (octal). Each "on" bit indicates that the driver has the corresponding handler or structure:

002000 Process *swtch( )* time routine.
001000 streamtab structure.
000400 tty structure.
000200 Halt routine.
000100 Initialization handler.
000040 Clock time poll routine.
000020 Open handler.
000010 Close handler.
000004 Read handler.
000002 Write handler.
000001 Ioctl handler.

The clock time poll routine, if present in the driver, is called every clock tick in which the clock interrupted task-time processing.

If the streamtab bit is on, the device is a stream module with an fmodsw entry, unless the character special bit is set in the type indicator (Field 4). If this is the case, the device is a stream end driver with a cdevsw entry.

Field 4: Device type indicator (octal):

000200 Not used
000100 No qswtch on interrupt.
000040 Not used.

000020 Required device.
000010 Block device.
000004 Character device.
000002 Not used.
000001 Not used.

Field 5: Handler prefix (4 chars. maximum). Usually same as Field 1. The routines of **dev.c** should begin *dev...* The tty structure of **dev.c** should be named *dev_tty*.
Field 6: Not used.
Field 7: Major device number for block-type device.
Field 8: Major device number for character-type device.
Field 9: Maximum number of devices per controller.
Field 10: The *spl* level (1 - 7) at which the device's interrupt routine should be called.
Fields 11-14: Maximum of four interrupt vector addresses (octal). Each address is followed by a unique letter or a blank.

Devices that are not interrupt-driven have an interrupt vector size of zero. Devices that generate interrupts but are not of the standard character or block device mold, should be specified with a type (field 4) which has neither the block nor character bits set.

Part 2

This part contains definitions for the system line discipline. Each line has 9 fields. Each field is a maximum of 8 characters delimited by a blank if less than 8:

Field 1: Device associated with this line.
Field 2: Open routine.
Field 3: Close routine.
Field 4: Read routine.
Field 5: Write routine.
Field 6: Ioctl routine.
Field 7: Receiver interrupt routine.
Field 8: Transmitter interrupt routine.
Field 9: Modem control interrupt routine.

Part 3

This part contains definitions for device aliases. Each line has 2 fields:

Field 1: Alias name of device (8 chars. maximum).
Field 2: Reference name of device as given in part 1 (8 chars. maximum).

Aliases may be used in place of actual device names when creating the *config*(ADM) description file.

Part 4

This part contains the names and default values for tunable parameters. Each line has 2 or 3 fields:

Field 1:	Parameter name to be used in the *config*(ADM) description file (20 chars. maximum).
Field 2:	Parameter name as it will appear in the resulting **c.c** file (20 chars. maximum).
Field 3:	Default parameter value (20 chars. maximum).

If a parameter has no default value, an explicit specification for the parameter must be given in the description file. See *config*(ADM) for a list of the tunable parameters.

Part 5

This part contains device names and handler routines for all devices used to generate events.

See Also

config(ADM), configure(ADM)

Name

maxuuscheds - UUCP uusched(ADM) limit file.

Description

The *Maxuuscheds* (*/usr/lib/uucp/Maxuuscheds*) file contains a numerical string to limit the number of simultaneous **uusched** programs running. Each **uusched** running will have one **uucico** associated with it; limiting the number will directly affect the load on the system. The limit should be less than the number of outgoing lines used by UUCP (a smaller number is often desirable). This file is delivered with a default entry of 2. Again, this may be changed to meet the needs of the local system. However, keep in mind that the load on the system increases with the number of **uusched** programs running.

See Also

uucico(ADM), uucp(C), uusched(ADM), uux(C), uuxqt(C)

Name

maxuuxqts - UUCP uuxqt(C) limit file.

Description

The *Maxuuxqts* (*/usr/lib/uucp/Maxuuxqts*) file contains an ASCII number to limit the number of simultaneous **uuxqt** programs running. This file has a default entry of 2. If there is a lot of traffic from **mail**, you can increase this number to reduce the time it takes for the mail to leave your system. Keep in mind that the load on the system increases with the number of **uuxqt** programs running.

See Also

uucico(ADM), uucp(C), uux(C), uuxqt(C)

Name

mcconfig - Irwin tape driver parameters.

Description

/etc/default/mcconfig contains information on Irwin tape driver parameters. *mcconfig* entries are in the following format:

variable=parameterlist

variable is a case insensitive character string that names a configuration parameter. *parameterlist* is a string of one or more parameter values, in formats that vary depending on the variable used.

The following variables are defined:

IROPT	driver options
IRDBG	debugging aids
SYSFDC	system floppy controller parameters
ALTFDC	alternate controller parameters
4100	Irwin 4100 PC bus controller parameters
4100B	second 4100 PC bus controller parameters
IRDRV	drive searching sequence (old method 2.00)
IRSRCH	drive searching sequence (new method 2.02)
4251	4251 address

When configuring parameters, space and tab characters can not be used. For example,

irdrv=3	is correct, while
irdrv = 3	is incorrect and will be ignored.

Parameters are passed to the tape driver by the daemon program **/etc/mcdaemon**. Configuration parameters are given on separate lines. The pound sign character (#) may be used open a comment. Comments are terminated by a newline. For example the *mcconfig* file might contain:

```
# this is a comment in the mcconfig file
iropt=F
4251=31f
```

Changes made to the *mcconfig* file do not take effect until the system is rebooted.

IROPT: Configuration Option String

The tape driver configuration variable IROPT may be used override certain default or automatically determined configuration parameters.

Multiple values can be specified, for example:

```
iropt=Bdf
```

The values for IROPT are as follows:

B/b: 64K DMA Boundary Present/Absent

B This computer's hardware architecture has a 64K DMA memory boundary. Tape data transfer buffers may not cross a 64K physical boundary. This is the case for most PC and AT compatible machines.

b This computer's hardware architecture does not have a 64K DMA physical memory boundary. Tape data transfer buffers may be allocated any where in memory. This is true for PS/2s with the Micro Channel Architecture.

When neither (B) nor (b) is set, configuration is based upon the result of Micro Channel presence determination (see the M/m option). In a Micro Channel machine, (b) is assumed, otherwise (B) is used.

D/d: Use Demand/Single Byte DMA with Controllers Having a FIFO

D When running in PC or AT class machine and using a controller which has a first-in-first-out (FIFO) buffer, use demand mode DMA transfers. Both the Intel 82072 and 82077 floppy controller chips (the later is used in the 4100PC) have a 16 byte FIFO.

d When running in a PC or AT class machine use the standard single byte DMA transfer mode regardless of the floppy controller type.

When neither (D) nor (d) is set, automatic configuration determines whether a floppy controller chip with a FIFO is present on a per controller basis. When a controller having a FIFO is found (e.g., Intel 82072/82077 parts return a positive response to the CONFIGURE command), DMA transfers with respect to that controller are setup using the demand mode. Using demand mode decreases the portion of the bus bandwidth consumed by tape read/write transfers and improves system performance during tape access.

F/f: Floating/Pulled-Up Drive Search

F When searching for drives on the system controller, use a special "floating track 0" drive search. The "floating" drive search assumes the track 0 floppy interface line floats (can be high or low) when no drive is attached. This algorithm works in all machines but can't locate a drive which is executing a load-point operation. The floating search is required on certain Adaptec controllers.

f When searching for drives on the system controller, use the standard "pulled-up track 0" drive search. The standard algorithm assumes the floppy interface's track 0 line is pulled up (is high) when no tape drive is attached. When the standard search is employed on a controller which "floats" the track 0 line, a drive may be erroneously detected at a line where none is present. To deal with this condition either the IRDRV configuration variable may be set to specify the drive line (preferred) or the "floating track 0" drive search (F) may be specified.

When neither (F) nor (f) is set, automatic configuration of this option is performed by examining the model information returned from the BIOS "Get Machine Configuration" service (int 15, AH = C0). The following model uses the "floating" drive search (F):

Model	Type	Sub-type	PS/2 Model
F8	0D		24 MHz Model 70

All other models use the "pulled-up track 0" search (f).

H/h: Do/Don't Test for 4100 PC Bus Controller Signature

H Test for Irwin 4100 PC Bus controller (default).

h No 4100 PC controller present.

In the PC or AT (not Micro Channel) hardware environment (see the M/m option), when testing for the presence of a 4100 PC controller, the driver reads a byte from a signature port on the controller and compares this against the value 45 hexadecimal. The I/O port address of the signature port is found by adding six to the board's base port address (see the controller configuration section). For a 4100 PC Bus controller with switches set to "as shipped from the factory" positions, the signature port address is 0370 (hexadecimal) + 6. If the byte compares the 4100 PC is present. Otherwise it isn't. This option is intended to be used when peeking at the factory set (0376 hexadecimal) signature port causes the disruption of some other adapter which is present at this address. Note that the driver can be instructed to find the controller at a different address by setting the 4100 parameter.

I/i: Do/Don't Wait-for-Index

I Wait-for-index before data transfer of each tape block.

i No need to wait-for-index before data transfer.

When neither (I) nor (i) is set, wait-for-index is enabled by default only when an Olivetti Micro Channel machine is present, otherwise wait-for-index is disabled.

If the following symptoms are experienced, after installing the MC driver in certain Micro Channel machines, the wait-for-index algorithm may need to be enabled:

- On the first backup this message is seen:

```
mc tape write error: Defect list has unrecoverable error
```

- If **tape format** gives the error:

```
Formatting failed: Block 0 medium error :
phase: CERTIFICATION,  track:  0,  cylinder:  0
```

- Extremely poor performance is experienced while listing the content of or restoring a previously written tape.

  A condition exists in some Micro Channel computers which causes errors reading the first sector of each tape block. Included are the IBM models 50, 60, and 80, and the Olivetti P-500.

  These machines employ 72065 (except for the Olivetti which has a 765) floppy controllers and data separators with certain characteristics. The 72065 differs from other controllers in that it does not inhibit VCO SYNC when an INDEX signal is received. Characteristically the data separator circuit will: 1) have a phase lock loop (PLL) which totally loses synchronization when confronted with a 50/50 duty cycle read data signal and 2) be slow to re-synchronize while in the "data following mode." Most Irwin drives generate a read data signal with the 50/50 duty cycle when transiting servo headers.

  When these factors are combined, the following sequence of events occurs during a tape read operation: A servo header crosses the head. The drive sends a 50/50 duty cycle 250 KHz signal on the read data line. The PLL loses sync (that is, the loop control voltage goes to a rail). The end of the servo header crosses the head and the drive gives an INDEX pulse. No corresponding VCO SYNC inhibit is generated by the 72065 (this would normally put the PLL back on track). Sector 1 crosses the head but the PLL is still too far off to read the sector. The 72065 generates a record-not-found error.

  Some Irwin drives are fitted with a data compensator board. This board has a circuit which alters the 50/50 duty cycle to a value which allows most of these controllers to maintain PLL synchronization. One exception is certain Model 80s.

  For Micro Channel systems which don't have the compensator (and certain Model 80s which do), this problem can be circumvented by software. The technique relies on a feature of the 72065 (and other controllers in the 765 class): A VCO SYNC inhibit is generated just after the last byte of a READ command is sent to the controller. Inhibiting the VCO SYNC pin (which is normally telling the PLL to lock on incoming read data) causes the VCO's input to be switched to a

reference. This results in quickly returning the PLL to a state in which it will be nearly synchronized with the "real" read data. VCO SYNC inhibition results from programming the floppy controller using a "wait-for-index" algorithm.

The wait-for-index algorithm sends all but the last byte of the data transfer command to the 72065. It then waits for a logical high to low transition of the floppy INDEX signal. The wait is accomplished by polling a special I/O port (at address 03F0h) provided by the Micro Channel floppy controller. The wait is used to delay the writing of the last byte of the 72065 transfer command until after the INDEX transition. As a result, the 72065 generates an inhibit pulse on VCO SYNC after INDEX, but with sufficient lead time to allow the PLL to achieve synchronization. Thus, sector one's ID can be correctly read.

As no index interrupt is available, wait-for-index polls to accomplish its task. The sought INDEX event is time critical. A high priority daemon is awakened to poll for the index transition. Using the wait-for-index algorithm has the following drawback: All other system task time processing is stopped until index polling is complete. This means the user will see sluggish system performance at certain times. Typically a 3 or 4 second dead period at tape track switch time. This may prove unacceptable in certain installations.

M/m: Micro-Channel-Architecture/PC-Bus

M This computer has a Micro Channel Architecture bus.

m This machine doesn't have a Micro Channel Architecture.

When neither (M) nor (m) is set, automatic configuration determines if Micro Channel Architecture hardware is present. The M/m option is used for automatic configuration of the B/b, I/i, and P/p options.

If the string "EISA" is found at physical memory location 0xfffd9, (BIOS ROM location F000:FFD9) this is not a Micro Channel Architecture. Otherwise if all 8 bits of the I/O port at address 0x0080 (DMA page register 0 in an AT compatibles) can be modified this is an AT 286/386 compatible. Otherwise this is a Micro Channel Architecture.

O/o: System Controller Does/Doesn't Support 1-Meg Transfers

O The system controller supports one Megabit data transfers.

o One Megabit transfers are not supported by the system controller.

When neither (O) nor (o) is set, automatic configuration determines whether the system controller supports 1-Megabit transfer rates. This is important when a 2120 is attached to the system controller. If the controller does not support 1- Megabit transfers, 500-Kilobit transfers are used for 80 and 120 Megabyte tapes. The driver detects the

presence of the following 1-Megabit controllers: Intel 82072 and 82077. 80 and 120 Megabyte drives do not work if the driver thinks the hardware is capable of 1-Megabit transfers and it is not. In the reverse situation, transfer performance is degraded.

P/p: 4251 Is/Isn't Present

P A 4251 board is present in the system and has its jumpers configured to address the 4251 digital output register (DOR) at 0372h. When present the tape driver echoes commands sent to the system floppy controller's DOR (at I/O port address 03F2h) to the 4251 DOR. This address can be configured using the 4251 parameter.

p No 4251 board present.

When neither (P) nor (p) is set, and when running in a PC-bus (non-Micro Channel) machine (see the M/m option), automatic configuration determines the presence of a 4251 board by reading I/O port 0372h and comparing the input byte to the signature of the 4251. The 4251 signature byte is 42h. This address can be configured using the 4251 parameter.

Q/q: Compaq Portable III Piggy Back Tape Unit Is/Isn't Present

Q A Compaq Portable III piggy back tape unit is present.

q No Compaq Portable III piggy back tape unit is present.

When neither (Q) nor (q) is set, the algorithm used to test for presence of an alternate (Compaq Portable III piggy back) controller does the following: First the model byte is checked to see if the machine is other than an 8086 class machine (that is, the model byte must be less than FE). If this test passes, the BIOS address F000:FFEA is checked for the string 'COMPAQ'. When a match is found, the I/O port at 0374 (that is, the alternate floppy controller chip status port) is read and the three low order bits are tested. If all three bits are zero, the alternate controller is present.

When an alternate floppy controller is present, the following port addresses are used by default:

Base	DOR	765 Stat	765 Data	Clock	
03F0	03F2	03F4	03F5	03F7	Primary FLOPPY controller
0370	0372	0374	0375	0377	Alternate TAPE controller

See the Controller Parameter Configuration section for information on reconfiguration of the default base address.

X/x: One Megabit Transfers Are/Aren't Allowed

X Allow 1 Megabit transfers when conditions permit.

x Never allow 1 Megabit transfers.

By default, 1 Megabit transfers (X) are allowed. If 1 Megabit transfers overload the system bus, the (x) option should be configured.

IRDBG: Debugging Options

Several debugging flags are available:

s Drive search debug

When (s) is set, the result of the tape drive search (presence test) is shown. The following shows an example:

```
4100MC:3=CTLRNOTFND :2=CTLRNOTFND :1=CTLRNOTFND :0=CTLRNOTFND
4100MCB:3=CTLRNOTFND :2=CTLRNOTFND :1=CTLRNOTFND :0=CTLRNOTFND
4100:3=DRVNOTFND :2=tapedrive :1=DRVNOTFND :0=DRVNOTFND
4100B:3=CTLRNOTFND :2=CTLRNOTFND :1=CTLRNOTFND :0=CTLRNOTFND
ALTFDC:3=CTLRNOTFND :2=CTLRNOTFND :1=CTLRNOTFND :0=CTLRNOTFND
SYDFDC:3=DRVNOTFND :2=tapedrive :1=nottested
```

The order of drive presence testing is shown left to right and top to bottom. On a given line, the left most field has a symbol which represents a controller. Numeric fields preceded by a colon (:) give the unit select in the range 0 through 3. Fields preceded by an equal sign (=) have a symbol which represents result of tape drive presence testing for the controller and unit. These fields normally have a upper case symbol which represents a driver error code. Two special strings are used: "tapedrive" if a drive was found, or "nottested" if drive presence was not tested.

i Initialization value debug

When (i) is set, certain initialization values are displayed. The following is an example:

```
hz=60 12_us_scaler=12 scaler_loops=27510 model=0x1FC
is64kdma=1 demanddma_ok=1
isuchannel=0 port_4251=3F0
timers=[ 0 1 2 1 2 7 19 37 181 235 ]
```

r Interrupt debug

When (r) is set, a character is displayed for each interrupt processed by the driver's finite state machine. In addition, reset cycles are shown. The following lists the characters and their meanings:

Character	**Meaning**
N	Floppy controller (NEC) interrupt
T	Timer Interrupt
R	Reset sent to floppy controller (start of reset)
r	Reset complete

x Data transfer debug

When (x) is set the status of a transfer request is displayed at interrupt time. The display is similar to that shown below:

```
     Cylinder
     |
     |     DMA
     |     Overruns
     |     |                       Alternating
Track|     |    Positional         Asterisk
|    |     |    Retries            |
|    |     |    |                  |
|    |     |    |    Interrupt     |
|    |     |    |    Status        |        Sector Map
+--+ +---+ +--+ +--+ +---------+ | +--------------------+
|  | |   | |  | |  | |         | | |                    |
T= 2 C= 42 O=12 R= 0 CRC         *[-c-- --Cs ---- M-O- --]
```

Track (T=*decimal number*) has the transfer request's track number.

Cylinder (C=*decimal number*) has the transfer request's cylinder number (tape block for the given track).

DMA Overruns (O=*decimal number*) has a count of DMA overruns (excluding, if indicated by in the Interrupt Status, the current DMAOVERRUN).

Positional Retry (R=*decimal number*) has the current positional retry number for the request. Note that a "free" retry is allowed under the following conditions: 1) A track switch was performed. 2) The tape is moving logically forward, this transfer request's target head, cylinder, and sector addresses match current values, but there is some positional uncertainty because this transfer request was not not started on the completion thread of the previous request (That is, the period of time the tape has been moving between requests is not known). 3) A DMA overrun has occurred during the previous pass for a given read/write/verify request.

Interrupt Status has the current reason for the interrupt displayed symbolically.

Alternating Asterisk (*). This one character field is alternately set with an asterisk (*) and a space (' ') character so that screen updates may be distinguished.

Sector Map displays a visual indication of the status of each sector when an error occurs. For example:

```
([-c-- --Cs ---- M-O- --])
```

Each printing character in the sector map represents the status of a sector. Before the start of a transfer, each entry is set to (s). On successful transfer of a sector, the corresponding entry is set to a hyphen (-). The following is a list of characters which appear in the sector map and their meanings:

Character	Interrupt Error Num	Symbol	Description
-	0	IE_NOERR	No error
C	12	IE_CRC	Data CRC error
c	13	IE_IDCRC	ID CRC error
s	14	IE_RECNOTFND	Record not found
M	16	IE_DATAMARK	No data address mark
O	17	IE_DMAOVERRUN	DMA overrun
?	other	unexpected	Unexpected value

IRDRV, IRSRCH: Drive Search Control

IRDRV drive searching sequence (old method)
IRSRCH drive searching sequence (new method)

The tape driver uses a default drive searching sequence to test for the presence of tape drives. The default sequence may be replaced with a user configured sequence using either the IRDRV or IRSRCH variables. This is useful in situations where tape drives are erroneously detected by the default sequence, or where multiple tape drives are supported and a different mapping of logical to physical drives is desired. For example:

```
IRSRCH=SYSFDC:3,4100:2
```

This searches for a tape drive at unit select 3 on the system floppy controller, and unit select 2 on an Irwin 4100 PC bus controller.

The equivalent IRDRV specification is:

```
IRDRV=04,43
```

or alternately:

```
IRDRV=4,43
```

IRDRV specifications use a 2-digit number to specify a controller and unit select. The high-order digit gives the controller, and the low-order the unit select. If the high-order digit is missing, 0 (for the system floppy controller) is assumed. Note that the unit select used by IRDRV is in the range 1-4 while the unit select used by IRSRCH is in the range 0-3.

The following is a list of controllers supported by IRSRCH and IRDRV:

IRSRCH Name	**IRDRV High Digit**	
SYSFDC	0	System floppy
ALTFDC	1	Alternate floppy
4100MC	2	Irwin 4100 Micro Channel
4100MCB	3	Second 4100 Micro Channel
4100	4	Irwin 4100 PC Bus
4100B	5	Second 4100 PC Bus

The syntax of an IRSRCH drive search sequence specification is:

IRSRCH=*searchlist*

searchlist = *searchspec*
searchspec,*searchlist*

searchspec = *controller*:*unitlist*

controller = SYSFDC (System floppy controller)
ALTFDC (Alternate controller)
4100MC (Irwin 4100 Micro Channel tape controller)
4100MCB (Second 4100 Micro Channel controller)
4100 (Irwin 4100 PC Bus tape controller)
4100B (Second 4100 PC Bus controller)

unitlist = *unit*
unit:*unitlist*

unit = 0
1
2
3

The syntax of an IRDRV drive search sequence specification is:

IRDRV=*searchlist*

searchlist = *searchspec*
searchspec,searchlist

searchspec = *controllerdigit unitdigit*

controllerdigit = 0 (System floppy controller, may be omitted)
1 (Alternate controller)
2 (Irwin 4100 Micro Channel tape controller)
3 (Second 4100 Micro Channel controller)
4 (Irwin 4100 PC Bus tape controller)
5 (Second 4100 PC Bus controller)

unitdigit = 1
2
3
4

SYSFDC, ALTFDC, 4100, 4100B: Controller Parameter Configuration

Certain variables may be set to specify tape controller specific parameters. For example:

```
4100=P:370,I:6,D:2,T:2,T:0
```

says an Irwin 4100 PC bus controller is installed and configured with a base I/O Port address (P) 0370 hexadecimal, using IRQ (I) 6, DMA channel (D) 2, and has two tape units (T), one wired for physical unit select number 2, and the other 0.

The general form for controller parameter specifications is:

controller=paramlist

paramlist = *parameter*
parameter,paramlist

parameter = *name:value*

controller = SYSFDC (System floppy controller)
ALTFDC (Alternate controller)
4100 (Irwin 4100 PC Bus controller)
4100B (Second 4100 PC Bus controller)

name = P (Base I/O Port address)
I (Interrupt Request line (IRQ))

D (DMA channel)
T (Tape unit number [0-3])

value = [0123456789abcefABCDEF]+ (Hexadecimal number)

4100 PC Configuration Switch Settings

The following tables contain the 4100 PC bus switch settings. (4100 Micro Channel settings are modified with the PS/2 reference (setup) diskette.

Base Address	SW1	SW2	SW3	SW4
300	ON	ON	ON	ON
310	off	ON	ON	ON
320	ON	off	ON	ON
330	off	off	ON	ON
340	ON	ON	off	ON
350	off	ON	off	ON
360	ON	off	off	ON
* 370	off	off	off	ON
380	ON	ON	ON	off
390	off	ON	ON	off
3a0	ON	off	ON	off
3b0	off	off	ON	off
3c0	ON	ON	off	off
3d0	off	ON	off	off
3e0	ON	off	off	off
3f0	off	off	off	off

DMA Channel	SW5	SW6	SW7	SW8
1	ON	off	ON	off
2*	off	ON	off	ON

IRQ	SW9	SW10
3	ON	off
6*	off	ON

* factory setting

4251: Floppy Extender Address Configuration

The Irwin 4251 adapter board augments the system floppy controller. It extends the total number of drives which may be attached from 2 to 4, and allows for the attachment of an external drive. The 4251 uses a single drive select I/O port. By design, the 4251 I/O port partially mimics the functionality of the system floppy controller's drive select port. The system controller's drive select port is called the Digital Output Register (DOR). When written with certain values, both the

system controller's DOR and the 4251 drive select port activate a drive select line at the floppy interface. In the standard "as shipped from the factory" configuration, the 4251 port is addressed at 03F2 hexadecimal. The same address is used by system floppy controller's DOR. Thus, in the standard configuration, the 4251 monitors (that is, listens to and uses) bytes written to the system's DOR to select a drive. The 4251 uses unit selects 2 and 3. Unit selects are used by the software and should not be confused with the DRIVE SELECT jumpers on the tape drive which are almost always set to DRIVE SELECT 2. In certain hardware environments, the standard 4251 configuration either doesn't detect the presence of or fails to write tapes in a tape drive.

When a 4251 is configured for the standard address and is connected to:

- a DTC controller, data is never written to tape. The reason: DTC controllers disable the floppy interface WRITE GATE signal when unit selects 2 or 3 (the third and fourth) selects are activated. This means the tape drive's write circuitry is never enabled.

- an Adaptec suffix 'B' controller (e.g., ACB-2xxxB or 1542B SCSI controllers), driver software never detects the presence of a tape drive. The reason: Adaptec suffix 'B' controllers drive the TRACK 0 line active for unit selects 2 or 3. The TRACK 0 line is the line used by the drive to return the results of status requests and motion commands issued by the driver software.

The conditions listed in the above three paragraphs can be overcome. Typically reconfiguring the 4251 to use the recommended alternate address by installing the A7 jumper allows the tape drive to function correctly. When this is done, the 4251 I/O address moves from 3F2 to 372 hexadecimal.

When configuring the address of the Irwin 4251, the board address jumpers are changed from the "as shipped" A0, A2, A3 position. Normally the change involves reinstalling a jumper stored on one pin of the A7 pin pair to connect the "A7" pin pair. This selects the address 372. However, when a secondary floppy controller (such as the Irwin 4100) or other adapter is present the 372 address may be in conflict. In general, a secondary floppy controller uses addresses in the range 370 through 377, which includes the alternate "372" address of the 4251. To resolve this conflict, the 4251 can be re-addressed. In addition, the tape driver software must be informed of the new address.

The following information is given to aid in understanding of the relationship of the 4251 and tape driver software, the meaning of the 4251 jumpers A0 through A9, and an example of a non-standard configuration.

At initialization, the tape driver software tests for the presence of a 4251 at an alternate address. By default, the alternate address is 372 hexadecimal. (To select the 372 address on the 4251 install jumpers across the A0, A2, A3, and A7 pin pairs.) The test reads a byte from the alternate address and compares the byte with the signature. When the 4251 select port is read, a signature byte (42 hexadecimal) is returned. If the signature compares, the driver sends select bytes to both the system's DOR and the 4251 port. The default alternate address may overridden by using the variable named "4251." For example,

```
4251=31f
```

tells the driver to test and use, if present, the port at 31F hexadecimal.

The 4251 port uses a single 10-bit I/O port address. The address is set using the jumper pin pairs labeled A0 through A9. Each jumper pin pair corresponds directly with an I/O port address bit. When a jumper pin pair is connected, the corresponding address bit is set to a logical 0. When the pin pair is disconnected, the address bit is set to a logical 1.

For example, to address the 4251 at 31F (an address which is unlikely to conflict with standard adapters), connect jumper pin pairs A5, A6, and A7.

Files

/etc/default/mcconfig
/etc/mcdaemon

See Also

tape(C), tape(HW)

Name

mem, kmem - Memory image file.

Description

The **mem** file provides access to the computer's physical memory. All byte addresses in the file are interpreted as memory addresses. Thus, memory locations can be examined in the same way as individual bytes in a file. Note that accessing a nonexistent location causes an error.

The **kmem** file is the same as **mem** except that it corresponds to kernel virtual memory rather than physical memory.

In rare cases, the **mem** and **kmem** files may be used to write to memory and memory-mapped devices. Such patching is not intended for the naive user and may lead to a system crash if not conducted properly. Patching device registers is likely to lead to unexpected results if the device has read-only or write-only bits.

Files

/dev/mem

/dev/kmem

Name

micnet - The Micnet default commands file.

Description

The **micnet** file lists the system commands that may be executed through the *remote* command. The file is required for each system in a Micnet network. Whenever a *remote* command is received through the network, the Micnet programs search the **micnet** file for the system command specified with the *remote* command. If found, the command is executed. Otherwise, the command is ignored and an error message is returned to the system which issued the *remote* command.

The file may contain one or more lines. If all commands may be executed, only the line

executeall

is required in the file. Otherwise, the commands must be listed individually. A line that defines an individual command has the form:

command=commandpath

Command is the command name to be specified in a *remote* command. **Commandpath** is the full pathname of the command on the specified system. The equal sign (=) separates the command and commandpath. For example, the line:

cat=/bin/cat

defines the command name *cat* (used in the *remote* command) to refer to the system command *cat* in the **/bin** directory.

When *executeall* is set, commands are sought in a series of default directories. Initially, the directories are **/bin** and **/usr/bin**. The default directories can be explicitly defined in the file by including a line of the form:

execpath=PATH=directory[:directory]...

The first part of the line, *execpath=PATH=*, is required. Each **directory** must be a valid pathname. The colon is required to separate directories. For example, the line:

```
execpath=PATH=/bin:/usr/bin:/usr/bobf/bin
```

sets the default directories to **/bin**, **/usr/bin**, and **/usr/bobf/bin**.

Files

/etc/default/micnet

See Also

aliases(M), netutil(ADM), systemid(F), top(F)

Notes

The **rcp** command cannot be executed from a remote system unless the **micnet** file contains either *executeall* , or the line

```
rcp=/usr/bin/rcp
```

Name

mnttab - Format of mounted file system table.

Syntax

#include <stdio.h>
#include <mnttab.h>

Description

The **/etc/mnttab** file contains a table of devices mounted by the *mount*(ADM) command.

Each table entry contains the pathname of the directory on which the device is mounted, the name of the device special file, the read/write permissions of the special file, and the date on which the device was mounted.

The maximum number of entries in *mnttab* is based on the system parameter NMOUNT located in **/usr/sys/conf/space.c**, which defines the number of allowable mounted special files.

See Also

mount(ADM)

Name

null - The null file.

Description

Data written on a null special file is discarded.

Reads from a null special file always return 0 bytes.

Files

/dev/null

Name

passwd - The password file.

Description

Passwd contains the following information for each user:

-Login name

-Encrypted password

-Numerical user ID

-Numerical group ID

-Comment

-Initial working directory

-Program to use as shell

Refer to *finger*(C) for information in the required format of the comment field for *finger*(C) to display the information. Each user is separated from the next by a newline. If the password field is null, no password is demanded; if the shell field is null, *sh*(C) is used.

This file resides in the directory **/etc**. Because the passwords are encrypted, the file has general read permission and can be used, for example, to map numerical user IDs to names.

The encrypted password consists of 13 characters chosen from a 64-character alphabet (., /, **0-9**, **A-Z**, **a-z**), except when the password is null, in which case the encrypted password is also null. Password aging is in effect for a particular user if his encrypted password in the password file is followed by a comma and a nonnull string of characters from the above alphabet. (Such a string must be introduced by the super-user.) The first character of the age denotes the maximum number of weeks for which a password is valid. A user who attempts to log in after his password has expired will be forced to supply a new one. The next character denotes the minimum period in weeks which must expire before the password may be changed. The remaining characters define the week (counted from the beginning of 1970) when the password was last changed. (A null string is equivalent to zero.) The first and second characters must have numerical values in the range 0-63, where the dot (.) is equal to 0 and lowercase *z* is equal to 63. If the numerical value of both characters is 0, the user will be forced to change his password the next time he logs in. If the second character is greater than the first, only the super-user will be able to change the password.

Files

/etc/passwd

See Also

login(M), passwd(C), a64l(S), getpwent(S), group(F), pwadmin(ADM).

Name

permissions - Format of UUCP Permissions file.

Description

The **Permissions** file (**/usr/lib/uucp/Permissions**) specifies the permissions for remote computers concerning login, file access, and command execution. In the **Permissions** file, you can specify the commands that a remote computer can execute and restrict its ability to request or receive files queued by the local site.

Each entry is a logical line with physical lines terminated by a \ to indicate continuation. Entries are made up of options delimited by white space. Each option is a name-value pair in the following format:

name=value

Note that no white space is allowed within an option assignment.

Comment lines begin with a pound sign (#) and they occupy the entire line up to a newline character. Blank lines are ignored (even within multi-line entries).

There are two types of **Permissions** file entries:

LOGNAME specifies the permissions that take effect when a remote computer calls your computer.

MACHINE specifies permissions that take effect when your computer calls a remote computer.

Options

This section describes each option, specifies how they are used, and lists their default values.

REQUEST=*yes/no*
Specifies whether the remote computer can request to set up file transfers from your computer. When a remote computer calls your computer and requests to receive a file, this request can be granted or denied. *no* value is the default value. It will be used if the REQUEST option is not specified. The REQUEST option can appear in either a LOGNAME (remote calls you) entry or a MACHINE (you call remote) entry.

SENDFILES=*yes/call*
Specifies whether your computer can send the work queued for the remote computer. When a remote computer calls your computer and completes its work, it may attempt to take work your computer has queued for it. The call value is the default for the SENDFILE option. This option is only significant in LOGNAME entries since MACHINE entries apply when calls are made out to remote computers. If this option is used with a MACHINE entry, it will be ignored.

READ and **WRITE**
Specify the various parts of the file system that **uucico** can read from or write to. The READ and WRITE options can be used with either MACHINE or LOGNAME entries.

The default for both the READ and WRITE options is the *uucppublic* directory as shown in the following example:

```
READ=/usr/spool/uucppublic
WRITE=/usr/spool/uucppublic
```

Supplying "/" as a pathname gives permission to access any file that can be read by UUCP. Multiple entries must be separated by a colon. The READ option is for requesting files, and the WRITE option for depositing files. One of the values must be the prefix of any full path name of a file coming in or going out.

Note that the READ and WRITE options do not effect the actual permissions of a file or directory. You should be careful what directories you make accessible for reading and writing by remote systems.

NOREAD and **NOWRITE**
Specify exceptions to the READ and WRITE options or defaults. NOWRITE works in the same manner as the NOREAD option. The NOREAD and NOWRITE can be used in both LOGNAME and MACHINE entries.

CALLBACK
Specifies in LOGNAME entries that no transaction will take place until the calling system is called back. There are two examples of when you would use CALLBACK. From a security standpoint, if you call back a machine you can be sure it is the machine it says it is. If you are doing long data transmissions, you can choose the machine that will be billed for the longer call. The default for the COMMAND option is no. The CALLBACK option is rarely used. If two sites have this option set for each other, a conversation will never get started.

COMMANDS

Specifies the commands in MACHINE entries that a remote computer can execute on your computer. This affects the security of your system; use it with extreme care.

The *uux* program will generate remote execution requests and queue them to be transferred to the remote computer. Files and a command are sent to the target computer for remote execution. Note that COMMANDS is not used in a LOGNAME entry; COMMANDS in MACHINE entries define command permissions whether you call the remote system or it calls you.

The default command that a remote computer can execute on your computer is *rmail*. If a command string is used in a MACHINE entry, the default commands are overridden. Full pathnames can also be used. Including the *ALL* value in the list means that any command from the remote computer specified in the entry will be executed. If you use this value, you give the remote computer full access to your computer. So, be careful; this allows far more access than normal users have. The VALIDATE option should be used with the COMMANDS option whenever potentially dangerous commands like **cat** and **uucp** are specified with the COMMANDS option. Any command that reads or writes files is potentially dangerous to local security when executed by the UUCP remote execution daemon (*uuxqt*).

VALIDATE

Used in conjunction with the COMMANDS option when specifying commands that are potentially dangerous to your computer's security. It provides a certain degree of verification of the caller's identity. The use of the VALIDATE option requires that privileged computers have a unique login/password for UUCP transactions. An important aspect of this validation is that the login/password associated with this entry be protected. If an outsider gets that information, that particular VALIDATE option can no longer be considered secure. (VALIDATE is merely an added level of security to the COMMANDS option, though it is a more secure way to open command access than ALL.)

Entries for OTHER Systems

You may want to specify different option values for machines or logins that are not mentioned in specific MACHINE or LOGNAME entries. This may occur when there are many computers calling in that have the same set of permissions. The special name *OTHER* for the computer name can be used in a MACHINE or LOGNAME entry

as follows:

```
MACHINE=OTHER \
COMMANDS=rmail:/usr/local/bin/lc

LOGNAME=OTHER \
REQUEST=yes SENDFILES=yes \
READ=/usr/spool/uucppublic \
WRITE=/usr/spool/uucppublic
```

All options that can be set for specific machines or logins can be used with the OTHER value, although the use of the VALIDATE option makes little sense.

Example

This entry is for public login. It provides the default permissions. Note that use of this type of anonymous login is not encouraged.

```
LOGNAME=nuucp \
MACHINE=OTHER \
READ=/usr/spool/uucppublic \
WRITE=/usr/spool/uucppublic \
SENDFILES=call REQUEST=no \
COMMANDS=/bin/rmail
```

See Also

uucico(ADM), uucp(C), uux(C), uuxqt(C)

Name

poll: Poll, Poll.hour, Poll.day - Format of UUCP Poll files.

Description

The **Poll** file (**/usr/lib/uucp/Poll**) contains information for polling remote computers. Each entry in the **Poll** file contains the name of a remote computer to call, followed by a tab character, and the hours the computer should be called. The hours must be integers in the range 0-23.

Poll file entries have the following format:

sysname<TAB>*hour ...*

The following entry provides polling of computer *gorgon* every four hours:

```
gorgon  0 4 8 12 16 20
```

The **uudemon.poll** (see *uudemon*(ADM)) script uses the **Poll** file to set up the polling. Alternatively, **uudemon.poll2** uses the files **Poll.hour** and **Poll.day** to perform similar, but more precise functions. The format of these files is identical to **Poll**.

See Also

uucico(ADM), uudemon(ADM), uucp(C), cron(C), crontab(C)

Name

queuedefs - Scheduling information for cron queues.

Description

The *queuedefs* file is read by the clock daemon, *cron*, and controls how jobs submitted with *at*, *batch*, and *crontab* are executed. Every job submitted by one of these programs is placed in a certain queue, and the behavior of these queues is defined in **/usr/lib/cron/queuedefs**. Queues are designated by a single, lower-case letter. The following queues have special significance:

a	*at* queue
b	*batch* queue
c	*cron* queue

For a given queue, the *queuedefs* file specifies the maximum number of jobs that may be executing at one time (*njobs*), the priority at which jobs will execute (*nice*), and the how long *cron* will wait between attempts to run a job (*wait*). If *njobs* jobs are already running in a given queue when a new job is scheduled to begin execution, *cron* will reschedule the job to execute *wait* seconds later. A typical file might look like this:

```
a.4j1n
b.2j2n90w
```

Each line gives parameters for one queue. The line must begin with a letter designating a queue, followed by a period (.). This is followed by the numeric values for *njobs*, *nice*, and *wait*, followed respectively by the letters "j", "n", and "w". The values must appear in this order, although a value and its corresponding letter may be omitted entirely, in which case a default value is used. The default values are *njobs* = 100, *nice* = 2, and *wait* = 60.

The value for *nice* is added to the default priority of the job (a higher numerical priority results in a lower scheduling priority - see *nice*(C)). *wait* is given in seconds.

Files

/usr/lib/cron/queuedefs *queuedefs* file

Name

sccsfile - Format of an SCCS file.

Description

An SCCS file is an ASCII file. It consists of six logical parts: the *checksum*, the *delta table* (contains information about each delta), *user names* (contains login names and/or numerical group IDs of users who may add deltas), *flags* (contains definitions of internal keywords), *comments* (contains arbitrary descriptive information about the file), and the *body* (contains the actual text lines intermixed with control lines). Each logical part of an SCCS file is described in detail below.

Throughout an SCCS file there are lines which begin with the ASCII SOH (start of heading) character (octal 001). This character is hereafter referred to as *the control character* and will be represented graphically as @. Any line described below which is not depicted as beginning with the control character is prevented from beginning with the control character. Entries of the form DDDDD represent a five digit string (a number between 00000 and 99999).

Checksum

The checksum is the first line of an SCCS file. The form of the line is:

@hDDDDD

The value of the checksum is the sum of all characters, except those of the first line. The @hR provides a *magic number* of (octal) 064001.

Delta Table

The delta table consists of a variable number of entries of the form:

@s DDDDD/DDDDD/DDDDD
@d <type> <**SCCS ID**> yr/mo/da hr:mi:se <pgmr> DDDDD DDDDD
@**i** DDDDD **...**
@**x** DDDDD **...**
@**g** DDDDD **...**
@**m** <MR number>
.
.
@**c** <comments> **...**
.
.
@**e**

The first line (@s) contains the number of lines inserted/deleted/unchanged respectively. The second line (@d) contains the type of the delta (currently, normal: D, and removed: R), the SCCS ID of the delta, the date and time of creation of the delta, the login name corresponding to the real user ID at the time the delta was created, and the serial numbers of the delta and its predecessor, respectively.

The @i, @x, and @g lines contain the serial numbers of deltas included, excluded, and ignored, respectively. These lines are optional.

The @m lines (optional) each contain one MR number associated with the delta; the @c lines contain comments associated with the delta.

The @e line ends the delta table entry.

User Names

The list of login names and/or numerical group IDs of users who may add deltas to the file, separated by new-lines. The lines containing these login names and/or numerical group IDs are surrounded by the bracketing lines @u and @U. An empty list allows anyone to make a delta.

Flags

Keywords used internally (see *admin*(CP) for more information on their use). Each flag line takes the form:

@f <flag> <optional text>

The following flags are defined:

@f t <type of program>
@f v <program name>
@f i
@f b
@f m <module name>
@f f <floor>
@f c <ceiling>
@f d <default-sid>
@f n
@f j
@f l <lock-releases>
@f q <user defined>

The **t** flag defines the replacement for the identification keyword. The **v** flag controls prompting for MR numbers in addition to comments; if the optional text is present it defines an MR number validity

checking program. The **i** flag controls the warning/error aspect of the "No id keywords" message. When the **i** flag is not present, this message is only a warning; when the **i** flag is present, this message will cause a "fatal" error (the file will not be gotten, or the delta will not be made). When the **b** flag is present the **-b** option may be used with the *get* command to cause a branch in the delta tree. The **m** flag defines the first choice for the replacement text of the sccsfile.F identification keyword. The **f** flag defines the "floor" release; the release below which no deltas may be added. The **c** flag defines the "ceiling" release; the release above which no deltas may be added. The **d** flag defines the default SID to be used when none is specified on a *get* command. The **n** flag causes *delta* to insert a "null" delta (a delta that applies *no* changes) in those releases that are skipped when a delta is made in a *new* release (e.g., when delta 5.1 is made after delta 2.7, releases 3 and 4 are skipped). The absence of the **n** flag causes skipped releases to be completely empty. The **j** flag causes *get* to allow concurrent edits of the same base SID. The **l** flag defines a *list* of releases that are *locked* against editing (*get*(CP) with the **-e** option). The **q** flag defines the replacement for the identification keyword.

Comments

Arbitrary text surrounded by the bracketing lines @t and @T. The comments section typically contains a description of the file's purpose.

Body

The body consists of text lines and control lines. Text lines don't begin with the control character, control lines do. There are three kinds of control lines: *insert*, *delete*, and *end*, as follows:

```
@I DDDDD
@D DDDDD
@E DDDDD
```

The digit string (DDDDD) is the serial number corresponding to the delta for the control line.

See Also

admin(CP), delta(CP), get(CP), prs(CP)

XENIX *Programmer's Guide*

Name

stat - Data returned by stat system call.

Syntax

#include <sys/stat.h>

Description

The **sys/stat.h** include file contains the definition for the structure returned by the *stat* and *fstat* functions. The structure is defined as:

```
struct stat{
    dev_t       st_dev;       /*

    ino_t       st_ino;       /* inode number */
    ushort      sh_mode;      /* file mode */
    short       st_nlink;     /* # of links */
    ushort      st_uid;       /* owner uid */
    ushort      st_gid;       /* owner gid */
    dev_t       st_rdev;      /*

    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' */
};
```

Note that the *st_atime*, *st_mtime*, and *st_ctime* values are measured in seconds since 00:00:00 (GMT) on January 1, 1970.

The *st_mode* value is actually a combination of one or more of the following file mode values:

```
S_IFMT      0170000     /* type of file */
S_IFDIR     0040000     /* directory */
S_IFCHR     0020000     /* character special */
S_IFBLK     0060000     /* block special */
S_IFREG     0100000     /* regular */
S_IFIFO     0010000     /* fifo */
S_IFNAM     0050000     /* name special entry */
S_INSEM     01          /* semaphore */
S_INSHD     02          /* shared memory */
S_ISUID     04000       /* set user id on execution */
```

```
S_IGUID     02000     /* set group id on execution */
S_ISVTX     01000     /* save swapped text even after use */
S_IREAD     00400     /* read permission, owner */
S_IWRITE    00200     /* write permission, owner */
S_IEXEC     00100     /* execute/search permission, owner */
```

Files

/usr/include/sys/stat.h

See Also

stat(S)

Name

sysfiles - Format of UUCP Sysfiles file.

Description

The **/usr/lib/uucp/Sysfiles** file lets you assign different files to be used by *uucp*(C) and *cu*(C) as **Systems**, **Devices**, and **Dialers** files.

You can use different **Systems** files so that requests for login services can be made to different addresses than UUCP services.

With different **Dialers** files you can use different handshaking for *cu* and *uucp*. Multiple **Systems**, **Dialers**, and **Devices** files are useful if any one file becomes too large.

An active **Sysfiles** file is not included in the distribution. Instead a **Sysfiles.eg** file is included, which contains comments and commented examples of how such a file can be used. This is done because UUCP runs faster without reading this file.

The format of the **Sysfiles** file is

service=w systems=x:x dialers=y:y devices=z:z

where *w* is replaced by *uucico*(ADM), *cu*, or both separated by a colon; *x* is one or more files to be used as the **Systems** file, with each file name separated by a colon and read in the order presented; *y* is one or more files to be used as the **Dialers** file; and *z* is one or more files to be used as the **Devices** file. Each file is assumed to be relative to the **/usr/lib/uucp** directory, unless a full path is given. A backslash-carriage return (\<*CR*>) can be used to continue an entry on to the next line.

An example of using a local *Systems* file in addition to the usual *Systems* file follows:

```
service=uucico:cu  systems=Systems:Local_Systems
```

If this is in */usr/lib/uucp/Sysfiles*, then both **uucico** and **cu** will first look in */usr/lib/uucp/Systems*. If the system they're trying to call doesn't have an entry in that file, or if the entries in the file fail, then they'll look in */usr/lib/uucp/Local_Systems*.

When different *Systems* files are defined for **uucico** and **cu** services, your machine will store two different lists of Systems. You can print the **uucico** list using the *uuname* command or the *cu* list using the *uuname -c* command.

Examples

The following example uses different **Systems** and **Dialers** files to separate the *uucico* and *cu*-specific info, with information that they use in common still in the "usual" **Systems** and **Dialers** files.

```
service=uucico  systems=Systems.cico:Systems \
                dialers=Dialers.cico:Dialers
service=cu      systems=Systems.cu:Systems \
                dialers=Dialers.cu:Dialers
```

This next example uses the same systems files for uucico and cu, but has split the **Systems** file into local, company-wide, and global files.

```
service=uucico  systems=Systems.local:Systems.company:Systems
service=cu      systems=Systems.local:Systems.company:Systems
```

See Also

uucico(ADM), uucp(C), systems(F)

Name

systemid - The Micnet system identification file.

Description

The **systemid** file contains the machine and site names for a system in a Micnet network. A *machine name* identifies a system and distinguishes it from other systems in the same network. A *site name* identifies the network to which a system belongs and distinguishes the network from other networks in the same chain.

The **systemid** file may contain a *site name* and up to four different *machine names*. The file has the form:

```
[site-name]
[machine-name1]
[machine-name2]
[machine-name3]
[machine-name4]
```

The file must contain at least one machine name. The other machine names are optional, serving as alternate names for the same machine. The file must contain a site name if more than one machine name is given or if the network is connected to another through a uucp link. The site name, when given, must be on the first line.

Each name can have up to eight letters and numbers but must always begin with a letter. There is never more than one name to a line. A line beginning with a pound sign (#) is considered a comment line and is ignored.

The Micnet network requires one **systemid** file on each system in a network with each file containing a unique set of machine names. If the network is connected to another network through a uucp link, each file in the network must contain the same site name.

The **systemid** file is used primarily during resolution of aliases. When aliases contain site and/or machine names, the name is compared with the names in the file and removed if there is a match. If there is no match, the alias (and associated message, file, or command) is passed on to the specified site or machine for further processing.

Files

/etc/systemid

See Also

aliases(M), netutil(ADM), top(F)

Name

systems - Format of UUCP Systems file.

Description

The **Systems** file (**/usr/lib/uucp/Systems**) contains the information needed by the *uucico* daemon to establish a communication link to a remote computer. Each entry in the file represents a computer that your computer can call. You can configure the **Systems** file to prevent unauthorized computers from logging in on your computer. More than one entry may be present for a particular computer. These additional entries represent alternative communication paths which the computer tries in sequential order.

Each entry in the *Systems* file has the following format:

sitename schedule device speed phone login-script

sitename field contains the node name of the remote computer.

schedule field is a string that indicates the day-of-week and time-of-day when the remote computer can be called.

device is the device type that should be used to establish the communication link to the remote computer.

speed indicates the transfer speed of the device used in establishing the communication link.

phone provides the phone number of the remote computer for automatic dialers. If you wish to create a portable *Systems* file that can be used at a number of sites where the dialing prefixes differ, see the *dialcodes*(F) man page.

login-script contains login information (also known as a "chat script").

See Also

uucico(ADM), uucp(C), devices(F), dialers(F)

Name

tar - Archive format.

Description

The command *tar*(C) dumps files to and extracts files from backup media or the hard disk.

Each file is archived in contiguous blocks, the first block being occupied by a header, whose format is given below, and the subsequent blocks of the files occupying the following blocks. All headers and file data start on 512 byte block boundaries and any spare unused space is padded with garbage. The format of a header block is as follows:

```
#define TBLOCK 512
#define NBLOCK 20
#define NAMSIZ 100
union hblock {
        char dummy[TBLOCK];
        struct header {
                char name[NAMSIZ];
                char mode[8];
                char uid[8];
                char gid[8];
                char size[12];
                char mtime[12];
                char chksum[8];
                char linkflag;
                char linkname[NAMSIZ];
                char extno[4];
                char extotal[4];
                char efsize[12];
        } dbuf;
} dblock;
```

The name entry is the path name of the file when archived. If the pathname starts with a zero word, the entry is empty. It is at most 100 bytes long and ends in a null byte. Mode, uid, gid, size, and time modified are the same as described under i-nodes (refer to *filesystem* (F)). The checksum entry has a value such that the sum of the words of the directory entry is zero.

If the entry corresponds to a link, then *linkname* contains the pathname of the file to which this entry is linked and *linkflag* gives a count of the links. No data is put in the archive file.

See Also

filesystem(F), tar(C)

Name

term - Terminal driving tables for nroff.

Description

nroff(CT) uses driving tables to customize its output for various types of output devices, such as printing terminals, special word-processing printers (such as Diablo, Qume, or NEC Spinwriter mechanisms), or special output filter programs. These driving tables are written as C programs, compiled, and installed in **/usr/lib/term/tab***name*, where *name* is the name for that terminal type as shown in **term**(CT).

The structure of the tables is as follows. Sizes are in 240ths of an inch.

```
#define     INCH      240

struct termtable tlp ; { \* lp is the name of the term, *\
            int bset;     \* modify with new name, such as tnew *\
            int breset;
            int Hor;
            int Vert;
            int Newline;
            int Char;
            int Em;
            int Halfline;
            int Adj;
            char *twinit;
            char *twrest;
            char *twnl;
            char *hlr;
            char *hlf;
            char *flr;
            char *bdon;
            char *bdoff;
            char *iton;
            char *itoff;
            char *ploton;
            char *plotoff;
            char *up;
            char *down;
            char *right;
            char *left;
            char *codetab[256-32];
            char *zzz;
} ;
```

The meanings of the various fields are as follows:

bset bits to set in *termio.c_oflag* see **tty**(M) and **termio**(M)). after output.

breset bits to reset in *termio.c_oflag* before output.

Hor horizontal resolution in fractions of an inch.

Vert vertical resolution in fractions of an inch.

Newline space moved by a newline (linefeed) character in fractions of an inch.

Char quantum of character sizes, in fractions of an inch. (i.e., characters are multiples of Char units wide. See *codetab* below.)

Em size of an em in fractions of an inch.

Halfline space moved by a half-linefeed (or half-reverse-linefeed) character in fractions of an inch.

Adj quantum of white space for margin adjustment in the absence of the **-e** option, in fractions of an inch. (i.e., white spaces are a multiple of Adj units wide)

Note: if this is less than the size of the space character (in units of Char; see below for how the sizes of characters are defined), *nroff* will output fractional spaces using plot mode. Also, if the **-e** switch to *nroff* is used, Adj is set equal to Hor by *nroff*.

twinit set of characters used to initialize the terminal in a mode suitable for *nroff*.

twrest set of characters used to restore the terminal to normal mode.

twnl set of characters used to move down one line.

hlr set of characters used to move up one-half line.

hlf set of characters used to move down one-half line.

flr set of characters used to move up one line.

bdon set of characters used to turn on hardware boldface mode, if any. *Nroff* assumes that boldface mode is reset automatically by the *twnl* string, because many letter-quality printers reset the boldface mode when they receive a carriage return; the *twnl* string should include whatever characters are necessary to reset the boldface mode.

bdoff set of characters used to turn off hardware boldface mode, if any.

iton set of characters used to turn on hardware italics mode, if any.

itoff set of characters used to turn off hardware italics mode, if any.

ploton set of characters used to turn on hardware plot mode (for Diablo-type mechanisms), if any.

plotoff set of characters used to turn off hardware plot mode (for Diablo-type mechanisms), if any.

up set of characters used to move up one resolution unit (Vert) in plot mode, if any.

down set of characters used to move down one resolution unit (Vert) in plot mode, if any.

right set of characters used to move right one resolution unit (Hor) in plot mode, if any.

left set of characters used to move left one resolution unit (Hor) in plot mode, if any.

codetab Array of sequences to print individual characters. Order is *nroff*'s internal ordering. See the file **/usr/lib/term/tabuser.c** for the exact order.

zzz a zero terminator at the end.

The *codetab* sequences each begin with a flag byte. The top bit indicates whether the sequence should be underlined in the **.ul** font. The rest of the byte is the width of the sequence in units of *Char*.

The remainder of each *codetab* sequence is a sequence of characters to be output. Characters with the top bit off are output as given; characters with the top bit on indicate escape into plot mode. When such an escape character is encountered, *nroff* shifts into plot mode, emitting *ploton*, and skips to the next character if the escape character was '\200'.

When in plot mode, characters with the top bit off are output as given. A character with the top bit on indicates a motion. The next bit indicates coordinate, with **1** being vertical and **0** being horizontal. The next bit indicates direction, with **1** meaning up or left. The remaining five bits give the amount of the motion. An amount of zero causes exit from plot mode.

When plot mode is exited, either at the end of the string or via the amount-zero exit, *plotoff* is emitted followed by a blank.

All quantities which are in units of fractions of an inch should be expressed as INCH**num/denom*, where *num* and *denom* are respectively the numerator and denominator of the fraction; that is, 1/48 of an inch would be written as "INCH/48".

If any sequence of characters does not pertain to the output device, that sequence should be given as a null string.

The XENIX Development System must be installed on the computer to create a new driving table. The source code for a generic output device is in the file **/usr/lib/term/tabuser.c** Copy this file and make the necessary modifications, including the name of the termtable struct. Refer to the hardware manual for the codes needed for the output device (terminal, printer, etc.). Name the file according to the convention explained in **term**(CT). The makefile, **/usr/lib/term/makefile**, should be updated to include the source file to the new driving table. When the files are prepared, enter the command :

make

(See **make**(CP)). The source to the new driving table is linked with the object file **mkterm.o**, and the new driving table is created and installed in the proper directory.

FILES

/usr/lib/term/tab*name*	driving tables
/usr/lib/term/tabuser.c	generic source for driving tables
/usr/lib/term/makefile	makefile for creating driving tables
/usr/lib/term/mkterms.o	linkable object file for creating driving tables

SEE ALSO

nroff(CT), term(CT).

Notes

The XENIX Development System must be installed on the computer to create new driving tables.

Not all XENIX facilities support all of these options.

Name

terminfo - Format of compiled terminfo file.

Description

Compiled terminfo descriptions are placed under the directory **/usr/lib/terminfo**. In order to avoid a linear search of a huge XENIX system directory, a two-level scheme is used: **/usr/lib/terminfo/c/name** where *name* is the name of the terminal, and *c* is the first character of *name*. Thus, *act4* can be found in the file **/usr/lib/terminfo/a/act4**. Synonyms for the same terminal are implemented by multiple links to the same compiled file.

The format has been chosen so that it will be the same on all hardware. An 8- or more-bit byte is assumed, but no assumptions about byte ordering or sign extension are made.

The compiled file is created with the *tic*(C) program, and read by the routine *setupterm* in *terminfo*(S). The file is divided into six parts: the header, terminal names, boolean flags, numbers, strings, and string table.

The header section begins the file. This section contains six short integers in the format described below. These integers are (1) the magic number (octal 0432); (2) the size, in bytes, of the names section; (3) the number of bytes in the boolean section; (4) the number of short integers in the numbers section; (5) the number of offsets (short integers) in the strings section; (6) the size, in bytes, of the string table.

Short integers are stored in two 8-bit bytes. The first byte contains the least significant 8 bits of the value, and the second byte contains the most significant 8 bits. (Thus, the value represented is 256*second+first.) The value -1 is represented by 0377, 0377; other negative values are illegal. The -1 generally means that a capability is missing from this terminal. Note that this format corresponds to the hardware of the VAX and PDP-11. Machines in which this does not correspond to the hardware read the integers as two bytes and compute the result.

The terminal names section comes next. It contains the first line of the terminfo description, listing the various names for the terminal, separated by the '|' character. The section is terminated with an ASCII NUL character.

The boolean flags have one byte for each flag. This byte is either 0 or 1, as the flag is present or absent. The capabilities are in the same order as the file **<term.h>**.

Between the boolean section and the number section, a null byte will be inserted, if necessary, to ensure that the number section begins on an even byte. All short integers are aligned on a short-word boundary.

The numbers section is similar to the flags section. Each capability takes up two bytes, and is stored as a short integer. If the value represented is -1, the capability is taken to be missing.

The strings section is also similar. Each capability is stored as a short integer, in the format above. A value of -1 means the capability is missing. Otherwise, the value is taken as an offset from the beginning of the string table. Special characters in ^X or \c notation are stored in their interpreted form, not the printing representation. Padding information $<nn> and parameter information %x are stored intact in uninterpreted form.

The final section is the string table. It contains all the values of string capabilities referenced in the string section. Each string is null-terminated.

Note that it is possible for *setupterm* to expect a different set of capabilities than are actually present in the file. Either the database may have been updated since *setupterm* was recompiled (resulting in extra unrecognized entries in the file) or the program may have been recompiled more recently than the database was updated (resulting in missing entries). The routine *setupterm* must be prepared for both possibilities; this is why the numbers and sizes are included. Also, new capabilities must always be added at the end of the lists of boolean, number, and string capabilities.

As an example, an octal dump of the description for the Microterm ACT 4 is included:

```
microterm|act4|microterm act iv,
    cr=^M, cudl=^J, ind=^J, bel=^G, am, cubl=^H,
    ed=^_, el=^^, clear=^L, cup=^T%p1%c%p2%c,
    cols#80, lines#24, cufl=^X, cuul=^Z, home=^],
```

```
000 032 001      \0 025  \0  \b  \0 212  \0   "  \0   m   i   c   r
020   o   t   e   r   m   |   a   c   t   4   |   m   i   c   r   o
040   t   e   r   m       a   c   t       i   v  \0  \0 001  \0  \0
060  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0  \0
100  \0  \0   P  \0 377 377 030  \0 377 377 377 377 377 377 377 377
120 377 377 377 377  \0  \0 002  \0 377 377 377 377 004  \0 006  \0
140  \b  \0 377 377 377 377  \n  \0 026  \0 030  \0 377 377 032  \0
160 377 377 377 377 034  \0 377 377 036  \0 377 377 377 377 377 377
200 377 377 377 377 377 377 377 377 377 377 377 377 377 377 377 377
*
520 377 377 377 377      \0 377 377 377 377 377 377 377 377 377 377
540 377 377 377 377 377 377 007  \0  \r  \0  \f  \0 036  \0 037  \0
560 024   %   p   1   %   c   %   p   2   %   c  \0  \n  \0 035  \0
600  \b  \0 030  \0 032  \0  \n  \0
```

Some limitations: the total size of a compiled description cannot exceed 4096 bytes; the name field cannot exceed 128 bytes.

Files

/usr/lib/terminfo/*/* compiled terminal capability data base

See Also

terminfo(M), terminfo(S), tic(C)

Name

top, top.next - The Micnet topology files.

Description

These files contain the topology information for a Micnet network. The topology information describes how the individual systems in the network are connected, and what path a message must take from one system to reach another. Each file contains one or more lines of text. Each line of text defines a connection or a communication path.

The **top** file defines connections between systems. Each line lists the machine names of the connected systems, the serial lines used to make the connection, and the speed (baud rate) of transmission between the systems. Each line has the following format:

machine1 tty1a machine2 tty2a speed

machine1 and *machine2a* are the machine names of the respective systems (as given in the **systemid** files). The *ttys* are the device names (e.g., tty1a) of the connecting serial lines. The speed must be an acceptable baud rate (e.g., 110, 300, ..., 19200).

The **top.next** file contains information about how to reach a particular system from a given system. There may be several lines for each system in the network. Each line lists the machine name of a system, followed by the machine name of a system connected to it, followed by the machine names of all the systems that may be reached by going through the second system. Such a line has the form:

machine1 machine2 machine3 [machine4]...

The machine names must be the names of the respective systems (as given by the first machine name in the **systemid** files).

The *top.next* file must be present even if there are only two computers in the network. In such a case, the file must be empty.

In the **top** and **top.next** files, any line beginning with a number sign (#) is considered a comment, and is ignored.

Files

/usr/lib/mail/top

/usr/lib/mail/top.next

See Also

aliases(M), netutil(ADM), systemid(F), top(F)

Name

ttys - Login terminals file.

Description

The **/etc/ttys** file contains a list of the device special files associated with possible login terminals, and defines which files are to be opened by the *init* (M) program on system start-up.

The file contains one or more entries of the form

state mode name

The *name* must be the filename of a device special file. Only the filename may be supplied, the path is assumed to be **/dev**. If *state* is "1", the file is enabled for logins; if "0", the file is disabled. The *mode* is used as an argument to the *getty* (M) program. It defines the line speed and type of device associated with the terminal. A list of arguments is provided in *getty* (M).

For example, the entry "1mtty02" means the serial line tty02 is to be opened for logging in at 9600 baud.

Files

/etc/ttys

See Also

disable(C), enable(C), getty(M), init(M), terminal(HW), terminals(M), tty(M)

Notes

The **/etc/ttys** file should only be edited when the system is in system maintenance mode. If it is edited when the system is in multi-user mode, the changes will not take effect until signal 2 is sent to *init* or an *enable* or *disable* command is given. (Enter the following command as root to send signal 2 to *init*: **kill -2 1**.) Rebooting the system will also cause the changes to take effect. See the XENIX *System Administrator's Guide*.

Name

types - Primitive system data types.

Syntax

#include <sys/types.h>

Description

The data types defined in the include file **<sys/types.h>** are used in XENIX system code; some data of these types are accessible to user code.

The form *daddr_t* is used for disk addresses except in an inode on disk, see *filesystem* (F). Times are encoded in seconds since 00:00:00 GMT, January 1, 1970. The major and minor parts of a device code specify kind and unit number of a device and are installation-dependent. Offsets are measured in bytes from the beginning of a file. The *label_t* variables are used to save the processor state while another process is running.

See Also

filesystem(F)

Name

utmp, wtmp - Formats of utmp and wtmp entries.

Syntax

#include <sys/types.h>
#include <utmp.h>

Description

These files, which hold user and accounting information for such commands as *who*(C), *write*(C), and *login*(M), have the following structure as defined by **<utmp.h>**:

```
#define    UTMP_FILE     "/etc/utmp"
#define    WTMP_FILE     "/etc/wtmp"
#define    ut_name       ut_user

struct utmp {
        char        ut_user[8];         /* User login name */
        char        ut_id[4];           /* usually line # */
        char        ut_line[12];        /* device name (console, lnxx) */
        short       ut_pid;             /* process id */
        short       ut_type;            /* type of entry */
        struct      exit_status {
          short       e_termination;    /* Process termination status */
          short       e_exit;           /* Process exit status */
        } ut_exit;                      /* The exit status of a process
                                           marked as DEAD_PROCESS. */
        time_t      ut_time;            /* time entry was made */
};

/* Definitions for ut_type */

#define EMPTY                   0
#define RUN_LVL                     1
#define BOOT_TIME               2
#define OLD_TIME                3
#define NEW_TIME                4
#define INIT_PROCESS            5   /* Process spawned by "init" */
#define LOGIN_PROCESS           6   /* A "getty" process waiting for login */
#define USER_PROCESS            7   /* A user process */
#define DEAD_PROCESS                8
#define ACCOUNTING              9
#define UTMAXTYPE    ACCOUNTING     /* Largest legal value of ut_type */

/* Special strings or formats used in the "ut_line" field when */
/* accounting for something other than a process */
/* No string for the ut_line field can be more than 11 chars + */
/* a NULL in length */
#define RUNLVL_MSG "run-level %c"
#define BOOT_MSG   "system boot"
```

```
#define  OTIME_MSG    "old time"
#define  NTIME_MSG    "new time"
```

Files

/usr/include/utmp.h
/etc/utmp
/etc/wtmp

See Also

getut(S), login(C), who(C), write(C)

Contents

Hardware Dependent (HW)

Name

intro - Introduction to machine related miscellaneous features and files.

Description

The hardware-dependent section (HW) contains information useful in maintaining the system. Included are descriptions of files, devices, tables and programs that are important in maintaining the entire system that are directly related to the kind of computer on which the system runs.

Name

80287 - Math coprocessor.

Description

The 80287 is the INTEL math co-processor for the 80286. The kernel tests for the presence of an 80287 at startup.

If your system has an 80287, you must turn off a switch on the main system board in order to enable 80287 interrupts. Check your hardware manual to determine the proper switch and setting. If your system does not have an 80287, or the switch is on, the kernel will run a set of emulator routines which are much slower.

The C compiler available with the program development package generates the appropriate 8087 (or 80287) opcodes. C routines compiled with this compiler have run as much as 200 times as fast as the emulated code. In particular, the standard math library routines run considerably faster if you have an 80287.

The overflow, division by zero, and invalid operand exceptions return a SIGFPE signal. This signal can be caught. The rest of the 80287 floating point exceptions (underflow, denormalized operand, and precision error) are masked.

Notes

The emulator returns meaningless information on divide by zero.

There is no obvious way to tell which 80287 exception generated the SIGFPE.

Name

80387 - Math coprocessor.

Description

The 80387 is the INTEL math co-processor for the 80386. The kernel tests for the presence of an 80387 at startup.

If your system has an 80387, you must turn off a switch on the main system board in order to enable 80387 interrupts. Check your hardware manual to determine the proper switch and setting. If your system does not have an 80387, or the switch is on, the kernel will run a set of emulator routines which are much slower.

The C compiler available with the program development package generates the appropriate 80387 opcodes. C routines compiled with this compiler have run as much as 200 times as fast as the emulated code. In particular, the standard math library routines run considerably faster if you have an 80387.

The overflow, division by zero, and invalid operand exceptions return a SIGFPE signal. This signal can be caught. The rest of the 80387 floating point exceptions (underflow, denormalized operand, and precision error) are masked.

Notes

The emulator returns meaningless information on divide by zero.

There is no obvious way to tell which 80387 exception generated the SIGFPE.

Because of design defects in Intel's 80386 chip (B1 stepping), the Intel 80387 math co-processor may not operate correctly in some computers. The problem causes the CPU to hang when DMA/paging/coprocessor accesses are occurring. A workaround for this problem has been engineered that is engaged by using a special string at boot time:

```
Boot
: xenix mulbug
```

This workaround may not work on all machines; some hardware is designed such that it will not work. The bootstring can also be added to the end of the default bootstring (DEFBOOTSTR) found in */etc/default/boot*.

If you cannot use this workaround, you have two options. You may replace the 386 chip with a newer release of the 386 chip (a D-step part), or you can bypass the 387 chip by adding the *ignorefpu* keyword in your boot command as follows:

```
Boot
: xenix ignorefpu
```

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

For further information, see the Intel publication: *Intel 80387 Programmer's Reference Manual.*

Name

boot - XENIX boot program.

Description

boot is an interactive program used to load and execute standalone XENIX programs. It is used primarily for loading and executing the XENIX kernel, but can load and execute any other programs that are linked for standalone execution. *boot* is a required part of the XENIX Operating System and must be present in the root directory of the root file system to ensure successful loading of the XENIX kernel.

The *boot* program is invoked by the system each time the computer is started. To restart the system without going through lengthy shutdown procedures, you can use the *reboot* command. This causes the system to reboot after shutting down without waiting for keyboard input. See *haltsys (ADM)* for more information.

For diskette boot, the procedure has three stages:

1. The ROMs load the boot block from sector 0 of the floppy, where sector 0 of the disk is the same as sector 0 of the filesystem.

2. The boot block-loads **/boot** from the floppy filesystem.

3. **/boot** executes and prompts the user.

For fixed disk boot, the procedure has five stages:

1. The ROMs load in the *masterboot* block from sector 0 on the hard disk.

2. The *masterboot* block then loads the partition boot block (boot0) from sector 0 of the active partition (see *fdisk*(ADM)).

3. Then, assuming the XENIX partition is active, boot1 is loaded from 1K into the active partition in a 2.2 or later XENIX installation. If the disk was installed with a pre-2.2 XENIX release, then boot1 is assumed to begin at 3K into the active partition. Boot1 spans 20 physically contiguous 1K blocks on the disk.

4. boot1 loads **/boot** from the XENIX file system.

5. **/boot** executes and prompts the user.

/boot and **/xenix** may lie on tracks that have been mapped by *badtrk(ADM)*. *masterboot*, boot0, and boot1 cannot lie on bad tracks.

The fixed disk boot procedure is invoked if the diskette drive is empty.

When first invoked, *boot* prompts for the location of a program to load by displaying the message:

```
XENIX System V

Boot
:
```

To specify the location of a program, a device and filename must be given. The filename must include the full pathname of the file containing the standalone program. You can display a list of the current allowable device names by typing a question mark (?).

The format for the device and pathname is as follows:

```
xx(m,o)filename
  or
xx(m)filename
```

where:

xx = device name
('hd' for the hard disk or 'fd' for diskette device)
m = minor device number
(40 for the **root** filesystem on the hard disk)
o = offset in the partition (usually 0). This is optional.
filename = standard XENIX pathname. Must start with a slash if the program is not in the root directory.

All numbers are in decimal. See the manual pages for *hd*(HW) and *fd*(HW) for minor device numbers of these devices. Specifying the offset is optional. The location of the program to be loaded must always be entered first on the command line and be present if other *boot* options are specified either on the command line or in **/etc/default/boot**.

If you want *boot* to pause and wait for a <RETURN> before executing the program that it loads, enter the word "prompt" on the command line. For example, if you enter "prompt" and press <RETURN>, *boot* prints the following message and waits for you to press the return key again:

```
Loaded, press <RETURN>.
```

The prompt can be changed to another string as in this example:

```
prompt="change diskettes now"
```

boot loads **xenix** from the diskette, prints the message "change diskettes now", and waits for <RETURN> to be pressed. No other characters can appear between *prompt*, the "=" sign and the prompt string,

although *string* may contain spaces. When you press <RETURN>, **xenix** will begin execution. "Prompt" can be set either on the command line or in **/etc/default/boot**. If a prompt is not specified, *boot* executes the loaded program without pausing.

If you have just loaded the *boot* program from the distribution diskette, simply press <RETURN> and *boot* defaults to the correct values.

To load XENIX from a hard disk, enter:

hd(40,0)xenix

To use the default boot string specified in **/etc/default/boot**, simply press <RETURN> when the system displays the boot prompt, and *boot* uses the values specified by DEFBOOTSTR in **/etc/default/boot**.

If nothing is typed after a short while and LOADXENIX is set to YES in the default *root* file system's **/etc/default/boot** file, *boot* times out and behaves as though a <RETURN> had been pressed, except that an "auto" is added to the boot string. (If, in addition to LOADXENIX=YES, TIMEOUT=*n* is defined, *boot* waits *n* seconds before timing out.) *boot* proceeds through the boot procedure, and *init*(M) is passed a **-a** flag with no "prompt".

It is recommended that you install DOS on the hard disk before XENIX. See the manual page for *dos*(C). However, once you install DOS you can boot it at the XENIX "Boot" prompt by entering "dos".

During XENIX installation, a custom *masterboot* is placed on the hard disk. If a non-standard disk is specified, its parameters are stored and enabled in this *masterboot*.

Configuring The Kernel

boot passes any boot string typed at the boot prompt to the kernel, except for the "prompt" string.

The kernel reads the boot string to determine which peripherals are the root, pipe and swap devices. If no devices are specified in either the **/etc/default/boot** description or on the command line, the default devices compiled into the kernel are used.

Additional arguments in the boot string can alter this default action. These arguments have the form:

```
dev=xx(m,o)
  or
dev=xx(m)
where:
    dev = The desired system device (root[dev], pipe[dev],
          or swap[dev])
    xx, m, o = same as for the boot device
```

If any combination of **root**, **pipe** or **swap** is specified, then those system devices will reside on that device, with the unspecified system devices using the defaults compiled in the kernel. Setting one device does not affect the default values for the other system devices.

Selecting The System Console

You can select the system console at boot time either by entering the command **systty=***x* at the boot prompt, or by placing the keywords **SYSTTY=***x* in the file **/etc/default/boot**. The letter *x* represents either a number or a string parameter.

If you use the **systty=***x* command at boot time, *boot* uses the string parameter *x* to pass the selected console device to the kernel. The values of the boot string parameter **systty** are:

sio	Serial port COM1
scrn	Display adapter

For example, to assign the system console to the serial port at COM1, enter this command at the boot prompt:

```
systty=sio
```

If you do not specifically set the system console at boot time, the *boot* program follows these steps to determine the system console:

- *boot* reads **/etc/default/boot** and looks for the keywords **SYSTTY=***x* where *x* is a number that specifies the system console device.

  1 indicates the serial adapter at COM1.
  0 indicates the display adapter.

- If **SYSTTY** is not found or **/etc/default/boot** is unreadable, *boot* checks for a display adapter and assigns it as the system console.

- If no display adapter is found, *boot* looks for COM1, sets the serial port to 9600 baud, 8 data bits, 1 stop bit, and no parity, and uses it as the system console.

Thus, to have *boot* automatically set the system console to the serial port at COM1, enter this line in **/etc/default/boot**:

```
SYSTTY=1
```

Aliasing

A set of system devices can be aliased to a single keyword by defining the keyword in the file **/etc/default/boot**. This keyword can then be entered on the "Boot" command line and the boot program then reads the corresponding system devices from **/etc/default/boot** and pass them to the kernel. An alias has the following form:

```
key=file [root=xx(m) pipe=xx(m) swap=xx(m) prompt[="string"]]
```

In all cases, the device specification can also have the format dev=xx(m,o), where o is the offset.

For example, if you have a root file system on a second hard disk and want to use it, but want to boot using the **xenix** located on the first hard disk, enter the following line into the **/etc/default/boot** description:

```
disk2=hd(40,0)xenix root=hd(104,0) prompt="Using second disk"
```

The next time you boot the system from the first hard disk, enter "disk2" in response to the "Boot" prompt. **xenix** will be loaded from the first hard disk, and when you see the message, "Using second disk", press <RETURN> . **xenix** will now boot and use the root file system on the second hard disk. Note that you must edit the **/etc/default/boot** file in the root file system on the device from which *boot* will be read, in this case the first hard disk.

Another example: suppose you want to boot off the second drive (hd10) and use the root filesystem and swap space of the second drive. At the boot prompt, use the following bootstring:

```
hd(104)xenix root=hd(104) pipe=hd(104) swap=hd(105)
```

Once booted, you must create the device nodes for the second drive for use by the utilities:

```
fixperm -c -dHD1 /etc/perms/inst
```

Boot options

Boot options can be changed via keywords in **/etc/default/boot**. The following keywords are recognized by *boot*:

LOADXENIX=YES	If YES, *boot* automatically loads XENIX after a delay time specified by the TIMEOUT parameter. The default value is 60 seconds.
DEFBOOTSTR=*string*	*string* is used as the default boot string for timeouts and for no input on the command line. There can be no white space between DEFBOOTSTR, the "=" sign and *string*.
SYSTTY=*x*	If *x* is one (1), the system console device is set to the serial adapter at COM1. If *x* is zero (0), the system console is set to the main display adapter.
RONLYROOT=NO	Whether or not the root filesystem is to be mounted *readonly*. This should only be set to "yes" during installation.
FSCKFIX=YES or NO	Whether or not *fsck*(ADM) fixes any root system problems by itself. If the variable is set at YES, then *fsck*(ADM) is run on the root filesystem with the **-rr** flag.
MULTIUSER=YES or NO	Whether or not *init*(M) invokes *sulogin* or proceeds to multiuser mode.
PANICBOOT=YES or NO	Whether or not the system reboots after a panic(). This variable is read from **/etc/default/boot** by *init*.
TIMEOUT=*n*	*n* is the number of seconds to wait at boot before timing out (if LOADXENIX is set to YES).

Diagnostics

If an error occurs, *masterboot* displays an error message, and locks the system. The following is a list of the most common messages and their meanings:

IO ERR
An error occurred when *masterboot* tried to read in the partition boot of the active operating system.

BAD TBL
The bootable partition indicator of at least one of the operating systems in the fdisk table contains an unrecognizable code.

NO OS
There was an unrecoverable error that prevented the active operating system's partition boot from executing.

When *boot* displays error messages, it returns to the "Boot" prompt. The following is a list of the most common messages and their meanings:

bad magic number
The given file is not an executable program.

can't open <*pathname*>
The supplied pathname does not correspond to an existing file, or the device is unknown.

Stage 1 boot failure
The bootstrap loader cannot find or read the **boot** file. You must restart the computer and supply a file system disk with the **boot** file in the root directory.

not a directory
The specified area on the device does not contain a valid XENIX filesystem.

zero length directory
Although an otherwise valid filesystem was found, it contains a directory of apparently zero length. This most often occurs when a pre- System V XENIX filesystem (with incorrect, or incompatible word ordering) is in the specified area.

fload:read(*x***)=***y*
An attempted read of *x* bytes of the file returned only *y* bytes. This is probably due to a premature end-of-file. It could also be caused by a corrupted file, or incorrect word ordering in the header.

Files

/boot
/etc/default/boot
/etc/masterboot
/etc/hdboot0
/etc/hdboot1

See Also

autoboot(ADM), badtrk(ADM), fd(HW), fdisk(ADM), haltsys(ADM), hd(HW), init(M), sulogin(M)

Notes

The computer tries to boot off any diskette in the drive. If the diskette does not contain a valid bootstrap program, errors occur.

The *boot* program cannot be used to load programs that have not been linked for standalone execution. To create standalone programs, the **-A** option of the XENIX linker (*ld*(CP)) and special standalone libraries must be used.

Standalone programs can operate in real or protected mode, but they must not be large or huge models. Programs in real mode can use the input/output routines of the computer's startup ROM.

RONLYROOT should only be set to "yes" for installation. If it is set to "yes" during day-to-day operations, it will prevent you making changes to the root filesystem. You will then be required to boot from the floppy drive, edit the **/etc/default/boot file and reboot.**

Name

cmos - Displays and sets the configuration data base.

Syntax

cmos [address [value]]

Description

The *cmos* command displays and/or sets the values in the CMOS configuration data base. This battery-powered data base stores configuration information about the computer that is used at power up to define the system hardware configuration and to direct boot procedures. The data base is 64 bytes long and is reserved for system operation. Refer to your computer hardware manual for more information.

The *cmos* command is typically used to alter the current hardware configuration when new devices are added to the system. When only *address* is given, the command displays the value at that address. If both *address* and a *value* are given, the command assigns the value to that address. If no arguments are given, the command displays the entire contents of the data base.

The CMOS configuration data base may also be examined and modified by reading from and writing to **/dev/cmos** file. Because successful system operation depends on correct configuration information, the data base should be modified by experienced system administrators only.

The computer manufacturer's diagnostic diskette should be run before setting the CMOS data base.

Files

/etc/cmos
/dev/cmos

Notes

Not all computers have a CMOS configuration data base. Some computers use switches on the main system board to configure the system. Refer to your computer hardware reference manual to determine whether you have a configuration data base.

Name

fd - floppy devices

Description

The **fd** devices implement the XENIX interface with floppy disk drives. Typically, the *tar*(C), *cpio*(C) or *dd*(C) commands are used to read or write floppy disks. For instance,

```
tar tvf /dev/fd0
```

tabulates the contents of the floppy disk in drive 0 (zero).

The block special **fd** devices are also block-buffered. The floppy driver can read or write 1K bytes at a time using raw i/o. Note that block transfers are always a multiple of the 1K disk block size.

The floppy devices are named **/dev/fd0** and **/dev/fd1** (see Notes, below, for more information about device naming procedure).

The corresponding character special (raw) devices, **/dev/rfd0** and **/dev/rfd1,** afford direct, unbuffered transmission between the floppy and the user's read or write transfer address in the user's program.

For information about formatting, see *format*(C).

The minor device number determines what kind of physical device is attached to each device file (see Notes).

Files

/dev/fd0	/dev/rfd048ds8	/dev/rfd096ds15	/dev/rfd0135ds9
/dev/fd1	/dev/rfd148ds8	/dev/rfd196ds15	/dev/rfd1135ds9
/dev/rfd0	/dev/rfd048ds9	/dev/rfd096ds9	/dev/rfd0135ds18
/dev/rfd1	/dev/rfd148ds9	/dev/rfd196ds9	/dev/rfd1135ds18
		/dev/rfd048ss8	
		/dev/rfd148ss9	

Notes

When accessing the character special floppy devices, the user's buffer must begin on a word boundary. The count in a *read*(S), *write*(S), or *lseek*(S) call to a character special floppy device must be a multiple of 1K bytes.

Device names determine the particular drive and media configuration. The device names have the form:

fd048ds9

Where:

fd0 = drive number (0, 1, 2 or 3)
48 = number of disk tracks per inch (48 or 96)
ds = single or double sided floppy (ss or ds)
9 = number of sectors on the floppy (8 or 9)

For instance, /dev/fd048ss9 indicates a 48 track per inch, single sided, 9 sector floppy disk device in drive 0.

The minor device numbers for floppy drives depend on the drive and media configuration. The most common are:

	48tpi				96tpi		135tpi	
	ds/8	ds/9	ss/8	ss/9	ds/15	ds/8	ds/9	ds/18
Drive	Minor Device Number							
0	12	4	8	0	52	44	36	60
1	13	5	9	1	53	45	37	61
2	14	6	10	2	54	46	38	62
3*								

* reserved for special, non-floppy devices connected to the floppy controller as unit #3.

The scheme for creating minor device numbers is as follows. When interpreted as a binary number, each bit of the minor device number represents some aspect of the device/media configuration.

For example, the minor device number for **/dev/fd048ss8** is "8." Interpreted as a binary number, 8 is:

00001000

This is how each bit, or binary digit, is significant:

48tpi - 0 96tpi - 1 135tpi - 1	Sectors per Track		ss - 0 ds - 1	Drive	
32	16	8	4	2	1
0	0	1	0	0	0

Only the last six digits of the number are used in minor device identification. The first significant digit is the third from the left. In this example, the third digit from the left is zero, thus the device is 48tpi. The next two digits mean:

Bits		Sectors per Track
16	8	
0	0	9
0	1	8
1	0	15
1	1	18

The fourth digit tells whether the floppy is single sided (ss - 0) or double sided (ds - 1). The last two signify the drive number:

Bits		Drive Number
2	1	
0	0	0
0	1	1
1	0	2
1	1	3*

* reserved for special, non-floppy devices connected to the floppy controller as unit #3.

Using this information, you can construct any minor device numbers you need.

It is not advisable to format a low density (48tpi) diskette on a high density (96tpi or 135tpi) floppy drive. Low density diskettes written on a high density drive should be read on high density drives. They may or may not be readable on a low density drive.

Use error-free floppy disks for best results on reading and writing.

Name

hd - Internal hard disk drive

Description

Block-buffered access to the *primary* hard disk is provided through the following block special files: **hd00**, **hd01** through **hd04**, **hd0a** and **hd0d, root**, and **swap** Block-buffered access to the *secondary* hard disk is provided through the following block special files: **hd10**, **hd11** through **hd14**, **hd1a**,

hd00 refers to the entire physical disk; **hd01** through **hd04** refer to the fdisk partitions. **root** refers to the root file system; **swap** refers to the swap area; The block special files access the disks via the system's normal buffering mechanism and may be read and written without regard to the size of physical disk records.

Character special files follow the same naming convention as the block special files except that the character special file is prefaced with an "r". For example, the character special file referring to the entire physical disk is **/dev/rhd00**.

The following are the names of the fixed disk partitions. Each partition can be accessed through a block interface, for example **/dev/hd01**, or through a character (raw) interface, for example **/dev/rhd01**.

Device File Names for Fixed Disks		
Disk 1	Disk 2	Partition
/dev/hd00 /dev/rhd00	/dev/hd10 /dev/rhd10	entire disk
/dev/hd01 /dev/rhd01	/dev/hd11 /dev/rhd11	first partition
/dev/hd02 /dev/rhd02	/dev/hd12 /dev/rhd12	second partition
/dev/hd03 /dev/rhd03	/dev/hd13 /dev/rhd13	third partition
/dev/hd04 /dev/rhd04	/dev/hd14 /dev/rhd14	fourth partition
/dev/hd0a /dev/rhd0a	/dev/hd1a /dev/rhd1a	active partition
/dev/hd0d /dev/rhd0d	/dev/hd1d /dev/rhd1d	DOS partition
/dev/root /dev/rroot		root file system
/dev/swap /dev/rswap		swap area

Note that the root and swap file names do not exist for a second disk.

To access DOS partitions, specify letters such as "C:" or "D:" to indicate first or second partitions. The file **/etc/default/msdos** contains lines that assign a letter abbreviation for the DOS device name. Refer to *dos*(C).

The following table lists the minor device number definitions for the hard disk special files, along with examples. Note that the block and character special devices share the same minor device definition. The minor device number definition is as follows: bits 7 and 6 denote physical drive, bits 5-3 denote virtual(*fdisk*) partition and bits 2-0 denote *divvy* partition.

Minor Device Bits				
Phys. 7 6	Virtual 5 4 3	divvy 2 1 0	Device special file name	Description
0 0	0 0 0	0 0 0	/dev/hd00	whole PD 0
0 1	0 0 0	0 0 0	/dev/hd10	whole PD 1
1 0	0 0 0	0 0 0	/dev/hd20	whole PD 2
1 1	0 0 0	0 0 0	/dev/hd30	whole PD 3
0 0	0 0 1	1 1 1	/dev/hd01	PD 0, whole VD 1
0 0	0 1 0	1 1 1	/dev/hd02	PD 0, whole VD 2
0 0	0 1 1	1 1 1	/dev/hd03	PD 0, whole VD 3
0 0	1 0 0	1 1 1	/dev/hd04	PD 0, whole VD 4
0 0	1 0 1	1 1 1	/dev/hd0a	PD 0, whole active VD
0 0	1 1 0	1 1 1	/dev/hd0d	PD 0, whole DOS VD
0 0	1 0 1	0 0 0	/dev/root	PD 0, active virtual, DP 0
0 0	1 0 1	0 0 1	/dev/swap	PD 0, active virtual, DP 1
0 0	1 0 1	0 1 0	/dev/usr	PD 0, active virtual, DP 2
0 0	1 0 1	1 1 0	/dev/recover	PD 0, active virtual, DP 6
0 1	0 0 1	1 1 1	/dev/hd11	PD 1, whole VD 1
0 1	0 1 0	1 1 1	/dev/hd12	PD 1, whole VD 2
0 1	0 1 1	1 1 1	/dev/hd13	PD 1, whole VD 3
0 1	1 0 0	1 1 1	/dev/hd14	PD 1, whole VD 4
0 1	1 0 1	1 1 1	/dev/hd1a	PD 1, whole active VD
0 1	1 1 0	1 1 1	/dev/hd1d	PD 1, whole DOS VD
0 1	1 0 1	0 0 0	/dev/u0	PD 1, active virtual, DP 0†
0 1	1 0 1	0 0 1	/dev/u1	PD 1, active virtual, DP 1†
0 1	1 0 1	0 1 0	/dev/u2	PD 1, active virtual, DP 2†

KEY	VD = virtual drive DP = divvy partition	PD = physical drive † = user-defined name

The device files **usr** and **u[0-2]** are optional filesystem names; these nodes are not present unless created by the system administrator.

Files

/dev/hd0a
/dev/rhd0a
/dev/hd0[0-4]
/dev/rhd0[0-4]
/dev/hd0d
/dev/rhd0d
/dev/hd1a
/dev/rhd1a
/dev/hd1[0-4]
/dev/rhd1[0-4]
/dev/hd1d
/dev/rhd1d
/dev/usr
/dev/rusr
/dev/root
/dev/rroot
/dev/swap
/dev/rswap

See Also

fdisk(ADM), badtrk(ADM), divvy(ADM), dos(C), mkdev(ADM)

Diagnostics

The following messages are among those that may be printed on the console:

invalid fixed disk parameter table

and:

error on fixed disk (minor *n*), block = *nnnnn*,
cmd=*nnnnn*, status=*nnnn*,
Sector = *nnnnn*, Cylinder/head = *nnnnn*

Possible reasons for the first error include:

- The kernel is unable to get drive specifications, such as number of heads, cylinders, and sectors per track, from the disk controller ROM.
- Improper configuration.
- The disk is not turned on.
- The disk is not supported.

The second error specifies the following information:

- *block :* The XENIX block number within the device.
- *cmd :* The last command sent to the disk controller.
- *status :* The error status from the disk controller.
- *Sector* and *Cylinder/head* specify the location of a possible flaw. This information is used with *badtrk*(ADM).

Notes

On the first disk, **hd00** denotes the entire disk and is used to access the master boot block which includes the fdisk partition table. For the second disk, **hd10** denotes the entire disk and is used to access its fdisk partition table. Do not write to **hd10** and **hd00**.

Name

keyboard - The PC keyboard.

Description

The PC keyboard is used to enter data, switch screens, and send certain control signals to the computer. XENIX performs terminal emulation on the PC screen and keyboard, and, in doing so, makes use of several particular keys and key combinations. These keys and key combinations have special names that are unique to the XENIX system, and may or may not correspond to the keytop labels on your keyboard. These keys are described later.

When you press a key, one of the following happens:

- An ASCII value is entered
- A string is sent to the computer.
- A function is initiated.
- The meaning of another key, or keys, is changed.

When a key is pressed (a keystroke), the keyboard sends a scancode to the computer, it is interpreted by the keyboard driver. The interpretation of key codes may be modified so that keys can function differently from their default actions.

There are three special occurrences, or keystrokes:

- Switch screens.
- Send signals.
- Change the value of previous character, characters or string.

Switching Screens (Multiscreen)

To get to the next consecutive screen, enter **Ctrl-PrtSc** using the **Ctrl** key, and the **PrtSc** key. Any active screen may be selected by entering **alt-F***n*, where **F**n is one of the function keys. **F1** refers to the PC display (**/dev/tty01**).

Signals

A signal affects some process or processes. Examples of signals are **Ctrl-d** (end of input, exits from shell), **Ctrl-** (quits a process), **Ctrl-s** (stop output to the screen), and **Ctrl-q** (resume sending output).

Typically, characters are mapped to signals using *stty*(C). The only way to map signals is using *stty*.

Altering Values

The actual code sent to the keyboard driver can be changed by using certain keys in combination. For example, the SHIFT key changes the ASCII values of the alphanumeric keys. Holding down the **Ctrl** key while pressing another key sends a control code (**Ctrl-d**, **Ctrl-s**, **Ctrl-q**, etc.).

Special Keys

To help you find the special keys, the following table shows which keys on a typical console correspond to XENIX system keys. In this table, a hyphen (-) between keys means 'hold down the first key while pressing the second.'

XENIX Name	Keytop	Action
INTR	Del	Stops current action and returns to the shell. This key is also called the RUB OUT or INTERRUPT key.
BACKSPACE	←	Deletes the first character to the left of the cursor. Note that the "cursor left" key also has a left arrow (←) on its keytop, but you cannot backspace using that key.
Ctrl-d	Ctrl-d	Signals the end of input from the keyboard; also exits current shell.
Ctrl-h	Ctrl-h	Deletes the first character to the left of the cursor. Also called the ERASE key.
Ctrl-q	Ctrl-q	Restarts printing after it has been stopped with Ctrl-s.

Ctrl-s	Ctrl-s	Suspends printing on the screen (does not stop the program).
Ctrl-u	Ctrl-u	Deletes all characters on the current line. Also called the KILL key.
Ctrl-\	Ctrl-\	Quits current command and creates a *core* file, if allowed. (Recommended for debugging only.)
ESCAPE	Esc	Special code for some programs. For example, changes from insert mode to command mode in the *vi*(C) text editor.
RETURN	(down-left arrow or ENTER)	Terminates a command line and initiates an action from the shell.
F*n*	F*n*	Function key *n*. F1-F12 are unshifted, F13-F24 are shifted F1-F12, F25-F36 are Ctrl-F1 through F12, and F37-F48 are Ctrl-Shift-F1 through F12. The next F*n* keys (F49-F60) are on the number pad (unshifted): F49 - '7' F55 - '6' F50 - '8' F56 - '+' F51 - '9' F57 - '1' F52 - '-' F58 - '2' F53 - '4' F59 - '3' F54 - '5' F60 - '0' For keys F61 through F96, see **/usr/lib/keyboard/strings**. These function keys are not available on all keyboards, but you can map other keys to represent them.

The keyboard mapping is performed through a structure defined in **/usr/include/sys/keyboard.h**. Each key can have ten states. The first eight are:

- Base
- Shift
- Ctrl
- Alt
- Ctrl-Shift
- Alt-Shift
- Alt-Ctrl
- Alt-Ctrl-Shift

There are two additional states indicated by two special bytes. The

first is a "special state" byte whose bits indicate whether the key is "special" in one or more of the first eight states.

The second is one of four characters (C, N, B, O) which indicate how the lock keys affect the particular key. This is discussed further in the next section, "Scan Codes."

Keyboard Mode

Most keyboards normally are in a PC compatibility mode, though some can be put into a native AT keyboard mode. The XENIX utility *kbmode*(ADM) can be used to determine if a keyboard supports AT mode, and can also be used to put the keyboard into AT mode until the next time the system is rebooted. A system can also be configured to boot with the keyboard in AT mode with the *configure*(ADM) utility.

Enhanced keyboards are more fully programmable in AT mode. Also, it recognizes two control keys and an alt key.

Scan Codes

The following table describes the default contents of **/usr/lib/keyboard/keys**. The column headings are:

SCAN CODE - The scan code generated by the keyboard hardware when a key is pressed. There is no user access to the scan code generated by releasing a key.

BASE - The normal value of a key press.

SHIFT - The value of a key press when the SHIFT is also being held down.

LOCK - Indicates which lock keys affect that particular key:

- C indicates Capslock
- N indicates Numlock
- B indicates both
- O indicates locking is off

Keys affected by the lock keys C, B, or N, send the shifted value (scan code) of current state when that lock key is on. When the shift key is depressed while a lock key is also on, the key reverts (toggles) to its original state.

The other columns are the values of key presses when combinations of the CTRL, ALT and SHIFT keys are also held down.

All values, except for keywords, are ASCII character values. The keywords refer to the special function keys.

SCAN CODE	BASE	SHIFT	CTRL	CTRL SHIFT	ALT	ALT SHIFT	ALT CTRL	ALT CTRL SHIFT	LOCK
0	nop	nop	nop	nop	nop	nop	nop	nop	O
1	esc	esc	nop	nop	esc	esc	nop	nop	O
2	'1'	'!'	nop	nop	'1'	'!'	nop	nop	O
3	'2'	'@'	nop	nop	'2'	'@'	nop	nop	O
4	'3'	'#'	nop	nop	'3'	'#'	nop	nop	O
5	'4'	'$'	nop	nop	'4'	'$'	nop	nop	O
6	'5'	'%'	nop	nop	'5'	'%'	nop	nop	O
7	'6'	'^'	rs	rs	'6'	'^'	rs	rs	O
8	'7'	'&'	nop	nop	'7'	'&'	nop	nop	O
9	'8'	'*'	nop	nop	'8'	'*'	nop	nop	O
10	'9'	'('	nop	nop	'9'	'('	nop	nop	O
11	'0'	')'	nop	nop	'0'	')'	nop	nop	O
12	'-'	'_'	ns	ns	'-'	'_'	ns	ns	O
13	'='	'+'	nop	nop	'='	'+'	nop	nop	O
14	bs	bs	del	del	bs	bs	del	del	O
15	ht	btab	nop	nop	ht	btab	nop	nop	O
16	'q'	'Q'	dc1	dc1	'q'	'Q'	dc1	dc1	C
17	'w'	'W'	etb	etb	'w'	'W'	etb	etb	C
18	'e'	'E'	enq	enq	'e'	'E'	enq	enq	C
19	'r'	'R'	dc2	dc2	'r'	'R'	dc2	dc2	C
20	't'	'T'	dc4	dc4	't'	'T'	dc4	dc4	C
21	'y'	'Y'	em	em	'y'	'Y'	em	em	C
22	'u'	'U'	nak	nak	'u'	'U'	nak	nak	C
23	'i'	'I'	ht	ht	'i'	'I'	ht	ht	C
24	'o'	'O'	si	si	'o'	'O'	si	si	C
25	'p'	'P'	dle	dle	'p'	'P'	dle	dle	C
26	'['	'{'	esc	esc	'['	'{'	esc	esc	O
27	']'	'}'	gs	gs	']'	'}'	gs	gs	O
28	cr	cr	nl	nl	cr	cr	nl	nl	O
29	ctrl	ctrl	ctrl	ctrl	ctrl	ctrl	ctrl	ctrl	O
30	'a'	'A'	soh	soh	'a'	'A'	soh	soh	C
31	's'	'S'	dc3	dc3	's'	'S'	dc3	dc3	C
32	'd'	'D'	eot	eot	'd'	'D'	eot	eot	C
33	'f'	'F'	ack	ack	'f'	'F'	ack	ack	C
34	'g'	'G'	bel	bel	'g'	'G'	bel	bel	C
35	'h'	'H'	bs	bs	'h'	'H'	bs	bs	C
36	'j'	'J'	nl	nl	'j'	'J'	nl	nl	C
37	'k'	'K'	vt	vt	'k'	'K'	vt	vt	C
38	'l'	'L'	np	np	'l'	'L'	np	np	C
39	';'	':'	nop	nop	';'	':'	nop	nop	O
40	'\"	'"'	nop	nop	'\"	'"'	nop	nop	O
41	'`'	'~'	nop	nop	'`'	'~'	nop	nop	O

42	lshift	lshift	lshift	lshift	lshift	lshift	lshift	lshift	O
43	'\\'	'|'	fs	fs	'\\'	'|'	fs	fs	O
44	'z'	'Z'	sub	sub	'z'	'Z'	sub	sub	C
45	'x'	'X'	can	can	'x'	'X'	can	can	C
46	'c'	'C'	etx	etx	'c'	'C'	etx	etx	C
47	'v'	'V'	syn	syn	'v'	'V'	syn	syn	C
48	'b'	'B'	stx	stx	'b'	'B'	stx	stx	C
49	'n'	'N'	so	so	'n'	'N'	so	so	C
50	'm'	'M'	cr	cr	'm'	'M'	cr	cr	C
51	','	'<'	nop	nop	','	'<'	nop	nop	O
52	'.'	'>'	nop	nop	'.'	'>'	nop	nop	O
53	'/'	'?'	nop	nop	'/'	'?'	nop	nop	O
54	rshift	rshift	rshift	rshift	rshift	rshift	rshift	rshift	O
55	'*'	'*'	nscr	nscr	'*'	'*'	nscr	nscr	O
56	alt	alt	alt	alt	alt	alt	alt	alt	O
57	' '	' '	' '	' '	' '	' '	' '	' '	O
58	clock	clock	clock	clock	clock	clock	clock	clock	O
59	fkey1	fkey13	fkey25	fkey37	scr1	scr11	scr1	scr11	O
60	fkey2	fkey14	fkey26	fkey38	scr2	scr12	scr2	scr12	O
61	fkey3	fkey15	fkey27	fkey39	scr3	scr13	scr3	scr13	O
62	fkey4	fkey16	fkey28	fkey40	scr4	scr14	scr4	scr14	O
63	fkey5	fkey17	fkey29	fkey41	scr5	scr15	scr5	scr15	O
64	fkey6	fkey18	fkey30	fkey42	scr6	scr16	scr6	scr16	O
65	fkey7	fkey19	fkey31	fkey43	scr7	scr7	scr7	scr7	O
66	fkey8	fkey20	fkey32	fkey44	scr8	scr8	scr8	scr8	O
67	fkey9	fkey21	fkey33	fkey45	scr9	scr9	scr9	scr9	O
68	fkey10	fkey22	fkey34	fkey46	scr10	scr10	scr10	scr10	O
69	nlock	nlock	dc3	dc3	nlock	nlock	dc3	dc3	O
70	slock	slock	del	del	slock	slock	del	del	O
71	fkey49	'7'	'7'	'7'	'7'	'7'	'7'	'7'	N
72	fkey50	'8'	'8'	'8'	'8'	'8'	'8'	'8'	N
73	fkey51	'9'	'9'	'9'	'9'	'9'	'9'	'9'	N
74	fkey52	'-'	'-'	'-'	'-'	'-'	'-'	'-'	N
75	fkey53	'4'	'4'	'4'	'4'	'4'	'4'	'4'	N
76	fkey54	'5'	'5'	'5'	'5'	'5'	'5'	'5'	N
77	fkey55	'6'	'6'	'6'	'6'	'6'	'6'	'6'	N
78	fkey56	'+'	'+'	'+'	'+'	'+'	'+'	'+'	N
79	fkey57	'1'	'1'	'1'	'1'	'1'	'1'	'1'	N
80	fkey58	'2'	'2'	'2'	'2'	'2'	'2'	'2'	N
81	fkey59	'3'	'3'	'3'	'3'	'3'	'3'	'3'	N
82	fkey60	'0'	'0'	'0'	'0'	'0'	'0'	'0'	N
83	del	'.'	del	del	del	del	del	del	N
84	ns	ns	ns	ns	ns	ns	ns	ns	O
85	nop	nop	nop	nop	nop	nop	nop	nop	O
86	nop	nop	nop	nop	nop	nop	nop	nop	O

The following scan codes exist only for keyboards which support, and are in, native AT mode rather than PC compatibility mode.

SCAN CODE	BASE	SHIFT	CTRL	CTRL SHIFT	ALT	ALT SHIFT	ALT CTRL	ALT CTRL SHIFT	LOCK
87	fkey11	fkey23	fkey35	fkey47	scr11	scr11	scr11	scr11	O
88	fkey12	fkey24	fkey36	fkey48	scr12	scr12	scr12	scr12	O
89	nop	nop	nop	nop	nop	nop	nop	nop	O
90	nop	nop	nop	nop	nop	nop	nop	nop	O
91	nop	nop	nop	nop	nop	nop	nop	nop	O
92	nop	nop	nop	nop	nop	nop	nop	nop	O
93	nop	nop	nop	nop	nop	nop	nop	nop	O
94	nop	nop	nop	nop	nop	nop	nop	nop	O
95	nop	nop	nop	nop	nop	nop	nop	nop	O
96	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	O
97	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	O
98	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	O
99	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	O
100	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	O
101	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	O
102	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	O
103	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	O
104	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	O
105	del	del	del	del	del	del	del	del	N
106	fkey54	fkey54	fkey54	fkey54	fkey54	fkey54	fkey54	fkey54	O
107	nop	nop	nop	nop	nop	nop	nop	nop	O
108	nop	nop	nop	nop	nop	nop	nop	nop	O
109	nop	nop	nop	nop	nop	nop	nop	nop	O
110	nop	nop	nop	nop	nop	nop	nop	nop	O
111	nop	nop	nop	nop	nop	nop	nop	nop	O
112	nop	nop	nop	nop	nop	nop	nop	nop	O
113	nop	nop	nop	nop	nop	nop	nop	nop	O
114	nop	nop	nop	nop	nop	nop	nop	nop	O
115	nop	nop	nop	nop	nop	nop	nop	nop	O
116	nop	nop	nop	nop	nop	nop	nop	nop	O
117	nop	nop	nop	nop	nop	nop	nop	nop	O
118	nop	nop	nop	nop	nop	nop	nop	nop	O
119	nop	nop	nop	nop	nop	nop	nop	nop	O
120	nop	nop	nop	nop	nop	nop	nop	nop	O
121	nop	nop	nop	nop	nop	nop	nop	nop	O
122	nop	nop	nop	nop	nop	nop	nop	nop	O
123	nop	nop	nop	nop	nop	nop	nop	nop	O
124	nop	nop	nop	nop	nop	nop	nop	nop	O
125	nop	nop	nop	nop	nop	nop	nop	nop	O
126	nop	nop	nop	nop	nop	nop	nop	nop	O
127	nop	nop	nop	nop	nop	nop	nop	nop	O
128	rctrl	rctrl	rctrl	rctrl	rctrl	rctrl	rctrl	rctrl	O

129	ralt	ralt	ralt	ralt	ralt	ralt	ralt	ralt	O
130	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	fkey60	O
131	del	del	del	del	del	del	del	del	N
132	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	fkey49	O
133	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	fkey57	O
134	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	fkey51	O
135	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	fkey59	O
136	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	fkey53	O
137	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	fkey55	O
138	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	fkey50	O
139	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	fkey58	O
140	'/'	nop	nop	nop	'/'	nop	nop	nop	O
141	cr	cr	nl	nl	cr	cr	nl	nl	O

The next table lists the "value" of each of the special keywords used in **/usr/lib/keyboard/keys** (and the preceding table). *mapkey*(ADM) places a "value" in the *ioctl* buffer during key mapping. The keywords are only used in the scan code file (**/usr/lib/keyboard/keys**) for readability.

Name	Value	Meaning
nop	0	No operation - no action from keypress
lshift	2	Left hand shift
rshift	3	Right hand shift
clock	4	Caps lock
nlock	5	Numeric lock
slock	6	Scroll lock
alt	7	Alt key
btab	8	Back tab key - generates fixed sequence (esc [Z)
ctrl	9	Control key
nscr	10	Switch to the next screen
scr1	11	Switch to screen #1
...		...
scr16	26	Switch to screen #16
fkey1	27	Function key #1
...		...
fkey96	122	Function key #96
rctl	128*	Right Control Key
ralt	129*	Right Alt Key

* AT mode keyboard only.

This table lists names and decimal values that are interchangeable in the *mapkey* file. Names are used in place of numeric constants to make it easier to read the scan code table. Again, only the decimal values are placed in the *ioctl* buffer. These are taken from **ascii**(M).

Name	Value	Name	Value
nul	0	dc1	17
soh	1	dc2	18
stx	2	dc3	19
etx	3	dc4	20
eot	4	nak	21
enq	5	syn	22
ack	6	etb	23
bel	7	can	24
bs	8	em	25
ht	9	sub	26
nl	10	esc	27
vt	11	fs	28
np	12	gs	29
cr	13	rs	30
so	14	ns	31
si	15	del	127
dle	16		

Keyboard Mapping

The PC keyboard is mapped as part of terminal emulation. This kind of mapping is performed only on the computer keyboard, not on remote terminals. Use *mapkey* to change keyboard mapping. To change the mapping for individual channels (multiscreens), use *mapchan*(M).

Keyboard mapping can also be performed using *ioctl*. The syntax is the same as for string key mapping (see previous section).

For keyboard mapping, *cmd* is GIO_KEYMAP to display the current map, and PIO_KEYMAP puts the prepared buffer into place.

String Key Mapping

To map string (function) keys, use the *mapstr* (see *mapkey*(ADM)) utility. *mapstr* modifies the string mapping table where function keys are defined.

The string mapping table is an array of 512 bytes (typedef *strmap_t*) containing null terminated strings that redefine the function keys. The first null terminated string is assigned to the first string key, the second string to the second string key, and so on.

There is no limit to the length of any particular string as long as the whole table does not exceed 512 bytes, including nulls. Strings are made null by the introduction of extra null characters.

The following is a list of default function key values:

Default Function Key Values				
Key #	Function	Shift Function	Ctrl Function	Ctrl Shift Function
1	ESC [M	ESC [Y	ESC [k	ESC [w
2	ESC [N	ESC [Z	ESC [l	ESC [x
3	ESC [O	ESC [a	ESC [m	ESC [y
4	ESC [P	ESC [b	ESC [n	ESC [z
5	ESC [Q	ESC [c	ESC [o	ESC [@
6	ESC [R	ESC [d	ESC [p	ESC [[
7	ESC [S	ESC [e	ESC [q	ESC [\
8	ESC [T	ESC [f	ESC [r	ESC []
9	ESC [U	ESC [g	ESC [s	ESC [^
10	ESC [V	ESC [h	ESC [t	ESC [_
11	ESC [W	ESC [i	ESC [u	ESC [`
12	ESC [X	ESC [j	ESC [v	ESC [{

Home	ESC [H	End	ESC [F
Up arrow	ESC [A	Down arrow	ESC [B
Page up	ESC [I	Page down	ESC [G
Left arrow	ESC [D	5	ESC [E
Right arrow	ESC [C	Insert	ESC [L

You can also map string keys using *ioctl* (S). The syntax is:

```
#include <sys/keyboard.h>
ioctl(fd,cmd,buf)
int fd, cmd;
char *buf;
...
```

For string key mapping where *cmd* is GIO_STRMAP to display the string mapping table and PIO_STRMAP to put the new string mapping table in place.

Files

/usr/lib/keyboard/keys
/usr/lib/keyboard/strings

See Also

mapchan(F), mapchan(M), mapkey(ADM), multiscreen(M), screen(HW), setkey(C), stty(C), kbmode(ADM), configure(ADM)

Name

lp, lp0, lp1, lp2 - Line printer device interfaces.

Description

The **lp0** , **lp1**, and **lp2** files provide access to the optional parallel ports of the computer. The **lp0** and **lp2** files provide access to parallel ports 1 and 2, respectively. The **lp1** file provides access to the parallel port on the monochrome adaptor.

Only one of **lp0** and **lp1** may be used on a given system. To access two parallel printers on a system, use either **lp0** or **lp1**, and **lp2**.

Files

/dev/lp0
/dev/lp1
/dev/lp2

See Also

lp(C), lpadmin(ADM), lpsched(ADM), lpinit(ADM)

Notes

The standard **lp** ports, **lp0**, **lp1**, and **lp2** send a printer initialization string the first time the file is opened after the system is *booted*.

Not all computers have an alternate parallel port slot.

Name

Machine - Description of host machine.

Description

This page lists the internal characteristics of personal computers which use the Intel 8086 processor family and its associated hardware. The information is intended for software developers who wish to transfer relocatable object or executable files from other XENIX machines to a personal computer then prepare the files for execution on the personal computer.

Central Processing Unit	Intel 8086, 8088, 80186, 80286, 80386
Disk Block Size (BSIZE)	1024 bytes
Memory Management Scheme	Unmapped (8086, 8088, 80186) Segmented (80286) Segmented and paged (80386)
Split Instruction and Data	Supported
Variable Stack Size	Supported (8086, 80386 only) (8086, 80386 default configuration)
Fixed Stack Size	Supported (80286 default configuration)
Clock Ticks	.05 second (8086, 8088, 80186) .02 second (80286, 80386)

Binary Compatibility

The small and middle model binary programs created by the C compiler *cc*(CP) run on many processors. The following chart shows which XENIX systems running on which processors produce code executable on other machines. It is assumed that system specific system calls are not used to produce portable code. *cc*(CP) produces code by default, but can also be used as a cross development compiler, by using the appropriate flags.

SCO-*nn* is XENIX distributed by The Santa Cruz Operation, Inc. MS-*nn* is XENIX distributed by Microsoft Corporation. Intel XENIX is distributed by Intel Corporation. Altos XENIX is distributed by Altos Computer Systems. *nn* designates the machine processor. System designates the version of XENIX, either 2.3, 3.0, or System V.

Binary Compatibility			
Your System Processor	**Default compiler produces programs which run on System/Processor**	**Runs default programs created on System/Processor**	**Compiles (cross development) programs for System/Processor**
SCO-86 3.0	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 SysV	SCO-86 3.0 SCO-186 3.0 Intel, Altos-86 2.3, 3.0	DOS*
SCO-86 SystemV	SCO-86 Sys V SCO-186 Sys V SCO-286 Sys V MS-286 Sys V	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 Sys V Intel, Altos-86 2.3, 3.0	MS-286 3.0† DOS*
SCO-186 3.0	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 Sys V	SCO-86 3.0 SCO-186 3.0 Intel, Altos-86 2.3, 3.0	DOS*
SCO-186 System V	SCO-86 Sys V SCO-186 Sys V SCO-286 Sys V MS-286 Sys V	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 Sys V Intel, Altos-86 2.3, 3.0	MS-286 3.0† DOS*
SCO-286 3.0	SCO-286 [3.0, Sys V] MS-286 [3.0†, Sys V]	SCO-286 3.0 MS-286 3.0†	DOS*
SCO-286 System V	SCO-86 Sys V SCO-186 Sys V SCO-286 Sys V MS-286 Sys V	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 [3.0, Sys V] MS-286 [3.0†, Sys V]	SCO-286 3.0 MS-286 3.0† DOS*
SCO-386 System V	SCO-86 Sys V SCO-186 Sys V SCO-286 Sys V SCO-386 Sys V MS-286 Sys V MS-386 Sys V	SCO-86 [3.0, Sys V] SCO-186 [3.0, Sys V] SCO-286 [3.0, Sys V] SCO-386 [Sys V] MS-286 [3.0†, Sys V] MS-386 [Sys V]	SCO-286 3.0 MS-286 3.0† DOS*
MS-286 3.0†	MS-286 [3.0†, Sys V] SCO-286 Sys V	SCO-286 3.0	DOS*
MS-286 System V	MS-286 Sys V SCO-286 Sys V	SCO-86 [3.0, Sys V]‡ SCO-186 [3.0, Sys V]‡ SCO-286 [3.0, Sys V]‡	DOS*
MS-386 System V	MS-386 Sys V SCO-386 Sys V	SCO-86 [3.0, Sys V]‡ SCO-186 [3.0, Sys V]‡ SCO-286 [3.0, Sys V]‡ SCO-386 [Sys V]‡	DOS*

* MS-DOS for i8086/8088, i80186 and i80286 processors.
† MS-286 3.0 XENIX is equivalent to Intel 286 3.0 XENIX.
‡ untested, pending release of this product.

See also

cc(CP), ld(CP), a.out(F).

Name

mouse - System mouse.

Description

XENIX supports mice attached directly to controller cards on the bus and mice attached to standard serial ports. The command:

mkdev mouse

is used to configure a new mouse or to reconfigure an existing mouse.

See Also

Files

/dev/mouse	Directory for mouse-related special device files.
/dev/mouse/bus[0-1]	Bus mouse device files.
/dev/mouse/vpix[0-1]	vpix-mouse device files.
/dev/mouse/microsoft_ser	Microsoft serial mouse device files.
/dev/mouse/logitech_ser	Logitech serial mouse device files.
/dev/mouse/mousesys_ser	Mousesys serial mouse device files.
/dev/ttyp[0-7]	Special pseudo-tty files for mouse input.
/etc/default/usemouse	Default map file for mouse-generated characters.
/usr/lib/event/devices	File containing device information for mice.
/usr/lib/event/ttys	File listing ttys eligible to use mice.
/usr/lib/mouse/*	Alternate map files for mice.

mkdev(ADM), usemouse(C)

Name

parallel - Parallel interface devices.

Description

There are several parallel devices:

/dev/lp0 Main parallel adapter.

/dev/lp1 Adapter on monochrome video card.

/dev/lp2 Alternate parallel adapter (on appropriate machines).

It is not possible to have all three parallel devices on one system. XT computers only allow the use of **/dev/lp0**. Some AT computers allow the use of two parallel devices, **/dev/lp2**, and either **/dev/lp0** or **/dev/lp1**. However, available devices vary from machine to machine, and may instead allow either **/dev/lp0**, or and either **/dev/lp1**, and **/dev/lp2**.

If a parallel device fails to interrupt properly, the parallel driver enters "poll mode." Once interrupts are received from the device, the driver returns to its original mode.

The parallel driver delays a certain amount of time when a parallel device is closed. The amount of delay can affect printer performance, but is necessary to compensate for different sizes of printer buffers and printer speeds. For example, this command sets the delay on close to 1 second, specified in 10ths of a second:

```
stty time 10< /dev/lp0
```

When given from a prompt, this command will only work if the port is open. It is recommended that a variation of this command be placed in the interface script used with the parallel device to achieve the same results:

```
stty time 10 0< &1
```

Notes

Parallel adapters on add-on cards will function, but switches must be set correctly. Some compatible computers have ports lp0 and lp1 reversed.

The *stty*(C) command for output processing is supported on a parallel device. *stty* options that have no effect on a parallel device are ignored and no error messages are displayed.

Usage

Usually invoked by through *lp*(C), but can be written to directly.

Files

/dev/lp0
/dev/lp1
/dev/lp2

See Also

lp(C), lp(HW), lpadmin(ADM), lpinit(ADM), lpsched(ADM), serial(HW)

Name

ramdisk - Memory block device

Description

The *ramdisk* device driver provides a block interface to memory. A *ramdisk* can be used like any other block device, including making it into a file systems using *mkfs*(ADM). There are eight *ramdisk*s available.

The characteristics of a *ramdisk* file are determined by its minor device number. The bits in the minor device number encode its size, longevity, and which of the eight possible *ramdisk*s it is.

The three low-order bits of the minor device number determine which of the eight *ramdisk*s is being accessed.

The next four bits of the minor device number determine the size of the *ramdisk*. The size of a *ramdisk* must be a power of 2, and must be at least 16K. Since 4 bits are available, there are 16 possible sizes, starting at 16K and doubling every time the size indicator is incremented, to produce possible sizes of 16K, 32K, 64K, and up.

The high-order bit is a longevity indicator. If set, memory is permanently allocated to that *ramdisk*, and can be deallocated only by rebooting the system. Permanent *ramdisk*s can only be allocated by the superuser. However, once a permanent *ramdisk* is allocated (by opening it), it can be read and written by anyone having the appropriate permissions on the *ramdisk* inode.

If clear, the *ramdisk* is deallocated when no processes have it open. To create an easily removable, but semi-permanent *ramdisk*, use a separate process to keep the device open for as long as necessary.

Since a complete set of *ramdisks* (8) would consume 256 inodes, only one example 16K *ramdisk* (**/dev/ram00**) is created when the system is installed. The system administrator can check this existing file to determine the major device number for any other required *ramdisks*. All *ramdisks* will use the same major device number.

The following table shows how the minor device number is constructed:

Example Minor Device Number Construction									
Description	Longevity	Size (see next table)				Ram Disk No.			Minor Device Number
16K (#1) (Temporary)	0	0	0	0	0	0	0	1	1
16K (#1) (Permanent)	1	0	0	0	0	0	0	1	129
64K (#0) (Temporary)	0	0	0	1	0	0	0	0	16
512K (#7) (Permanent)	1	0	1	0	1	1	1	1	175

The contents of the size field and the corresponding *ramdisk* size is shown in the next table.

Size Bits				Ramdisk Size
0	0	0	0	16K
0	0	0	1	32K
0	0	1	0	64K
0	0	1	1	128K
0	1	0	0	256K
0	1	0	1	512K
0	1	1	0	1M
0	1	1	1	2M
1	0	0	0	4M
1	0	0	1	8M
1	0	1	0	16M
1	0	1	1	32M
1	1	0	0	64M
1	1	0	1	128M
1	1	1	0	256M
1	1	1	1	512M

To create a ramdisk, follow these steps:

1. Create the device node.

You must first create the device that the ramdisk will reside on. It has the form:

mknod *device_name b_or_c major_device_number minor_device_number*

where *b_or_c* "b" or "c". ''b" is for blocked devices and is the one you will use. The major number will always be 31. The minor number is derived from the table above. The minor number is the sum of the three attribute columns.

Longevity:
permanent = 128 non-permanent = 0

Size:

16K = 0	128K = 24	1 Meg = 48	8 Meg = 72
32K = 8	256K = 32	2 Meg = 56	16 Meg = 80
64K = 16	512K = 40	4 Meg = 64	32 Meg = 88

Ram Disk number: 0 through 7 Note: There are only 8 devices available. Two different size devices may not share the same number.

For example, to create a 64K permanent ramdisk, the minor number could vary from 144 to 151. If the disk number was 1 the mknod command would be:

```
mknod /dev/ram64 b 31 145
```

2. Make a file system.

This creates a file system on the the ramdisk. In this example *mkfs* has the form:

mkfs *device_name size_of_file_in_Bsize_blocks*

In this example, the command to create a 64K file system would be:

```
mkfs /dev/ram64 64
```

3. Mount the filesystem.

This mounts the selected device on the specified mount point. It has the form:

```
mount device_name mount_point
```

In order to mount the example 64K ramdisk on /mnt the command would be:

```
mount /dev/ram64 /mnt
```

To make a file system on a non-permanent *ramdisk*, the device file must be held open between the *mkfs* and the *mount*(ADM) operations. Otherwise, the *ramdisk* is allocated at the start of the *mkfs* command, and deallocated at its end. Once the *ramdisk* is mounted, it is open until it is unmounted.

The following shell fragment shows one way to use *mkfs* on a non-permanent 512K *ramdisk*, then mount it:

```
(       /etc/mkfs /dev/ram40 512
        /etc/mount /dev/ram40 /mnt
) < /dev/ram40
```

Notes

*ramdisk*s must occupy contiguous memory. If free memory is fragmented, opening a *ramdisk* may fail even though there is enough total memory available. Ideally, all *ramdisk*s should be allocated at system startup. This helps prevent the *ramdisk*s themselves from fragmenting memory.

ramdisks are geared towards use in specialized applications. In many cases, you will notice a *decrease in system performance* when *ramdisks* are used, because XENIX can generally put the memory to better use elsewhere.

Files

/dev/ram00

See Also

mkfs(ADM), mount(ADM), mknod(C)

screen - tty[01-n], color, monochrome, ega, vga display adapter and video monitor

Description

The **tty[01-*n*]** device files provide character I/O between the system and the video display monitor and keyboard. Each file corresponds to a separate teletype device. Although there is a maximum of 12 screens, the exact number available (*n*) depends upon the amount of memory in the computer. The screens are modeled after a 25 line, 80 column ASCII terminal, unless specified otherwise.

System error messages from the kernel are written to **/dev/console**, which is normally the current multiscreen. If the **/dev/console** is the default output device for system error messages, and the display being used is switched to graphics mode, console messages are not displayed. When the video device returns to text mode, a notice message is displayed and the text of the kernel error can be recovered from **usr/adm/messages**.

Although all **tty**[01-*n*] devices may be open concurrently, only one of the corresponding devices can be active at any given time. The active device displays its own screen and takes sole possession of the keyboard. It is an error to attempt to access the **color**, **monochrome**, or **ega** file when no corresponding adapter exists or no multiscreens are associated with it.

To get to the next consecutive screen, enter **Ctrl-PrtSc** using the **Ctrl** key, and the **PrtSc** key. Any active screen may be selected by entering **alt-Fn**, where **Fn** is one of the function keys. For example, **F1** refers to the **tty01** device.

Control Modes

Multiscreens can be reassigned to different adapters (in multi-adapter systems) with these *ioctl*s :

SWAPMONO	Selects the monochrome display as the output device for the multiscreen.
SWAPCGA	Selects the regular color display as the output device for the multiscreen.
SWAPEGA	Selects the enhanced color display as the output device for the multiscreen.

SWAPVGA	Selects the video graphics array color display as the output device for the multiscreen.

To find out which display adapter type is currently attached to the multiscreen, you can use *ioctl*(S) with the following request:

CONS_CURRENT	Returns the display adapter type currently associated with the multiscreen. The return value can be one of: MONO, CGA, EGA, or VGA.

Display Modes

The following *ioctl*s can be used to change the video display mode:

SW_B80x25	Selects 80x25 black and white text display mode. (MONO, CGA, EGA, VGA)
SW_C80x25	Selects 80x25 color text display mode. (CGA, EGA, VGA)
SW_B40x25	Selects 40x25 black and white text display mode. (MONO, CGA, EGA, VGA)
SW_C40x25	Selects 40x25 color text display mode. (CGA, EGA, VGA)
SW_BG320	Selects 320x200 black and white graphics display mode. (CGA, EGA, VGA)
SW_CG320	Selects 320x200 color graphics display mode. (CGA, EGA, VGA)
SW_BG640	Selects 640x200 black and white graphics display mode. (CGA, EGA, VGA)
SW_EGAMONO80x25	Selects EGA (Enhanced Graphics Adapter) mode 7 - emulates support provided by the monochrome display. (EGA, VGA)
SW_EGAMONOAPA	Selects EGA support for 640x350 graphics display mode (EGA mode F). (EGA with mono monitor)

SW_ENHMONOAPA2	Selects EGA mode F*. (EGA with mono monitor)
SW_ENHB40x25	Selects enhanced EGA support for 40x25 black and white text display mode. (EGA, VGA)
SW_ENHC40x25	Selects enhanced EGA support for the 40x25 color text display mode. (EGA, VGA)
SW_ENHB80x25	Selects enhanced EGA support for 80x25 black and white text display mode. (EGA, VGA)
SW_ENHC80x25	Selects enhanced EGA support for 80x25 color text display mode. (EGA, VGA)
SW_ENHB80x43	Selects enhanced EGA support for 80x43 black and white text display mode. (EGA, VGA)
SW_ENHC80x43	Selects enhanced EGA support for 80x43 color text display mode. (EGA, VGA)
SW_CG320_D	Selects EGA support for 320x200 graphics display mode. (EGA mode D.) (EGA, VGA)
SW_CG640_E	Selects EGA support for 640x200 graphics display mode (EGA mode E). (EGA, VGA)
SW_CG640x350	Selects EGA support for 640x350 graphics display mode (EGA mode 10). (EGA, VGA)
SW_ENH_CG640	Selects EGA mode 10*. (EGA, VGA)
SW_MCAMODE	Reinitializes the monochrome adapter. (MONO)
SW_VGA40x25	Selects VGA support for the 40x25 color text display mode (VGA mode 1+). (VGA)
SW_VGA80x25	Selects VGA support for the 80x25 black and white text display mode (VGA mode 2+). (VGA)
SW_VGAM80x25	Selects VGA mode 7+ - emulates support provided by the monochrome display. (VGA with mono monitor)

SW_VGA11	Selects VGA support for the 640x480 graphics display mode (VGA mode 11). (VGA)
SW_VGA12	Selects VGA support for the 640x480 graphics display mode (VGA mode 12). (VGA)
SW_VGA13	Selects VGA support for the 320x200 graphics display mode (VGA mode 13). (VGA)

Switching to an invalid display mode for a display device will result in an error.

Getting Display Modes

The following *ioctl( )* requests are provided to obtain information about the current display modes:

CONS_GET	Returns the current display mode setting for current display adapter. (All)
CGA_GET	Returns the current display mode setting of the color graphics adapter. (CGA only)
EGA_GET	Returns the current display mode setting of the enhanced graphics adapter. (EGA only)
MCA_GET	Returns the current display mode setting of the monochrome adapter. (MONO only)
VGA_GET	Returns the current display mode of the video graphics adapters. (VGA only)
CONS_GETINFO	Returns structure *vid_info* (below). Size of structure (first field) must be filled in by user.

```
struct vid_info
{
      short   size;               /* must be first field          */
      short   m_num;              /* multiscreen number, 0 based  */
      ushort  mv_row, mv_col;     /* cursor position              */
      ushort  mv_rsz, mv_csz;     /* text screen size             */
      struct  colors mv_norm,     /* normal attributes            */
                     mv_rev,      /* reverse video attributes     */
                     mv_grfc;     /* graphic character attributes */
      uchar_t mv_ovscan;          /* border color                 */
      uchar_t mk_keylock;         /* caps/num/scroll lock         */
};
```

CONS_6845INFO	Returns structure *m6845_info* (below). Size of structure (first field) must be filled in by user.

```
struct m6845_info
{
     short   size;          /* must be first field       */
```

```
    ushort  screen_top;     /* offset of screen in video  */
    ushort  cursor_type;    /* cursor shape               */
};
```

CONSADP — Returns number of multiscreen displayed on adaptor associated with that multiscreen.

GIO_ATTR — Return value of ioctl is 6845-style attribute byte in effect.

GIO_COLOR — Return value of ioctl is zero or one depending on whether the device supports color

GIO_SCRNMAP — Gets the 256-byte screen map table, which is the mapping of ASCII values (0-256) onto the PC video ROM font characters (0-256). Note that control characters (ASCII values less than hex 20) have control functions and do not display ROM characters (example: ^J is new-line).

This is often used to map the low font values that normally correspond to ASCII control values to higher ASCII values, thus displaying the desired ROM characters.

PIO_SCRNMAP — Puts the 256-byte screen map table (see GIO_SCRNMAP).

PIO_KEYMAP — See *keyboard*(HW)

PIO_KEYMAP — See *keyboard*(HW)

GIO_FONT8X*n* — Gets font, where is 8, 14, and 16. Argument is a pointer to a font table. Size of 8X8 font table is 8X256 bytes, 8X14 is 14X256 bytes, etc.

PIO_FONT8X*n* — Puts font, where is 8, 14, and 16. Argument is a pointer to a font table. Size of 8X8 font table is 8X256 bytes, 8X14 is 14X256 bytes, etc.

Memory Mapping Modes

The *ioctl*(S) routine is used to map the display memory of the various devices into the user's data space.

Note that the MAP* ioctls map the memory associated with the current mode. You must put the adapter into the desired mode before performing mapping, or the pointers returned will not be appropriate. Refer to your hardware manual for details on various displays, adapters, and controllers.

These *ioctl*( ) requests can be used to map the display memory:

MAPCONS	Maps the display memory of the adaptor currently being used into the user's data space. (All)
MAPMONO	Maps the monochrome adapter's display memory into the user's data space. (MONO only)
MAPCGA	Maps the color adapter's display memory into the user's data space. (CGA only)
MAPEGA	Maps the enhanced graphics adapter's display memory into the user's data space. (EGA only)
MAPVGA	Maps the video graphics adapter's display memory into the user's data space. (VGA only)

For example, the following code can be used to acquire a pointer to the start of the user data space associated with the color graphics adapter display memory:

```
char *dp;
int retval;
     .
     .
     .
/* fd is a file descriptor for a
   multiscreen device */
retval = ioctl (fd, MAPCONS,0L);
dp = (char *) retval;
     .
     .
     .
```

Note that when the display memory is mapped into the user space, the adapter's m6845 start address registers are not set. The start address can be reset in two ways, so that the start address of the display memory corresponds to the upper left hand corner of the screen:

1. Switch modes with an *ioctl*() (the "switch" can be to the present mode). See the "Display Modes" section of this manual page.

2. Change the start address high and low address with the *in-on-port/out-on-port ioctl*().

The *in-on-port/out-on-port* ioctl()'s can also be used to determine the current value in the start address register, and then set up a pointer to point to the offset in the mapped-in data space.

MAP_CLASS
Package ioctl that gives I/O privileges to an arbitrary list of ports and maps an arbitrary frame buffer into user's address space identified by a string found in the struct vidclass vidclasslist[] located in **/usr/include/sys/vtkd.h.**

EGA_IOPRIVL

VGA_IOPRIVL
These add the list of IO ports found on standard EGA and VGA cards into the process' TSS IO permission bitmap. This allows the process to access the EGA or VGA io ports directly from user space with 386 IN and OUT instructions.

KDDISPTYPE
This call returns display information to the user. The argument expected is the buffer address of a structure of type *kd_disparam* into which display information is returned to the user. The *kd_disparam* structure is defined as follows:

```
struct kd_disparam {
        long type;      /*display type*/
        char *addr;     /*display memory address*/
}
```

Possible values for the *type* field include:

KD_MONO (0x01), for the IBM monochrome display adapter.

KD_HERCULES (0x02), for the Hercules monochrome graphics adapter.

KD_CGA (0x03), for the IBM color graphics adapter.

KD_EGA (0x04), for the IBM enhanced graphics adapter.

KD_VGA (0x05), for the IBM video graphics adapter.

KDDISPINFO
Returns *struct kd_disparam*, which contains adaptor type and physical address of frame buffer.

KIOCSOUND
Start sound generation. Turn on sound. The *arg* is the frequency desired. A frequency of 0 turns off the sound. This is useful for generating tones while in graphics mode.

KDGETLED
Get keyboard LED status. The argument is a pointer to a character. The character will be filled with a boolean combination of the following values:
1 scroll lock
2 num lock
4 caps lock

KDSETLED
Set keyboard LED status. The argument is a character whose value is the boolean combination of the values listed under "KDGETLED".

KDMKTONE
Not supported. (See KIOCSOUND.)

KDADDIO
Not supported. (See MAP_CLASS.)

KDDELIO
Not supported. (See MAP_CLASS.)

KIOCDOSMODE
Not supported.

KIOCNONDOSMODE
Not supported.

KDSETMODE
(VP/IX only.) Set console in text or graphics mode. The argument is of type integer, which should contain one of the following values:

KD_TEXT	0x00	(sets console to text mode)
KD_GRAPHICS	0x01	(sets console in graphics mode)

Note, the user is responsible for programming the color/graphics adaptor registers for the appropriate graphical state.

KDGETMODE
(VP/IX only.) Get current mode of console. Returns integer argument containing either KD_TEXT or KD_GRAPHICS as defined in the KDSETMODE ioctl description.

KDENABIO
Enable in's and out's to video adaptor ports. No argument.

KDDISABIO
Disable in's and out's to video adaptor ports. No argument.

KDGKBTYPE
Always returns 0.

KDGKBMODE
Get keyboard translation mode, also known as scan code mode. Mode is returned where arg points.

KDSKBMODE
Set keyboard translation mode, also known as scan code mode.

KDGKBSTATE
Returns the state of the shifted, alt-, or control- state of the keyboard. Returns a bollean combination of:
1 shifted
2 control-
4 alt-

KIOCINFO
Always returns 0x6664.

KDMAPDISP
(VP/ix only) Maps display memory into user process address space. Argument is a pointer to structure type *kd_memloc*. This ioctl requires that a virtual 8086 subtask be attached to the current process. KDMAPDISP should not be used by ordinary users to map the console display; use MAPCONS.

KDUNMAPDISP
(VP/ix only) Unmap display memory from user process address space. No argument required.

VT_SETMODE
Set the virtual terminal mode. The argument is a pointer to a vt_mode structure, as defined below.

VT_GETMODE
Determine what mode the active virtual terminal is currently in, either VT_AUTO or VT_PROCESS. The argument to the ioctl is the address of the following type of structure:

```
struct vt_mode {
char  mode; /* VT mode */
      char    waitv;  /* not implemented */
      short   relsig; /* signal to use for release request */
      short   acqsig; /* signal to use for display acquired */
      short   frsig;  /* not implemented */
      }

      #define VT_AUTO         0x00    /* automatic VT switching */
      #define VT_PROCESS      0x01    /* process controls switching */
```

The vt_mode structure will be filled in with the current value for each field.

VT_RELDISP
Used to tell the virtual terminal manager that the display has or has not been released by the process.

0 == release refused
1 == release acknowledged
2 == acquire acknowledged

VT_ACTIVATE
Makes the multiscreen number specified in the argument the active multiscreen. The video driver will cause a switch to occur in the same manner as if a hotkey sequence had been typed at the keyboard. If the specified multiscreen is not open or does not exist, the call will fail and errno will be set to ENXIO.

Graphics Adapter Port I/O

You can use *ioctl*(S) to read or write a byte from or to the graphics adapter port. The *arg* parameter of the *ioctl* call uses the *io_arg* data structure:

```
struct port_io_arg {
     struct port_io_struct args[4];
};
```

As shown above, the *io_arg* structure points to an array of four *port_io* data structures. The *port_io* structure has the following format:

```
struct port_io_struct {
        char dir;     /* direction flag (in vs. out) */
        unsigned short port;    /* port address */
        char data;    /* byte of data */
};
```

You may specify one, two, three, or four of the *port_io_struct* structures in the array for one *ioctl* call. The value of *dir* can be either IN_ON_PORT to specify a byte being input to the graphics adapter port or OUT_ON_PORT to specify a byte being output to the graphics adapter port. *Port* is an integer specifying the port address of the desired graphics adapter port. *Data* is the byte of data being input or output as specified by the call.

If you are not using any of the *port_io* structures, load the *port* with 0, and leave the unused structures at the end of the array. Refer to the hardware manuals for port addresses and functions for the various adapters.

You can use the following *ioctl(S)* commands to input or output a byte on the graphics adapter port:

CONSIO	Inputs or outputs a byte on the current graphics adapter port as specified. (All)
MGAIO	Inputs or outputs a byte on the monochrome adapter port as specified. (MONO only)
CGAIO	Inputs or outputs a byte on the color graphics adapter port as specified. (CGA only)
EGAIO	Inputs or outputs a byte on the enhanced graphics adapter port as specified. (EGA only)
VGAIO	Inputs or outputs a byte on the video graphics array adapter port as specified. (VGA only)

To input a byte on any of the graphics adapter ports, load *dir* with IN_ON_PORT and load *port* with the port address of the graphics adapter. The byte input from the graphics adapter port will be returned in *data*.

To output a byte, load *dir* with OUT_ON_PORT, load *port* with the port address of the graphics adapter, and load *data* with the byte you want output to the graphics adapter port.

Function Keys

ioctl(S) can be used to define or obtain the current definition of a function key. The **arg** parameter of the **ioctl** call uses the **fkeyarg** data structure:

```
struct fkeyarg {
        unassigned int keynum;
        char keydef [MAXFK];
        /* Comes from
        char flen; ioctl.h via comcrt.h */
}
```

You can use the following **ioctl**(S) requests to obtain or assign function key definitions:

GETFKEY	Obtains the current definition of a function key. The function key number must be passed in **keynum**. The string currently assigned to the key will be returned in **keydef** and the length of the string will be returned in **flen** when the **ioctl**

is performed.

SETFKEY — Assigns a given string to a function key. The function key number must be passed in **keydef** and the length of the string (number of characters) must be passed in **flen**.

SETLOCKLOCK — Toggles the <Caps Lock> and <Num Lock> keys to be either global to all the multiscreens, or local to each individual multiscreen. To make the <Caps Lock> global (its default), set the *arg* parameter to 1. To make the <Caps Lock> local to each screen, set the *arg* parameter to 0.

ANSI Screen Attribute Sequences

The following character sequences are defined by ANSI X3.64-1979 and may be used to control and modify the screen display. Each **n** is replaced by the appropriate ASCII number (decimal) to produce the desired effect. The last column is for *termcap*(M) codes, where "n/a" means not applicable.

The use of 7 or 8 bit characters in the escape sequence is a valid invocation for each action defined. For example the ANSI ED command can be invoked via the "ESC[*n* J" (0x1b-0x5b-*n*-0x4a, 7 bit chars) sequence or the "CSI*n*J" (0x9b-*n*-0x4n, 8 bit chars) sequence.

ISO	Sequence	Action	Termcap Code
ED (Erase in Display)	CSI*n*J	Erases all or part of a display. *n=0*: erases from active position to end of display. *n=1*: erases from the beginning of display to active position. *n=2*: erases entire display.	cd
EL (Erase in Line)	CSI*n*K	Erases all or part of a line. *n=0*: erases from active position to end of line. *n=1*: erases from beginning of line to active position. *n=2*: erases entire line.	ce
ECH (Erase Character)	CSI*n*X	Erases *n* characters	n/a

CBT (Cursor Backward Tabulation)	CSI*n*Z	Moves active position back *n* tab stops.	bt
SU (Scroll Up)	CSI*n*S	Scroll screen up *n* lines, introducing new blank lines at bottom.	sf
SD (Scroll Down)	CSI*n*T	Scrolls screen down *n* lines, introducing new blank lines at top.	sr
CUP (Cursor Position)	CSIm;*n*H	Moves active position to location *m* (vertical) and *n* (horizontal).	cm
HVP (Horizontal & Vertical Position)	CSIm;*n*f	Moves active position to location *m* (vertical) and *n* (horizontal).	n/a
CUU (Cursor Up)	CSI*n*A	Moves active position up *n* number of lines.	up (ku)
CUD (Cursor Down)	CSI*n*B	Moves active position down *n* number of lines.	do (kd)
CUF (Cursor Forward)	CSI*n*C	Moves active position *n* spaces to the right.	nd (kr)
CUB (Cursor Backward)	CSI*n*D	Moves active position *n* spaces backward.	bs (kl)
HPA (Horizontal Position Absolute)	CSI*n*‘	Moves active position to column given by *n*.	n/a
HPR (Horizontal Position Relative)	CSI*n*a	Moves active position *n* characters to the right.	n/a

VPA (Vertical Position Absolute)	CSI*n*d	Moves active position to line given by *n*.	n/a
VPR (Vertical Position Relative)	CSI*n*e	Moves active position down *n* number of lines.	n/a
IL (Insert Line)	CSI*n*L	Inserts *n* new, blank lines.	al
ICH (Insert Character)	CSI*n*@	Inserts *n* blank places for **n** characters.	ic
DL (Delete Line)	CSI*n*M	Deletes *n* lines.	dl
DCH (Delete Character)	CSI*n*P	Deletes *n* number of characters.	dc
CPL (Cursor to Previous Line)	CSI*n*F	Moves active position to beginning of line, *n* lines up.	n/a
CNL (Cursor Next Line)	CSI*n*E	Moves active position to beginning of line, *n* lines down.	n/a

SGR (Select Graphic Rendition)	CSI*n*m	Character attributes, as summarized in the chart below. Up to three attributes can be specified in the form: CSI *n1*; *n2*; *n3* m	n/a

Select Graphic Rendition (SGR) Chart		
n	Meaning	
0	all attributes off (normal display)	
1	bold intensity (or light color)	
4	underscore on (if hardware supports it)	
5	blink on (if hardware supports it)	
7	reverse video	
8	sets blank (non-display)	
10	selects the primary font	
11	selects the first alternate font; lets ASCII characters less than 32 be displayed as ROM characters	
12	selects a second alternate font; toggles high bit of extended ASCII code before displaying as ROM characters	
30	black	foreground
31	red	foreground
32	green	foreground
33	brown	foreground
34	blue	foreground
35	magenta	foreground
36	cyan	foreground
37	white	foreground
38	enables underline option; white foreground with white underscore	
39	disables underline option	
40	black	background
41	red	background
42	green	background
43	brown	background
44	blue	background
45	magenta	background
46	cyan	background
47	white	background

ISO	Sequence	Action	Termcap Code
SM (Set Mode)	CSI2h	Lock keyboard. Ignores keyboard input until unlocked. Characters are not saved.	n/a

MC (Media Copy)	CSI2i	Send screen to host. Current screen contents are sent to the application.	n/a
RM (Reset Mode)	CSI2l	Unlock keyboard. Re-enable keyboard input.	n/a

Additional Screen Attribute Sequences

Name	Sequence	Action	Termcap Code
n/a	CSI=*p*;*d*B	Set the bell parameter to the decimal values of *p* and *d*. *p* is the period of the bell tone in units of 840.3 nanoseconds, and *d* is the duration of the tone in units of 100 milliseconds.	n/a
n/a	CSI=*s*;*e*C	Set the cursor to start on scanline *s* and end on scanline *e*.	n/a
n/a	CSI=*x*D	Turn on or off (*x*=1 or 0) the intensity of the background color.	n/a
n/a	CSI=*x*E	Set or clear (*x*=1 or 0) the Blink vs. Bold background bit in the 6845 crt controller.	n/a
n/a	CSI=*c*A	Set overscan color to color *c*. *c* is a decimal value taken from Color Table above. (This sequence may not be supported on all hardware.)	n/a
n/a	CSI=*c*F	Set normal foreground color to *c*. (*c* is a decimal parameter taken from Color Table.)	n/a
n/a	CSI=*c*G	Set normal background. (See Color Table.)	n/a
n/a	CSI=*c* H	Set reverse foreground. (See Color Table.)	n/a

n/a	CSI=*c* I	Set reverse background. (See Color Table.)	n/a
n/a	CSI=*c* J	Set graphic foreground. (See Color Table.)	n/a
n/a	CSI=*c* K	Set graphic background. (See Color Table.)	n/a

Color Table

Cn	Color	Cn	Color
0	Black	8	Grey
1	Blue	9	Lt. Blue
2	Green	10	Lt. Green
3	Cyan	11	Lt. Cyan
4	Red	12	Lt. Red
5	Magenta	13	Lt. Magenta
6	Brown	14	Yellow
7	White	15	Lt. White

Name	Sequence	Action	Termcap Code
n/a	CSI*n*g	Accesses alternate graphics set. Not the same as "graphics mode." Refer to your owner's manual for decimal/character codes (**Pn**) and possible output characters.	n/a
n/a	CSI*n*L	Fills new regions with current (*n*=0) or normal (*n*=1) attributes. Default is 0.	n/a
n/a	CSI*n*M	Returns current foreground color attributes, with *n*=0 for normal, 1 for reverse, and 2 for graphic. The colors are sent back in the keyboard data input stream as text decimal values separated by a space and terminated with a newline. For example, if the current foreground color is lt_red on black, "12 0\n" is returned.	n/a
n/a	CSIs	Saves current cursor position.	n/a

n/a	CSIu	Restores saved cursor position.	n/a
n/a	ESC7	Saves current cursor position.	n/a
n/a	ESC8	Restores saved cursor position.	n/a
n/a	ESCQFn'*string*'	Define function key **Fn** with *string*. String delimiters ' and ' may be any character not in *string*. **Fn** is defined as the key number starting at zero plus the ASCII value of zero. For example, **F1** = 0... **F16** = ?, and so on. In this escape sequence, the ^ character will cause the next character to have 32 subtracted from its ASCII value. Thus ^! results in a soh (^A) characters.	n/a
n/a	CSI*nz*	Switches to screen *n*. If the screen does not exist, no action will take place.	n/a

Files

/dev/console

/dev/tty [02 -*n*]

/dev/color

/dev/monochrome

/dev/ega

/dev/vga

See Also

console(M), ioctl(S), keyboard(HW), keymap(M), mapkey(M), mapchan(M), multiscreen(M), setcolor(C), stty(C), systty(M), vidi(C), termcap(M), tty(M)

Name

scsi - Small computer systems interface.

Description

SCSI provides a standard interface for peripherals such as hard disks, printers, tape drives and others. SCSI is run via a host adapter card that can support up to 7 devices.

The minor device numbering scheme for SCSI devices (for example, a hard disk) is the same as the standard minor device number scheme for non-SCSI devices. Each SCSI device has its own major device number.

Unsupported Tape Devices

Although some tape drives are not supported (example: DAT and 8mm tape drives), the SCSI driver permits the connection of these devices. In order to use these tape drives you must create the special device files manually. Here is a description of additional tape device nodes:

Name	Major	Minor	See Note	Tape Type
/dev/rct0	34+TID	0	1, 5	QIC, 9TLD
/dev/brct0	34+TID	4	1, 6	9TLD, HS
/dev/nrct0	34+TID	8	2, 5	QIC, 9TLD
/dev/bnrct0	34+TID	12	2, 6	9TLD, HS
/dev/hirct0	34+TID	16	4, 1, 5	9THD
/dev/hibrct0	34+TID	20	4, 1, 6	9THD
/dev/hinrct0	34+TID	24	4, 2, 5	9THD
/dev/hibnrct0	34+TID	28	4, 2, 6	9THD
/dev/urct0	34+TID	32	3, 5	QIC, 9TLD
/dev/burct0	34+TID	36	3, 6	9TLD, HS
/dev/hiurct0	34+TID	48	4, 3, 5	9THD
/dev/hiburct0	34+TID	52	4, 3, 6	9THD

Tape Type:

9THD	Nine Track Hi-Density Tape (reel-to-reel)
HS	Helical Scan Tape drive (WangDAT/Exabyte)
9TLD	Nine Track Low-Density Tape (reel-to-reel)
QIC	Quarter Inch Tape Cartridge

NOTES:

1. This device will do a tape rewind and unload at the end of the operation (at close).

2. This device will not issue a rewind to the device, but an unload will be issued. On some tape drives an unload implies a rewind will be done (at close).

3. This device will issue a rewind, but no unload will be done (at close).

4. This is used to set the tape operation to high density for reel-to-reel tape drives (at close).

5. This device uses a 512 byte block size. For typical quarter-inch tape drives.

6. This device uses a 1024 byte block size. To be used for devices, that do not have a fixed block size, such as a helical scan tape, or reel-to-reel tape. Using this device on a quarter inch tape drive will not have any effect.

You cannot run **mkdev tape** to add drives other than the QIC type because they are not supported. The default devices are **/dev/rct0** and **/dev/nrct0**. To create the other entries, you will need to do:

mknod /dev/*name* **c 34+***TID major minor*

Where *name* is a name from the left column in the drive table. *TID* is the target ID of the SCSI tape drive you are installing.

For instance, to create the */dev/urct0* device, with the tape drive target ID set to 2, you would enter the following:

mknod /dev/urct0 c 36 32

Notes

This functionality applies only to XENIX-386 distributions.

See Also

hd(HW), tape(HW)

Name

tty1[a-h] , tty1[A-H] , tty2[a-h] , tty2[A-H] - Interface to serial ports.

Description

The **tty1[a-h]**, **tty1[A-H]**, **tty2[a-h]** and **tty2[A-H]** files provide access to the standard and optional serial ports of the computer. Each file corresponds to one of the serial ports (with or without modem control). Files are named according to the following conventions:

- The first number in the file name corresponds to the COM expansion slot.
- Lower case letters indicate no modem control.
- Upper case letters indicate the line has modem control.

tty1a and **tty1A** both refer to COM 1, whereas **tty2a** and **tty2A** both refer to COM 2.

For example, with a four port expansion board installed at COM 1 and a single port board installed at COM 2, you can access:

tty1a	tty1A
tty1b	tty1B
tty1c	tty1C
tty1d	tty1D
tty2a	tty2A

Each serial port has modem and non-modem invocations. The device names in the following table refer to the serial ports, with and without modem control. The first section of the table describes boards at COM 1 and the second section describes boards installed at COM 2. "Minor" is the minor device number for the port (see *mknod*(C)).

Serial Lines				
Board Type	Non-Modem Control		Modem Control	
	Minor	*Name*	*Minor*	*Name*
1 Port	0	tty1a	128	tty1A
4 Port	1	tty1b	129	tty1B
	2	tty1c	130	tty1C
	3	tty1d	131	tty1D
8 Port	4	tty1e	132	tty1E
	5	tty1f	133	tty1F
	6	tty1g	134	tty1G
	7	tty1h	135	tty1H
1 Port	8	tty2a	136	tty2A
4 Port	9	tty2b	137	tty2B
	10	tty2c	138	tty2C
	11	tty2d	139	tty2D
8 Port	12	tty2e	140	tty2E
	13	tty2f	141	tty2F
	14	tty2g	142	tty2G
	15	tty2h	143	tty2H
16 Port (MCA)	16	tty2i	144	tty2I
	17	tty2j	145	tty2J
	18	tty2k	146	tty2K
	19	tty2l	147	tty2L
	20	tty2m	148	tty2M
	21	tty2n	149	tty2N
	22	tty2o	150	tty2O
	23	tty2p	151	tty2P

Interrupt Vectors:

All board(s) installed at COM 1 - 4
All board(s) installed at COM 2 - 3

For a list of I/O addresses, see the *Release Notes* furnished with your distribution.

Access

The files may only be accessed if the corresponding serial interface card is installed and its jumper I/O address correctly set. Also, for multi-port expansion cards, you must use the *mkdev*(ADM) program to

create more than the default number of files.

The serial ports must also be defined in the system configuration. Check your hardware manual to determine how your system is configured, via a CMOS database or by switch settings on the main system board. If your system is configured using a CMOS database, the ports are defined in the database (see *cmos*(HW)). Otherwise, define the ports by setting the proper switches on the main system board. Refer to your computer hardware manual for switch settings.

It is an error to attempt to access a serial port that has not been installed and defined.

The serial ports can be used for a variety of serial communication purposes such as connecting login terminals to the computer, attaching printers, or forming a serial network with other computers. Note that a serial port may operate at most of the standard XENIX baud rates, and that the ports (on most computers) have a DTE (Data Terminal Equipment) configuration. The following table defines how each pin is used for 25-pin and 9-pin connections:

25-Pin	**9-Pin**	**Description**
2	2	Transmit Data
3	3	Receive Data
4	7	Request to Send
5	8	Clear to Send
7	5	Signal Ground
8	1	Carrier Detect (Data Set Ready)
20	4	Data Terminal Ready

Only pins 2, 3, and 7 (2,3 and 5 for 9-pin) are necessary for a terminal (or direct) connection.

A modem control device (port) uses pins 2, 3, and 7 in the same way as a non-modem control device: send on pin 2 and receive on pin 3. Pin 7 is data ground. On a non-modem control device the state of the other pins are not set or read. On a modem control device, pins 4 and 20 (RTS & DTR) are asserted and the port will not open until pin 8 (CXD) is asserted. That is, no signal travels from pin 2 until pin 8 is asserted from another source. The modem control device monitors the the status of pin 8.

See *tty*(M) and *termio*(M) for the details of serial line operation in the XENIX system.

Files

/dev/tty1[a-h]
/dev/tty1[A-H]

/dev/tty2[a-h]
/dev/tty2[A-H]

See Also

cmos(HW), csh(C), cu(C), getty(ADM), mkdev(ADM), mknod(C) nohup(C), open(S), termio(M), tty(M), uucp(C)

Notes

If you login via a modem control serial line, hanging up logs that line out and kills your background processes. See *nohup*(C) and *csh*(C)).

You cannot use the same serial port with both modem and non-modem control at the same time. For example, you cannot use tty1a and tty1A simultaneously.

Use a modem cable to connect your modem to a computer.

Name

tape - Magnetic tape device.

Description

The *tape* device implements the XENIX interface with a tape drive. QIC-02 cartridge tape drives are supported by the *ct* device driver, QIC-40 and QIC-80 tape drives connected to the floppy disk controller are supported with the *ft* device driver, and Irwin tape drives connected to the floppy disk controller are supported with the *mc* device driver. Typically, the *tar*(C), *cpio*(C), *dd*(C), *backup*(ADM), or *restore*(ADM) commands are used to access a tape drive.

A single tape drive with a raw (character, non-blocking) interface is supported, except for the SCSI tape driver which supports up to four devices. There are four standard tape device types. Devices beginning with the "r" prefix, (for "raw device"), should be used for most normal tape work, while devices with the "n" prefix, ("for no rewind on hold"), should be used for storing and restoring multiple files. Devices beginning with the "x" prefix are control devices, which are used for sending *ioctl*(S) commands to the tape subsystem.

Devices beginning with the "e" prefix (for ECC device) support a 2/64 error recovery scheme. Thus two 512-byte blocks out of every 64 blocks can be bad and the driver will correct the errors. This software ECC support provides a high degree of error recovery.

The *ft* and *mc* floppy tape drivers do not support the "n" or "e" device types. ECC encoding and decoding is automatically used with the standard "r" device. On the QIC-40, QIC-80 and Irwin 80MB drives, for every 29K written to the tape, 3K of ECC data is written with it to provide error recovery. On the Irwin 10, 20, 40 and 60MB drives, for every 16K written to the tape, 2K of ECC data is written.

QIC-40 and QIC-80 tapes must be formatted with the *tape*(C) command before use, unless you use pre-formatted tapes. Similarly, Irwin tapes must be first servo-written and then formatted with *tape*(C) before use, unless you use pre-formatted tapes. The new Irwin driver cannot write tapes formatted under earlier releases, so pre-formatted tapes are strongly recommended.

The following table summarizes the base naming conventions for the tape drives supported:

ct0,1	QIC24 unit 0,1
ct2,3	QIC11 unit 0,1
Stp0,1,2,3	SCSI tape unit 0,1,2,3
ft0	QIC-40 or QIC-80 floppy tape unit
mc0	Irwin floppy tape unit
ctmini	default mini-cartridge device

mt0,1	reel to reel unit 0,1 1600 bpi
mt2,3	reel to reel unit 0,1 800 bpi
mt4,5	reel to reel unit 0,1 6250 bpi

The default tape device is stored in the file **/etc/default/tape**, which is also used by *tape*(C). **/etc/default/tape** should always contain the "x" (control) device name of the default device, and is normally updated by *mkdev*(ADM) *tape*. If the default device is an QIC-40, QIC-80 or Irwin tape drive, the appropriate device from the table above will be linked to the *ctmini* device node. QIC-02 tape drives will always be accessed by the *ct0,1* device nodes as shown in the table. If a SCSI tape drive is installed as the default device and there is no QIC-02 drive installed, it will be linked to the *ct0* device node. If both SCSI and QIC-02 drives are installed, the SCSI device node cannot be linked to the *ct0* device node.

tape(C) describes the commands used to access tape drives.

Definition of ioctl commands

The following *ioctl* commands can be used with the various tape device drivers supported under XENIX. The letters following each description indicate which drivers support each *ioctl* command:

A	All drivers
C	QIC-02 cartridge tape driver
S	SCSI tape driver
F	QIC-40 and QIC-80 mini-cartridge tape drivers
I	Irwin mini-cartridge tape driver

MT_STATUS
Returns a device-independent structure holding the status of the drive. The *tape_info* structure is defined in **/usr/include/sys/tape.h**. (C,S,F)

MT_DSTATUS
Returns a device-dependent structure holding status information of the drive. (C,S,F)

MT_RESET
Resets the driver software and the tape drive. Interrupts tape commands in progress. (C,S,F)

MT_REPORT
Returns an integer code which determines the type of device which the driver controls. The type numbers are defined in **/usr/include/sys/tape.h**. (C,S,F)

MT_RETEN
Winds the tape forward to EOT and then backward to BOT. (C,S,F)

MT_REWIND
Rewinds the tape to BOT. (C,S,F)

MT_ERASE
Erases the data on the tape and retensions the cartridge. (C,S,F)

MT_AMOUNT
Returns an integer count of the amount of the last data transfer. (C,S,F)

MT_FORMAT
Formats the tape. Expects as an argument the number of tracks to format, which must be an even number. If no argument is provided, the default is 20 tracks for QIC-40 drives, and 28 tracks for QIC-80 drives. (F)

MT_GETHDR
Expects as an argument a pointer to a *struct ft_header* or *struct ir_header* and copies the header of the current tape into it. (F)

MT_PUTHDR
Takes a pointer to a *struct ft_header* or *struct ir_header* and writes it onto the tape. This command should be used with caution. (F)

MT_GETNEWBB
Takes a pointer to a *struct ft_newbbt* or *struct ir_newbbt* and copies in a list of bad blocks detected on the last write operation. (F)

MT_PUTNEWBB
Takes a pointer to a *struct ft_newbbt* or *struct ir_newbbt*, reads in the header from the tape, then writes a new bad block onto the tape with the new bad blocks from the provided bad block table. (F)

MT_GETVTBL
Takes a pointer to a *struct ft_vtbl* and copies in the volume table from the tape. (F)

MT_PUTVTBL
Takes a pointer to a *struct ft_vtbl* and writes the volume table onto the tape. This command should be used with caution. (F)

MT_RFM
Winds the tape forward to the next file mark. (C,S)

MT_WFM
Writes a file mark at the current location on the tape. (C,S)

MT_LOAD
On devices which are capable of doing so, loads the tape into the drive. (S)

MT_UNLOAD
On devices which are capable of doing so, unloads the tape from the drive. (S)

Irwin-specific ioctl Interface

Device specific functions of the Irwin tape drive are accessed via special commands passed to the Irwin driver using the *ioctl()* interface. An Irwin driver interface library is available. This library provides a system independent interface to *ioctl()* via the entry point *mcioctl()*:

```
#include "mc.h"

int mcioctl(fh, cmd, arg)
int fh;         /* File handle from open() */
int cmd;        /* MCCTL_* command code */
void *arg;      /* Additional argument pointer */

mcioctl(fh, MCCTL_NOP, NULL)
mcioctl(fh, MCCTL_VERSION, verbuf)
mcioctl(fh, MCCTL_CAPACITY, capp)
mcioctl(fh, MCCTL_LSEEK, lskbuf);
mcioctl(fh, MCCTL_REWIND)
mcioctl(fh, MCCTL_RETEN)
mcioctl(fh, MCCTL_REWIND_NW)
mcioctl(fh, MCCTL_RETEN_NW)
mcioctl(fh, MCCTL_GETDRVCFG, cfgbuf)
mcioctl(fh, MCCTL_GETCFG, cfgbuf)
mcioctl(fh, MCCTL_SETCFG, cfgbuf)
mcioctl(fh, MCCTL_GETTHDR, hdrbuf)
mcioctl(fh, MCCTL_PUTTHDR, hdrbuf)
mcioctl(fh, MCCTL_GETDLISTS, listbuf)
mcioctl(fh, MCCTL_FLUSH)
mcioctl(fh, MCCTL_FORMAT, fmtbuf)
mcioctl(fh, MCCTL_FMTSTAT, fmtbuf)
mcioctl(fh, MCCTL_ABORT)
mcioctl(fh, MCCTL_DEVSTAT, dstatp)
mcioctl(fh, MCCTL_GETERCTL, erctlp)
mcioctl(fh, MCCTL_SETERCTL, erctlp)
mcioctl(fh, MCCTL_GETER, ierrp)
struct mcver *verbuf;     /* version buffer */
long *capp;               /* capacity in bytes */
struct mclseek *lskbuf;   /* tape logical position descriptor */
struct mccfg *cfgbuf;     /* configuration buffer */
char *hdrbuf;             /* 1024 byte header buffer */
unsigned short * listbuf; /* 2048 byte defect list buffer */
struct mcfmt *fmtbuf;     /* format control/status buffer */
unsigned short *dstatp;   /* device status word */
unsigned short *erctlp;   /* error control word */
unsigned short *ierrp;    /* device specific error */
```

mcioctl() provides system independent ioctl interface to the Irwin driver. This subroutine is essentially a pass-trough. That is, arguments are passed through to *ioctl()*. If a device specific error occurs (i.e., a non-system error) at completion of the system *ioctl()* and the command is other than MCCTL_NOP or MCCTL_VERSION, *mcioctl()* executes *ioctl(MCCTL_GETER)* to retrieve the device specific error.

The following ioctl commands are available for the Irwin driver:

MCCTL_NOP
No operation. The argument is ignored. A success status is returned. This command may be used as an aid in determining if a special file refers to the MC driver.

MCCTL_VERSION
Gets driver version information. The argument is the address of version information buffer (see *struct mcver* in **/usr/include/sys/mc.h**) to which the driver writes.

MCCTL_CAPACITY
Gets a tape's capacity in bytes. The argument is the address of a long integer.

MCCTL_REWIND
MCCTL_RETEN
MCCTL_REWIND_NW
MCCTL_RETEN_NW
These four commands physically position the tape at high speed. MCCTL_RETEN and MCCTL_RETEN_NW run the tape to the early warning hole first. All four commands return the tape to the load-point hole. MCCTL_REWIND_NW and MCCTL_RETEN_NW start a request but don't wait for completion.

MCCTL_GETDRVCFG
MCCTL_GETCFG
MCCTL_SETCFG
These three commands provide access to configuration parameters for a particular a mini cartridge tape unit. The structure of these parameters is *struct mccfg* (defined in **/usr/include/sys/mc.h**) This structure has driver, tape drive, and cartridge related fields. Both MCCTL_GETDRVCFG and MCCTL_GETCFG copies the driver's the MCCFG structure to the caller's buffer. When MCCTL_GETDRVCFG is used, *struct mccfg* members with driver and tape drive related fields are returned. No error is given when a cartridge is absent. When MCCTL_GETCFG is used successfully, all fields are returned with valid data. An error is returned if no cartridge is present. MCCTL_SETCFG allows the caller to adjust certain fields in the driver's configuration.

MCCTL_GETTHDR
MCCTL_PUTTHDR

MCCTL_GETTHDR and MCCTL_PUTTHDR read and write the 1024 byte tape header in block 0. MCCTL_PUTTHDR assumes an Irwin style header. The the following procedure is used to write the header:

Tape block 0 is read to a buffer. The caller's 1024 byte header buffer is copied to the first, fifth, and when space permits, the ninth and thirteenth 1024-byte sectors in the buffer. When the cartridge format uses ECC (i.e., other than 110 cartridge format), the header's ECC in use field is set. When the cartridge format uses ECC, ECC is encoded. A check sum is calculated for the buffer. The buffer is written back to block 0. Block 0 is reread and the cartridge state is redetermined. A new checksum is calculated and compared against the original.

MCCTL_GETDLISTS

Returns lists used by the driver's flaw management. The caller gives the address of a buffer which is at least 2 KB in length. Four lists are copied to the buffer. Each list is comprised of physical tape block numbers stored as unsigned short integers and terminated with the value 0xffff. The lists are contiguous and given in the following order:

Primary Defect List (PDL)
Working Defect List (WDL)
Grown Defect List (GDL)
Relocation List (RL)

MCCTL_FLUSH

Flushes dirty buffers to tape. MCCTL_FLUSH forces dirty buffers in the Irwin driver's cache to be written to tape. The pointer argument is ignored. Control returns when data is written. Buffers are automatically flushed upon a *close()* or when the device is idle for a certain period (see *mc_autoflush* in *struct mccfg* in **/usr/include/sys/mc.h**).

MCCTL_FORMAT
MCCTL_FMTSTAT

MCCTL_FORMAT starts a erase, servo-format-certify-initialize header or re-certify operations. The argument is the address of *struct mcfmt* (see **/usr/include/sys/mc.h**). Formatting operations performed depend upon the values in the structure's *fm_cmd* and *fm_option* fields, and *struct mccfg mc_cartstate field.* When an MCCTL_FORMAT command completes successfully, MCCTL_FMTSTAT is used to determine the progress (when a no-wait flag is set) or results of formatting. Like MCCTL_FORMAT, MCCTL_FMTSTAT also uses the *struct mcfmt* structure (typically the same one passed to MCCTL_FORMAT).

MCCTL_ABORT
Used to interrupt and terminate operations started by MCCTL_FORMAT. The pointer argument is ignored. Control returns after formatting has terminated.

MCCTL_DEVSTAT
Returns a 16-bit device status word to an unsigned short integer who's address is passed in the third argument of ioctl(). This field is intended for use by applications which use the tape drive interactively. The status bits are defined in *struct mclseek* in **/usr/include/sys/mc.h**.

MCCTL_GETERCTL
MCCTL_SETERCTL
MCCTL_GETERCTL and MCCTL_SETERCTL give application access to the state of and control over certain error mechanisms. The argument is the address of a 16-bit error control variable which the Irwin driver writes with current values for MCCTL_GETERCTL and reads for MCCTL_SETERCTL. Certain flags may or may not have an effect depending on the implementation. Bit values for the error control variable are defined in **/usr/include/sys/mc.h**.

MCCTL_GETER
Gets device specific error: IE_*. In general the value 0 is returned to indicate success or -1 to indicate an error. When *mcioctl()* returns the value -1, an error has occurred. The error condition may have been detected in the operating system or in the driver. In order to discriminate the origin the global *_mcerrno* should be examined first (before errno). When non-zero, the error was returned by the driver. Values for *_mcerrno* are defined in **/usr/include/ierrno.h** with an IE_ prefix.

Irwin Drive and Cartridge Models

This section is concerned with Irwin tape drives and cartridges supported.

Drive Models

Many Irwin mini cartridge drives have a three digit model number. Each digit has a meaning. The high order digit encodes the form factor and cabinetry:

1xx 5-1/4 inch drive (mounted in system cabinet).
2xx 3-1/2 inch drive (mounted in system cabinet).

3xx	5-1/4 inch drive in a metal cabinet w/ power supply.
4xx	3-1/2 inch drive in a plastic cabinet (no supply).
7xx	3-1/2 inch drive in a metal cabinet w/ power supply.

The middle digit gives the approximate capacity, in 10 Megabyte units for a standard capacity (not extra long) tape:

x1x	10 Megabytes
x2x	20
x4x	40
x6x	60
x8x	80

The low digit encodes the drive's normal data transfer rate (i.e., the floppy controller data clock rate).

xx0	250 Kilobits/Second
xx5	500 Kilobits/Second
xx7	1 Megabit/Second

In addition, a new 4-digit model numbering system is in use. These model numbers are associated with drives which are adaptable to different system hardware environments with accessory hardware kits.

2020	3-1/2 inch, 20 Megabyte, 250 Kilobits/Second
2040	3-1/2 inch, 40 Megabyte, 500 Kilobits/Second
2080	3-1/2 inch, 80/120 Megabyte, 500 Kilobits/Second
2120	3-1/2 inch, 80/120 Megabyte, 1 Megabit/Second

Mini Cartridges

There are three primary physical mini cartridges types:

DC1000	185 feet of 0.150 inch wide tape (same as TC-200)
DC2000	205 feet of 0.250 inch wide tape (same as TC-400)
DC2120	307.5 feet of 0.250 inch wide tape

The DC1000 cartridge is physically thinner than DC2000 and DC2120 cartridges. The DC2000 and DC2120 have the same physical form but the DC2120 has a longer tape. These cartridges are distinguished by there labels. Each physical cartridge type has at least two cartridge formats:

Mini (Irwin) Cartridge Format Parameters								
Cart-ridge Format	AccuTrak Reorder Number see note	Cart-ridge	Total Tape Blocks	Trks	Blocks per Track	Sectors per Block		Dens-ity (FTPI)
						Data	ECC	
110	1000-10	DC1000	1264	8	158	8	0	6400
120	2000-20	DC2000	1190	14	85	16	2	6400
120XL	2000-30	DC2120	1792	14	128	16	2	6400
125	1000-20	DC1000	1320	12	110	16	2	10000
145	2000-40	DC2000	2480	20	124	16	2	10000
145XL	2000-60	DC2120	3720	20	186	16	2	10000
165	2000-64	DC2000	3936	24	164	16	2	13200
285	2000-80	DC2000	2752	32	86	29	3	11600
285XL	2000-120	DC2120	4160	32	130	29	3	11600

Notes: The suffix part of the AccuTrak Reorder Number is an approximate cartridge capacity in Megabytes.

All formats use 1024 byte MFM encoded sectors.

Drive Read/Write Compatibility for Mini Cartridge Formats								
	Drive Model (See Note)							
Cart-ridge Format	410 310 110	2020 720 420 320 220 120	725 425 325 225 125	2040 745 445 345 245 145	765 465 265 165	2080 785 485 285	2120 787 487 287	Cart-ridge
110	rw	rw	r-	r-	r-	r-	r-	DC1000
120	--	rw	--	r-	r-	r-	r-	DC2000
120XL	--	rw	--	r-	r-	r-	r-	DC2120
125	--	--	rw	rw	r-	r-	r-	DC1000
145	--	--	--	rw	r-	r-	r-	DC2000
145XL	--	--	--	rw	r-	r-	r-	DC2120
165	--	--	--	--	rw	r-	r-	DC2000
285	--	--	--	--	--	rw	rw	DC2000
285XL	--	--	--	--	--	rw	rw	DC2120

Key:

r Drive reads cartridge format

w Drive writes cartridge format

- Incompatible: When a cartridge is formatted but incompatible for reading or writing, the driver reports that the cartridge is either incompatible or erased.

Extra Long (XL) DC2120 Cartridge Compatibility

Extra long (i.e., DC2120) cartridges are incompatible with the following drives as the drive will not physically accommodate the cartridge:

110, 310, 410, 125, 225, 325, 425, and 725

Even though DC2120 cartridges are physically accepted in the following drives, they may not be formatable:

120, 220, 320, 420, 720, 2020, 145, 245, 345, 445, 745, 2040

Drives manufactured previous to about 1989 don't recognize the longer tape. However, the MC driver is able to read and write preformatted extra long tapes in these drives, but it is unable to correctly format them. Formatting will start, but terminate in error. To determine whether a drive supports formatting of DC2120 cartridges, use the mcart utility. If the command *mcart drive* reports a drive type with the suffix XL, formatting of DC2120 cartridges is supported.

Files

/dev/rStp0	/dev/rct0	/dev/erct0	/dev/rmc1
/dev/nrStp0	/dev/nrct0	/dev/xct0	/dev/mcdaemon
/dev/xStp0	/dev/rct2	/dev/rctmini	
/dev/rft0	/dev/nrct2	/dev/xctmini	
/dev/xft0	/dev/xct0	/dev/rmc0	

Include files:

/usr/include/sys/tape.h
/usr/include/sys/ct.h
/usr/include/sys/ft.h
/usr/include/sys/ir.h
/usr/include/sys/mc.h
/usr/include/sys/mcheader.h

Notes

After certain tape operations are executed, the system returns a prompt before the tape controller has finished its operation. If the user enters another tape command too quickly, a "device busy" error is returned until the tape device is finished with its previous operation.

Periodic tape cartridge retensioning and tape head cleaning are necessary for continued error-free operation of the tape subsystem. Use *tape*(C) to retension the tape.

See Also

backup(ADM), cpio(C), dd(C), format(C), tape(C), tar(C), restore(ADM)

Name

terminal - Login terminal.

Description

A *terminal* is any device used to enter and display data. It may be connected to the computer:

- By a serial wire, either direct or dialup
- As a virtual terminal, for example with emulator software
- Through a display adapter

A terminal has an associated device file **/dev/tty***.

Files

/dev/tty*

See Also

console(M), disable(C), enable(C), mkdev(ADM), serial(HW), stty(C), vidi(C), termcap(M), term(F), terminals(M)

Contents

Miscellaneous (M)

Name

intro - Introduction to miscellaneous features and files.

Description

This section contains miscellaneous information useful in maintaining the system. Included are descriptions of files, devices, tables and programs that are important in maintaining the entire system.

Name

aliases, aliases.hash, maliases, maliases.hash, faliases - Micnet aliasing files.

Description

These files contain the alias definitions for a Micnet network. Aliases are short names or abbreviations that may be used in the *mail* command to refer to specific machines or users in a network. Aliasing allows a complex combination of site, machine, and user names to be represented by a single name.

The **aliases**, **maliases**, and **faliases** files each define a different type of alias. The **aliases** file defines the standard aliases which are names for specific systems and users and, in some case, for commands. The **maliases** file defines machine aliases, names, and paths for specific systems. The **faliases** file defines forwarding aliases which are temporary names for forwarding mail intended for one system or user to another.

The **aliases.hash** file is the hashed version of the **aliases** file created by the *aliashash* command. The file is used by the *mail* command to resolve all standard aliases and is identical to the **aliases** file except for a hash table at the beginning of the file. The hash table allows for more efficient access to the entries in the file. The **aliases** file need only be present to generate the **aliases.hash** file. The **aliases** file is not required to run the network.

The **maliases.hash** file is the hashed version of the **maliases** file. It is an optional file created by executing the following command:

/usr/lib/mail/aliashash /usr/lib/mail/maliases

If the **maliases.hash** file is created, **maliases** is no longer necessary to run the network. If the number of machines in the network is large, and particularly if several types of networks are in use, it is recommended that the **maliases** file be hashed. In such a network, the configuration is no longer homogeneous, aliases are likely to be fairly complex and machine aliases are likely to differ between machines. The use of machine aliases allows the standard alias file to be identical on all machines in the network. In such an environment, *netutil* can only generate network files that can be used as a starting point. The rest of the network maintenance should be done manually with a text editor.

Each file contains zero or more lines. If hashing is to be performed, at least one alias is required. Each line lists the alias and its meaning. The alias meaning can have site, machine, and user login names and

other aliases (its exact composition depends on the type of alias). A colon (:) separating the alias and meaning is required.

In the **aliases** file, a line can have the forms:

alias:[[site!]machine:]user[,[[site!]machine:]user]...

alias:[[site!]machine:]command-pipeline

alias:error-message

Site and *machine* are the site and machine names of the system to which the user belongs or on which the specified command is to be executed. The site and machine names must end with an exclamation mark (!) or colon (:) respectively, and must be defined in a **systemid** file. A machine alias may be used in place of a site and machine name if it is followed by a question mark.

User is a user login name or another alias. User names in a list must be separated by commas. A newline may immediately follow a comma. Spaces and tabs are allowed, but only immediately before or after a comma or newline.

Command-pipeline is any valid command (with necessary arguments) preceded by a pipe symbol (|) and enclosed in double quotation marks. Spaces may separate the command and arguments, but there must be no space between the first double quotation mark and the pipe symbol.

Error-message is any sequence of letters, numbers, and punctuation marks (except a double quotation mark), preceded by a number sign (#) and enclosed in double quotation marks.

In the **faliases** file, each line can have the same form as lines in the **aliases** file except that no more than one user name can be given for any one alias. To prevent alias expansion on a remote machine, the meaning should be escaped with "\\", as in:

foo: mach?\\foo

Failure to do the escape may result in an infinite forwarding loop. If this happens and the loop does not invoke a **uucp** connection, looping will be detected, and the mail will be returned to the sender.

The **alias.hash** file has already been searched at this point. If there is no explicit machine given as part of the meaning, the recipient will be assumed to be local. After forward aliasing is complete, machine aliasing is performed as necessary.

In the **maliases** file, a line has the form:

alias:[[site!]machine:]...

Site and *machine* are the site and machine names for a specific network and system. Multiple site and machine names direct messages along the specified path of systems. If no site or machine name is given, the alias is ignored.

Before the *mail* program sends a message, it searches the **aliases.hash**, **faliases**, and **maliases** files to see if any of the names given with the command are aliases. Each file is searched in turn (**aliases.hash**, **faliases,** then **maliases**) and if a match is found, the alias is replaced with its meaning. If no match is found, the name is assumed to be the valid login name of a user on that machine. The search in the **aliases.hash** file continues until all aliases have been replaced, so it is possible for several replacements to occur for a single name. Alias loops are now detected. If a loop exists, any recipients involved in the alias loop are dropped from the mail recipient list, and an error message is displayed. The **faliases** file is searched once, from beginning to end, even if it is empty. The **maliases** file is searched only if the alias contains a machine alias.

When an alias is a user or a list of users, the *mail* command sends the message to each user in the list. When it is a command-pipeline, the *mail* command starts execution of the command on the specified machine and sends the message as input. When the alias is an error-message, the *mail* command ignores the message and instead, displays the alias and its meaning at the standard error.

In all files, any line beginning with a number sign (#) is considered a comment and is ignored.

As a special feature, any alias that contains a site name as the first component of its meaning is automatically prepended with the machine alias **uucp?.** This alias may be explicitly defined in the **maliases** file to help direct mail between networks to the system performing the *uucp* link.

Directives

Though alias directives are never included in an alias expansion, they can be used to restrict the expansion to a class of users, forward the unexpanded alias to another machine, or produce error messages. An **aliases** file may include directives of the form:

testalias: $xalaska, mikem, georger, terih

sams: "$e ambiguous, use samst or samsm"

Fields on the right-hand side of an alias (after the colon) that begin with a dollar sign ($) character, are alias directives. Fields containing any blanks or tabs must be enclosed in quotes. The directive must precede all normal right-hand fields as shown in the example above. The character following the dollar sign ($) specifies the directive type:

$n <real name or description>

$x <machine>

$e <error message>

$p <permissions>

$r <restrictions>

None of the above directives are currently supported in **/usr/lib/mail/faliases**. Only the $e is supported in **/usr/lib/mail/maliases** and **maliases.hash**. Unrecognized directives do not create error messages and are treated as if they do not exist. The above directives are described in detail as follows:

$n For a user alias, this field should contain the full real name of the user associated with the alias. For a group alias, a description of the group should be given.

$x Causes the alias to be forwarded, unexpanded, to the machine specified in this field. White space is only allowed immediately following the $x. Since machine aliasing will be performed, the appropriate machine alias must exist in the **maliases** file.

$e This field contains an error message to be printed. The left side of the alias will be removed from the list of users to be aliased. An alternate form of $e is #.

$p This field contains the character star (*) or a string of upper and lowercase alphabetic characters. Each character indicates that the user on the left-hand side of the alias belongs to a special "class" of users. The star (*) character implies membership in all such classes.

$r This field contains a string of upper and lower case alphabetic characters, each character indicating a "class" of users to be granted expansion permision. The absence of a $r field means that any user can expand the alias. If the $r field exists, expansion is only allowed if:

1) the user requesting expansion has a $p field and it contains one or more of the characters found in the $r field.

2) the user has a $p field and it contains a "*".

3) the real user ID is 0 (super user).

If expansion is not allowed, no error messages result; the alias in question is treated as if it were not present.

To send mail delivery problems to root, the following alias could be used:

network: "$n the network mail recipient," root

To forward a group alias called *testalias* to a machine called *alaska* and expand it there, the following alias may be used:

testalias: $xalaska, mikem, georger, terih

Files

/usr/lib/mail/aliases

/usr/lib/mail/aliases.hash

/usr/lib/mail/maliases

/usr/lib/mail/faliases

/usr/lib/mail/maliases.hash

See Also

aliashash(ADM), netutil(ADM), systemid(F), top(F)

Name

ascii - Map of the ASCII character set.

Description

ascii is a map of the 7-bit ASCII character set. It lists both octal and hexadecimal equivalents of each character. It contains:

Octal							
000 nul	001 soh	002 stx	003 etx	004 eot	005 enq	006 ack	007 bel
010 bs	011 ht	012 nl	013 vt	014 np	015 cr	016 so	017 si
020 dle	021 dc1	022 dc2	023 dc3	024 dc4	025 nak	026 syn	027 etb
030 can	031 em	032 sub	033 esc	034 fs	035 gs	036 rs	037 us
040 sp	041 !	042 "	043 #	044 $	045 %	046 &	047 '
050 (	051)	052 *	053 +	054 ,	055 -	056 .	057 /
060 0	061 1	062 2	063 3	064 4	065 5	066 6	067 7
070 8	071 9	072 :	073 ;	074 <	075 =	076 >	077 ?
100 @	101 A	102 B	103 C	104 D	105 E	106 F	107 G
110 H	111 I	112 J	113 K	114 L	115 M	116 N	117 O
120 P	121 Q	122 R	123 S	124 T	125 U	126 V	127 W
130 X	131 Y	132 Z	133 [	134 \	135]	136 ^	137 _
140 `	141 a	142 b	143 c	144 d	145 e	146 f	147 g
150 h	151 i	152 j	153 k	154 l	155 m	156 n	157 o
160 p	161 q	162 r	163 s	164 t	165 u	166 v	167 w
170 x	171 y	172 z	173 {	174 |	175 }	176 ~	177 del

Hexadecimal							
00 nul	01 soh	02 stx	03 etx	04 eot	05 enq	06 ack	07 bel
08 bs	09 ht	0a nl	0b vt	0c np	0d cr	0e so	0f si
10 dle	11 dc1	12 dc2	13 dc3	14 dc4	15 nak	16 syn	17 etb
18 can	19 em	1a sub	1b esc	1c fs	1d gs	1e rs	1f us
20 sp	21 !	22 "	23 #	24 $	25 %	26 &	27 '
28 (	29)	2a *	2b +	2c ,	2d -	2e .	2f /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7
38 8	39 9	3a :	3b ;	3c <	3d =	3e >	3f ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G
48 H	49 I	4a J	4b K	4c L	4d M	4e N	4f O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W
58 X	59 Y	5a Z	5b [	5c \	5d]	5e ^	5f _
60 `	61 a	62 b	63 c	64 d	65 e	66 f	67 g
68 h	69 i	6a j	6b k	6c l	6d m	6e n	6f o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w
78 x	79 y	7a z	7b {	7c |	7d }	7e ~	7f del

The extended 8-bit ASCII character set is shown here, again with the octal and hexadecimal value of each character. The *mapchan*(C) utility allows access to these characters. Display of these characters is dependent on the capabilities of the hardware device. (A ▩ indicates an unassigned character.)

Octal							
200 ▩	201 ▩	202 ▩	203 ▩	204 ind	205 nel	206 ssa	207 esa
210 hts	211 htj	212 vts	213 pld	214 plu	215 ri	216 ss2	217 ss3
220 dcs	221 pu1	222 pu2	223 sts	224 cch	225 mw	226 spa	227 epa
230 ▩	231 ▩	232 ▩	233 csi	234 st	235 osc	236 pm	237 apc
240 nbsp	241 ¡	242 ¢	243 £	244 ¤	245 ¥	246 ¦	247 §
250 ¨	251 ©	252 ª	253 «	254 ¬	255 shy	256 ®	257 ¯
260 °	261 ±	262 ²	263 ³	264 ´	265 µ	266 ¶	267 ·
270 ¸	271 ¹	272 º	273 »	274 ¼	275 ½	276 ¾	277 ¿
300 À	301 Á	302 Â	303 Ã	304 Ä	305 Å	306 Æ	307 Ç
310 È	311 É	312 Ê	313 Ë	314 Ì	315 Í	316 Î	317 Ï
320 Ð	321 Ñ	322 Ò	323 Ó	324 Ô	325 Õ	326 Ö	327 ▩
330 Ø	331 Ù	332 Ú	333 Û	334 Ü	335 Ý	336 Þ	337 ß
340 à	341 á	342 â	343 ã	344 å	345 æ	346 æ	347 ç
350 è	351 é	352 ê	353 ë	354 ì	355 í	356 î	357 ï
360 ð	361 ñ	362 ò	363 ó	364 ô	365 õ	366 ö	367 ▩
370 ø	371 ù	372 ú	373 û	374 ü	375 ý	376 þ	377 ÿ

Hexadecimal							
80 ▩	81 ▩	82 ▩	83 ▩	84 ind	85 nel	86 ssa	87 esa
88 hts	89 htj	8a vts	8b pld	8c plu	8d ri	8e ss2	8f ss3
90 dcs	91 pu1	92 pu2	93 sts	94 cch	95 mw	96 spa	97 epa
98 ▩	99 ▩	9a ▩	9b csi	9c st	9d osc	9e pm	9f apc
a0 nbsp	a1 ¡	a2 ¢	a3 £	a4 ¤	a5 ¥	a6 ¦	a7 §
a8 ¨	a9 ©	aa ª	ab «	ac ¬	ad shy	ae ®	af ¯
b0 °	b1 ±	b2 ²	b3 ³	b4 ´	b5 µ	b6 ¶	b7 ·
b8 ¸	b9 ¹	ba º	bb »	bc ¼	bd ½	be ¾	bf ¿
c0 À	c1 Á	c2 Â	c3 Ã	c4 Ä	c5 Å	c6 Æ	c7 Ç
c8 È	c9 É	ca Ê	cb Ë	cc Ì	cd Í	ce Î	cf Ï
d0 Ð	d1 Ñ	d2 Ò	d3 Ó	d4 Ô	d5 Õ	d6 Ö	d7 ▩
d8 Ø	d9 Ù	da Ú	db Û	dc Ü	dd Ý	de Þ	df ß
e0 à	e1 á	e2 â	e3 ã	e4 ä	e5 å	e6 æ	e7 ç
e8 è	e9 é	ea ê	eb ë	ec ì	ed í	ee î	ef ï
f0 ð	f1 ñ	f2 ò	f3 ó	f4 ô	f5 õ	f6 ö	f7 ▩
f8 ø	f9 ù	fa ú	fb û	fc ü	fd ý	fe þ	ff ÿ

Files

/usr/pub/ascii

Name

chrtbl - Create a ctype locale table.

Syntax

chrtbl [*specfile*]

Description

The utility *chrtbl* is provided to allow new LC_CTYPE locales to be defined; It reads a specification file, containing definitions of the attributes of characters in a particular character set, and produces a binary table file, to be read by *setlocale* (S), which determines the behavior of the *ctype* (S) and *conv* (S) routines.

The information supplied in the specification file consists of lines in the following format:

char type conv

The three fields, which are separated by space or tab characters, have the following meanings and syntax:

char This is the character which is being defined. It may be specified in one of six different ways (the following examples all specify the ASCII character "A"):

65	decimal
0101	octal
0x41	hexadecimal
'A'	quoted character
'\101'	quoted octal
'\x41'	quoted hexadecimal

type This specifies the classification of the character, as reported by the *ctype* (S) routines. There are 7 basic classifications:

C	iscntrl
D	sdigit
L	islower
P	ispunct
S	isspace
U	isupper
X	isxdigit

Other ctype macros use combinations of these 7 basic classifications. Zero, one or more of these classification letters can be specified, in any order, although only certain combinations are logically reasonable, as follows:

C	control character
CS	spacing control character
U	uppercase alphabetic
UX	uppercase alphabetic hex digit
UL	dual case character
L	lowercase alphabetic
LX	lowercase alphabetic hex digit
DX	decimal and hex digit
S	spacing character
P	punctuation (all other printing chars)
blank	undefined (all classifications false)

conv This optional field specifies the corresponding upper case character for a lower case character, or the corresponding lower case character for an upper case character. Dual case characters should have their own values repeated in this field.

The syntax is as for the *char* field.

All characters following a hash (#) are treated as a comment and ignored up to the end of the line, unless the hash is within a quoted character.

The initial LC_CTYPE table used is that for the *ascii*(M) character set, with the entries for the higher 128 characters (0x80 - 0xff) set to zero (i.e. all classifications false). Thus an empty specification file will result in a table for US ASCII . Any specifications found in the input to *chrtbl* will overwrite the specifications for that character only, thus additions and modifications to the ASCII table can be made without respecifying those characters which are unchanged.

The binary table output is placed in a file named *ctype*, within the current directory. This file should be copied or linked to the correct place in the *setlocale* file tree (see *locale*(M)). To prevent accidental corruption of the output data, the file is created with no write permission; if the *chrtbl* utility is run in a directory containing a write-protected "ctype" file, the utility will ask if the existing file should be replaced; any response other than "yes" or "y" will cause *chrtbl* to terminate without overwriting the existing file.

If the *specfile* argument is missing, the specification information is read from the standard input.

Diagnostics

If the input table file cannot be opened for reading, processing will terminate with the error message, "Cannot open specification file".

Any lines in the specification file which are syntactically incorrect will cause an error message to be issued to the standard error output, specifying the line number on which the error was detected. The line will be ignored, and processing will continue.

If the output file, "ctype", cannot be opened for writing, processing will terminate with the error message, "Cannot create table file."

Any error conditions encountered will cause the program to exit with a non-zero return code; successful completion is indicated with a zero return code.

Specification File Format

The *chrtbl* specification file has the following format (the order of the specifications is not significant):

```
#
# chrtbl file for TVI 7-bit Spanish character set
# Note that only non-ASCII characters need be specified
#
'@'    P         # inverted ?
'['    L   ']'   # n tilde
'\\'   P         # inverted !
']'    U   '['   # N tilde
'~'    P         # degree sign
```

Files

/usr/include/ctype.h

See Also

ascii(M), conv(S), ctype(S), locale(M), setlocale(S)

Name

coffconv - Convert 386 COFF files to XENIX format.

Syntax

coffconv [**-v**] [**-o** outfile] coff-file

Description

coffconv converts 386 Common Object Format Files (COFF) to the appropriate Xenix file format. If the file specified is a relocatable object module it is converted to Microsoft OMF format. If it is an executable binary it is converted to x.out format.

If the file is a UNIX System V archive, it is converted to XENIX archive format and each file in the archive is converted as appropriate. Any files in the archive which are not in 386 COFF format are copied to the new archive unchanged. *coffconv* also creates a XENIX format __.SYMDEF symbol directory for the new archive.

Options are:

-v Verbose mode. The name of each member of an archive is displayed as it is converted.

-o Output file name. If no output file name is specified the default is x.out.

Notes

Only essential symbol table information is converted. Source line numbers and additional symbol information for use by the symbolic debugger sdb will be ignored.

Note that *coffconv* only converts 386 COFF files. It is not possible to convert 286 COFF files.

Files

x.out Default output file

See Also

86rel(F), a.out(F), ar(F)

Name

coltbl - Create a collation locale table.

Syntax

coltbl [*specfile*]

Description

The utility *coltbl* is provided to allow LC_COLLATE locales to be defined. It reads in a specification file (or standard input if *specfile* is not defined), containing definitions for a particular locale's collation ordering, and produces a concise format table file, to be read by *setlocale*(S).

In general, characters may be specified in one of six different ways (the following examples all specify the ASCII character "A"):

65	decimal
0101	octal
0x41	hexadecimal
'A'	quoted character
'\101'	quoted octal
'\x41'	quoted hexadecimal

The information in the specification file is to an extent free format. A particular type of definition is started by one of the following keywords:

PRIM:
ZERO:
EQUIV:
DOUBLE:

The keywords, *PRIM:*, *ZERO:* and *EQUIV:*, are concerned directly with the setting of the collation ordering of characters

A group of characters which are to be collated as equal, unless all other characters in a pair of strings are also equal, are grouped together with the *PRIM:* keyword. The position of a particular group in the specification file is significant as far as the collation ordering is concerned. Collating elements following the *PRIM:* keyword are separated by white spaces. A two character collating element can be specified here by *(a b)*, where *a* and *b* are the two characters making up the sequence. The order of the collating elements defined in one group is significant in secondary collation ordering. It is also possible to define a range of characters, for example:

PRIM: 'a' - 'z'

Collating elements following the *ZERO:* keyword, are to be ignored when collating. The format of the definitions is the same as with *PRIM:* . Ranges of characters can also be defined, as for example:

ZERO: 0x80 - 0x9f

EQUIV: is used to give two collating elements identical positions in the collation ordering. The syntax is:

EQUIV: a = b

where *a* and *b* are the two equal collating elements. There can be only one definition for each occurrence of this keyword.

Single characters which are to be collated as two characters, for example the German sharp s, are defined with the *DOUBLE:* keyword. The syntax is:

DOUBLE: a = (b c)

where *a* is the single character, and *b* and *c* are the two characters in the collating sequence. There can be only one definition for each occurrence of this keyword. The single character *a* must not also appear after a *PRIM:* , a *ZERO:* or a *EQUIV:* keyword.

All characters following the hash character are treated as a comment and ignored up to the end of the line, unless the hash is within a quoted string.

The concise format locale table is placed in a file named *collate* in the current directory. This file should be copied or moved to the correct place in the *setlocale* (S) file tree (see *locale* (M)). To prevent accidental corruption of the output data, the file is created with no write permission; if the *coltbl* utility is run in a directory containing a write-protected *collate* file, the utility will ask if the existing file should be replaced - any response other than "yes" or "y" will cause *coltbl* to terminate without overwriting the existing file.

See Also

chrtbl(M), collation(S), locale(M), numtbl(M), mestbl(M), montbl(M), timtbl(M), setlocale(S)

Diagnostics

All error messages printed are self explanatory.

Name

console - System console device.

Description

The file **/dev/console** is the device used by the system administrator for system maintenance (single-user) operations. It is the **tty** to which the first default shell is attached.

The system *console* device can be either a terminal (a serial adapter device, **tty1a**) or a sytem keyboard display adapter monitor (**tty01**).

Many programs, such as the XENIX kernel, redirect error messages to **/dev/console**. Initially **/dev/console** is linked to **/dev/systty**.

Files

/dev/console

See Also

boot(HW), systty(M), tty(M)

Notes

/dev/console should not be enabled, instead either the the display adapter (**tty01**) or the serial adapter device (**tty1a**) should be enabled.

A serial console cannot be attached to a multiport card or one that uses special drivers; it must be on a standard COM1 card.

In any console escape sequence, the caret character (^) will have 32 (decimal) subtracted from the ASCII value and will be interpreted as the right angle bracket or "greater than" key.

Name

daemon.mn - Micnet mailer daemon

Syntax

/usr/lib/mail/daemon.mn [-ex]

Description

The mailer daemon performs the "backend" networking functions of the *mail*, *rcp*, and *remote* commands by establishing and servicing the serial communication link between computers in a Micnet network.

When invoked, the daemon creates multiple copies of itself, one copy for each serial line used in the network. Each copy opens the serial line, creates a startup message for the LOG file, and waits for a response from the daemon at the other end. The startup message lists the names of the machines to be connected, the serial line to be used, and the current date and time. If the daemon receives a correct response, it establishes the serial link and adds the message "first handshake complete" to the LOG file. If there is no response, the daemon waits indefinitely.

If invoked with the **-x** switch, the daemon records each transmission in the LOG file. A transmission entry shows the direction of the transmission (tx for transmit, rx for receive), the number of bytes transmitted, the elasped time for the transmission (in minutes and seconds), and the time of day of the transmission (in hours, minutes, and seconds). Each entry has the form:

direction byte_count elasped_time time_of_day

The daemon also records the date and time every hour. The date and time have the same format as described for the *date* command.

If invoked with the **-e** switch, the daemon records all transmission errors in the LOG file. An error entry shows the cause of the error preceded by the name of the daemon subroutine which detected the error.

The mailer daemon is normally invoked by the *start* option of the *netutil* command and is stopped by the *stop* option.

During the normal course of execution, the mailer daemon uses several files in the **/usr/spool/micnet/remote** directory. These files provide storage for LOG entries, commands issued by the *remote*(C) command, and a list of processes under daemon control.

Files

/usr/lib/mail/daemon.mn

/usr/spool/micnet/remote/*/LOG

/usr/spool/micnet/remote/*/mn

/usr/spool/micnet/remote/local/mn*

/usr/spool/micnet/remote/lock

/usr/spool/micnet/remote/pids

See Also

netutil(ADM)

Name

environ - User environment.

Description

The user environment is a collection of information about a user, such as login directory, mailbox, and terminal type. The environment is stored in special "environment variables," which can be assigned character values, such as names of files, directories, and terminals. These variables are automatically made available to programs and commands invoked by the user. The commands can then use the values to access the user's files and terminal.

The following is a short list of commonly used environment variables.

PATH — Defines the search path for the directories containing commands. The system searches these directories whenever a user types a command without giving a full pathname. The search path is one or more directory names separated by colons (:). Initially, PATH is set to :/bin:/usr/bin.

HOME — Names the user's login directory. Initially, HOME is set to the login directory given in the user's **passwd** file entry.

EDITOR — Used to set the editor. The default editor is *ed*(C). Using *vi* as an example, for Bourne Shell users, the syntax is:

EDITOR = /bin/vi

For C-Shell users, the syntax is:

setenv EDITOR /bin/vi

EXINIT — Used to set *vi* options and define *vi* abbreviations and mappings. For Bourne Shell users, the syntax is:

EXINIT = 'set *options*'

For C-Shell users, the syntax is:

setenv EXINIT 'set *options*'

For example, a C-Shell user might place the following command in **$HOME/.cshrc**:

setenv EXINIT 'set wm=24 | map g 1G'

This would automatically set *vi's* wrapmargin option to 24 and would define the "g" key to move to the top of the file (just as "G" moves to the bottom of the file).

You can set more than one option with the same **set** command. If you define abbreviations or mappings with this environment variable, you must separate the **abbr** and **map** commands from the **set** command and from each other with a bar (|). The function of the bar is similar to that of the semicolon that separates commands on a shell command line.

If you are defining many customizations, you might prefer to use the **.exrc** file, where each command can be listed one per line (see *vi*(C)).

TERM Defines the type of terminal being used. This information is used by commands such as *more*(C) which rely on information about the capabilities of the user's terminal. The variable may be set to any valid terminal name (see *terminals*(M)) directly or by using the *tset*(C) command.

TZ Defines time zone information. This information is used by *date*(C) to display the appropriate time. The variable may have any value of the form:

xxx*n***zzz***s;* **start**/*time*, **end**/*time*

where **xxx** is standard local time zone abbreviation (1-9 characters), *n* is the standard time zone difference from GMT, and may be given as hh:mm:ss (hours:minutes:seconds), **zzz** is the summertime local time zone abbreviation of 1-9 characters (if any), *s* is the summertime time zone difference from GMT, and may be given as hh:mm:ss (hours:minutes:seconds), **start** and **end** specify the day to begin and end summertime based on one of four rules, and **time** is the time of day the change to or from summertime occurs. The rules for specifying **start** and **end** are:

J*n*	1 based Julian day *n*
n	0 based Julian day *n*
W*n.d*	*n*th day of week *d*
M*m.n.d*	*n*th day of week *d* in month *m*

For example:

```
EST5:00:00EDT4:00:00;M4.1.0/2:00:00,M10.5.0/2:00:00.
```

Refer to the *tz*(M) manual page for more on *TZ*.

HZ Defines, with a numerical value, the number of clock interrupts per second. The value of this variable is dependent on the hardware, and configured in the file **etc/default/login**. If *HZ* is not defined, programs which depend on this hertz value, such as *prof*(CP) and *times*(S), will not run.

LANG Represents the international *locale* in the format *language_territory.codeset*. This is used by *setlocale* (S) to establish the default *locale* on program startup.

Individual locale-specific functions can be affected independently using the following optional environment variables:

LC_CTYPE Locale affecting character classification routines (*ctype(S)*).

LC_NUMERIC
Locale affecting numeric formatting.

LC_TIME Locale affecting time and date format.

LC_COLLATE
Locale affecting collation/sorting sequence.

LC_MESSAGES
Locale affecting message language.

LC_MONETARY
Locale affecting currency formatting.

The environment can be changed by assigning a new value to a variable. An assignment has the form:

name=value

For example, the assignment:

TERM=h29

sets the TERM variable to the value "h29". The new value can be "exported" to each subsequent invocation of a shell by exporting the variable with the *export* command (see *sh*(C)) or by using the *env* (C) command.

You may also add variables to the environment, but you must be sure that the new names do not conflict with exported shell variables such as MAIL, PS1, PS2, and IFS. Placing assignments in the **.profile** file is a useful way to change the environment automatically before a session begins.

Note that the environment is made available to all programs as an array of strings. Each string has the form:

name=value

where the *name* is the name of an exported variable and the *value* is the variable's current value. For programs started with a *exec* (S) call, the environment is available through the external pointer *environ*. For other programs, individual variables in environment are available through *getenv* (S) calls.

See Also

env(C), exec(S), getenv(S) setlocale(S), locale(M), login(M), profile(M), sh(C)

Name

error - Kernel error output device.

Description

System error messages are collected and made available to error logging daemons through the **/dev/error** device. **/dev/error** is a read-only device which returns one error per read and no EOF character. **/etc/rc** uses a utility to read messages from **/dev/error** and write them to the system error log file **/usr/adm/messages**:

```
/etc/logger /dev/error /usr/adm/messages &
```

Any process can read **/dev/error** or arrange to be signaled when errors are queued in **/dev/error**. The following *ioctl* causes the error device to signal the process with **SIGUSR1** when an error message is queued in **/dev/error**.

```
#include <signal.h>
#include <syserr.h>
...
int fd;
...
fd = open("/dev/error", O_RDONLY);
ioctl(fd, EMSG_SIG, SIGUSR1);
```

Before exiting, the process must return **/dev/error** to its normal state. Do this with the following *ioctl*:

```
...
ioctl(fd,EMSG_NOSIG, 0);
...
```

Panic error messages are not logged in **/dev/error**.

Files

/dev/error

See Also

messages(M)

Name

getty - Sets terminal type, modes, speed, and line discipline.

Syntax

/etc/getty [**-h**] [**-t** timeout] line [speed [type [linedisc]]]
/etc/getty -c file

Description

getty is a program that is invoked by *init*(M). It is the second process in the series, (*init-getty-login-shell*), that ultimately connects a user with the XENIX system. Initially *getty* displays the login message field for the entry it is using from **/etc/gettydefs**. *getty* reads the user's login name and invokes the *login*(M) command with the user's name as argument. While reading the name, *getty* attempts to adapt the system to the speed and type of terminal being used.

Line is the name of a tty line in **/etc/ttys** to which *getty* is to attach itself. *getty* uses this string as the name of a file in the **/dev** directory to open for reading and writing. The **-t** flag, plus *timeout* in seconds, specifies that *getty* should exit if the open on the line succeeds and no one enters anything in the specified number of seconds. The optional second argument, *speed*, is a label to a speed and tty definition in the file **/etc/gettydefs**. This definition tells *getty* what speed to initially run, what the login message should look like, what the initial tty settings are, and what speed to try next should the user indicate that the speed is inappropriate (by entering a BREAK character). The default *speed* is 300 baud. The optional third argument, *type*, is a character string describing to *getty* what type of terminal is connected to the line in question. *getty* understands the type **none**—any CRT or normal terminal unknown to the system. This is the default.

For terminal type to have any meaning, the virtual terminal handlers must be compiled into the operating system. They are available, but not compiled in the default condition. The optional fourth argument, *linedisc*, is a character string describing which line discipline to use in communicating with the terminal. Again the hooks for line disciplines are available in the operating system but there is only one presently available, the default line discipline, **LDISC0**.

When given no optional arguments, *getty* sets the *speed* of the interface to 300 baud, specifies that raw mode will be used (awaken on every character), that echo will be suppressed, either parity allowed, that new-line characters will be converted to carriage return-line feed, and that tab expansion is performed on the standard output. It displays the login message before reading the user's name a character at a time. If a null character (or framing error) is received, it is assumed to be the result of the user pushing the BREAK key. This will cause *getty* to

attempt the next *speed* in the series. The series that *getty* tries is determined by what it finds in **/etc/gettydefs**.

The user's name is terminated by a new-line or carriage-return character. The latter results in the system being set to treat carriage returns appropriately (see *ioctl* (S)).

The user's name is scanned to see if it contains any lower-case alphabetic characters. *getty* suggests that the user use all lower-case characters. If the user uses upper case characters, the system is told to map any future upper-case characters into the corresponding lower-case characters.

Finally, the *login-program* from **/etc/gettydefs** is called with the user's name as an argument. Additional arguments may be entered after the login name. These are passed to the *login-program*. The default *login-program*, **/etc/login**, places them in the environment (see *login*(M)).

A check option is provided. When *getty* is invoked with the **-c** option and *file*, it scans the file as if it were scanning **/etc/gettydefs** and prints out the results to the standard output. If there are any unrecognized modes or improperly constructed entries, it reports these. If the entries are correct, it displays the values of the various flags. See *ioctl* (S) to interpret the values. Note that some values are added to the flags automatically.

Notes

Changes have been made to support using the line for *uucico*, *cu*, and *ct*; that is, the line can be used in both directions. The *getty* will allow users to login, but if the line is free, *uucico*, *cu*, or *ct* can use it for dialing out. The implementation depends on the fact that *uucico*, *cu*, and *ct* create lock files when devices are used. When the "open( )" returns on a modem-control-line (or the first character is read on a non-modem-control line), the status of the lock file indicates whether the line is being used by *uucico*, *cu*, *ct*, or someone trying to login. Note that in the non-modem-control case, several <carriage-return> characters may be required before the login message is output. The human users will be able to handle this slight inconvenience. *uucico* trying to login will have to be told by using a login script similar to the following:

"" \r\d\r\d\r\d\r in:--in: ...

where ... is whatever would normally be used for the login sequence.

getty only behaves in this special UUCP mode (waiting for a first character, checking for a lock file) if the line is shared between dial-in and dial-out (i.e., only if there is an entry for that line in **/usr/lib/uucp/Devices**). If the UUCP package is not installed, then

getty will not behave in this manner. If a line is shared between dial-in and dial-out and there is a dialer on the line, then *getty* will reinitialize the line to dial-in prior to opening the the line by running *dialer* **-h**, where *dialer* is the dialer program given in the **Devices** entry (see *dial*(M)), or by running **/usr/lib/uucp/uuchat** with the reinitialization chat specified by an ampersand (&) entry in **/usr/lib/uucp/Dialers**. *getty* generates no error message if this reinitialization fails.

The **-h** flag is used when *ct* invokes *getty* itself; it instructs *getty* to bypass this special UUCP function, since *ct* has already opened and locked the line.

Files

/etc/gettydefs
/etc/ttys
/usr/lib/uucp/Devices
/usr/lib/uucp/Dialers
/usr/lib/uucp/LCK..ttyXX

See Also

init(M), login(M), ioctl(S), gettydefs(F), ttys(F), ct(C), dial(M), cu(C), uucico(ADM).

Name

init, inir - Process control initialization.

Syntax

/etc/init
/etc/inir

Description

The *init* program is invoked as the last step of the boot procedure and as the first step in enabling terminals for user logins. *init* is one of three programs (*init*, *getty*(M), and *login*(M)) used to initialize a system for execution.

init creates a process for each terminal on which a user may log in. It begins by opening the console device, **/dev/console**, for reading and writing. It then invokes a shell which prompts for a password to start the system in "maintenance mode". If at this prompt an EOF is read, the system proceeds toward "multi-user mode". If the root pasword is entered, a shell is started and attached to the console. When this shell is terminated the system proceeds toward "multi-user mode".

If the system was automatically loaded at boot time, *init* will be passed a **-a** flag when it is started. *init* also passes this flag to the programs it runs so they may choose to behave differently under *autoboot*(ADM) conditions.

The user may *boot* and the filesystem may be dirty. In this case, *inir* prompts the user, asking whether to do an *fsck (ADM)* (See *fsck (ADM)* for more information.)

The user may *boot* and the filesystem may be clean. In this case, *init* reads commands from the **/etc/rc** file. This is followed by the "multi-user/rc" and the "getty/login" procedures as documented below.

"multi-user/rc" procedure: Once the filesystem is clean, the shell terminates, and *init* performs several steps to begin normal operation. It invokes a shell and reads the commands in the **/etc/rc** file. This command file performs housekeeping tasks such as removing temporary files, mounting file systems, and starting daemons. Then it reads the file **/etc/ttys** and forks several times to create a process for each terminal device in the file. Each line in the **/etc/ttys** lists the state of the line (0 for closed, 1 for open), the line mode, and the serial line (see *ttys*(F)). Each process opens the appropriate serial line for reading and writing, assigning the file descriptors 0, 1, and 2 to the line and establishing it as the standard input, output, and error files. If the serial line is connected to a modem, the process delays opening the

line until someone has dialed up and a carrier has been established on the line.

"getty/login" procedure: Once *init* has opened a line, it executes the *getty* program, passing the line mode as an argument. The *getty* program reads the user's name and invokes *login*(M) to complete the login process (see *getty*(M) for details). *init* waits until the user logs out by typing ASCII end-of-file (Ctrl-D) or by hanging up. It responds by waking up and removing the former user's login entry from the file **utmp**, which records current users, and makes a new entry in the file **wtmp**, which is a history of logins and logouts. Then the corresponding line is reopened and *getty* is reinvoked.

init has special responses to the hangup, interrupt, and quit signals. The hangup signal SIGHUP causes *init* to change the system from normal operation to maintenance mode. The interrupt signal SIGINT causes *init* to read the **ttys** file again to open any new lines and close lines that have been removed. The quit signal SIGQUIT causes *init* to disallow any further logins. In general, these signals have a significant effect on the system and should not be used by a inexperienced user. Instead, similar functions can be safely performed with the *enable*(C), *disable*(C), and *shutdown*(ADM) commands.

Files

/dev/tty*
/etc/utmp
/usr/adm/wtmp
/etc/default/boot
/etc/ttys
/etc/rc
/etc/gettydefs

See Also

autoboot(ADM), telenit(ADM), disable(C), enable(C), login(M), kill(C) sh(C), shutdown(ADM), ttys(F), getty(M), gettydefs(F), inittab(F)

Diagnostics

If seven or more *getty* processes are started on the same line in five minutes or less, *init* writes an error message to **/dev/console** and refuses to start another *getty* on that line for at least 30 minutes. If desired, *init* will try again immediately if a SIGINT is sent.

Notes

init can only be invoked by the kernel as process 1. It cannot be invoked from the shell prompt.

For users more familiar with the *telenit* approach to terminal administration, **inittab** is provided. For more information, see *telenit*(ADM) and *inittab*(F).

Name

ld - Invokes the link editor.

Syntax

ld [*options*] *filename...*

Description

ld is the XENIX link editor. It creates an executable program by combining one or more object files and copying the executable result to the file **a.out**. The *filename* must name an object or library file. These names must have the ".o" (for object) or ".a" (for archive library) extensions. If more than one name is given, the names must be separated by one or more spaces. If errors occur while linking, *ld* displays an error message; the resulting **a.out** file is unexecutable.

ld concatenates the contents of the given object files in the order given in the command line. Library files in the command line are examined only if there are unresolved external references encountered from previous object files. Library files must be in *ranlib*(CP) format, that is, the first member must be named __.SYMDEF, which is a dictionary for the library. The library is searched iteratively to satisfy as many references as possible and only those routines that define unresolved external references are concatenated. Object and library files are processed at the point they are encountered in the argument list, so the order of files in the command line is important. In general, all object files should be given before library files. *ld* sets the entry point of the resulting program to the beginning of the first routine.

There are the following options:

-A *num*
Creates a standalone program whose expected load address (in hexadecimal) is *num*. This option sets the absolute flag in the header of the a.out file. Such program files can only be executed as standalone programs. Options **-A** and **-F** are mutually exclusive.

-B *num*
Sets the text selector bias to the specified hexadecimal number.

-c *num*
Alters the default target CPU in the *x.out* header. *num* can be 0, 1, 2, or 3 indicating 8086, 80186, 80286 and 80386 processors, respectively. The default on 8086/80286 systems is 0. The default on 80386 systems is 3. Note that this option only alters the default; if object modules containing code for a higher numbered processor are linked, then that will take precedence over the default.

-C
Causes the link editor to ignore the case of symbols.

-D *num*
Sets the data selector bias to the specified hexadecimal number.

-C5
Turns on a bit to invoke **/usr/lib/coffconv** with the linker, producing an **x.out** COFF-compatible binary.

-CX
Turns off bit set with **-C5**, which resides in the header of the object file.

-F *num*
Sets the size of the program stack to *num* bytes where num is a hexadecimal number. This option is ignored for 80386 programs which have a variable sized stack. By default 8086 programs have a variable stack located at the top of the first data segment, and 80286 programs have a fixed size 4096 byte stack. The **-F** option is incompatible with the **-A** option

-i
Creates separate instruction and data spaces for small model programs. When the output file is executed, the program text and data areas are allocated separate physical segments. The text portion will be read-only and shared by all users executing the file.

-La
Sets advisory file locking. Advisory locking is used on files with access modes that do not require mandatory locking.

-Lm
Sets mandatory file locking. Mandatory file locking is used on files that cannot be opened by more than one user at the same time.

-m name
Creates a link map file named *name* that includes public symbols.

-Ms
Creates a small model program and checks for errors, such as fixup overflow. This option is reserved for object files compiled or assembled using the small model configuration. This is the default model if no **-M** option is given.

-Mm
Creates middle model program and checks for errors. This option is reserved for object files compiled or assembled using the middle model configuration. This option implies **-i .**

-Ml
Creates a large model program and checks for errors. The option is reserved for object files compiled using the large model configuration. This option implies **-i .**

-M*x*
Specifies the memory model. *x* can have the following values:

s	small
m	middle
l	large
h	huge
e	mixed

-n *num*
Truncates symbols to the length specified by *num.*

-N *num*
Sets the pagesize to hex-*num* (which should be a multiple of 512) - the default is 1024 for 80386 programs. 8086/80186/80286 programs do not normally have page-aligned *x.out* files and the default for these is 0.

-o *name*
Sets the executable program filename to *name* instead of **a.out.**

-P
Disables packing of segments

-r Invokes the incremental linker, **/lib/ldr ,** with the arguments passed to **ld** to produce a relocatable output file.

-R Ensures that the relocation table is of non-zero size. Important for 8086 compatibility.

-Rd num
Specify the data segment relocation offset (80386 only). *num* is hexadecimal.

-Rt num
Specify the text segment relocation offset (80386 only) *num* is hexadecimal.

-s
Strips the symbol table.

-S *num*
Sets the maximum number of segments to *num.* If no argument is given, the default is 128.

-u *symbol*
Designates the specified *symbol* as undefined.

-v *num*
Specifies the XENIX version number. Acceptable values for *num* are 2, 3, or 5; 5 is the default.

ld should be invoked using the *cc*(CP) instead of invoking it directly. *Cc* invokes *ld* as the last step of compilation, providing all the necessary C-language support routines. Invoking *ld* directly is not recommended since failure to give command line arguments in the correct order can result in errors.

Files

/bin/ld

See Also

ar(CP), cc(CP), ld(CP), masm(CP), ranlib(CP)

Notes

The user must make sure that the most recent library versions have been processed with *ranlib*(CP) before linking. If this is not done, *ld* cannot create executable programs using these libraries.

Name

locale - International locale.

Syntax

language [_ [territory] [. [codeset]]]
"C"

Description

The international locale is a definition of the local conventions to be used by XENIX libraries (and hence utilities and applications) for features whose behavior varies internationally.

The locale is specified by a character string of the form *language_territory.codeset*, where:

language represents both the language of text files being used, and the preferred language for messages (where the utility or application is capable of displaying messages in many languages),

territory represents the geographical location (usually the country) determining such factors as currency and numeric formats, and

codeset represents the character set in use for the internal representation of text.

The locale string "french_canada.8859" could therefore represent a Canadian user using the French language, processing data using the ISO 8859/1 standard international character set.

Each element (*language*, *territory* or *codeset*) can be up to 14 characters long, and should use only alphanumeric ASCII characters (see *ascii(M)*).

Note that the locale is not required to be completely specified: *territory* and *codeset* are optional. When a locale is incompletely specified, missing values are sought in the following sequence:

1. For each subclass, such as LC_TIME , in an environment variable of the same name as the subclass.

2. In the LANG environment variable.

3. In the file */etc/default/lang* .

The special locale string "C", used to represent the minimal environment needed for the C programming language, is taken to be equivalent to "english_us.ascii".

The format of the file */etc/default/lang* is at least one line, of the form:

```
LANG="language_territory.codeset"
```

A partly specified locale string will be expanded to the first *LANG* = entry in which the specified locale fields match.

Thus if the */etc/default/lang* file contains the following:

```
LANG=english_us.ascii
LANG=english_uk.8859
LANG=french_france.8859
```

A locale string "english_uk" will get expanded to "english_uk.8859", whereas a locale string "french" will get expanded to "french_france.8859".

The information used to configure a particular locale is generated by the utilities *chrtbl*(M), *coltbl*(M), *mestbl*(M), *montbl*(M), *numtbl*(M) and *timtbl*(M). The output files produced by these utilities (*ctype*, *collate*, *currency*, *messages*, *numeric* and *time* respectively) must be installed in the correct place in the directory structure */usr/lib/lang*. The correct directory name is found by substituting the language, territory and codeset names into the string "/usr/lib/lang/*language/territory/codeset*". The files should be installed into this directory with their existing file name (such as *ctype*).

A suggested naming convention for locales is as follows:

language The name of the language, in English, such as: english, french, german.

territory The name of the nation, in English, such as: us, uk, canada, france, germany, switzerland.

codeset An identification of the codeset, such as: ascii, 8859.

See Also

chrtbl(M), coltbl(M), environ(M), mestbl(M), montbl(M), numtbl(M), setlocale(S), timtbl(M)

Name

login - Gives access to the system.

Description

The *login* command is used at the beginning of each terminal session to identify the user and allow them access to the system. It cannot be invoked except when a connection is first established, or after the previous user has logged out by sending an end-of-file (Ctrl-D) to his initial shell.

login prompts for user name, and if appropriate, a password. Echoing is turned off (where possible) while the password is being entered, so it will not appear on the written record of the session.

It is possible to assign an additional password to dial-in lines for additional security. This is discussed below in "Dial-in Passwords."

If the login sequence is not completed successfully within a certain period of time (e.g., one minute), the user is returned to the "login:" prompt or silently disconnected from a dial-in line.

After a successful login, accounting files (*/etc/utmp* and */etc/wtmp*) are updated, the user is notified if they have mail, and the start-up shell files (i.e., **.profile** for the Bourne shell or **.login** for the C-shell) if any, are executed.

login checks **/etc/default/login** for ULIMIT (maximum file size in 512 byte blocks, default is 2,097,152), and for environment variables, such as TZ (time zone), HZ (hertz), and ALTSHELL (allows other than **sh** shell types). Other entries sometimes found in **/etc/default/login** are IDLEWEEKS, CONSOLE, and PASSREQ. IDLEWEEKS=*n*, where *n* is a number of weeks, works in conjunction with *pwadmin*(ADM). If a password has expired, the user is prompted to choose a new one. If it has expired beyond IDLEWEEKS, the user is not allowed to log in, and must consult system administrator. The CONSOLE=**/dev/***???* entry means that root can only log in on the **/dev** listed. PASSREQ=YES, if set, forces the user to select a password if they do not have one.

login initializes the user and group IDs and the working directory, then executes a command interpreter (usually *sh*(C)) according to specifications found in the **/etc/passwd** file. Argument 0 of the command interpreter is a dash (**-**) followed by the last component

of the interpreter's pathname. The basic *environment* (see *environ*(M)) is initialized to:

HOME= your-login-directory
PATH=:/bin:/usr/bin
SHELL=*last field of passwd entry*
MAIL=/usr/spool/mail/*your-login-name*
TZ=*timezone-specification*

Initially, *umask* is set to octal 022 by *login*.

If a user's UID is 0 (i.e. if this is the superuser), the PATH variable is set to SUPATH, if SUPATH is specified in */etc/default/login*. If it is not, PATH is set to the following:

PATH=:/bin:/usr/bin:/etc

It is not advisable for SUPATH to include the current directory symbol (.).

Dial-in Passwords

If desired, special dial-in passwords can be defined for selected tty lines, requiring selected classes of users to input these passwords. Logging information, including the last time of connection, can be stored for later use.

Specific dial-in lines that require passwords are defined in the file **/etc/dialups**. The actual dialup passwords are kept in the file **/etc/d_passwd**. The password must be generated **/etc/passwd** an transferred.

The first field ("user name") in **/etc/d_passwd** is the name of a shell program (for example, /bin/sh) used in **/etc/passwd**. If the login shell of the user attempting to log in (on a tty line listed in **/etc/dialups**) is listed in **/etc/d_passwd**, then the user is prompted for the dial-in password stored in */etc/d_passwd*. (A shell name of "*" in **/etc/d_passwd** specifies the default dialup password.)

A sample **/etc/d_passwd** file might be:

*:<*encrypted passwd*>:Default dialup password
/usr/lib/uucp/uucico::UUCP dialup password (none)
/bin/rsh:<*encrypted passwd*>:Restricted shell user dialup password

To enable time-of-login recording (and reporting of the time of last login at each login), create the log file **/usr/adm/lastlog**. This file should be owned by **/bin** and group **bin**; the permissions can be restricted to 600 if desired. If this file exists and the user is not currently logged in, the *finger*(C) utility will report the time of last login.

Files

/etc/utmp	Information on current logins
/etc/wtmp	History of logins since last multiuser
/usr/spool/mail/*name*	Mailbox for user *name*
/etc/motd	Message of the day
/etc/default/login	Default values for environment variables
/etc/passwd	Password file
/etc/profile	System profile
$HOME/.profile	Personal profile

See Also

environ(M), getty(ADM), machine(M), mail(C), newgrp(C), passwd(C), passwd(F), profile(M), su(C), sh(C), ulimit(S), umask(C), who(C).

Diagnostics

Login incorrect
The user name or the password is incorrect.

No shell, cannot open password file, no directory:
Your account has not been properly set up.

Your password has expired. Choose a new one.
Password aging is implemented and yours has expired.

Notes

Only the superuser may execute *login* from a shell.

As explained in *machine*(M), when setting ULIMIT in the **/etc/default/login** file on filesystems with 1024 byte blocks (see *machine*(M)), be sure to specify even numbers, as the ULIMIT variable accepts a number of 512-byte blocks. The default is 2,097,152 blocks, or 1 gigabyte. Use this variable to increase or decrease the maximum allowable file size.

Name

mapchan - Configure tty device mapping.

Syntax

mapchan [**-ans**] [**-f** *mapfile*] [*channels* ...]
mapchan [[**-o**] [**-d**]] [*channel*]

Description

mapchan configures the mapping of information input and output of XENIX. The *mapchan* utility is intended for users of applications that employ languages other than English (character sets other than 7-bit ASCII).

mapchan translates codes sent by peripheral devices, such as terminals, to the internal character set used by the XENIX system. *mapchan* can also map codes in the internal character set to other codes, for output to peripheral devices (such as terminals, printers, console screen, etc.). Note that PC keyboard configuration is accomplished through the *mapkey*(M) utility.

mapchan has several uses: to map a *channel* (**-a** or **-s**); to unmap a *channel* (**-n** and optionally **-a**); or to display the map on a channel (optionally **-o**, **-d**, *channels*).

mapchan with no options displays the map on the user's *channel*. The map displayed is suitable as input for *mapchan*.

The options are:

-a when used alone, sets all *channels* given in the default file (**/etc/default/mapchan**) with the specified map. When used with **-n**, it refers to all *channels* given in the default file. Superuser maps or unmaps all *channels*, other users map only *channels* they own. **-a** can not be used with **-d**, **-o**, or **-s**.

-d causes the mapping table currently in use on the given device, *channel*, to be displayed in decimal instead of the default hexadecimal. An ASCII version is displayed on standard output. This output is suitable as an input file to *mapchan* for another *channel*. Mapped values are displayed. Identical pairs are not output. **-d** can not be used with **-a**, **-f**, **-n**, **-o**, or **-s**.

-f causes the current *channel* or list of *channels* to be mapped with *mapfile*. **-f** can not be used with **-d**, **-n**, **-s**, or **-o**.

-n causes null mapping to be performed. All codes are input and output as received. Mapping is turned off for the user's *channel* or for other *channels*, if given. **-a** used with **-n** will turn mapping off on all *channels* given in the default file. This is the default mapping for all *channels* unless otherwise configured. **-n** can not be used with **-d**, **-f**, **-o**, or **-s**.

-o causes the mapping table currently in use on the given device, *channel*, to be displayed in octal instead of the default hexadecimal. An ASCII version is displayed on standard output. This output is suitable as an input file to *mapchan* for another port. Mapped values are displayed. Identical pairs are not output. **-o** can not be used with **-a**, **-d**, **-f**, **-n**, or **-s**.

-s sets the user's current *channel* with the *mapfile* given in the default file. **-s** can not be used with any other option.

The user must own the *channel* in order to map it. The super-user can map any channel. Read or write permission is required to display the map on a *channel*.

Each tty device *channel* (display adapter and video monitor on computer, parallel port, serial port, etc.) can have a different map. When XENIX boots, mapping is off for all *channels*.

mapchan is usually invoked in the **/etc/rc** file. This file is executed when the system enters multi-user mode and sets up the default mapping for the system. Users can invoke *mapchan* when they log in by including a *mapchan* command line in their **.profile** or **.login** file. In addition, users can remap their *channel* at any time by invoking *mapchan* from the command line. *channels* not listed in the default file are not automatically mapped. *channels* are not changed on logout. Whatever mapping was in place for the last user remains in effect for the next user, unless they modify their **.profile** or **.login** file.

For example, the default file **/etc/default/mapchan** can contain:

```
tty02          ibm
tty1a
tty2a          wy60.ger
lp             ibm
```

The default directory containing *mapfiles* is **/usr/lib/mapchan**. The default directory containing *channel* files is **/dev**. Full pathnames may be used for *channels* or *mapfiles*. If a *channel* has no entry, or the entry field is blank, no mapping is enabled on that *channel*. Additional *channels* added to the system, (for example, adding a serial or parallel port) are not automatically entered in the *mapchan* default file. If mapping is required, the system administrator must make the entries.

The format of the *mapfiles* is documented in the *mapchan*(F) manual page.

Using a Mapped channel

The input information is assumed to be 7- or 8-bit codes sent by the peripheral device. The device may make use of "dead" or "compose" keys to produce the codes. If the device does not have dead or compose keys, these keys can be simulated using *mapchan.*

One to one mapped characters are displayed when the key is pressed, and the mapped value is passed to the kernel.

Certain keys are designated as dead keys in the *mapfile*. Dead key sequences are two keystrokes that produce a single mapped value that is passed to the kernel. The dead key is usually a diacritical character, the second key is usually the letter being modified. For example, the sequence ´ *e* could be mapped to the ASCII value 0xE9, and display as é.

One key is designated as the compose key in the *mapfile*. Compose key sequences are composed of three keystrokes that produce a single mapped value that is passed to the kernel. The compose key is usually a seldom used character or ctrl-*letter* combination. The second key is usually the letter being modified. The third key may be another character being combined, or a diacritical character. For example, if '@' is the compose key, the sequence @ *c O* could be mapped to the ASCII value 0xA9, and display as ©.

Characters are not echoed to the screen during a dead or compose sequence. The mapped character is echoed and passed to the kernel once the sequence is correctly completed.

Characters are always put through the input map, even when part of dead or compose sequences. The character is then checked for the internal value. The value may also be mapped on output. This should be kept in mind when preparing map files.

The following conditions will cause an error during input:

- non-recognized (not defined in the *mapfile*) dead or compose sequence
- restarting a compose sequence before completion by pressing the compose key in the middle of a dead or compose sequence. This is an error, but a new compose sequence is initiated.

If the *mapfile* contains the keyword *beep*, a bell sounds when either of the above conditions occurs. In either case, the characters are not echoed to the screen, or passed to the kernel.

In order to allow for character sequences sent to control the terminal (move the cursor, and so on) rather than to print characters on the screen, mapchan allows character sequences to be specified as special sequences which are not passed through the normal mapping procedure. Two sections may be specified, one for each of the input (keyboard) and output (screen) controls.

Character Sets

The internal character set used by XENIX is defined by the *mapfiles* used. By default, this is the ISO 8859/1 character set which is also known as the dpANS X3.4.2 and ISO/TC97/SC2. It supports most of the Latin alphabet and can represent most European languages.

Several partial map files are provided as examples. They must be modified for use with specific peripheral devices. Consult your hardware manual for the codes needed to display the desired characters. Two map files are provided for use with the console device: **/usr/lib/mapchan/ibm** for systems with a standard PC character set ROM, and **/usr/lib/mapchan/iso** for systems with an optional ISO 8859/1 character set ROM.

Care should be taken that the *stty*(C) settings are correct for 8-bit terminals. The **/etc/gettydefs** file may require modification to allow logging in with the correct settings.

7-bit U.S. ASCII (ANSI X3.4) should be used if no mapping is enabled on the *channel*.

Files

/etc/default/mapchan
/usr/lib/mapchan/*

See Also

ascii(M), keyboard(HW), lp(C), lpadmin(ADM), mapchan(F), mapkey(M), parallel(HW), screen(HW), serial(HW), setkey(M), trchan(M), tty(M)

Notes

Some non-U.S. keyboards and display devices do not support characters commonly used by XENIX command shells and the C programming language. It is not recommended that these devices be used for system administration tasks.

Printers can be mapped, output only, and can either be sent 8-bit codes or one-to-many character strings using *mapchan*. Line printer spooler interface scripts can be used (setuid *root*) to change the output map on the printer when different maps are required (as in changing print wheels to display a different character set). See *lp*(C) and *lpadmin*(ADM) for information on installing and administering interface scripts.

Not all terminals or printers can display all the characters that can be represented using this utility. Refer to the device's hardware manual for information on the capabilities of the peripheral device.

Warnings

Use of *mapfiles* that specify a different "internal" character set per-channel, or a set other than the 8-bit ISO 8859 set supplied by default can cause strange side effects. It is especially important to retain the 7-bit ASCII portion of the character set (see *ascii*(M)). XENIX utilities and many applications assume these values.

Media transported between machines with different internal code set mappings may not be portable as no mapping is performed on block devices, such as tape and floppy drives. However, *trchan* with an appropriate *mapfile* can be used to "translate" from one internal character set to another.

Do not set ISTRIP (see *stty*(C)) when using *mapchan*. This option causes the eighth bit to be stripped before mapping occurs.

Name

mapkey, mapscrn, mapstr, convkey - Configure monitor screen mapping.

Syntax

mapkey [**-dox**][*datafile*]
mapscrn [**-d**][*datafile*]
mapstr [**-d**][*datafile*]
convkey [**in** [**out**]]

Description

mapscrn configures the output mapping of the monitor screen on which it is invoked. *mapkey* and *mapstr* configure the mapping of the keyboard and string keys (eg. function keys) of the monitor (and multiscreens if present). *mapkey* can only be run by the super-user.

mapstr functions on a per-screen basis. Mapping strings on one screen does not affect any other screen.

If a file name is given on the argument line the respective mapping table is configured from the contents of the input file. If no file is given, the default files in **/usr/lib/keyboard** and **/usr/lib/console** is used. The **-d** option causes the mapping table to be read from the kernel instead of written and an ASCII version to be displayed on the standard output. The format of the output is suitable for input files to *mapscrn*, *mapkey*, or *mapstr* . Non-super-users can run *mapkey* and *mapstr* when the **-d** option is given.

With the **-o** or **-x** options, *mapkey* displays the mapping table in octal or hexadecimal.

convkey translates an old-style mapkey file into the current format. If *in* or *out* are missing, they default to *stdin* or *stdout.*

Files

/usr/lib/keyboard/*
/usr/lib/console/*

Notes

There is no way to specify that the map utilities read their configuration tables from standard input.

See Also

keyboard(HW), screen(HW), setkey(C)

Name

messages - Description of system console messages.

Description

This section describes the various system messages which may appear on the system console. All messages are displayed in the following format:

label:*severity*:*comment*

The segments break down as follows:

label
Name of the driver or routine where the error occurred.

severity
The level of error severity, consisting of four levels:

PANIC	These fatal messages indicate hardware problems or kernel inconsistencies that are too severe for continued operation. After displaying a PANIC message, the system stops. Rebooting is required.
ERROR	Resource use has been affected. Some corrective action is needed.
WARNING	An error indication that should be monitored (example, free file space is low) but requires no immediate action.
INFO	Some information about the system is provided.

comment
A field containing information about the problem at hand.

action
The course of action to remedy the situation.

The system services error messages are generated by the shell and do not follow the above convention.

System Message Meanings

The following classifications are meant to be a key for you to use to determine the actions to take to correct an error situation. Each kernel message will have one of the following three classifications listed

with it. The classifications are:

System inconsistency
A contradictory situation exists in the kernel.

Abnormal
A probably legitimate but extreme situation exists.

Hardware
Indicates a hardware problem.

System inconsistency messages indicate problems usually traceable to hardware malfunction, such as memory failure. These messages rarely occur since associated hardware problems are generally detected before such an inconsistency can occur.

Abnormal messages represent kernel operation problems, such as the overflow of critical tables. It takes extreme situations to bring these problems about, so they should never occur in normal system use. However, in some cases you can modify the kernel parameters that are causing the error message. Use the *configure*(ADM) utility to make the necessary changes.

Hardware messages normally specify the device, *dev*, that caused the error. Each message gives a device specification of the form *nn/mm* where *nn* is the major number of the device, and *mm* is its minor number. The command pipeline

ls -l /dev | grep *nn* **| grep** *mm*

may be used to list the name of the device associated with the given major and minor numbers.

System Messages

** Normal System Shutdown **
This message appears when the system has been shutdown properly. It indicates that the machine may now be rebooted or powered down.

kernel:PANIC:** ABNORMAL System Shutdown **
This message appears when errors occur during system shutdown. It is usually accompanied by other system messages. *System inconsistency, fatal.*

kernel:WARNING:bad block on dev *nn/mm*
A nonexistent disk block was found on, or is being inserted in, the structure's free list. *System inconsistency.*

kernel:WARNING:bad count on dev *nn/mm*
A structural inconsistency in the superblock of a file system. The system attempts a repair, but this message will probably be followed by more complaints about this file system. *System inconsistency.*

kernel:WARNING:Bad free count on dev *nn/mm*
A structural inconsistency in the superblock of a file system. The system attempts a repair, but this message will probably be followed by more complaints about this file system. *System inconsistency.*

kernel:ERROR:error on dev *name* (*nn/mm*)
This is the way that most device driver diagnostic messages start. The message will indicate the specific driver and complaint. The *name* is a word identifying the device.

kernel:ERROR:iaddress > 2^24
This indicates an attempted reference to an illegal block number, one so large that it could only occur on a file system larger than 8 billion bytes. *Abnormal.*

kernel:WARNING:Inode table overflow
Each open file requires an inode entry to be kept in memory. When this table overflows, the specific request (usually *open*(S) or *creat*(S)) is refused. Although not fatal to the system, this event may damage the operation of various spoolers, daemons, the mailer, and other important utilities. Abnormal results and missing data files are a common result. Use *configure*(ADM) to raise the number of inodes. *Abnormal.*

kernel:WARNING:interrupt from unknown device, vec=*num*
The CPU received an interrupt via a supposedly unused vector. This message is followed by "panic:unknown interrupt." Typically, this event comes about when a hardware failure miscomputes the vector of a valid interrupt. *Hardware.*

kernel:WARNING:stray interrupt on vector *num*
The CPU received an interrupt via a supposedly unused vector. *Hardware.*

kernel:WARNING:no file
There are too many open files. The system has run out of entries in its "open file" table. The warnings given for the message "inode table overflow" apply here. Use *configure*(ADM) to raise the total number of available files or the number of files available per process. *Abnormal.*

kernel:WARNING:no space on dev *nn/mm*
This message means that the specified file system has run out of free blocks. Although not normally as serious, the warnings discussed for "inode table overflow" apply:often user programs are written casually and ignore the error code returned when they tried to write to the disk; this results in missing data and "holes" in data files. The system administrator should keep close watch on the amount of free disk space and take steps to avoid this situation. *Abnormal.*

kernel:WARNING:Out of inodes on dev *nn/mm*
The indicated file system has run out of free inodes. The number of inodes available on a file system is determined when the file system is created (using *mkfs*(ADM)). The default number is quite generous; this message should be very rare. The only recourse is to remove some worthless files from that file system, or dump the entire system to a backup device, run *mkfs*(ADM) with more inodes specified, and restore the files from backup. *Abnormal.*

kernel:PANIC:blkdev
An internal disk I/O request, already verified as valid, is discovered to be referring to a nonexistent disk. *System inconsistency, fatal.*

kernel:PANIC:devtab
An internal disk I/O request, already verified as valid, is discovered to be refering to a nonexistent disk. *System inconsistency, fatal.*

kernel:PANIC:iinit
The super-block of the root file system could not be read. This message occurs only at boot time. *Hardware, fatal.*

kernel:PANIC:swap IO error
A fatal I/O error occurred while reading or writing the swap area. *System inconsistency, fatal.*

kernel:PANIC:memory failure - parity error
A hardware memory failure trap has been taken. *System inconsistency, fatal.*

kernel:PANIC:no fs
A mounted file system's entry has disappeared from the system mount table. *System inconsistency, fatal.*

kernel:PANIC:no imt
A mounted file system has disappeared from the mount table. *System inconsistency, fatal.*

kernel:PANIC:no procs
Each user is limited in the amount of simultaneous processes he can have; an attempt to create a new process when none is available or when the user's limit is exceeded and refused. That is an occasional event and produces no console messages; this panic occurs when the kernel has certified that a free process table entry is available and can't find one when it goes to get it. *System inconsistency, fatal.*

kernel:WARNING:Out of swap
There is insufficient space on the swap disk to hold a task. The system refuses to create tasks when it feels there is insufficient disk space, but it is possible to create situations to circumvent this mechanism. *Abnormal.*

kernel:PANIC:general protection trap
General protection trap taken in kernel. *System inconsistency, fatal.*

kernel:PANIC:segment not present
An attempt has been made to access an invalid segment. It may also indicate the segment-not-present trap has been taken in the kernel. *System inconsistency, fatal.*

kernel:PANIC:Timeout table overflow
The timeout table is full. Timeout requests are generated by device drivers, there should usually be room for one entry per system serial line plus ten more for other usages. Use *configure*(ADM) to raise the number of timeout table entries.

kernel:PANIC:Trap in system
The CPU has generated an illegal instruction trap while executing kernel or device driver code. This message is preceded with an information dump describing the trap. *System inconsistency, fatal.*

kernel:PANIC:Invalid TSS
Internal tables have become corrupted. *System inconsistency, fatal.*

kernel:WARNING:bootstring invalid, ignored
A bad bootstring was entered at the Boot prompt.

kernel:ERROR:bad syntax - *string*
A bad bootstring was entered at the Boot prompt.

kernel:PANIC:bad mapping in copyio
Copyio was called with a strange request. Usually a bad driver.

kernel:WARNING:HARDWARE FAILURE:386 incorrectly multiplies 32-bit numbers
The cpu is displaying the 32-bit multiply bug.

kernel:PANIC:*** POWER CYCLE TO REBOOT ***
This message follows the above HARDWARE FAILURE 32 bit error message.

kernel:INFO:10 bits of I/O address decoding
The hardware is only decoding 10 bits of i/o addresses. This amount is sufficient in most cases. This condition is only an issue if you are strapping i/o devices with a base address above 400 (hex).

kernel:WARNING:A31 CPU bug workaround not possible for this machine
A31 was specified on the boot line, but cannot be applied to the current system.

kernel:INFO:A31 CPU bug workaround in effect
A31 was specified on the boot line and the software workaround is currently in effect.

kernel:PANIC:bad boot string An invalid boot string was entered at the Boot prompt.

kernel:PANIC:** WYSE/SCO UNIX only operates on WYSE PC systems **
A kernel was serialized for WYSE hardware only and is being booted on a non-WYSE machine.

kernel:PANIC:out of both memory & swap
No more memory pages or swap pages are free.

kernel:PANIC:not enough contiguous memory
The kernel memory allocation routines require more physically contiguous memory. Either decrease the size of some kernel parameters (like disk buffers) or add more physical memory.

kernel:WARNING:filesystem page read failed
An error occurred trying to read a page from the disk. This is not fatal, but usually indicates hardware problems.

kernel:PANIC:free inode isn't
There is internal inode table corruption within the kernel.

kernel:ERROR:Map overflow (*num*), shutdown and reboot, mp->mpent
There are internal kernel map inconsistencies. Reboot your

system.

kernel:PANIC:write_sb():cannot cvts3superb() yet
: This message is found in the 386 kernel only. A write of a non SYS III or SYS V filesystem superblock is being attempted. This action should be impossible due to earlier checks.

kernel:WARNING:Can't allocate message buffer
: This message indicates a lack of memory. Processes should be killed to make more room. Another option is to add more physical memory.

kernel:PANIC:Large model 386 ssig
: Internal kernel error in processing large model 386 signals.

Trap *type*
: This message precedes a "kernel:PANIC:" message. The *type* is the trap number given by the processor. The message is followed by a dump of registers. *System inconsistency, fatal.*

fpsave:PANIC:no fp_task
: No floating point context to save, internal kernel error.

mdep.386/fp.c:WARNING:No floating point emulator found in *string*,
: No */etc/emulator* was present in the root filesystem. The System Administrator should install one and reboot.

fp_OVERRUN:PANIC:coprocessor overrun - with no 287/387
: Internal coprocessor error. fatal.

fp_COPROC:PANIC:, coprocessor error - with no 287/387
: Inconsistent kernel internal state.

fp_COPROC:PANIC:coprocessor error - switched away from fp_task
: Internal kernel mismanagement of floating point processes.

fp_DNA:PANIC:
: A device trap happened while emulating floating point instructions.

iinit:PANIC:cannot copy in superblock
: An error happened during the root filesystem superblock loading.

srmount:PANIC:cannot cvtv7superb() yet
: A root filesystem superblock was not recognized as a SYS III or SYS V superblock. V7 superblocks cannot currently be converted on the 386 kernel.

mapphys:PANIC:sptmap overflow
: No system page table pages are available. This is an internal error in the kernel, usually caused by a faulty device driver.

physio:PANIC:bad state
A device driver made an invalid request to physio.

badint:PANIC:bad interrupt handler
Invalid interrupt request, usually fault hardware.

setup:PANIC:sptmap overflow
This message indicates possible kernel image corruption or lack of physical memory.

setup:PANIC:u-area not page aligned
This indicates possible kernel image corruption.

setup:PANIC:u-area address does not match SPTADDR
Indicates possible kernel image corruption.

cmn_err:PANIC:DOUBLE PANIC The kernel panicked while trying to panic. You must power cycle at this point to reboot the machine.

cmn_err:PANIC:unknown level in cmn_err (level=*num*, msg=*string*),
The kernel's cmn_err() routine was called with an invalid argument.

Kernel Paging Messages

The following messages indicate system inconsistencies in the kernel paging code. These inconsistencies can be caused by hardware or software problems. Reboot your system and note the circumstances if you see one of these messages:

mfalloc:PANIC:page not free

mfalloc:PANIC:page not free at exit

mffree:PANIC:page already free

mffree:PANIC:page is locked

dfalloc:PANIC:frame not free at exit

xlcheck:PANIC:xlink serial mismatch

impcode:PANIC:called to load impure 386

impcode:PANIC:more than 1 data segment?

preload:PANIC:, invalid page (*num*, *num*)

kernel:PANIC:bad page type for protection fault

kernel:PANIC:protection fault on read access

kernel:PANIC:not present fault on shared data

kernel:PANIC:added strange page table - *num*, index

pgfind:PANIC:not in cache

pghash:PANIC:not in cache

pginval:PANIC:list broken

pginval:PANIC:not in cache

mftomp:PANIC:bad frameno *num*

mptomf:PANIC:bad mp *num*

swapadd:PANIC:no space for dpfi

dftodp:PANIC:bad frameno *num*

dptodf:PANIC:bad dp *num*

dptodf:PANIC:bad dp *num*

pgread:PANIC:no xlink

pgfree:PANIC:invalid page marked present

pgfree:PANIC:freeing intransit page

pgpid:WARNING:setting disk pid

kernel:PANIC:page table under page table?

kernel:PANIC:swapping intransit page

dftomf:PANIC:non-swap page table entry changed

dftomf:PANIC:swap disk frame rcnt(*num*) != 1, dp=*num*, dp->dp_rcnt,dp

dftomf:PANIC:page type mismatch - mptype *num* dptype *num* mp *num* dp *num*, mp->mp_type, dp->dp_type, mp, dp

dftomf2:PANIC:, swap memory frame rcnt(*num*) != 1, mp=*num*,

dftomf3:PANIC:swap mem frame rcnt(*num*) != 1, mp=*num*, mp->mp_rcnt, mp

mftodf1:PANIC:swap mem frame rcnt(*num*) != 1, mp=*num*, mp->mp_rcnt, mp

mftodf:PANIC:memory frame marked in transit

mftodf:PANIC:page type mismatch - dptype *num* mptype *num* dp *num* mp *num*

mftodf2:PANIC:swap disk frame rcnt(*num*) != 1, dp=*num*

mftodf3:PANIC:swap disk frame rcnt(*num*) != 1, dp=*num*, dp->dp_rcnt, dp

fftomf:PANIC:page type(*num*) not TE_FILSYS, mp = *num*,mp->mp_type, mp

mfcvt:PANIC:zero ref count

ptdup:PANIC:TE_SWAP page rcnt(*num*) > 1,

ptdup:PANIC:xlinked page has reference

ptdup2:PANIC:TE_SWAP page rcnt > 1

ptdup:PANIC:xlinked page has reference

ptdup:PANIC:locked page not present

ptdup:PANIC:intransit page

pgcheck:PANIC:page type mismatch:ptp *num* type *num* xtype *num*,ptp,type,xtype

The above listed messages indicate system inconsistencies in the kernel paging code. These inconsistencies can be caused both by hardware or software problems. Reboot your system.

cputok:PANIC:

cpktou:PANIC:

sdfrcm:PANIC:sdp->sd_inode not found

The above 3 errors indicate internal shared data errors within the kernel.

v86sighdlint:WARNING:lost signal

v86setint:PANIC:xtss pte not present

The above 2 errors indicate internal VPIX processing errors within the kernel.

namei:PANIC:null cache ino

namei:PANIC:duplicating cache

The above 2 messages indicate internal file management errors in the kernel.

System Services Messages

The following messages are displayed by the shell when a system call fails.

Not owner:
Typically, this error indicates an attempt to modify a file in some way forbidden except to its owner or super-user. It is also returned for attempts by ordinary users to do things allowed only to the super-user.

No such file or directory:
This error occurs when a filename is specified and the file should exist but doesn't, or when one of the directories in a pathname does not exist.

No such process:
No process can be found corresponding to that specified by *pid* in *kill* or *ptrace*.

Interrupted system call:
An asynchronous signal (such as interrupt or quit), which the user has elected to catch, occurred during a system call. If execution is resumed after processing the signal, it will appear as if the interrupted system call returned this error condition.

I/O error:
Some physical I/O error. This error may in some cases occur on a call following the one to which it actually applies.

No such device or address:
I/O on a special file refers to a subdevice which does not exist, or beyond the limits of the device. It may also occur when, for example, a tape drive is not on-line or no disk pack is loaded on a drive.

Arg list too long:
An argument list longer than 5,120 bytes is presented to a member of the *exec* family.

Exec format error:
A request is made to execute a file which, although it has the appropriate permissions, does not start with a valid magic number (see *a.out*(F)).

Bad file number:
Either a file descriptor refers to no open file, or a read (respectively write) request is made to a file which is open only for writing (respectively reading).

No child processes:
A *wait* was executed by a process that had no existing or unwaited-for child processes.

No more processes:
A *fork* failed because the system's process table is full or the user is not allowed to create any more processes.

Not enough space:
During an *exec*, or *sbrk*, a program asks for more space than the system is able to supply. This is not a temporary condition; the maximum space size is a system parameter. The error may also occur if the arrangement of text, data, and stack segments requires too many segmentation registers, or if there is not enough swap space during a *fork*.

Permission denied:
An attempt was made to access a file in a way forbidden by the protection system.

Bad address:
The system encountered a hardware fault in attempting to use an argument of a system call.

Block device required:
A nonblock file was mentioned where a block device was required, e.g., in *mount*.

Device busy:
An attempt to mount a device that was already mounted or an attempt was made to dismount a device on which there is an active file (open file, current directory, mounted-on file, active text segment). It will also occur if an attempt is made to enable accounting when it is already enabled.

File exists:
An existing file was mentioned in an inappropriate context, e.g., *link*.

Cross-device link:
A link to a file on another device was attempted.

No such device:
An attempt was made to apply an inappropriate system call to a device; e.g., read a write-only device.

Not a directory:
A nondirectory was specified where a directory is required, for example, in a path prefix or as an argument to *chdir*(S).

Is a directory:
An attempt to write on a directory.

Invalid argument:
An invalid argument (e.g., dismounting a nonmounted device; mentioning an undefined signal in *signal* or *kill*; reading or writing a file for which *lseek* has generated a negative pointer). Also set by the math functions described in the (S) entries of this manual.

File table overflow:
The system's table of open files is full and temporarily no more *opens* can be accepted.

Too many open files:
No process may have more than 60 file descriptors open at a time.

Not a character device

Text file busy:
An attempt to execute a pure-procedure program which is currently open for writing (or reading). Also an attempt to open for writing a pure-procedure program that is being executed.

File too large:
The size of a file exceeded the maximum file size (1,082,201,088 bytes) or ULIMIT; see *ulimit*(S).

No space left on device:
During a *write* to an ordinary file, there is no free space left on the device.

Illegal seek:
An *lseek* was issued to a pipe.

Read-only file system:
An attempt to modify a file or directory was made on a device mounted read-only.

Too many links:
An attempt to make more than the maximum number of links (1000) to a file.

Broken pipe:
A write on a pipe for which there is no process to read the data. This condition normally generates a signal; the error is returned if the signal is ignored.

Arg out of domain of func:
The argument of a function in the math package is out of the domain of the function.

Result too large:
The value of a function in the math package is not representable within machine precision.

File system needs cleaning:
An attempt was made to *mount*(S) a file system whose super-block is not flagged clean.

Would deadlock:
A process' attempt to lock a file region would cause a deadlock between processes vying for control of that region.

Not a name file:
A *creatsem*(S), *opensem*(S), *waitsem*(S), or *sigsem*(S) was issued using an invalid semaphore identifier.

Not available:
An *opensem*(S), *waitsem*(S) or *sigsem*(S) was issued to a semaphore that has not been initialized by a call to *creatsem*(S). A *sigsem* was issued to a 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 on which a process was waiting has been left in an inconsistent state when the process controlling the semaphore exits without relinquishing control properly; i.e., without issuing a *waitsem* on the semaphore.

A name file:
A name file (semaphore, shared data, etc.) was specified when not expected.

No message of desired type: An attempt was made to receive a message of a type that does not exist on the specified message queue [see *msgop*(S)].
An attempt was made to receive a message of a type that does not exist on the specified message queue; see *msgop*(S).

Identifier removed:
This error is returned to a process that resumes execution due to the removal of an identifier from the file system's
name space; see *msgctl*(S), *semctl*(S), and *shmctl*(S).

No record locks available:
In *fcntl*(S) the setting or removing of record locks on a file cannot be accomplished because there are no more record entries left on the system.

Channel number out of range

Level 2 not synchronized

Level 3 halted

Level 3 reset

Link number out of range

Protocol driver not attached

No CSI structure available

Level 2 halted

Deadlock situation detected/avoided
A deadlock situation was detected and avoided. This error pertains to file and record locking.

No record locks available

Bad exchange descriptor

Bad request descriptor

Message tables full

Inode table overflow

Bad request code

Invalid slot

File locking deadlock

Bad font file format

Not a stream device
A *putmsg*(S) or *getmsg*(S) system call was attempted on a file descriptor that is not a STREAMS device.

No data available

Timer expired
The timer set for a STREAMS *ioctl*(S) call has expired. The cause of this error is device specific and could indicate either a hardware

or software failure, or perhaps a timeout value that is too short for the specific operation. The status of the *ioctl*(S) operation is indeterminate.

Out of stream resources
During a STREAMS *open*(S), either no STREAMS queues or no STREAMS head data structures were available.

Machine is not on the network
This error is Remote File Sharing (RFS) specific. It occurs when users try to advertise, unadvertise, mount, or unmount remote resources while the machine has not done the proper startup to connect to the network.

Package not installed
This error occurs when users attempt to use a system call from a package which has not been installed.

Object is remote
This error is RFS specific. It occurs when users try to advertise a resource which is not on the local machine, or try to mount/unmount a device (or pathname) that is on a remote machine.

Link has been severed
This error is RFS specific. It occurs when the link (virtual circuit) connecting to a remote machine is gone.

Advertise error
This error is RFS specific. It occurs when users try to advertise a resource which has been advertised already, or try to stop the RFS while there are resources still advertised, or try to force unmount a resource when it is still advertised.

Srmount error
This error is RFS specific. It occurs when users try to stop RFS while there are resources still mounted by remote machines.

Communication error on send
This error is RFS specific. It occurs when trying to send messages to remote machines but no virtual circuit can be found.

Protocol error
Some protocol error occurred. This error is device specific, but is generally not related to a hardware failure.

Multihop attempted
This error is RFS specific. It occurs when users try to access remote resources which are not directly accessible.

Not a data message
During a *read*(S), *getmsg*(S), or *ioctl*(S) I_RECVFD system call to a STREAMS device, something has come to the head of the queue that can't be processed. That something depends on the system call:
read(S) - control information or a passed file descriptor.
getmsg(S) - passed file descriptor.
ioctl(S) - control or data information.

Name not unique on network

File descriptor in bad state

Remote address changed

Cannot access a needed shared library
Trying to *exec*(S) an *a.out* that requires a shared library (to be linked in) and the shared library doesn't exist or the user doesn't have permission to use it.

Accessing a corrupted shared library
Trying to *exec*(S) an *a.out* that requires a shared library (to be linked in) and *exec*(S) could not load the shared library. The shared library is probably corrupted.

Trying to *exec*(S) an *a.out* that requires a shared library (to be linked in) and there was erroneous data in the .lib section of the *a.out*. The .lib section tells *exec*(S) what shared libraries are needed. The *a.out* is probably corrupted.

Attempting to link in more shared libraries than system limit
Trying to *exec*(S) an *a.out* that requires more shared libraries (to be linked in) than is allowed on the current configuration of the system. See the System Administrator's Guide.

Cannot exec a shared library directly
Trying to *exec*(S) a shared library directly. This is not allowed.

Driver Messages

The following messages are different from kernel messages in that they are generated by the device drivers for the various hardware supported under XENIX. The source of the message can be determined by checking the *label* field of the message.

Console Driver Messages

console:WARNING:Kernel messages lost on non-text screen
(also check /usr/adm/messages)
Kernel messages were lost while the console was in graphics

mode and did not appear. Check the last lines of **/usr/adm/messages** to find the messages.

console:WARNING:Too many keyboard groups
There are more video devices attached to your system than your kernel is designed to support.

Irwin Driver Messages

mc:ERROR:Block not found
A block not found error occurs when the driver cannot locate a physical tape block during a read or write operation. Ensure the tape head is clean (see the tape drive hardware manual for cleaning instructions). When this message is displayed during a data restore operation, try retensioning the tape, then repeat the restore operation. If this fails, try restoring the data using a different tape drive. When this message is displayed during data backup operation, try another tape. If your backup is successful on another tape, discard or bulk erase and reformat the original tape.

mc:ERROR:Data CRC error

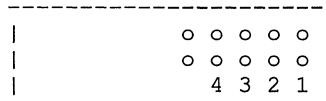
mc:ERROR:ID CRC error
These messages are displayed during a tape read operation when a tape block cannot be recovered by ECC. If this message appears, retension the tape and try again. If this fails, the data might be recovered by using a different tape drive. Causes of persistent CRC errors are: poor quality tapes, worn tape head, a defect in the drive's record circuitry, or an incompatible or otherwise defective data separator circuit on the controller. CRC errors might be stopped by using new tapes, or installing a data compensator circuit on the drive.

mc:ERROR:Record not found
This error occurs when some sector within a tape block cannot be located. This error typically occurs on or during a tape read operation when there are too many erroneous sectors to recover data using ECC. (See Data CRC error.)

mc:ERROR:Drive not found
When **/etc/mcdaemon** is run for the first time after system boot, a drive searching algorithm is executed by the driver. If this algorithm fails to detect the presence of a tape drive, the message "mc:ERROR:Drive not found" is displayed. Subsequently, the same message is displayed on any read or write access to an opened mc device file for which no drive is present. When this message appears, hardware should be checked.

Shut down the system and then cycle the power switch. With no cartridge present, the tape drive should flash its LED on power up. If it doesn't, power down and check (when applicable) for a disconnected or defective tape drive power cable. On PC/AT class machines (and some Micro Channel compatibles) the power cable resembles the four wire cable which powers the floppy diskette drive. For internally mounted drives, the power cable is connected directly to the drive (whether the drive connected to the system floppy controller, a 4251 extender, or a 4100 PC bus controller). For external drives, make sure the four wire cable is connected to the 4251 floppy extender or 4100 PC bus controller adapters. Also check that the 35-pin connector at the end of the tape drive's cable is correctly seated in the adapter socket on the back of the computer. If a 4251 board is present, check the tubular glass fuses. When cables and fuses appear to be in order and the LED still doesn't flash, either the cables, 4251 or 4100 (when applicable), or drive may be defective.

The drive select jumper (on the tape drive) should also be checked. In most installations, the jumper should connect the DRIVE SELECT 2 pin pair. For 5-1/4 form factor drives, DRIVE SELECT 2 is labeled with a "[2]" on the drive's circuit board. For 3-1/2 inch form factor drives with connector adapter which have jumpers mounted on the adapter, consult the hardware installation instructions. For other 3-1/2 inch form factor drives, the DRIVE SELECT 2 is the forth pin pair from the corner of the drive's circuit board:



If the drive is connected to an Irwin 4251 floppy extender which is, in turn, cabled to an Adaptec suffix 'B' (e.g., ACB-2xxxB, or 1542B scsi) controller and the "Drive not found" message is seen, check the 4251 jumpers. In the "as shipped from the factory" state, the A0, A2, and A3 pin pairs are jumpered, and the A7 pin pair has a spare jumper (stored on one pin of the pair). If the jumpers are in this "as shipped" state, reinstall the A7 jumper to connect the pin pair. Typically this change will allow the drive to be found.

mc:ERROR:Servo failure

This is a tape formatting error message. The servo writing function is a part of the tape drive's firmware. The driver issues a command to the drive to servo write and awaits tape drive completion status. Usually the drive's LED will be flashing on servo writing failure. Try bulk erasing the cartridge and restarting the format. If this fails, try another cartridge.

mc:ERROR:Insufficient memory

This message is displayed when the driver fails to allocate at least three tape block buffers. Sufficient memory may be available when single user mode is entered immediately after system

boot. Usually adding memory to the system will stop this message.

mc:ERROR:Block 0 missing servo header

mc:ERROR:Too many sequential missing servo headers

mc:ERROR:Too many missing servo headers on track

mc:ERROR:Too many missing servo headers

mc:ERROR:Too many sequential bad blocks

mc:ERROR:Too many bad blocks on a track

mc:ERROR:Too many bad blocks
These messages occur during formatting. When formatting fails for one of these reasons, try bulk erasing the cartridge and reformatting. If this fails, try another cartridge.

mc:ERROR:Block 0 medium error
This error results when, during tape state determination, the first tape block has a medium error which is not recoverable by either redundant correction or ECC. Normally the cartridge should be reformatted or discarded. If the cartridge has a backup on it, try using a different drive to read the tape.

If this message persists for multiple cartridges, the tape drive's read circuitry may be out of adjustment, or there may be an incompatibility between the floppy controller's data separator circuit and the tape drive. When running on a Micro Channel machine, the problem can be overcome by adding the following line to the **/etc/default/mcconfig** file:

```
iropt=I
```

This enables an algorithm known as "wait-for-index."

mc:ERROR:Defect list has unrecoverable error
This message is displayed when both copies of the relocation table (kept in the second and third good tape blocks) have unrecoverable medium errors or are otherwise corrupt.

mc:ERROR:Defect list corrupt
This message is displayed if an error is found in the primary defect list kept in block 0. Reformat the tape.

mc:ERROR:Daemon not started
The tape driver uses a single daemon process to encode ECC during tape write operations and recover data with ECC during tape reads. When this message occurs, execute **/etc/mcdaemon** and retry the tape operation.

mc:ERROR:Timeout reading controller result
mc:ERROR:Timeout writing controller command
The driver accesses the tape drive by sending commands to and reading results from a floppy controller chip. These messages are displayed when the controller will not accept a command or return results in the manner expected by the driver. Floppy controller access timeouts may indicate a driver conflict. For instance, a diskette driver may be accessing the floppy controller chip at the same time as the tape driver.

mc:ERROR:Unrecognized controller error
This message indicates the floppy controller has returned an error code which is not in a list kept by the tape driver. Causes might be defective hardware, or a new floppy controller chip. This error message has yet to be seen.

mc:ERROR:State machine hung
The driver will enter the hung state when an unexpected event occurs. The hung state is cleared when the device file is first closed, then reopened. Causes for this condition are:

- A hardware defect, or
- another device driver is accessing the floppy controller, or
- some system function or driver has kept interrupts disabled for an excessive period of time.

mc:ERROR:DMA attempt past end of cylinder
This error occurs the floppy controller receives a DMA data transfer request after data for a given tape block has been transferred.

The message may indicate a hardware problem or an error in driver programming. The message can appear when another device driver attempts use the tape drive's DMA channel while in use by the tape driver. This message has been seen on XT class machines which are fitted with certain early Advanced Micro Devices (AMD) DMA controllers. These controllers have a defect which doesn't allow concurrent DMA accesses (on different channels) by the tape and hard disk.

mc:ERROR:Write protected
The "Write protected" message appears when an attempt is made to write a write protected cartridge. Writing includes both formatting and back-up operations. Check the cartridge write protect silder. It must be in the RECORD position before the tape can be written. When a cartridge is inserted with the slider in the RECORD position, the slider presses against the lever of a microswitch. The switch is one of two visible in the mouth of the drive and is the closest to the circuit board. The slider's

pressure closes the (normally open) micro switch which, in turn, enables write circuitry in the drive. If the "Write protected" message persists, the switch lever may be bent, the switch may be electrically noisy, or the switch or associated write circuitry may be defective.

mc:ERROR:No ID address mark

A "No ID address mark" is used internally by the driver and does not normally appear. "IDMARK" may be seen when debugging of data transfers is enabled. The error normally appears when tape block's servo header is weak or missing. This error will also occur when the "read data" signal path is broken or defective. When applicable, check the cable which connects the tape drive to the floppy controller (try a substitute).

mc:ERROR:Request timed out

This message occurs when the drive's BUSY (i.e., TRACK 0) line remains active for more than a certain period. Typically two minutes for data transfers. (Yet to be implemented.)

mc:ERROR:DMA boundary error

A "DMA boundary error" messages indicate an an attempt to program the DMA controller to transfer data which crosses a 64K physical memory boundary in an AT class machine. This may be due to an error in programming.

mc:ERROR:Cylinder not found

This code is returned by the floppy controller chip and used internally by the driver. It is not returned to a program by the driver interface.

mc:ERROR:No data address mark

Each sector is comprised of an ID field and a data field. The data address mark is used by the controller to identify the start of a data field. The "No data address mark" message is displayed as the result of a read error. However, the cause of the error is related to writing the tape. When this message persists for different tapes after writing then reading, there may be defect somewhere in the write circuitry. The write circuitry includes the floppy controller, the WRITE DATA signal line at the floppy controller/tape drive interface and the write circuitry internal to the tape drive. If data needs to be recovered from a tape, try a different drive.

mc:ERROR:DMA overrun

Tape data transfers between the floppy controller and memory are accomplished using the services of a special chip called the Direct Memory Access (DMA) controller. When the floppy controller needs to transfer a data byte to or from its register, it activates a hardware signal called the DMA Request line (DRQ). This tells the DMA that its time to move a data byte. When the memory bus is available the DMA controller responds

by activating the appropriate bus signals to transfer the data byte. Upon completion of the transfer, the DMA controller activates a DMA Acknowledge (DACK) line to inform the floppy controller.

DMA Overrun errors result when the DMA controller is too slow in responding to a floppy controller data transfer request.

Most floppy controllers are sensitive to slow DMA response. At a 500 KHz data transfer rate (i.e., the transfer rate used by 125, 145, 165, 285 drives) the DMA controller must respond with in 13 microseconds.

In some cases DMA Overruns can be cured by not printing to the screen during tape operations. Try "silent" modes.

In most cases DMA Overruns are stopped by attaching the tape drive to a floppy adapter which has a first-in-first-out (FIFO) buffer. The FIFO is part of the floppy controller chip. Intel 82072 and 82077 controller chips have FIFOs. Certain Adaptec AT class controllers have the 82072 (those with a 'B' suffix). Both the Irwin 4100 (for AT class machines) and 4100MC (Micro Channel) tape adapters employ the 82077.

mc:ERROR:Memory address conversion error
: The "Memory address conversion error" message occurs, when the driver encounters an error converting a logical (or virtual) memory address to a physical memory address. In 80286 systems this message might mean the system is out of selectors.

mc:ERROR:Controller not found
: When the driver's tape drive search debug option is enabled, the "Controller not found" message is given for each controller which has been tested for presence but not found.

mc:ERROR:Equipment fault
: An "Equipment fault" error is generated when a selected drive sets the equipment fault signal line. As this line is wired to an inactive state at the floppy controller chip, this error might indicate a controller hardware error. This error has not yet been seen.

mc:ERROR:Drive not ready

mc:ERROR:Medium changed
: The driver polls the tape drive for cartridge presence and change status. The tape drive senses cartridge presence and removal using a "cartridge present" microswitch. The switch is one of two visible in the mouth of the drive and is the furthest from the circuit board. When a cartridge is present, it presses the micro switch lever causing the switch to close. When a new cartridge is inserted, the tape is brought to load-point. For some drives,

the load-point operation is automatically performed on cartridge insertion. For others, the driver issues the load-point command to the drive. When either the "Drive not ready" or "Medium changed" messages is seen and the cartridge is known to be present or not changed, there may be a defect in the cartridge present microswitch. The switch might have a bent lever, or may be electrically disconnected or noisy. to be found.

mc:ERROR:Erase failure

Some 145 Irwin tape drives support an erase feature. It is recommended that this feature not be used. Erasing is done by applying a DC bias to the tape head, repeatedly spooling the tape from end-to-end and stepping the head 1/4 of a track at the end of each repetition. The "Erase failure" message appears when the drive does not support the erase feature.

mc:ERROR:Seek track error

This code is used internally by the driver. If displayed, there may be an error in programming.

mc:ERROR:Track following error

A track following error results when no index signals are received from the controller. The following are possible causes:

- The cartridge is erased (no servo tracks and not formatted).
- The cartridge was formatted on a higher density tape drive and is not recognized in a lower density drive. For example an 80 MB cartridge (formatted on a 285 drive) in early 145 drive.
- The tape is despooled (examine the cartridge)
- The INDEX signal line may be broken or the cable which connects the tape drive to the controller.
- The main tape driving motor in the drive is not spinning. Check that the tape driving capstan (the rubber wheel visible in the mouth of the tape drive) spins freely. If the capstan cannot be rotated with a finger, check for an obstruction in the area of the main flywheel/rotor on the side of the drive opposite to the printed circuit board. If the motor spins freely, the motor fuse may be blown. The fuse is soldered in. Send the drive in to Irwin for repair.

mc:ERROR:Too many outstanding interrupts

When the driver receives an interrupt, it enters a loop in which the initial interrupt and additional hidden interrupts are serviced. To prevent infinite looping in the interrupt handler, four iterations are allowed. On the fifth iteration, the driver stops processing and enters a hung state. If a request is in service, the

"Too many outstanding interrupts" message is displayed. This condition has yet to be seen.

mc:ERROR:Error on sense interrupt status

mc:ERROR:Sense drive status failure
When the tape driver receives an interrupt, it retrieves the content of both the floppy controller interrupt status and the drive status registers. Interrupt status is used to determine the interrupt type. Drive status tells the state of signal lines at the floppy interface cable. If retrieval of either of these status registers fails, the appropriate message is displayed if a tape transfer request is active. These messages may caused by faulty floppy arbitration programming. That is, both the tape and diskette drivers are communicating with the floppy controller concurrently.

mc:ERROR:Floppy controller reset failure
When the tape driver gains owner ship of the floppy controller, it starts a floppy controller reset procedure. When the procedure cannot be completed successfully, this message will be displayed if a tape data transfer request being processed.

mc:ERROR:Error sending command to drive
The driver uses two floppy controller signal lines to both communicate with the tape drive and control tape motion. "Pulse" commands are sent by the driver to the tape drive on the STEP signal line. In turn, the tape drive responds by either activating or deactivating the TRACK 0 line. When the "Error sending command to drive" message appears, the controller did not accept the command to send STEP pulses. Typically this message is generated when two drivers are using the floppy controller concurrently. That is, there is a failure in floppy ownership arbitration.

mc:ERROR:Error starting data transfer
"Error starting data transfer" is displayed when the driver fails to setup the floppy controller chip at the start of a read/write/format operation. This error may indicate a tape driver/diskette driver conflict. That is, both drivers may be using the floppy controller concurrently.

mc:ERROR:Vector installation failure
This message indicates the driver could not install its interrupt vector. It may indicate an error in programming.

mc:ERROR:Unexpected interrupt
An "Unexpected interrupt" occurs when the tape driver is in a state in which it is not expecting an interrupt from the floppy controller. If this message is seen, there may be a tape driver/diskette driver conflict or a noisy interrupt line.

mc:ERROR:Internal error
"Internal error" may be an indication of an error in driver programming.

mc:ERROR:Request aborted
"Request aborted" is a message used internally by the driver. When seen, there may be a an error in driver programming.

mc:ERROR:Bad operation code

mc:ERROR:Bad device number

mc:ERROR:Bad block address

mc:ERROR:Bad count
These messages, in general, indicate an error in driver programming. When tape drive search debugging is enabled (irdbg=s), it is normal for the "BADDEV" message to be displayed for the alternate floppy controller (ALTFDC). By default, the BADDEV error code is set in low level controller searching algorithms to prevent testing for drive presence on this controller. Testing for drives on an alternate controller (other than a 4100) is explicitly enabled by user configuration (altfdc=*config*).

mc:ERROR:No servo
The "No servo" message is synonymous with the message "Track following error."

mc:ERROR:Servo but no sector format
Normally "Servo but no sector format" means that a cartridge has servo written but no sector ID's have been written. The message is displayed at the completion of tape state determination. Tape state determination is the first operation performed for a freshly inserted cartridge. Tape state determination includes up to 5 tries at reading block zero -- the first block on the tape. When a cartridge is known to have been correctly formatted, this message may indicate a defect somewhere in the read data signal path. Included in the read data signal path are the tape drive's head and read circuitry, the cable which connects the drive to the controller, and the floppy controller's data receiving and separator circuit.

mc:ERROR:Block 0 corrupt
A "Block 0 corrupt" message is displayed when the driver does not recognize the data in the first sector on the tape (i.e., the physical tape header). This may be the result of incomplete formatting or a tape which was written by another tape driver.

mc:ERROR:Defect list has unrecoverable error
This message is displayed when both copies of the relocation table (kept in the second and third good tape blocks) have unrecoverable medium errors or are otherwise corrupt.

When this message is displayed on the first backup after drive installation in a Micro Channel machine, the wait-for-index algorithm may be need to be enabled.

mc:ERROR:Block merge failure
: The tape driver writes only full tape blocks. Since system blocks are smaller (usually 512 through 10 KB) are smaller than than tape blocks (8, 16, or 29 KB) a block merging operation is occasionally performed. A merging operation typically takes place at the end of a tar backup or the start of a tar append. This operation involves reading the medium copy of the tape block, partially overlaying the tape block data with user data, appending ECC sectors and finally writing the block back to tape. A "Block merge failure" message is displayed when some part of the operation fails.

mc:ERROR:Block allocation failure
: This message is displayed, when during a write relocation operation, no spare block can be allocated. The driver keeps a count of free spare blocks and will not attempt block relocation when the count is zero. Therefore, this message indicates the defect lists associated with block relocation are most probably corrupt.

mc:ERROR:Block relocation failure

mc:ERROR:Maximum block relocation tries reached
: The "Maximum block relocation tries reached" message may be displayed when three sequential attempts to relocate a given tape block fail. This message might indicate a tape is of low quality. It may also be the result of sector 1 errors in certain Micro Channel machines. If this is the case, enabling the wait-for-index algorithm may alleviate this condition (see "Block 0 medium error").

mc:ERROR:Incompatible cartridge
: During reading, this message appears when the cartridge was formatted by a higher density drive. Newer 145 drives recognize cartridges servo written by by 165 (64 MB), 285 and 287 (80/120 MB) drives. Tapes are not read as the tracks are too narrow.

During writing the "Incompatible cartridge" message appears for cartridges which have formatted tracks which are other than the width of the tape head.

During formatting, this message normally occurs, when a cartridge already has servo tracks written by a drive of a different type. The message also appears when formatting of a blank DC-1000 (0.150 inch wide tape) cartridge is attempted in 165, 285, or 287 drives. These drives will only servo write quarter inch DC-2000 and DC-2120 cartridges.

The "Incompatible cartridge" message also occurs when the tape drive's read circuitry is disturbed by magnetic fields generated by CRT monitors. Strong magnetic disturbance prevents the drive from correctly reading the "servo-type-finger-print" recorded at the beginning of tape, during the load-point operation. Lower levels of disturbance prevent tape data from being read. It is important that external drives be separated by a good distance from display monitors. Internal drives may also be affected when the display monitor sits on the case. If the computer has a plastic enclosure, try moving the monitor off the case. Otherwise, if the computer has a metal case, try sliding the monitor toward the back of the computer (away from the bezel of the tape drive).

mc:ERROR:Timer initialization failure
: This message is displayed, when during initialization, no timer interrupts were received from the system.

mc:ERROR:Operating system call failed
: This message may indicate an error in driver programming.

mc:ERROR:Invalid parameter
: The "Invalid parameter" message is associated with incorrect parameters passed by ioctl calls. If this message is seen, there is either an error in the application making the call or the driver.

mc:ERROR:Device busy

mc:ERROR:Device busy formatting

mc:ERROR:Device performing diagnostic
: If these messages appear the device is in use by another task. Try again later.

mc:ERROR:Read after write miscompare
: At the end of the first backup, the driver will checksum the last block written, read the block, re-checksum the block and compare the checksums. If the checksums don't match, the "Read after write miscompare" message is displayed.

When this message occurs the following should be checked: If the tape drive is connected to an Irwin 4251 floppy extender board which is, in turn, connected to a DTC (Data Technology Corporation) hard disk/floppy disk controller, check the jumper pins on the 4251 board. In the "as shipped from the factory" state, the A0, A2, and A3 pin pairs are jumpered, and the A7 pin pair has a spare jumper (stored on one pin of the pair). If the jumpers are in this "as shipped" state, reinstall the A7 jumper to connect the pin pair. Typically this change will allow tapes to be correctly written.

The "Read after write miscompare" message will also be displayed if either the "write data" or "write gate" signal lines in the (when applicable) cable which connects the tape drive to floppy controller are

broken. Check the cable connection.

Cartridge Driver Messages

ct:ERROR:Tape controller (type=*name*) not found
The controller specified in in the file */usr/sys/io/ctconf.asm* was not found.

ct:ERROR:Cartridge tape is write protected
You must remove the write protect tab from the cartridge before use.

ct:ERROR:system too busy for efficient tape use
There is not enough user memory available to allow the device to work.

ct:WARNING:attempted to free invalid buffer
The driver attempted free a buffer that was not active. The buffer must be activated before use.

SCSI Driver Messages

scsi:ERROR:No controller response :*num*
Requested controller is not present on SCSI bus *num*. Check your system setup and connections.

scsi:ERROR:CTLR *num* LUN *num* not attached
Requested unit not present on controller. Check your system setup.

scsi:ERROR:CTLR *num* LUN *num*:invalid type <*num*>,
Requested unit is not a disk or tape. Disk and tape and printer are currently the only supported SCSI devices.

scsi:ERROR:CTLR *num* LUN *num*:device not ready, ctlr, x);
Requested device is busy.

scsi:ERROR:adstrategy:device/type error 0x*type*/0x*type*
Internal error - open device is not disk, tape or printer.

scsi:ERROR:adioctl:ADMODESENSE rc *num* host *num* unit *num*
ioctl sense command did not complete as expected.

scsi:WARNING:adioctl:ADEXECUTE rc *num* host *num* unit *num*
ioctl execute command did not complete as expected.

scsi:INFO:adioctl:*num* reassigned
ioctl bad block mapping completed (done in pairs)

scsi:WARNING:adsetparam:ADMODESENSE rc *num* host *num* unit *num*
Mode sense command did not complete as expected.

scsi:ERROR:adgetcdb:unsupported command *num*
Internal error - unexpected command.

scsi:WARNING:adintr:adapter *num* SR_DETECTED status=*num*, intr=*num*
SCSI reset detected.

scsi:WARNING:Unexpected MBI status *num*
Unexpected condition after interrupt.

scsi:WARNING:ad_sndcmd:unexpected port status = *num*
Unable to send command to adapter.

scsi:ERROR:adpresent:Adapter *num* internal failure:*num*
Adapter returned bad status on initialization.

scsi:ERROR:on disk dev=*num/num* ha=*num* id=*num* lun=*num* block=*num* sector=*num*, cylinder/head = *num/num*
Disk I/O failure.

scsi:ERROR:on tape ha=*num* id=*num* lun=*num* hst *num* ust *num*
AHA-1540 cmd :*num* [*num* ...]
AHA-1540 sense :*num* [*num* ...]
Tape I/O failure; followed by one of these messages:

end of tape
tape is write protected
wrong record length

Disk Driver Messages

disk:ERROR:Diskinfo table overflow
Too many disk drives in use - reconfigure kernel to increase the available number of disks.

disk:ERROR:Invalid partition sector on hard disk
Master boot block on disk is unrecognizable. Run **fsck**(ADM).

Floppy Driver Messages

floppy:WARNING:CMOS indicates no diskette drives installed
Configuration memory invalid - run your DOS SETUP disk.

floppy:WARNING:CMOS indicates diskette drive *num* not present
Configuration memory invalid - run your DOS SETUP disk.

floppy:ERROR:fd*num* being formatted
The floppy drive is in use.

floppy:ERROR:disk is write protected
The disk cannot be written because it is protected.

floppy:ERROR:on dev (*num*/*num*), block=*num* cmd=*num* status=*num*
Floppy I/O failure. possibly followed by the message:
insert disk or close floppy door
if appropriate.

floppy:WARNING:cmd result error
I/O error on the floppy drive.

VPIX Messages

VPIX:command completed unexpectedly
Process terminated prematurely.

OMTI Driver Messages

omti:ERROR:cannot allocate a GDT descriptor
Internal error - kernel dscralloc routine failed.

omti:ERROR:unit=*num* controller not configured
Internal error - driver open failed to identify disk type.

omti:WARNING:already busy
Internal error - omtistart called for a busy drive.

omti:ERROR:unknown command(*num*), bp->b_cmd
Internal error - omtistart encountered an unrecognized command.

omti:ERROR:command setup failed
Controller failed to accept command.

omti:WARNING:non-omti interrupt (*num*), omti_status
Controller did not signal an interrupt when an interrupt was received.

omti:WARNING:unexpected omti interrupt (*num*), omti_status
Internal error - no pending command when interrupt received.

omti:WARNING:still busy
Controller still busy after generating an interrupt.

omti:ERROR:during omti_sense
Interrupt received during an OMTI sense command.

omti:ERROR:initialization failure
Error indicated during an initialization.

omti:ERROR:sense command setup failed
Controller failed to accept setup command.

omti:ERROR:minor=*num*, block=*num*, errtype=*num*, code=*num*, unit=*num* [sector=*num*, cylinder/head=*num*/*num*,] <message>
Disk I/O failure. <message> is one of:

No error or no sense information,
No Index,
No Seek/Command Complete,
Write/Drive Fault,
Drive Not Selected/Not Ready,
No Track zero or Cylinder zero found,
Multiple Drives Selected,
Seek/Command in progress,
Cartridge Changed
ID CRC,
Uncorrectable Data ECC,
ID Address Mark Not Found,
Data Address Mark Not Found,
Sector Not Found,
Seek Error,
Sequence/DMA,
Write Protected,
Correctable ECC,
Bad Track Encountered,
Illegal Interleave Factor,
Unknown Error,
Illegal Access To An Alternated Track/Unable to Read the Alternate Track Address,
Alternate of Bad Track Already Assigned,
No Alternate Track Found,
Illegal Alternate Track Address
Invalid Command,
Illegal Disk Address,
Illegal Function for Drive Type,
Volume Overflow
RAM error,
EPROM Checksum/Internal Diagnostic error
Error with unknown type or code

omti:ERROR:controller already in select state
Internal error - controller busy when sending command.

omti:ERROR:cannot enter command phase
Controller failed to accept select command.

omti:ERROR:C_D bit stuck off
Controller failed to indicate readiness for command.

omti:ERROR:OMTI_BUSY bit still stuck on
Controller failed to obey reset command.

omti:INFO:unloading all requests
Preparing for manual reset because programmed reset did not work.

omti:WARNING:colliding polling routines ...
Internal error - multiple instances of omtipoll.

omti:ERROR:timed out
Expected interrupt did not arrive.

omti:ERROR:please use sfmt to modify disk parameters
Attempt to write disk characteristics directly with DIOWDISK ioctl.

Serial Driver Messages

serial:ERROR:Garbage or loose cable on dev *num*, port shut down
Too many interrupts were received together. Check your connections.

Winchester Driver Messages

wd:ERROR:on fixed disk dev=*num/num* block=*num* cmd=*num* status=*num* sector=*num*, cylinder/head = *num/num*
Disk I/O failure.

Event Driver Messages

event:ERROR:event channel full
There are no more devices available in the event queue.

event:ERROR:event table full
All of the system's event queues are opened.

Keyboard Driver Messages

kb:ERROR:keyboard is in an unknown mode
The keyboard has been set in an invalid mode through an *ioctl*(). The only valid keyboard modes are XT (0) and AT(1).

Notes

Some messages are processor dependent.

Name

mestbl - Create a messages locale table.

Syntax

mestbl [*specfile*]

Description

The utility *mestbl* is provided to allow *LC_MESSAGES* locales to be defined. It reads in a specification file (or standard input if *specfile* is not defined), containing a definition for a particular locale's response strings to yes/no queries, and produces a concise format table file, to be read by *setlocale*(S).

The response strings may be specified as a string held within double quotes or as a series of characters which are specified in one of six different ways (the following examples all specify the ASCII character 'A'):

```
65     - decimal
0101   - octal
0x41   - hexadecimal
'A'    - quoted character
'\101' - quoted octal
'\x41' - quoted hexadecimal
```

or a combination of both methods, for example:

```
'y' "es"
```

is identical to:

```
"yes"
```

To specify the response strings, the above string definitions must be preceded by the keyword **YESSTR=** for affirmative responses, and **NOSTR=** for negative responses.

All characters following the hash character are treated as a comment and ignored up to the end of the line, unless the hash is within a quoted string.

The concise format locale table is placed in a file named *messages* in the current directory. This file should be copied or moved to the correct place in the *setlocale* (S) file tree (see *locale* (M)). To prevent accidental corruption of the output data, the file is created with no write permission; if the mestbl utility is run in a directory containing a write-protected "messages" file, the utility will ask if the existing file

should be replaced - any response other than "yes" or "y" will cause mestbl to terminate without overwriting the existing file.

See Also

chrtbl(M), montbl(M), coltbl(M), locale(M), numtbl(M), timtbl(M), setlocale(S)

Diagnostics

All error messages printed are self explanatory.

Name

montbl - Create a currency locale table.

Syntax

montbl [*specfile*]

Description

The utility *montbl* is provided to allow new LC_MONETARY locales to be defined; it reads a specification file, containing a definition of the currency symbol for a particular locale, and produces a binary table file, to be read by *setlocale* (S), which determines the behavior of the *nl_langinfo* (S) routine.

The information supplied in the specification file consists of a line in the following format:

CRNCYSTR = *string*

The " = " can be separated from the keyword and string fields by zero or more space or tab characters.

The *string* is a sequence of characters surrounded by quotes ("). The first character of the string should be "-" if the symbol is to precede the currency value, or "+" if it should appear after the value. Characters within the string can be specified both literally and using " \ " escapes; the following three strings are equivalent:

"+DM"	literal
"+\x44M"	hexadecimal escapes
"+D\115"	octal escapes

All characters following a hash (#) are treated as a comment and ignored up to the end of the line, unless the hash is within a quoted string.

The binary table output is placed in a file named *currency* , within the current directory. This file should be copied or linked to the correct place in the *setlocale* file tree (see *locale* (M)). To prevent accidental corruption of the output data, the file is created with no write permission; if the *montbl* utility is run in a directory containing a write-protected *currency* file, the utility will ask if the existing file should be replaced - any response other than "yes" or "y" will cause **montbl** to terminate without overwriting the existing file.

If the *specfile* argument is missing, the specification information is read from the standard input.

See Also

chrtbl(M), locale(M), msgtbl(M), nl_langinfo(S), numtbl(M), setlocale(S), timtbl(M)

Diagnostics

If the input table file cannot be opened for reading, processing will terminate with the error message, "Cannot open specification file".

Any lines in the specification file which are syntactically incorrect, or contain an unrecognized value instead of CRNCYSTR will cause an error message to be issued to the standard error output, specifying the line number on which the error was detected. The line will be ignored, and processing will continue.

If the output file, *currency,* cannot be opened for writing, processing will terminate with the error message, "Cannot create table file".

Any error conditions encountered will cause the program to exit with a non-zero return code; successful completion is indicated with a zero return code.

Name

mscreen - Serial multiscreens utility.

Syntax

mscreen [**-s**] [**-n** number] [**-t**]

Description

mscreen allows a serial terminal to have multiple login screens similar to the *multiscreen*(M) console.

Note: For full mscreen support the terminal must have the ability to switch internal screen pages on command and it must retain a separate cursor position for each screen page.

The options are used as follows:

-s Silent mode. This flag suppresses the startup messages, and on "dumb" terminals it suppresses the screen switch messages

-n Selects the number of serial multiscreens desired up to the maximum defined for the terminal type.

-t Disables the transparent tty checking. *mscreen* normally exits silently if the terminal device name starts with the characters "ttyp". Device names beginning with "ttyp" are used as slave devices for *mscreen*. The correct names for the master tty devices begin with "ptyp".

mscreen can be used on both "smart" and "dumb" terminals. Although it is optimized to take advantage of smart terminals with screen memory, *mscreen* also works on dumb terminals, although the screen images are not saved during screen changes. *mscreen* also supports terminals with two (or more) serial ports that are connected to different computers.

mscreen is designed to be invoked from the **.profile** or **.login** files. Use *mscreen* in place of the SHELL variable so that serial multiscreens can be automatic at login time. The "stop" and "quit" keys allow you to logout from all screens with a single keystroke.

Configuration

mscreen determines the terminal type of the terminal it is invoked from by examining the environment variable TERM. *mscreen* looks in **/etc/mscreencap** or in the filename contained in the environment

variable MSCREENCAP to get the capabilities for the terminal type.

The pseudo terminals assigned to the user are automatically determined at startup by *mscreen*. Manual assignment of ttys can be accomplished by creating a file in the user's home directory called *.mscreenrc*.

mscreencap format

mscreencap contains an entry for each terminal type supported. An entry may have several names if the support for several terminal types are the same. Within an entry are the key mappings for each potential pseudo terminal. Each pseudo terminal has a help key string, an input string (the sequence generated by the key that selects this screen), and an optional output string (the sequence to send to the terminal that will cause a page switch). The input and output strings are in a termcap like format: (the backslash and caret are special lead in (escape) characters)

nnn	an octal number, one to three digits are allowed
\n	newline
\r	carriage return
\t	tab
\b	backspace
\f	form feed
\E	escape (hex 1b octal 33).
\	enter backslash as a data character
\^	enter caret as a data character
\^X	ctrl-X where X can be: @ABCDEFGHIJKLMNOPQESTUVWXYZ[]^_ effectively the caret can generate hex 01 through hex 1f.

If a terminal type has no output strings then it is assumed to be a dumb terminal that does not have multiple internal memory pages.

There are five special entries that allow the user to define keys to support the other functions of *mscreen*. They are the help key (which prints a list of all of the keys that are currently available and their functions), the who key (prints the name of the current screen), the stop key (terminates *mscreen* and returns a good (zero) shell return code), and quit key (terminates *mscreen* and returns a bad (non-zero) shell return code and the dummy entry that is used for terminals with multiple ports.

The format is:

```
#this is a comment and may only appear between entries
entryname|alias1|alias1...|aliasn:
    :specialname,helpname,inputstring,pageselectstring:
    :specialname,helpname,inputstring,pageselectstring:
entryname|alias1|alias1...|aliasn:
    :specialname,helpname,inputstring,pageselectstring:
    :specialname,helpname,inputstring,pageselectstring:
```

The specialname is empty for real screen entries. See the provided **/etc/mscreencap** for examples.

.mscreenrc format

.mscreenrc contains a list of ttynames if the user wants to allocate a fixed set of ttys for use:

ttyp0
ttyp1
ttypn

Shell return codes and auto login/logout

mscreen exits with a bad (non-zero) return code if there is an error or when the "quit" key is pressed. The "stop" key causes *mscreen* to exit with a good (zero) return code. This allows users to place *mscreen* in the .login or .profile files. The .login or .profile files should set up an automatic logout if the *mscreen* return code is good (zero). The following is a **csh** sample invocation of *mscreen* for a .login file:

mscreen -n 4
if ($status == 0) logout

The single key logout feature of *mscreen* works as if a normal logout was entered on each pseudo-terminal. A hangup signal is sent to all of the processes on all the pseudo terminals.

Multiple Port Option

mscreen provides a dummy entry type. It allows *mscreen* to be placed in an inactive state while the user uses his terminal to converse through another (physical) io port to another computer. see the provided **/etc/mscreencap** for an example. To be used, you must take the example and configure it for your needs.

mscreen Driver

The *mscreen* driver is already installed in the XENIX kernel with eight

pseudo terminals available for use. You must enable a pseudo terminals to use it. See the link-kit instructions for relinking the kernel to have more available pseudo terminals.

Notes

mscreen has a VTIM timeout of 1/5 second for input strings.

mscreen has a limit of twenty multiscreens per user.

You should not switch screen pages in *mscreen* when output is occurring because if an escape sequence is cut in half it may leave the terminal in an indeterminate state and distort the screen image.

Terminals that save the cursor location for each screen often do not save states such as insert mode, inverse video, and others. For example, you should not change screens if you are in insert mode in vi, and you should not change screens during an inverse video output sequence.

For inactive screens (screens other than the current one) *mscreen* saves the last 2048 characters of data (2K). Data older than this is lost. This limit occasionally results in errors for programs that require a memory of more data than this. The application-defined screen redraw key restores the screen to normal appearance.

mscreen depends on the pseudo terminal device names starting with ttyp for the slave devices and ptyp for the master devices. The number of trailing character in the device name is not significant.

See Also

multiscreen(M), enable(C)

Name

multiscreen - Multiple screens (device files)

Syntax

alt-Fn
alt-ctrl-Fn
alt-shift-Fn
alt-ctrl-shift-Fn

Description

With the *multiscreen* feature, a user can access up to twelve different "screens," each corresponding to a separate device file. Each screen can be viewed one at a time through the **primary monitor** video display.

The number of screens on a system depends upon the amount of memory in the computer. The system displays the number of enabled screens during the boot process.

Access

To see the next consecutive screen, enter:

Ctrl-PrtSc

To move to any screen from any other screen, enter:

alt-F*n* or alt-ctrl-F*n* or alt-shift-F*n*
alt-F*n* or alt-ctrl-F*n* (screens 1-12)
alt-shift-F*n* or alt-ctrl-shift-F*n* (screens 11-16, 7-12)

where *n* is the number of one of the "F" function keys on the primary monitor keyboard. For example:

alt-F2

selects **tty02**, and all output in that device's screen buffer is displayed on the monitor screen.

The second form (using the **SHIFT** key) permits access to screens 11 and 12 on keyboards that have only ten function keys. It is also possible to configure the kernel for up to 16 screens, but 12 is the default.

The function key combinations used to display the various screens are defined in the keyboard mapping file. The **/usr/lib/keyboard/keys** or other *mapkey*(ADM) file can be modified to allow different key combinations to change multiscreens. Use the *mapkey* utility to create a

new keyboard map.

Files

/dev/tty[01-12]	multiscreen devices (number available depends on system memory)

See Also

mapkey(ADM), keyboard(HW), screen(HW), serial(HW), stty(C)

Notes

Any system error messages are normally output on the **console** device file (**/dev/console**). When an error message is output, the video display reverts to the **console** device file, and the message is displayed on the screen. The **console** device is the only teletype device open during the system boot sequence and when in single user, or system maintenance mode.

Limitations to the number of multiscreens available on a system does not affect the number of serial lines or devices available. See *serial*(M) for information on available serial devices.

Note that the keystrokes given here are the default for XENIX, but your keyboard may be different. If so, see *keyboard*(M) for the appropriate substitutes. Also, any key can be programmed to generate the screen switching sequences by using the mapkey utility.

Name

numtbl - Create a numeric locale table.

Syntax

numtbl [table_file]

Description

This utility will create a numeric locale table to be interpreted by the *setlocale* (S) system call.

The *table_file* contains information about the numeric locale in a user readable form.

At present, two pieces of information can be supplied. These are: the character to be used as a decimal place marker (radix character), and the character to be used as a thousands delimiter, for example the commas in 1,000,000. To specify these, there must be lines, in the table file, of the form:

```
DECIMAL=d
THOUSANDS=t
```

Where "d" is the character to be used as the decimal place mark and "t" is the character to be used as the thousands delimiter. The characters "d" and "t" may be specified in six different ways. The following lines show different formats for the letter *b*.

```
    98    - decimal
  0142    - octal
  0x62    - hexadecimal
   'b'    - quoted character
'\0142'   - quoted octal
 '\x62'   - quoted hexadecimal
```

Any line starting with a hash ("#") is treated as a comment.

The output is a file, called *numeric*, which is placed in the current directory. This file is in a form which can be interpreted by the *setlocale(S)* system call. For more information on where this file should be placed, please see *locale(M)*.

If no table file is specified, the information is taken from the standard input. The format of the information is identical.

If either *DECIMAL* or *THOUSANDS* is not specified, its value will default to "." or ",", respectively.

See Also

locale(M), environ(M)

Diagnostics

Any lines of input which are in the wrong format will cause a warning to be issued on the terminal, but will not terminate the program.

"Character syntax error" will be issued on the terminal if the format of the character specification does not match one of those specified above. The program will then terminate.

If the input table file cannot be opened for reading, the program will also terminate with the error message, "Cannot open table file".

If the output file, *numeric,* cannot be opened for writing, the program will terminate with the error message, "Cannot create numeric locale file".

Notes

The thousands delimiter is not currently used within any of the standard XENIX libraries or utilities, although it can be accessed by application programs using the *nl_langinfo* (S) function.

The string RADIXCHAR may be used as an alternative to DECIMAL , and THOUSEP as an alternative to THOUSANDS , if required. These alternatives are provided for consistency with the identifiers used by *nl_langinfo* (S).

Name

profile - Sets up an environment at login time.

Description

The optional file, **.profile**, permits automatic execution of commands whenever a user logs in. The file is generally used to personalize a user's work environment by setting exported environment variables and terminal mode (see **environ**(C)).

When a user logs in, the user's login shell looks for **.profile** in the log-in directory. If found, the shell executes the commands in the file before beginning the session. The commands in the file must have the same format as if they were entered at the keyboard. Any line beginning with the number sign (#) is considered a comment and is ignored. The following is an example of a typical file:

```
# Tell me when new mail comes in
MAIL=/usr/mail/myname
# Add my /bin directory to the shell search sequence
PATH=$PATH:$HOME/bin
# Make some environment variables global
export MAIL PATH TERM
# Set file creation mask
umask 22
```

Note that the file **/etc/profile** is a system-wide profile that, if it exists, is executed for every user before the user's **.profile** is executed.

Files

$HOME/.profile
/etc/profile

See Also

env(C), login(M), mail(C), sh(C), stty(C), su(C), environ(M)

Name

sxt - Pseudo-device driver

Description

Sxt is a pseudo-device driver that interposes a discipline between the standard *tty* line disciplines and a real device driver. The standard disciplines manipulate *virtual tty* structures (channels) declared by the *sxt* driver. *Sxt* acts as a discipline manipulating a *real tty* structure declared by a real device driver. The *sxt* driver is currently only used by the *shl*(C) command.

Virtual ttys are named **/dev/sxt???** and are allocated in groups of up to eight. To allocate a group, a program should exclusively open a file with a name of the form **/dev/sxt??0** (channel 0) and then execute a SXTIOCLINK *ioctl* call to initiate the multiplexing.

Only one channel, the *controlling* channel, can receive input from the keyboard at a time; others attempting to read will be blocked.

There are two groups of *ioctl*(S) commands supported by *sxt*. The first group contains the standard *ioctl* commands described in *termio*(M), with the addition of the following:

TIOCEXCL Set *exclusive use* mode: no further opens are permitted until the file has been closed.

TIOCNXCL Reset *exclusive use* mode: further opens are once again permitted.

The second group are directives to *sxt* itself. Some of these may only be executed on channel 0.

SXTIOCLINK Allocate a channel group and multiplex the virtual ttys onto the real tty. The argument is the number of channels to allocate. This command may only be executed on channel 0. Possible errors include:

EINVAL The argument is out of range.

ENOTTY The command was not issued from a real tty.

ENXIO *linesw* is not configured with *sxt*.

EBUSY An SXTIOCLINK command has already been issued for this real *tty*.

ENOMEM
There is no system memory available for allocating the virtual tty structures.

EBADF Channel 0 was not opened before this call.

SXTIOCSWTCH Set the controlling channel. Possible errors include:

EINVAL An invalid channel number was given.

EPERM The command was not executed from channel 0.

SXTIOCWF Cause a channel to wait until it is the controlling channel. This command will return the error, *EINVAL*, if an invalid channel number is given.

SXTIOCUBLK Turn off the **loblk** control flag in the virtual tty of the indicated channel. The error *EINVAL* will be returned if an invalid number or channel 0 is given.

SXTIOCSTAT Get the status (blocked on input or output) of each channel and store in the *sxtblock* structure referenced by the argument. The error *EFAULT* will be returned if the structure cannot be written.

SXTIOCTRACE Enable tracing. Tracing information is written to the console. This command has no effect if tracing is not configured.

SXTIOCNOTRACE Disable tracing. This command has no effect if tracing is not configured.

Files

/dev/sxt??[0-7]	virtual tty devices
/usr/include/sys/sxt.h	driver specific definitions

See Also

shl(C), stty(C), ioctl(S), open(S), termio(M)

Name

systty - System maintenance device.

Description

The file **/dev/systty** is the device on which system error messages are displayed. The actual physical device accessed via **/dev/systty** is selected during boot, and is typically the device used to control the bootup procedure. The default physical device **/dev/systty** is determined by *boot*(HW) when the system is brought up.

Initially **/dev/console** is linked to **/dev/systty**.

Files

/dev/systty

See Also

boot(HW), console(M)

Name

termcap - Terminal capability data base.

Description

The file **/etc/termcap** is a data base describing terminals. This data base is used by commands such as *vi*(C), *vsh*(C), Lyrix®, Multiplan™ and sub-routine packages such as *curses*(S). Terminals are described in *termcap* by giving a set of capabilities and by describing how operations are performed. Padding requirements and initialization sequences are included in *termcap*.

Entries in *termcap* consist of a number of fields separated by colons ':'. The first entry for each terminal gives the names that are known for the terminal, separated by vertical bars (|). For compatibility with older systems the first name is always 2 characters long. The second name given is the most common abbreviation for the terminal and the name used by *vi (C)* and *ex*(C). The last name given should be a long name fully identifying the terminal. Only the last name can contain blanks for readability.

Capabilities (including XENIX Extensions)

The following is a list of the capabilities that can be defined for a given terminal. In this list, (P) indicates padding can be specified, and (P*) indicates that padding can be based on the number of lines affected. The capability type and padding fields are described in detail in the following section "Types of Capabilities."

The codes beginning with uppercase letters (except for CC) indicate XENIX extensions. They are included in addition to the standard entries and are used by one or more application programs. As with the standard entries, not all modes are supported by all applications or terminals. Some of these entries refer to specific terminal output capabilities (such as GS for "graphics start"). Others describe character sequences sent by keys that appear on a keyboard (such as PU for PageUp key). There are also entries that are used to attribute special meanings to other keys (or combinations of keys) for use in a particular software program. Some of the XENIX extension capabilities have a similar function to standard capabilities. They are used to redefine specific keys (such as using function keys as arrow keys). The extension capabilities are included in the **/etc/termcap** file, as they are required for some XENIX utilities (such as *vsh*(C)). The more commonly used extension capabilities are described in more detail in the section "XENIX Extensions."

Name	Type	Pad?	Description
ae	str	(P)	End alternate character set
al	str	(P*)	Add new blank line
am	bool		Terminal has automatic margins
as	str	(P)	Start alternate character set
bc	str		Backspace if not ^**H**
bs	bool		Terminal can backspace with ^**H**
bt	str	(P)	Back tab
bw	bool		Backspace wraps from column 0 to last column
CC	str		Command character in prototype if terminal settable
cd	str	(P*)	Clear to end of display
ce	str	(P)	Clear to end of line
CF	str		Cursor off
ch	str	(P)	Like cm but horizontal motion only, line stays same
CL	str		Sent by CHAR LEFT key
cl	str	(P*)	Clear screen
cm	str	(P)	Cursor motion
co	num		Number of columns in a line
CO	str		Cursor on
cr	str	(P*)	Carriage return, (default ^**M**)
cs	str	(P)	Change scrolling region (vt100), like **cm**
cv	str	(P)	Like **ch** but vertical only.
CW	str		Sent by CHANGE WINDOW key
da	bool		Display may be retained above
DA	bool		Delete attribute string
db	bool		Display may be retained below
dB	num		Number of millisec of **bs** delay needed
dC	num		Number of millisec of **cr** delay needed
dc	str	(P*)	Delete character
dF	num		Number of millisec of **ff** delay needed
dl	str	(P*)	Delete line
dm	str		Delete mode (enter)
dN	num		Number of millisec of **nl** delay needed
do	str		Down one line
dT	num		Number of millisec of tab delay needed
ed	str		End delete mode
ei	str		End insert mode; give `:ei=:´ if **ic**
EN	str		Sent by END key
eo	bool		Can erase overstrikes with a blank
ff	str	(P*)	Hardcopy terminal page eject (default ^**L**)
G1	str		Upper-right (1st quadrant) corner character
G2	str		Upper-left (2nd quadrant) corner character

Name	Type	Pad?	Description
G3	str		Lower-left (3rd quadrant) corner character
G4	str		Lower-right (4th quadrant) corner character
GC	str		Center graphics character (similar to "+")
GD	str		Down-tick character
GE	str		Graphics mode end
GG	num		Number of chars taken by GS and GE
GH	str		Horizontal bar character
GL	str		Left-tick character
GR	str		Right-tick character
GS	str		Graphics mode start
GU	str		Up-tick character
GV	str		Vertical bar character
hc	bool		Hardcopy terminal
hd	str		Half-line down (forward 1/2 linefeed)
HM	str		Sent by HOME key (if not **kh**)
ho	str		Home cursor (if no **cm**)
hu	str		Half-line up (reverse 1/2 linefeed)
hz	str		Hazeltine; can't print ~'s
ic	str	(P)	Insert character
if	str		Name of file containing **is**
im	str		Insert mode (enter); give ':im=' if **ic**
in	bool		Insert mode distinguishes nulls on display
ip	str	(P*)	Insert pad after character inserted
is	str		Terminal initialization string
k0-k9	str		Sent by 'other' function keys 0-9
kb	str		Sent by backspace key
kd	str		Sent by terminal down arrow key
ke	str		Out of 'keypad transmit' mode
kh	str		Sent by home key
kl	str		Sent by terminal left arrow key
kn	num		Number of 'other' keys
ko	str		Termcap entries for other non-function keys
kr	str		Sent by terminal right arrow key
ks	str		Put terminal in 'keypad transmit' mode
ku	str		Sent by terminal up arrow key
l0-l9	str		Labels on 'other' function keys
LD	str		Sent by line delete key
LF	str		Sent by line feed key
li	num		Number of lines on screen or page
ll	str		Last line, first column (if no **cm**)
ma	str		Arrow key map, used by **vi** version 2 only
mi	bool		Safe to move while in insert mode
ml	str		Memory lock on above cursor
MP	str		Multiplan initialization string
MR	str		Multiplan reset string
ms	bool		Will scroll in stand-out mode
mu	str		Memory unlock (turn off memory lock)

Name	Type	Pad?	Description
nc	bool		No correctly working carriage return (DM2500,H2000)
nd	str		Non-destructive space (cursor right)
nl	str	(P*)	Newline character (default **\n**)
ns	bool		Terminal is a CRT but doesn't scroll
NU	str		Sent by NEXT UNLOCKED CELL key
os	bool		Terminal overstrikes
pc	str		Pad character (rather than null)
PD	str		Sent by PAGE DOWN key
PN	str		Start local printing
PS	str		End local printing
pt	bool		Has hardware tabs (may need to be set with **is**)
PU	str		Sent by PAGE UP key
RC	str		Sent by RECALC key
RF	str		Sent by TOGGLE REFERENCE key
RT	str		Sent by RETURN key
se	str		End stand out mode
sf	str	(P)	Scroll forwards
sg	num		Number of blank chars left by **so** or **se**
so	str		Begin stand out mode
sr	str	(P)	Scroll reverse (backwards)
ta	str	(P)	Tab (other than ^**I** or with padding)
tc	str		Entry of similar terminal - must be last
te	str		String to end programs that use **cm**
ti	str		String to begin programs that use **cm**
uc	str		Underscore one char and move past it
ue	str		End underscore mode
ug	num		Number of blank chars left by **us** or **ue**
ul	bool		Terminal underlines even though it doesn't overstrike
up	str		Upline (cursor up)
UP	str		Sent by up-arrow key (alternate to ku)
us	str		Start underscore mode
vb	str		Visible bell (may not move cursor)
ve	str		Sequence to end open/visual mode
vs	str		Sequence to start open/visual mode
WL	str		Sent by WORD LEFT key
WR	str		Sent by WORD RIGHT key
xb	bool		Beehive (f1=escape, f2=ctrl C)
xn	bool		A newline is ignored after a wrap (Concept)
xr	bool		Return acts like **ce** \r \n (Delta Data)
xs	bool		Standard out not erased by writing over it (HP 264?)
xt	bool		Tabs are destructive, magic **so** char (Teleray 1061)

A Sample Entry

The following entry describes the Concept-100, and is among the more complex entries in the *termcap* file. (This particular Concept entry is outdated, and is used as an example only.)

```
c1|c100|concept100:is=\EU\Ef\E7\E5\E8\El\ENH\EK\E\200\Eo&\200:\
        :al=3*\E^R:am:bs:cd=16*\E^C:ce=16\E^S:cl=2*^L:\
        :cm=\Ea%+ %+ :co#80:dc=16\E^A:dl=3*\E^B:\
        :ei=\E\200:eo:im=\E^P:in:ip=16*:li#24:mi:nd=\E=:\
        :se=\Ed\Ee:so=\ED\EE:ta=8\t:ul:up=\E;:vb=\Ek\EK:xn:
```

Entries may continue over to multiple lines by giving a backslash (\) as the last character of a line. Empty fields can be included for readability between the last field on a line and the first field on the next. Capabilities in *termcap* are of three types: Boolean capabilities, which indicate that the terminal has some particular feature, numeric capabilities giving the size of the terminal or the size of particular delays, and string capabilities, which give a sequence that can be used to perform particular terminal operations.

Types of Capabilities

All capabilities have two letter codes. For instance, the fact that the Concept has 'automatic margins' (i.e., an automatic return and linefeed when the end of a line is reached) is indicated by the capability **am**. The description of the Concept includes **am**. Numeric capabilities are followed by the character '#' and then the value. Thus **co**, which indicates the number of columns the terminal has, gives the value '80' for the Concept.

Finally, string valued capabilities, such as **ce** (clear to end of line sequence) are given by the two character code, an '=', and then a string ending at the next following ':'. A delay in milliseconds may appear after the '=' in such a capability, and padding characters are supplied by the editor after the rest of the string is sent to provide this delay. The delay can be either a integer, e.g., '20', or an integer followed by an '*', i.e. '3*'. A '*' indicates that the padding required is proportional to the number of lines affected by the operation, and the amount given is the per-affected-unit padding required. When a '*' is specified, it is sometimes useful to give a delay of the form '3.5' to specify a delay per unit to tenths of milliseconds.

A number of escape sequences are provided in the string valued capabilities for easy encoding of characters there. A **\E** maps to an ESCAPE character, **^x** maps to a control-x for any appropriate x, and the sequences **\n \r \t \b \f** give a newline, return, tab, backspace and formfeed. Finally, characters may be given as three octal digits after a \, and the characters ^ and \ may be given as \^ and \\. If it is necessary to place a colon (**:**) in a capability, it must be escaped in octal as **\072**. If it is necessary to place a null character in a string capability, it must be encoded as **\200**. The routines that deal with *termcap* use C strings,

and strip the high bits of the output very late so that a **\200** comes out as a **\000** would.

Preparing Descriptions

The most effective way to prepare a terminal description is by imitating the description of a similar terminal in *termcap* and to build up a description gradually, using partial descriptions with *ex* to check that they are correct. Be aware that a very unusual terminal may expose deficiencies in the ability of the *termcap* file to describe it. To test a new terminal description, you can set the environment variable TERMCAP to a pathname of a file containing the description you are working on and the editor will look there rather than in **/etc/termcap.** TERMCAP can also be set to the termcap entry itself to avoid reading the file when starting up the editor.

Basic capabilities

The number of columns on each line for the terminal is given by the **co** numeric capability. If the terminal is a CRT, the number of lines on the screen is given by the **li** capability. If the terminal wraps around to the beginning of the next line when it reaches the right margin, it should have the **am** capability. If the terminal can clear its screen, this is given by the **cl** string capability. If the terminal can backspace, it should have the **bs** capability, unless a backspace is accomplished by a character other than **^H** in which case you should give this character as the **bc** string capability. If it overstrikes (rather than clearing a position when a character is struck over), it should have the **os** capability.

A very important point here is that the local cursor motions encoded in *termcap* are undefined at the left and top edges of a CRT terminal. The editor will never attempt to backspace around the left edge, nor will it attempt to go up locally off the top. The editor assumes that feeding off the bottom of the screen will cause the screen to scroll up, and the **am** capability tells whether the cursor sticks at the right edge of the screen. If the terminal has switch selectable automatic margins, the *termcap* file usually assumes that this is on (i.e., **am**).

These capabilities suffice to describe hardcopy and 'glass-tty' terminals. Thus the model 33 teletype is described as

```
t3|33|tty33:co#72:os
```

while the Lear Siegler ADM-3 is described as:

```
cl|adm3|3|lsi adm3:am:bs:cl=^Z:li#24:co#80
```

Cursor addressing

Cursor addressing in the terminal is described by a **cm** string capability. This capability uses *printf*(S) like escapes (such as **%x**) in it. These substitute to encodings of the current line or column position, while other characters are passed through unchanged. If the **cm** string is thought of as being a function, its arguments are the line and then the column to which motion is desired, and the **%** encodings have the following meanings:

%d	replaced by line/column position, 0 origin
%2	like %2d - 2 digit field
%3	like %3d - 3 digit field
%.	like *printf*(S) %c
%+x	adds *x* to value, then %.
%>xy	if value > x adds y, no output
%r	reverses order of line and column, no output
%i	increments line/column position (for 1 origin)
%%	gives a single %
%n	exclusive or row and column with 0140 (DM2500)
%B	BCD (16*(x/10)) + (x%10), no output
%D	Reverse coding (x-2*(x%16)), no output (Delta Data).

Consider the HP2645, which, to get to row 3 and column 12, needs to be sent \E&a12c03Y padded for 6 milliseconds. Note that the order of the rows and columns is inverted here, and that the row and column are printed as two digits. Thus its **cm** capability is 'cm=6\E&%r%2c%2Y'. The Microterm ACT-IV needs the current row and column sent preceded by a ^**T**, with the row and column simply encoded in binary, 'cm=^T%.%.'. Terminals that use '%.' need to be able to backspace the cursor (**bs** or **bc**), and to move the cursor up one line on the screen (**up** introduced below). This is necessary because it is not always safe to transmit **\t**, **\n** ^**D** and **\r**, as the system may change or discard them.

A final example is the LSI ADM-3a, which uses row and column offset by a blank character, thus 'cm=\E=%+ %+ '.

Cursor motions

If the terminal can move the cursor one position to the right, leaving the character at the current position unchanged, this sequence should be given as **nd** (non-destructive space). If it can move the cursor up a line on the screen in the same column, it should be given as **up**. If the terminal has no cursor addressing capability, but can home the cursor (to very upper left corner of screen), this can be given as **ho**; similarly, a fast way of getting to the lower left hand corner can be given as **ll**; this may involve going up with **up** from the home position, but the editor will never do this itself (unless **ll** does) because it makes no

assumption about the effect of moving up from the home position.

Area clears

If the terminal can clear from the current position to the end of the line, leaving the cursor where it is, the sequence should be given as **ce**. If the terminal can clear from the current position to the end of the display, the sequence should be given as **cd**. The editor only uses **cd** from the first column of a line.

Insert/delete line

If the terminal can open a new blank line before the line where the cursor is, the sequence should be given as **al**. Note that this is done only from the first position of a line. The cursor must then appear on the newly blank line. If the terminal can delete the line on which the cursor rests, the sequence should be given as **dl**. This is done only from the first position on the line to be deleted. If the terminal can scroll the screen backwards, the sequence can be given as **sb**, but **al** can suffice. If the terminal can retain display memory above, the **da** capability should be given, and if display memory can be retained below, then **db** should be given. These let the editor know that deleting a line on the screen may bring non-blank lines up from below or that scrolling back with **sb** may bring down non-blank lines.

Insert/delete character

There are two basic kinds of intelligent terminals with respect to the insert/delete character that can be described using *termcap*. The most common insert/delete character operations affect only the characters on the current line and shift characters off the end of the line. Other terminals, such as the Concept 100 and the Perkin Elmer Owl, make a distinction between typed and untyped blanks on the screen, shifting upon an insert or delete only to an untyped blank on the screen which is either eliminated, or expanded to two untyped blanks. You can find out which kind of terminal you have by clearing the screen and entering text separated by cursor motions. Enter 'abc def', using local cursor motions (not spaces) between the 'abc' and the 'def'. Then position the cursor before the 'abc' and put the terminal in insert mode. If entering characters causes the rest of the line to shift rigidly and characters to fall off the end, your terminal does not distinguish between blanks and untyped positions. If the 'abc' shifts over to the 'def' which then move together around the end of the current line and onto the next as you insert, you have the second type of terminal, and should give the capability **in**, which stands for 'insert null'. No known terminals have an insert mode, not falling into one of these two classes.

The editor can handle both terminals that have an insert mode and terminals that send a simple sequence to open a blank position on the current line. Specify **im** as the sequence to get into insert mode, or give it an empty value if your terminal uses a sequence to insert a

blank position. Specify **ei** as the sequence to leave insert mode (specify this with an empty value if you also gave **im** an empty value). Now specify **ic** as any sequence needed to be sent just before sending the character to be inserted. Most terminals with a true insert mode will not support **ic**, terminals that send a sequence to open a screen position should give it here. (Insert mode is preferable to the sequence to open a position on the screen if your terminal has both.) If post insert padding is needed, give this as a number of milliseconds in **ip** (a string option). Any other sequence that may need to be sent after an insert of a single character may also be given in **ip**.

It is occasionally necessary to move around while in insert mode to delete characters on the same line (e.g., if there is a tab after the insertion position). If your terminal allows motion while in insert mode, you can give the capability **mi** to speed up inserting in this case. Omitting **mi** will affect only speed. Some terminals (notably Datamedia's) must not have **mi** because of the way their insert mode works.

Finally, you can specify delete mode by giving **dm** and **ed** to enter and exit delete mode, and **dc** to delete a single character while in delete mode.

Highlighting, underlining, and visible bells

If your terminal has sequences to enter and exit standout mode, these can be given as **so** and **se** respectively. If there are several flavors of standout mode (such as reverse video, blinking, or underlining - half bright is not usually an acceptable 'standout' mode unless the terminal is in reverse video mode constantly), the preferred mode is reverse video by itself. It is acceptable, if the code to change into or out of standout mode leaves one, or even two blank spaces on the screen, as the TVI 912 and Teleray 1061 do. Although it may confuse some programs slightly, it cannot be helped.

Codes to begin underlining and end underlining can be given as **us**, and **ue** respectively. If the terminal has a code to underline the current character and move the cursor one space to the right, such as the Microterm Mime, the sequence can be given as **uc**. (If the underline code does not move the cursor to the right, specify the code followed by a nondestructive space.)

If the terminal has a way of flashing the screen to indicate an error quietly (a bell replacement), the sequence can be given as **vb**; it must not move the cursor. If the terminal should be placed in a different mode during open and visual modes of *ex*, the sequence can be given as **vs** and **ve**, sent at the start and end of these modes respectively. These can be used to change from a underline to a block cursor and back.

If the terminal needs to be in a special mode when running a program that addresses the cursor, the codes to enter and exit this mode can be given as **ti** and **te**. This arises, for example, from terminals like the

Concept with more than one page of memory. If the terminal has only memory relative cursor addressing and not screen relative cursor addressing, a one screen-sized window must be fixed into the terminal for cursor addressing to work properly.

If your terminal correctly generates underlined characters (with no special codes needed), even though it does not overstrike, you should give the capability **ul**. If overstrikes are erasable with a blank, this should be indicated by specifying **eo**.

Keypad

If the terminal has a keypad that transmits codes when the keys are pressed, this information can be given. Note that it is not possible to handle terminals where the keypad only works in local (this applies, for example, to the unshifted HP 2621 keys). If the keypad can be set to transmit or not to transmit, enter these codes as **ks** and **ke**. Otherwise, the keypad is assumed always to transmit. The codes sent by the left arrow, right arrow, up arrow, down arrow, and home keys can be given as **kl, kr, ku, kd,** and **kh**. If there are function keys such as f0, f1, ..., f9, the codes they send can be given as **k0, k1, ..., k9**. If these keys have labels other than the default f0 through f9, the labels can be given as **l0, l1, ..., l9**. If there are other keys that transmit the same code as the terminal expects for the corresponding function, such as clear screen, the *termcap* 2 letter codes can be given in the **ko** capability, for example, ':ko=cl,ll,sf,sb:', which says that the terminal has clear, home down, scroll down, and scroll up keys that transmit the same thing as the cl, ll, sf, and sb entries.

The **ma** entry is also used to indicate arrow keys on terminals which have single character arrow keys. It is obsolete, but still in use in version 2 of vi, which must be run on some minicomputers due to memory limitations. This field is redundant with **kl, kr, ku, kd,** and **kh**. It consists of groups of two characters. In each group, the first character is what an arrow key sends, the second character is the corresponding vi command. These commands are **h** for **kl**, **j** for **kd**, **k** for **ku**, **l** for **kr**, and **H** for **kh**. For example, the Mime would be **:ma=^Kj^Zk^Xl:** indicating arrow keys left (^H), down (^K), up (^Z), and right (^X). (There is no home key on the Mime.)

Miscellaneous

If the terminal requires other than a null (zero) character as a pad, this can be given as **pc**.

If tabs on the terminal require padding, or if the terminal uses a character other than **^I** to tab, the sequence can be given as **ta**.

Terminals that do not allow '~' characters to be displayed (such as Hazeltines), should indicate **hz**. Datamedia terminals that echo carriage-return-linefeed for carriage return, and then ignore a following linefeed, should indicate **nc**. Early Concept terminals, that ignore

a linefeed immediately after an **am** wrap, should indicate **xn**. If an erase-eol is required to get rid of standout (instead of merely writing on top of it), **xs** should be given. Teleray terminals, where tabs turn all characters moved over to blanks, should indicate **xt**. Other specific terminal problems may be corrected by adding more capabilities of the form **x***x*.

If the leading character for commands to the terminal (normally the escape character) can be set by the software, specify the command character(s) with the capability **CC**.

Other capabilities include **is**, an initialization string for the terminal, and **if**, the name of a file containing long initialization strings. These strings are expected to properly clear and then set the tabs on the terminal, if the terminal has settable tabs. If both are given, **is** is displayed before **if**. This is useful where **if** is **/usr/lib/tabset/std** , but **is** clears the tabs first.

Similar Terminals

If there are two very similar terminals, one can be defined as being just like the other with certain exceptions. The string capability, **tc**, can be given with the name of the similar terminal. This capability must be *last* and the combined length of the two entries must not exceed 1024. Since *termlib* routines search the entry from left to right, and since the **tc** capability is replaced by the corresponding entry, the capabilities given at the left override the ones in the similar terminal. A capability can be cancelled with **xx@** where xx is the capability. For example:

```
hn|2621nl:ks@:ke@:tc=2621:
```

This defines a 2621nl that does not have the **ks** or **ke** capabilities, and does not turn on the function key labels when in visual mode. This is useful for different modes for a terminal, or for different user preferences.

XENIX Extensions

Capabilities This table lists the (previously listed) XENIX extensions to the termcap capabilities. It shows which codes generate information input from the keyboard to the program reading the keyboard and which codes generate information output from the program to the screen.

Name	Input/Output	Description
CF	str	Cursor off
CL	str	Sent by CHAR LEFT key
CO	str	Cursor on
CW	str	Sent by CHANGE WINDOW key
DA	bool	Delete attribute string
EN	str	Sent by END key
G1	str	Upper-right (1st quadrant) corner character
G2	str	Upper-left (2nd quadrant) corner character
G3	str	Lower-left (3rd quadrant) corner character
G4	str	Lower-right (4th quadrant) corner character
GC	str	Center graphics character (similar to +)
GD	str	Down-tick character
GE	str	Graphics mode end
GG	num	Number of chars taken by GS and GE
GH	str	Horizontal bar character
GL	str	Left-tick character
GR	str	Right-tick character
GS	str	Graphics mode start
GU	str	Up-tick character
GV	str	Vertical bar character
HM	str	Sent by HOME key (if not **kh**)
MP	str	Multiplan initialization string
MR	str	Multiplan reset string
NU	str	Sent by NEXT UNLOCKED CELL key
PD	str	Sent by PAGE DOWN key
PU	str	Sent by PAGE UP key
RC	str	Sent by RECALC key
RF	str	Sent by TOGGLE REFERENCE key
RT	str	Sent by RETURN key
UP	str	Sent by up-arrow key (alternate to ku)
WL	str	Sent by WORD LEFT key
WR	str	Sent by WORD RIGHT key

Cursor motion Some application programs make use of special editing codes. **CR** and **CL** move the cursor one character right and left respectively. **WR** and **WL** move the cursor one word right and left respectively. **CW** changes windows, when they are used in the program.

Some application programs turn off the cursor. This is accomplished using **CF** for cursor off and **CO** to turn it back on.

Graphic mode. If the terminal has graphics capabilities, this mode can be turned on and off with the **GS** and **GE** codes. Some terminals generate graphics characters from all keys when in graphics mode (such as the Visual 50). The other **G** codes specify particular graphics characters accessed by escape sequences. These characters are available on some terminals as alternate graphics character sets (not as a bit-map graphic mode). The vt100 has access to this kind of alternate graphics character set, but not to a bit-map graphic mode.

Files

/etc/termcap File containing terminal descriptions

See Also

ex(C), curses(S), termcap(S), tset(C), vi(C), more(C), screen(HW)

Credit

This utility was developed at the University of California at Berkeley and is used with permission.

Notes

ex(C) allows only 256 characters for string capabilities, and the routines in *termcap(S)* do not check for overflow of this buffer. The total length of a single entry (excluding only escaped newlines) may not exceed 1024.

The **ma**, **vs**, and **ve** entries are specific to the *vi*(C) program.

Not all programs support all entries. There are entries that are not supported by any program.

XENIX termcap extensions are explained in detail in the software application documentation.

Refer to the *screen*(HW) manual page, for a description of the character sequences used by the monitor device on your specific XENIX System.

Name

terminals - List of supported terminals.

Description

The following list, derived from the file **/etc/termcap**, shows the terminal name (suitable for use as a TERM shell variable), and a short description of the terminal. The advice in *termcap* (F) will assist users in creating termcap entries for terminals not currently supported.

Name	Terminal
1200	terminet 1200
1620	diablo 1620
1640	diablo 1640
2392	239x series
2392an	hp 239x in ansi mode
2392ne	239x series
2621	hp 2621
2621k45	hp 2621 with 45 keyboard
2621nl	hp 2621 with no labels
2621nt	hp 2621 w/no tabs
2621wl	hp 2621 with labels
2622	hp 2622
262x	hp 262x series
2640	hp 2640a
2640b	hp 264x series
300	terminet 300
3045	datamedia 3045a
33	model 33 teletype
37	model 37 teletype
40	teletype dataspeed 40/2
4025	tektronix 4024/4025/4027
4025-17	tek 4025 17 line window
4025-17ws	tek 4025 17 line window in workspace
4025ex	tek 4025 w/!
43	model 43 teletype
515	AT&T-IS 515 terminal in native mode
5410	5410 terminal 80 columns
5410-nfk	version 1 tty5410 entry without function keys
5410132	5410 132 columns
5420132	5420 132columns
5425	AT&T Teletype 5425 80 columns
5425-w	AT&T Teletype 5425 132 columns
610bct	AT&T 610; 80 column; 98key keyboard
615mt	AT&T 615; 80 column; 98key keyboard

620mtg	AT&T 620; 80 column; 98key keyboard
7900	NCR 7900-1
8001	intecolor
912b	new televideo
925	newer televideo
925so	newer televideo with attribute byte workaround
ATT5620	5620 terminal 88 columns
Ma2	Ampex Model 232 / 132 lines
TWO	Altos Computer Systems II
a980	adds consul 980
aa	ann arbor
aaa	ann arbor ambassador/48 lines
aaa30	ann arbor ambassador 30/destructive backspace
aaa48db	ann arbor ambassador 48/destructive backspace
aaadb	ann arbor ambassador 48/destructive backspace
act5s	skinny act5
adds	adds viewpoint
adds25	adds regent 25 with local printing
adm11	lsi adm11
adm12	lsi adm12
adm2	lsi adm2
adm3	lsi adm3
adm31	Lear Siegler ADM31
adm3a	lsi adm3a
adm3a+	lsi adm3a+
adm3a19.2	lsi adm3a at 19.2 baud
adm3aso	lsi adm3a with { } for standout
adm42	lsi adm42
adm5	lsi adm5
aj830	anderson jacobson
altos3	Altos III
altos4	Altos IV
altos5	Altos V
am219w	Ampex 132 Cols
amp219	Ampex with Automargins
amp232	Ampex Model 232
ampex	ampex dialogue 80
ansi	Ansi standard crt
ansi-nam	Ansi standard crt without automargin
arpanet	network
at386	at/386 console
at386-m	at/386 console
atarist	Atari ST vt52
att513	AT&T-IS 513 Business Communications Terminal 80 columns
att513-w	AT&T-IS 513 Business Communications Terminal 132 columns
att605	AT&T 605 BCT

att630	AT&T 630 windowing terminal
bct500	teletype 5541
bh3m	beehiveIIIm
big2621	48 line 2621
c100	concept 100
c1004p	c100 w/4 pages
c100rv	c100 rev video
c100rv4p	c100 w/4 pages
c100rv4pna	c100 with no arrows
c100rv4ppp	c100 with printer port
c100rvs	slow reverse concept 100
c100s	slow concept 100
c3102	cromemco 3102
carlock	klc
cci	cci 4574
cdc456	cdc
cdc456tst	cdc456tst
cdi	cdi1203
cie467	C.Itoh 467, 414 Graphics
cit80	c.itoh 80
cit80nam	C.Itoh 80 without automargins
compucolor	compucolorII
d132	datagraphix 132a
datapoint	datapoint 3360
delta	delta data 5000
dg	data general 6053
digilog	digilog 333
dm1520	datamedia 1520
dm1521	datamedia 1521
dm2500	datamedia 2500
dm3025	datamedia 3025a
dmterm	Tandy deskmate terminal
dosansi	ANSI.SYS standard crt
dt100	Tandy DT-100 terminal
dt100w	Tandy DT-100 terminal
dt200	Tandy DT-200
dt80	datamedia dt80/1
dt80132	datamedia dt80/1 in 132 char mode
dtc300s	dtc 300s
du	dialup
dumb	unknown
dw1	decwriter I
dw2	decwriter II
ep40	execuport 4000
ep48	execuport 4080
esp925	esprit tvi925 emulation
espHA	esprit 6310 in hazeltine emulation mode
ethernet	network

exidy	exidy sorcerer as dm2500
fos	Fortune system
fox	perkin elmer 1100
free100	liberty freedom 100
free110	Freedom 110
ft1024	Forward Technology graphics controller
gt40	dec gt40
gt42	dec gt42
h1500	hazeltine 1500
h1510	hazeltine 1510
h1520	hazeltine 1520
h1552	hazeltine 1552
h1552rv	hazeltine 1552 reverse video
h19	heathkit h19 w/ function keypad
h19a	heathkit h19 ansi mode
h19nk	heathkit w/numeric keypad (not function keys)
h2000	hazeltine 2000
hp	hp 264x series
hp2626	hp 2626
hp2648	HP 2648a graphics terminal
hpansi	Hewlett Packard 700/44 in HP-PCterm mode, PC character set
hpansi-24	HP 700/44 in HP-PCterm 24 line mode, PC character set
hpex	hp extended capabilities
hpsub	hp terminals -- capability subset
i100	General Terminal 100A (formerly Infoton 100)
ibm3101	IBM 3101-10
ibm3151	3151
ibm3161	3161
ibm3163	3163
ibm3164	3164
ibm5151	ibm console
ibmcons	Ansi standard with EGA
ibmcons-43	Ansi EGA console in 43 line mode
intext	ISC modified owl 1200
ipc	Intel IPC
k10	Kaypro 10
kn	kt70pcix
kt7ix	kimtron kt-7
lisa	apple lisa xenix console display (white on black)
m100	radio shack model 100
macterm	macintosh MacTerm in vt-100 mode
macterm-nam	MacTerm in vt-100 mode with automargin NOT set
mdl110	cybernex mdl-110
microb	micro bee series
microterm	microterm act iv
microterm5	microterm act v
mime	microterm mime1

mime2a	microterm mime2a (emulating an enhanced vt52)
mime2as	microterm mime2a (emulating an enhanced soroc iq120)
mime3a	mime1 emulating 3a
mime3ax	mime1 emulating enhanced 3a
mimefb	full bright mime1
mimehb	half bright mime1
mt70	morrow mt70
nabu	nabu terminal
netx	netronics
nucterm	NUC homebrew
oadm31	old adm31
omron	Omron 8025AG
ot80	onyx ot80
owl	perkin elmer 1200
pe550	perkin elmer 550
pixel	Pixel terminal
plasma	plasma panel
pt1500	Convergent Technologies PT
pt210	Tandy TRS-80 PT-210 printing terminal
qume5	Qume Sprint 5
qvt101	Qume QVT-101 vers c
qvt101+	Qume QVT-101 Plus vers c
qvt101+so	Qume QVT-101+ with protected mode/standout
qvt101b	QVT-101 with cursor set to blinking underline
qvt102	Qume QVT 102
qvt103	Qume QVT-103
qvt108	QVT-108
qvt109	QVT-109
qvt119	Qume QVT-119
qvt119+	Qume QVT-119 Plus vers c
qvt201	Qume QVT-201
qvt202	Qume QVT-202
qvt203	Qume QVT 203 PLUS
regent	adds regent series
regent100	adds regent 100
regent20	adds regent 20
regent25	adds regent 25
regent25a	adds regent 25a
regent40	adds regent 40
regent60	adds Regent 60
regent60na	regent 60 w/no arrow keys
rx303	rexon 303 terminal
sb1	beehive super bee
sb2	fixed superbee
sexidy	exidy smart
sk8620	Seiko 8620
soroc	Soroc 120
sun	Sun Microsystems Workstation console

sun-cmd	Sun Microsystems Workstation console with scrollable history
sun-nic	Sun Microsystems Workstation console without insert character
sun1	old Sun Microsystems Workstation console
superbeeic	super bee with insert char
svt100	1220/PC, Sperry in VT100 mode
svt1210	Sperry 1210, standard setup
svt1220	Sperry 1220, standard setup
svt52	1210/1220/PC, Sperry in VT52 mode
switch	intelligent switch
swtp	southwest technical products ct82
t1061	teleray 1061
t1061f	teleray 1061 with fast PROMs
t3700	dumb teleray 3700
t3800	teleray 3800 series
td200	Tandy 200
tek	tektronix 4012
tek4013	tektronix 4013
tek4014	tektronix 4014
tek4014sm	tektronix 4014 in small font
tek4015	tektronix 4015
tek4015sm	tektronix 4015 in small font
tek4023	tektronix 4023
tek4107	tektronix 4107
teletec	Teletec Datascreen
terak	Terak emulating Datamedia 1520
ti	ti silent 700
ti745	ti silent 745
ti924	Texas Instruments 924 VDT 7 bit
ti924-8	Texas Instruments 924 VDT 8 bit
ti926	Texas Instruments 926 VDT
ti931	Texas Instruments 931 VDT
trs100	Tandy TRS-80 Model 100
trs16	Tandy trs-80 model 16 console
trs600	Tandy Model 600
tty4420	teletype 4420
tty4424	teletype 4424
tty4424-w	teletype 4424 in display function group ii
tty5410	Teletype 5410 terminal in 80 column mode
tty5410-w	Teletype 5410 in 132 column mode
tvi910	old televideo 910
tvi910+	televideo 910 PLUS
tvi912	old televideo
tvi9220	Televideo 9220 w/status line @ bottom
tvi9220w	Televideo 9220 132 col w/status line @ bottom
tvi924	televideo924
tvi950	televideo950

tvi950-2p	tvi 950 w/2 pages
tvi950-4p	tvi 950 w/4 pages
tvi950-ap	tvi 950 w/alt pages
tvi950b	bare tvi950 no is
tvi950ns	tvi950 w/no standout
v50	Visual 50 emulation of DEC VT52
v55	Visual 55 emulation of DEC VT52 (called V55)
vi200	visual 200 with function keys
vi200f	visual 200 no function keys
vi200ic	visual 200 using insert char
vi200rv	visual 200 reverse video
vi200rvic	visual 200 reverse video using insert char
vi50	Visual 50 in ADDS viewpoint emulation
vi55	Visual 55 using ADDS emulation
vis613	Visual 613
vs100	xterm terminal emulator
vs100s	xterm terminal emulator (small screen 24x80)
vt100	dec vt100
vt100n	vt100 w/no init
vt100nam	DEC VT100 without automargins
vt100s	dec vt100 132 cols 14 lines
vt100w	dec vt100 132 cols
vt102	dec vt102
vt131	dec vt131
vt132	vt-132
vt220	dec vt220 generic
vt220d	DEC VT220 in vt100 mode with DEC function key labeling
vt50	dec vt50
vt50h	dec vt50h
vt52	dec vt52
vt52so	dec vt52 with brackets added for standout use
vtz	Zilog vtz 2/10
w2110A	Wang 2110 Asynch Data Entry Terminal - 80 column
ws584	Olivetti WS584
ws584fr	Olivetti WS584 with French keyboard
ws584gr	Olivetti WS584 with German keyboard
ws584nr	Olivetti WS584 with Norwegian/Danish keyboard
ws584sp	Olivetti WS584 with Spanish keyboard
ws584sw	Olivetti WS584 with Swedish/Finnish keyboard
ws584uk	Olivetti WS584 with U.K. keyboard
ws584us	Olivetti WS584 with U.S.A. keyboard
ws685	Olivetti WS685
wy100	wyse 100
wy120	Wyse 120
wy120-25	Wyse 120 80-column 25-lines
wy120-vb	Wyse 120 Visible bell
wy120-wvb	wyse120-wvb

wy120w	Wyse 120 132-column
wy120w-25	Wyse 120 132-column 25-lines
wy150	Wyse 150
wy150-25	Wyse 150 80-column 25-lines
wy150-vb	Wyse 150 Visible bell
wy150-wvb	wyse150-wvb
wy150w	Wyse 150 132-column
wy150w-25	Wyse 150 132-column 25-lines
wy30	Wyse WY-30 in wy30 mode
wy30-vb	wyse 30 Visible bell
wy350	Wyse 350 80 column color terminal emulating wy50
wy350-vb	wyse 350 Visible bell
wy350-wvb	wyse 350 132-column Visible bell
wy350w	Wyse 350 132 column color terminal emulating wy50
wy50	Wyse 50/80 Wyse WY-50 with 80 column screen
wy50-wvb	wyse 50 132-column Visible bell
wy50l	Wyse WY-60 with 80 column/43 line screen in WY50+ mode
wy50n	Wyse WY-50 - 80 column screen, no automargin
wy50vb	Wyse WY-50/80vb Wyse WY-50/80 with visible bell
wy50w	Wyse WY-50/132 Wyse WY-50 with 132 column screen
wy60	Wyse WY-60 with 80 column/24 line screen in wy60 mode
wy60-25	wyse 60 80-column 25-lines
wy60-42	wyse 60 80-column 42-lines
wy60-43	wyse 60 80-column 43-lines
wy60-vb	Wyse 60 Visible bell
wy60ak	Wyse 60 in wy60 mode with ANSI arrow keys +
wy60w	Wyse WY-60 with 132 column/24 line screen in wy60 mode
wy60w-25	wyse 60 132-column 25-lines
wy60w-42	wyse 60 132-column 42-lines
wy60w-43	wyse 60 132-column 43-lines
wy60w-vb	Wyse 60 132-column Visible bell
wy75	Wyse WY-75 with 80 column line
wy75-mc	wyse 75 with magic cookies
wy75-vb	wyse 75 with visible bell
wy75-wvb	wyse 75 with visible bell 132 columns
wy75ap	Wyse WY-75 with Applications and Cursor keypad modes
wy75w	Wyse WY-75 in 132 column mode
wy75x	Wyse WY-75 with 132 column lines in vi editor mode
wy85	Wyse 85 in 80 column mode, vt100 emulation
wy85-vb	wyse 85 with visible bell
wy85-wvb	wyse 85 with visible bell 132-columns
wy85w	Wyse 85 in 132 column mode, vt100 emulation

wy85w	wyse 85 in 132-column mode
wy99gt	Wyse 99gt
wy99gt-25	wyse 99gt 80-column 25-lines
wy99gt-25-w	wyse 99gt 132-column 25-lines
wy99gt-vb	Wyse 99gt Visible bell
wy99gt-w	wyse 99gt 132-column
wy99gt-w-vb	wyse99gt-wvb
wyse120ak	Wyse 120 with ANSI key values
x1720	xerox 1720
xitex	xitex sct-100
z29	zenith z29
z39	Zenith Z-39
zen30	zentec 30
zen40	zentec 40
zen50	zentec 50
zephyr	zentec zephyr220 in vt100 mode
zephyrnam	zentec zephyr220 in vt100 mode w/out automargins

Files

/etc/termcap

See Also

tset(C), environ(M), termcap(F)

Name

terminfo - Terminal capability data base

Syntax

/usr/lib/terminfo/*/*

Description

terminfo is a data base describing terminals, used, *e.g.*, by *terminfo*(S). Terminals are described in *terminfo* by a set of capabilities that they have, and by describing how operations are performed. Padding requirements and initialization sequences are included in *terminfo*.

Entries in *terminfo* consist of a number of fields separated by commas ','. White space after each ',' is ignored. The first entry for each terminal gives the various names that are known for the terminal. Each of these entries is separated by '|'. The first name given is the most common abbreviation for the terminal, (referred to as the "root name") the last name given should be a long name fully identifying the terminal, and all others are understood as synonyms for the terminal name. All names but the last should be in lower case and contain no blanks; the last name can contain upper case and blanks for readability.

Terminal names (except for the last entry) should be chosen using the following conventions. The particular piece of hardware making up the terminal should have a root name chosen, for example, "hp2621". This name should not contain hyphens, except that synonyms may be chosen that do not conflict with other names. Modes that the hardware can be in, or user preferences, should be indicated by appending a hyphen and an indicator of the mode. Thus, a vt-100 in 132 column mode would be vt100-w. The following suffixes should be used where possible:

Suffix	**Meaning**	**Example**
-w	Wide mode (more than 80 columns)	vt100-w
-am	With auto margins (usually default)	vt100-am
-nam	Without automatic margins	vt100-nam
-*n*	Number of lines on the screen	aaa-60
-na	No arrow keys (leave them in local)	c100-na
-*n*p	Number of pages of memory	c100-4p
-rv	Reverse video	c100-rv

In the following table, the "variable" is the name by which the programmer (using the *terminfo* library) accesses the capability. The "capname" is the short name used in the text of the database, and is used by a person updating the database. The "i.code" is the two letter internal code used in the compiled database, and always corresponds to the **termcap**(M) capability name.

Capability names have no hard length limit, but an informal limit of 5 characters has been adopted to keep them short. Whenever possible, names are chosen to be the same as or similar to the ANSI X3.64-1979 standard. Semantics are also intended to match those of the specification.

(P)
indicates that padding may be specified

(G)
indicates that the string is passed through *tparm* with *parms* as given (*#i*).

(*)
indicates that padding may be based on the number of lines affected

($\#_i$)
indicates the i^{th} parameter.

(†) Not present in all versions of *termcap*.

Variable Booleans:	Cap-name	I. Code	Description
auto_left_margin,	bw	bw	cub1 wraps from column 0 to last column
auto_right_margin,	am	am	Terminal has automatic margins
beehive_glitch,	xsb	xb	Beehive (f1=escape, f2=ctrl C)
ceol_standout_glitch,	xhp	xs	Standout not erased by overwriting (hp)
eat_newline_glitch,	xenl	xn	Newline ignored after 80 cols (Concept)
erase_overstrike,	eo	eo	Can erase overstrikes with a blank
generic_type,	gn	gn	Generic line type (e.g., dialup, switch).
hard_copy,	hc	hc	Hardcopy terminal
has_meta_key,	km	km	Has a meta key (shift, sets parity bit)
has_status_line,	hs	hs	Has extra "status line"
insert_null_glitch,	in	in	Insert mode distinguishes nulls
memory_above,	da	da	Display may be retained above the screen
memory_below,	db	db	Display may be retained below the screen
move_insert_mode,	mir	mi	Safe to move while in insert mode
move_standout_mode,	msgr	ms	Safe to move in standout modes
over_strike,	os	os	Terminal overstrikes
status_line_esc_ok,	eslok	es	Escape can be used on the status line

teleray_glitch,	xt	xt	Tabs ruin, magic **so** char (Teleray 1061)
tilde_glitch,	hz	hz	Hazeltine; can not print ~'s
transparent_underline,	ul	ul	Underline character overstrikes
xon_xoff,	xon	xo	Terminal uses XON/XOFF handshaking
Numbers:			
columns,	cols	co	Number of columns in a line
init_tabs,	it	it	Tabs initially every # spaces
lines,	lines	li	Number of lines on screen or page
lines_of_memory,	lm	lm	Lines of memory if > lines. 0 means varies
magic_cookie_glitch,	xmc	sg	Number of blank chars left by smso or rmso
padding_baud_rate,	pb	pb	Lowest baud where cr/nl padding is needed
virtual_terminal,	vt	vt	Virtual terminal number (UNIX system)
width_status_line,	wsl	ws	No. columns in status line
Strings:			
back_tab,	cbt	bt	Back tab (P)
bell,	bel	bl	Audible signal (bell) (P)
carriage_return,	cr	cr	Carriage return (P*)
change_scroll_region,	csr	cs	Change to lines #1 through #2 (vt-100) (PG)
clear_all_tabs,	tbc	ct	Clear all tab stops (P)
clear_screen,	clear	cl	Clear screen and home cursor (P*)
clr_eol,	el	ce	Clear to end of line (P)
clr_eos,	ed	cd	Clear to end of display (P*)
column_address,	hpa	ch	Set cursor column (PG)
command_character,	cmdch	CC	Term. settable cmd char in prototype
cursor_address,	cup	cm	Screen rel. cursor motion row #1 col #2 (PG)
cursor_down,	cud1	do	Down one line
cursor_home,	home	ho	Home cursor (if no cup)
cursor_invisible,	civis	vi	Make cursor invisible
cursor_left,	cub1	le	Move cursor left one space
cursor_mem_address,	mrcup	CM†	Memory relative cursor addressing
cursor_normal,	cnorm	ve	Make cursor appear normal (undo vs/vi)
cursor_right,	cuf1	nd	Non-destructive space (cursor right)
cursor_to_ll,	ll	ll	Last line, first column (if no cup)
cursor_up,	cuu1	up	Upline (cursor up)

cursor_visible,	cvvis	vs	Make cursor very visible
delete_character,	dch1	dc	Delete character (P*)
delete_line,	dl1	dl	Delete line (P*)
dis_status_line,	dsl	ds	Disable status line
down_half_line,	hd	hd	Half-line down (forward 1/2 linefeed)
enter_alt_charset_mode,	smacs	as	Start alternate character set (P)
enter_blink_mode,	blink	mb	Turn on blinking
enter_bold_mode,	bold	md	Turn on bold (extra bright) mode
enter_ca_mode,	smcup	ti	String to begin programs that use cup
enter_delete_mode,	smdc	dm	Delete mode (enter)
enter_dim_mode,	dim	mh	Turn on half-bright mode
enter_insert_mode,	smir	im	Insert mode (enter);
enter_protected_mode,	prot	mp	Turn on protected mode
enter_reverse_mode,	rev	mr	Turn on reverse video mode
enter_secure_mode,	invis	mk	Turn on blank mode (chars invisible)
enter_standout_mode,	smso	so	Begin stand out mode
enter_underline_mode,	smul	us	Start underscore mode
erase_chars	ech	ec	Erase #1 characters (PG)
exit_alt_charset_mode,	rmacs	ae	End alternate character set (P)
exit_attribute_mode,	sgr0	me	Turn off all attributes
exit_ca_mode,	rmcup	te	String to end programs that use cup
exit_delete_mode,	rmdc	ed	End delete mode
exit_insert_mode,	rmir	ei	End insert mode
exit_standout_mode,	rmso	se	End stand out mode
exit_underline_mode,	rmul	ue	End underscore mode
flash_screen,	flash	vb	Visible bell (may not move cursor)
form_feed,	ff	ff	Hardcopy terminal page eject (P*)
from_status_line,	fsl	fs	Return from status line
init_1string,	is1	i1	Terminal initialization string
init_2string,	is2	i2	Terminal initialization string
init_3string,	is3	i3	Terminal initialization string
init_file,	if	if	Name of file containing is
insert_character,	ich1	ic	Insert character (P)
insert_line,	il1	al	Add new blank line (P*)
insert_padding,	ip	ip	Insert pad after character inserted (p*)
key_backspace,	kbs	kb	Sent by backspace key
key_catab,	ktbc	ka	Sent by clear-all-tabs key
key_clear,	kclr	kC†	Sent by clear screen or erase key
key_ctab,	kctab	kt	Sent by clear-tab key
key_dc,	kdch1	kD†	Sent by delete character key
key_dl,	kdl1	kL†	Sent by delete line key
key_down,	kcud1	kd	Sent by terminal down arrow key
key_eic,	krmir	kM†	Sent by rmir or smir in insert mode

key_eol,	kel	kE†	Sent by clear-to-end-of-line key
key_eos,	ked	kS†	Sent by clear-to-end-of-screen key
key_f0,	kf0	k0	Sent by function key f0
key_f1,	kf1	k1	Sent by function key f1
key_f10,	kf10	k	Sent by function key f10
key_f2,	kf2	k2	Sent by function key f2
key_f3,	kf3	k3	Sent by function key f3
key_f4,	kf4	k4	Sent by function key f4
key_f5,	kf5	k5	Sent by function key f5
key_f6,	kf6	k6	Sent by function key f6
key_f7,	kf7	k7	Sent by function key f7
key_f8,	kf8	k8	Sent by function key f8
key_f9,	kf9	k9	Sent by function key f9
key_home,	khome	kh	Sent by home key
key_ic,	kich1	kI	Sent by ins char/enter ins mode key
key_il,	kil1	kA†	Sent by insert line
key_left,	kcub1	kl	Sent by terminal left arrow key
key_ll,	kll	kH†	Sent by home-down key
key_npage,	knp	kN†	Sent by next-page key
key_ppage,	kpp	kP†	Sent by previous-page key
key_right,	kcuf1	kr	Sent by terminal right arrow key
key_sf,	kind	kF†	Sent by scroll-forward/down key
key_sr,	kri	kR†	Sent by scroll-backward/up key
key_stab,	khts	kT†	Sent by set-tab key
key_up,	kcuu1	ku	Sent by terminal up arrow key
keypad_local,	rmkx	ke	Out of "keypad transmit" mode
keypad_xmit,	smkx	ks	Put terminal in "keypad transmit" mode
lab_f0,	lf0	l0	Labels on function key f0 if not f0
lab_f1,	lf1	l1	Labels on function key f1 if not f1
lab_f10,	lf10	la	Labels on function key f10 if not f10
lab_f2,	lf2	l2	Labels on function key f2 if not f2
lab_f3,	lf3	l3	Labels on function key f3 if not f3
lab_f4,	lf4	l4	Labels on function key f4 if not f4
lab_f5,	lf5	l5	Labels on function key f5 if not f5
lab_f6,	lf6	l6	Labels on function key f6 if not f6
lab_f7,	lf7	l7	Labels on function key f7 if not f7
lab_f8,	lf8	l8	Labels on function key f8 if not f8
lab_f9,	lf9	l9	Labels on function key f9 if not f9
meta_on,	smm	mm	Turn on "meta mode" (8th bit)
meta_off,	rmm	mo	Turn off "meta mode"
newline,	nel	nw	Newline (behaves like cr followed by lf)
pad_char,	pad	pc	Pad character (rather than null)
parm_dch,	dch	DC†	Delete #1 chars (PG*)

parm_delete_line,	dl	DL†	Delete #1 lines (PG*)
parm_down_cursor,	cud	DO†	Move cursor down #1 lines (PG*)
parm_ich,	ich	IC†	Insert #1 blank chars (PG*)
parm_index,	indn	SF†	Scroll forward #1 lines (PG)
parm_insert_line,	il	AL†	Add #1 new blank lines (PG*)
parm_left_cursor,	cub	LE†	Move cursor left #1 spaces (PG)
parm_right_cursor,	cuf	RI†	Move cursor right #1 spaces (PG*)
parm_rindex,	rin	SR†	Scroll backward #1 lines (PG)
parm_up_cursor,	cuu	UP†	Move cursor up #1 lines (PG*)
pkey_key,	pfkey	pk	Prog funct key #1 to type string #2
pkey_local,	pfloc	pl	Prog funct key #1 to execute string #2
pkey_xmit,	pfx	px	Prog funct key #1 to xmit string #2
print_screen,	mc0	ps	Print contents of the screen
prtr_off,	mc4	pf	Turn off the printer
prtr_on,	mc5	po	Turn on the printer
repeat_char,	rep	rp	Repeat char #1 #2 times. (PG*)
reset_1string,	rs1	r1	Reset terminal completely to sane modes
reset_2string,	rs2	r2	Reset terminal completely to sane modes
reset_3string,	rs3	r3	Reset terminal completely to sane modes
reset_file,	rf	rf	Name of file containing reset string
restore_cursor,	rc	rc	Restore cursor to position of last sc
row_address,	vpa	cv	Vertical position absolute (set row) (PG)
save_cursor,	sc	sc	Save cursor position (P)
scroll_forward,	ind	sf	Scroll text up (P)
scroll_reverse,	ri	sr	Scroll text down (P)
set_attributes,	sgr	sa	Define the video attributes (PG9)
set_tab,	hts	st	Set a tab in all rows, current column
set_window,	wind	wi	Current window is lines #1-#2 cols #3-#4
tab,	ht	ta	Tab to next 8 space hardware tab stop
to_status_line,	tsl	ts	Go to status line, column #1
underline_char,	uc	uc	Underscore one char and move past it
up_half_line,	hu	hu	Half-line up (reverse 1/2 linefeed)
init_prog,	iprog	iP	Path name of program for init
key_a1,	ka1	K1†	Upper left of keypad
key_a3,	ka3	K3†	Upper right of keypad

key_b2,	kb2	K2†	Center of keypad
key_c1,	kc1	K4†	Lower left of keypad
key_c3,	kc3	K5†	Lower right of keypad
prtr_non,	mc5p	pO†	Turn on the printer for #1 bytes

A Sample Entry

The following entry, which describes the Concept-100, is among the more complex entries in the *terminfo* file.

```
concept100 | c100| concept | c104 | c100-4p | concept 100,
    am, bel=^G, blank=\EH, blink=\EC, clear=^L$<2*>, cnorm=\Ew,
    cols#80, cr=^M$<9>, cub1=^H, cud1=^J, cuf1=\E=,
    cup=\Ea%p1%' '%+%c%p2%' '%+%c,
    cuu1=\E;, cvvis=\EW, db, dch1=\E^A$<16*>, dim=\EE, dl1=\E^B$<3*>,
    ed=\E^C$<16*>, el=\E^U$<16>, eo, flash=\Ek$<20>\EK, ht=\t$<8>,
    il1=\E^R$<3*>, in, ind=^J, .ind=^J$<9>, ip=$<16*>,
    is2=\EU\Ef\E7\E5\E8\El\ENH\EK\E\200\Eo&\200\Eo\47\E,
    kbs=^h, kcub1=\E>, kcud1=\E<, kcuf1=\E=, kcuu1=\E;,
    kf1=\E5, kf2=\E6, kf3=\E7, khome=\E?,
    lines#24, mir, pb#9600, prot=\EI, rep=\Er%p1%c%p2%' '%+%c$<.2*>,
    rev=\ED, rmcup=\Ev    $<6>\Ep\r\n, rmir=\E\200, rmkx=\Ex,
    rmso=\Ed\Ee, rmul=\Eg, rmul=\Eg, sgr0=\EN\200,
    smcup=\EU\Ev  8p\Ep\r, smir=\E^P, smkx=\EX, smso=\EE\ED,
    smul=\EG, tabs, ul, vt#8, xenl,
```

Entries may continue onto multiple lines by placing white space at the beginning of each line except the first. Comments lines begin with "#". Capabilities in *terminfo* are of three types: Boolean capabilities which indicate that the terminal has some particular feature, numeric capabilities giving the size of the terminal or the size of particular delays, and string capabilities, which give a sequence that can be used to perform particular terminal operations.

Types of Capabilities

All capabilities have names. For instance, the fact that the Concept has *automatic margins* (i.e., an automatic return and linefeed when the end of a line is reached) is indicated by the capability **am**. Hence the description of the Concept includes **am**. Numeric capabilities are followed by the character '#' and then the value. Thus **cols**, which indicates the number of columns the terminal has, gives the value '80' for the Concept.

Finally, string valued capabilities, such as **el** (clear to end of line sequence) are given by the two-character code, an '=', and then a string ending at the next following ','. A delay in milliseconds may appear anywhere in such a capability, enclosed in $<..> brackets, as in **el**=\EK$<3>, and padding characters are supplied by *tputs* to provide this delay. The delay can be either a number, e.g., '20', or a number followed by an '*', i.e., '3*'. A '*' indicates that the padding required is proportional to the number of lines affected by the operation, and the amount given is the per-affected-unit padding required. (In the

case of insert character, the factor is still the number of *lines* affected. This is always one unless the terminal has **xenl** and the software uses it.) When a '*' is specified, it is sometimes useful to give a delay of the form '3.5' to specify a delay per unit to tenths of milliseconds. (Only one decimal place is allowed.)

A number of escape sequences are provided in the string valued capabilities for easy encoding of characters there. Both **\E** and **\e** map to an ESCAPE character, **^x** maps to a control-x for any appropriate x, and the sequences **\n \l \r \t \b \f \s** give a newline, linefeed, return, tab, backspace, formfeed, and space. Other escapes include \^ for ^, \\ for \, \, for comma, \: for :, and \0 for null. (\0 will produce \200, which does not terminate a string but behaves as a null character on most terminals.) Finally, characters may be given as three octal digits after a \.

Sometimes individual capabilities must be commented out. To do this, put a period before the capability name. For example, see the second **ind** in the example above.

Preparing Descriptions

The most effective way to prepare a terminal description is to imitate the description of a similar terminal in *terminfo* and to build up a description gradually, using partial descriptions with *vi* to check that they are correct. Be aware that a very unusual terminal may expose deficiencies in the ability of the *terminfo* file to describe it or bugs in *vi*. To test easily a new terminal description you can set the environment variable TERMINFO to a pathname of a directory containing the compiled description you are working on and programs will look there rather than in **/usr/lib/terminfo**. To get the padding for insert line right (if the terminal manufacturer did not document it) a severe test is to edit a copy of **/etc/passwd** at 9600 baud, delete 16 or so lines from the middle of the screen, then hit the 'u' key several times quickly. If the terminal display is scrambled, more padding is usually needed. A similar test can be used for insert character.

Basic Capabilities

The *cols* numeric capability describes the number of columns on each line for the terminal. If the terminal is a CRT, then the number of lines on the screen is given by the **lines** capability. If the terminal wraps around to the beginning of the next line when it reaches the right margin, then it should have the **am** capability. If the terminal can clear its screen, leaving the cursor in the home position, then this is given by the **clear** string capability. If the terminal overstrikes (rather than clearing a position when a character is struck over) then it should have the **os** capability. If the terminal is a printing terminal, with no soft copy unit, give it both **hc** and **os**. (**os** applies to storage scope terminals, such as TEKTRONIX 4010 series, as well as hard copy and APL terminals.) If there is a code to move the cursor to the left edge of the current row, give this as **cr**. (Normally this will be carriage return, control M.) If there is a code to produce an audible signal (bell, beep,

etc) define this as **bel**.

If there is a code to move the cursor one position to the left (such as backspace) that capability should be defined as **cub1**. Similarly, codes to move to the right, up, and down should be defined as **cuf1**, **cuu1**, and **cud1**. These local cursor motions should not alter the text they pass over, for example, you would not normally use '**cuf1**= ' because the space would erase the character moved over.

A very important point here is that the local cursor motions encoded in *terminfo* are undefined at the left and top edges of a CRT terminal. Programs should never attempt to backspace around the left edge, unless **bw** is given, and never attempt to go up locally off the top. In order to scroll text up, a program will go to the bottom left corner of the screen and send the **ind** (index) string.

To scroll text down, a program goes to the top left corner of the screen and sends the **ri** (reverse index) string. The strings **ind** and **ri** are undefined when not on their respective corners of the screen.

Parameterized versions of the scrolling sequences are **indn** and **rin,** which have the same semantics as **ind** and **ri** except that they take one parameter, and scroll that many lines. They are also undefined except at the appropriate edge of the screen.

The **am** capability tells whether the cursor sticks at the right edge of the screen when text is output, but this does not necessarily apply to a **cuf1** from the last column. The only local motion which is defined from the left edge is when **bw** is given, in which case a **cub1** from the left edge will move to the right edge of the previous row. If **bw** is not given, the effect is undefined. This is useful for drawing a box around the edge of the screen, for example. If the terminal has switch selectable automatic margins, the *terminfo* file usually assumes that this is on; i.e., **am**. If the terminal has a command which moves to the first column of the next line, that command can be given as **nel** (newline). It does not matter if the command clears the remainder of the current line, so if the terminal has no **cr** and **lf** it may still be possible to craft a working **nel** out of one or both of them.

These capabilities suffice to describe hardcopy and glass-tty terminals. Thus the model 33 teletype is described as:

```
33|tty33|tty|model 33 teletype,
bel=^G, cols#72, cr=^M, cud1=^J, hc, ind=^J, os,
```

while the Lear Siegler ADM-3 is described as:

```
adm3|3|lsi adm3,
am, bel=^G, clear=^Z, cols#80, cr=^M, cub1=^H, cud1=^J,
ind=^J, lines#24,
```

Parameterized Strings

Cursor addressing and other strings requiring parameters in the terminal are described by a parameterized string capability, with *printf*(S) like escapes **%x** in it. For example, to address the cursor, the **cup** capability is given, using two parameters: the row and column to address to. (Rows and columns are numbered from zero and refer to the physical screen visible to the user, not to any unseen memory.) If the terminal has memory relative cursor addressing, that can be indicated by **mrcup**.

The parameter mechanism uses a stack and special **%** codes to manipulate it. Typically a sequence will push one of the parameters onto the stack and then print it in some format. Often more complex operations are necessary.

The **%** encodings have the following meanings:

%%	outputs '%'
%d	print pop() as in printf
%2d	print pop() like %2d
%3d	print pop() like %3d
%02d	
%03d	as in printf
%c	print pop() gives %c
%s	print pop() gives %s
%p[1-9]	push ith parm
%P[a-z]	set variable [a-z] to pop()
%g[a-z]	get variable [a-z] and push it
%'c'	char constant c
%{nn}	integer constant nn
%+ %- %* %/ %m	
	arithmetic (%m is mod): push(pop() op pop())
%& %| %^	bit operations: push(pop() op pop())
%= %> %<	logical operations: push(pop() op pop())
%! %~	unary operations push(op pop())
%i	add 1 to first two parms (for ANSI terminals)

%? expr %t thenpart %e elsepart %;

if-then-else, %e elsepart is optional.
else-if's are possible ala Algol 68:
%? c_1 %t b_1 %e c_2 %t b_2 %e c_3 %t b_3 %e c_4 %t b_4 %e %;

c_i are conditions, b_i are bodies.

Binary operations are in postfix form with the operands in the usual order. That is, to get x-5 one would use "%gx%{5}%-".

Consider the HP2645, which, to get to row 3 and column 12, needs to be sent \E&a12c03Y padded for 6 milliseconds. Note that the order of the rows and columns is inverted here, and that the row and column

are printed as two digits. Thus its **cup** capability is cup=\E&%p2%2dc%p1%2dY$<6>.

The Microterm ACT-IV needs the current row and column sent preceded by a ^**T**, with the row and column simply encoded in binary, cup=^T%p1%c%p2%c. Terminals that use %c need to be able to backspace the cursor (**cub1**), and to move the cursor up one line on the screen (**cuu1**). This is necessary because it is not always safe to transmit **\n ^D** and **\r**, as the system may change or discard them. (The library routines dealing with terminfo set tty modes so that tabs are never expanded, so \t is safe to send. This turns out to be essential for the Ann Arbor 4080.)

A final example is the LSI ADM-3a, which uses row and column offset by a blank character, thus cup=\E=%p1%' '%+%c%p2%' '%+%c. After sending '\E=', this pushes the first parameter, pushes the ASCII value for a space (32), adds them (pushing the sum on the stack in place of the two previous values) and outputs that value as a character. Then the same is done for the second parameter. More complex arithmetic is possible using the stack.

If the terminal has row or column absolute cursor addressing, these can be given as single parameter capabilities **hpa** (horizontal position absolute) and **vpa** (vertical position absolute). Sometimes these are shorter than the more general two parameter sequence (as with the HP2645) and can be used in preference to **cup** . If there are parameterized local motions (e.g., move *n* spaces to the right) these can be given as **cud**, **cub**, **cuf**, and **cuu** with a single parameter indicating how many spaces to move. These are primarily useful if the terminal does not have **cup**, such as the TEKTRONIX 4025.

Cursor Motions

If the terminal has a fast way to home the cursor (to very upper left corner of screen) then this can be given as **home**; similarly a fast way of getting to the lower left-hand corner can be given as **ll**; this may involve going up with **cuu1** from the home position, but a program should never do this itself (unless **ll** does) because it can make no assumption about the effect of moving up from the home position. Note that the home position is the same as addressing to (0,0): to the top left corner of the screen, not of memory. (Thus, the \EH sequence on HP terminals cannot be used for **home**.)

Area Clears

If the terminal can clear from the current position to the end of the line, leaving the cursor where it is, this should be given as **el**. If the terminal can clear from the current position to the end of the display, then this should be given as **ed**. **ed** is only defined from the first column of a line. (Thus, it can be simulated by a request to delete a large number of lines, if a true **ed** is not available.)

Insert/delete line

If the terminal can open a new blank line before the line where the cursor is positioned, this should be given as **il1**; this is done only from the first position of a line. The cursor must then appear on the newly blank line. If the terminal can delete the line on which the cursor is positioned, then this should be given as **dl1**; this is done only from the first position on the line to be deleted. Versions of **il1** and **dl1** that take a single parameter and insert or delete that many lines can be given as **il** and **dl**. If the terminal has a settable scrolling region (like the vt-100) the command that sets this can be described with the **csr** capability, which takes two parameters: the top and bottom lines of the scrolling region. The cursor position is, however, undefined after using this command. It is possible to get the effect of insert or delete line using this command - the **sc** and **rc** (save and restore cursor) commands are also useful. Inserting lines at the top or bottom of the screen can also be done using **ri** or **ind** on many terminals without a true insert/delete line, and is often faster even on terminals with those features.

If the terminal has the ability to define a window as part of memory, which all commands affect, it should be given as the parameterized string **wind**. The four parameters are the starting and ending lines in memory and the starting and ending columns in memory, in that order.

If the terminal can retain display memory above, then the **da** capability should be given; if display memory can be retained below, then **db** should be given. These indicate that deleting a line or scrolling may bring non-blank lines up from below or that scrolling back with **ri** may bring down non-blank lines.

Insert/Delete Character

There are two basic kinds of intelligent terminals with respect to insert/delete character that can be described using *terminfo*. The most common insert/delete character operations affect only the characters on the current line and shift characters off the end of the line rigidly. Other terminals, such as the Concept 100 and the Perkin Elmer Owl, make a distinction between typed and untyped blanks on the screen, shifting upon an insert or delete only to an untyped blank on the screen which is either eliminated, or expanded to two untyped blanks. You can determine the kind of terminal you have by clearing the screen and then typing text separated by cursor motions. Type abc def using local cursor motions (not spaces) between the abc and the def. Then position the cursor before the abc and put the terminal in insert mode. If typing characters causes the rest of the line to shift rigidly and characters to fall off the end, then your terminal does not distinguish between blanks and untyped positions. If the "abc" shifts over to the def which then move together around the end of the current line and onto the next as you insert, you have the second type of terminal, and should give the capability **in**, which stands for insert null. While these are two logically separate attributes (one line vs. multiline insert mode, and special treatment of untyped spaces) we have

seen no terminals whose insert mode cannot be described with the single attribute.

terminfo can describe both terminals that have an insert mode, and terminals that send a simple sequence to open a blank position on the current line. To get into insert mode use the **smir** sequence. To leave insert mode use the **rmir** sequence. Now give as **ich1** any sequence needed to be sent just before sending the character to be inserted. Most terminals with a true insert mode will not give **ich1**; terminals that send a sequence to open a screen position should give it here. (If your terminal has both, insert mode is usually preferable to **ich1**. Do not give both unless the terminal actually requires both to be used in combination.) If post insert padding is needed, give this as a number of milliseconds in **ip** (a string option). Any other sequence which may need to be sent after an insert of a single character may also be given in **ip**. If your terminal needs both to be placed into an 'insert mode' and a special code to precede each inserted character, then both **smir/rmir** and **ich1** can be given, and both will be used. The **ich** capability, with one parameter, *n*, will repeat the effects of **ich1** *n* times.

It is occasionally necessary to move around while in insert mode to delete characters on the same line (e.g., if there is a tab after the insertion position). If your terminal allows motion while in insert mode you can give the capability **mir** to speed up inserting in this case. Omitting **mir** will affect only speed. Some terminals (notably Datamedia's) must not have **mir** because of the way their insert mode works.

Finally, you can specify **dch1** to delete a single character, **dch** with one parameter, *n*, to delete *n characters,* and delete mode by giving **smdc** and **rmdc** to enter and exit delete mode (any mode the terminal needs to be placed in for **dch1** to work).

A command to erase *n* characters (equivalent to outputting *n* blanks without moving the cursor) can be given as **ech** with one parameter.

Highlighting, Underlining, and Visible Bells

If your terminal has one or more kinds of display attributes, these can be represented in a number of different ways. You should choose one display form as *standout mode*, representing a good, high contrast, easy-on-the-eyes, format for highlighting error messages and other attention getters. (If you have a choice, reverse video plus half-bright is good, or reverse video alone.) The sequences to enter and exit standout mode are given as **smso** and **rmso**, respectively. If the code to change into or out of standout mode leaves one or even two blank spaces on the screen, as the TVI 912 and Teleray 1061 do, then **xmc** should be given to tell how many spaces are left.

Codes to begin underlining and end underlining can be given as **smul** and **rmul** respectively. If the terminal has a code to underline the current character and move the cursor one space to the right, such as

the Microterm Mime, this can be given as **uc**.

Other capabilities to enter various highlighting modes include **blink** (blinking) **bold** (bold or extra bright) **dim** (dim or half-bright) **invis** (blanking or invisible text) **prot** (protected) **rev** (reverse video) **sgr0** (turn off *all* attribute modes) **smacs** (enter alternate character set mode) and **rmacs** (exit alternate character set mode). Turning on any of these modes singly may or may not turn off other modes.

If there is a sequence to set arbitrary combinations of modes, this should be given as **sgr** (set attributes), taking 9 parameters. Each parameter is either 0 or 1, as the corresponding attribute is on or off. The 9 parameters are, in order: standout, underline, reverse, blink, dim, bold, blank, protect, alternate character set. Not all modes need be supported by **sgr**, only those for which corresponding separate attribute commands exist.

Terminals with the "magic cookie" glitch (**xmc**) deposit special "cookies" when they receive mode-setting sequences, which affect the display algorithm rather than having extra bits for each character. Some terminals, such as the HP 2621, automatically leave standout mode when they move to a new line or the cursor is addressed. Programs using standout mode should exit standout mode before moving the cursor or sending a newline, unless the **msgr** capability, asserting that it is safe to move in standout mode, is present.

If the terminal has a way of flashing the screen to indicate an error quietly (a bell replacement) then this can be given as **flash**; it must not move the cursor.

If the cursor needs to be made more visible than normal when it is not on the bottom line (to make, for example, a non-blinking underline into an easier to find block or blinking underline) give this sequence as **cvvis**. If there is a way to make the cursor completely invisible, give that as **civis**. The capability **cnorm** should be given which undoes the effects of both of these modes.

If the terminal needs to be in a special mode when running a program that uses these capabilities, the codes to enter and exit this mode can be given as **smcup** and **rmcup**.
This arises, for example, from terminals like the Concept with more than one page of memory. If the terminal has only memory relative cursor addressing and not screen relative cursor addressing, a one screen-sized window must be fixed into the terminal for cursor addressing to work properly. This is also used for the TEKTRONIX 4025, where **smcup** sets the command character to be the one used by *terminfo*.

If your terminal correctly generates underlined characters (with no special codes needed) even though it does not overstrike, then you should give the capability **ul**. If overstrikes are erasable with a blank, then this should be indicated by giving **eo**.

Keypad

If the terminal has a keypad that transmits codes when the keys are pressed, this information can be given. Note that it is not possible to handle terminals where the keypad only works in local (this applies, for example, to the unshifted HP 2621 keys). If the keypad can be set to transmit or not transmit, give these codes as **smkx** and **rmkx**. Otherwise the keypad is assumed to always transmit. The codes sent by the left arrow, right arrow, up arrow, down arrow, and home keys can be given as **kcub1, kcuf1, kcuu1, kcud1,** and **khome** respectively. If there are function keys such as f0, f1, ..., f10, the codes they send can be given as **kf0, kf1, ..., kf10**. If these keys have labels other than the default f0 through f10, the labels can be given as **lf0, lf1, ..., lf10**. The codes transmitted by certain other special keys can be given: **kll** (home down), **kbs** (backspace), **ktbc** (clear all tabs), **kctab** (clear the tab stop in this column), **kclr** (clear screen or erase key), **kdch1** (delete character), **kdl1** (delete line), **krmir** (exit insert mode), **kel** (clear to end of line), **ked** (clear to end of screen), **kich1** (insert character or enter insert mode), **kil1** (insert line), **knp** (next page), **kpp** (previous page), **kind** (scroll forward/down), **kri** (scroll backward/up), **khts** (set a tab stop in this column). In addition, if the keypad has a 3 by 3 array of keys including the four arrow keys, the other five keys can be given as **ka1**, **ka3**, **kb2**, **kc1**, and **kc3**. These keys are useful when the effects of a 3 by 3 directional pad are needed.

Tabs and Initialization

If the terminal has hardware tabs, the command to advance to the next tab stop can be given as **ht** (usually control I). A "backtab" command that moves leftward to the next tab stop can be given as **cbt**. By convention, if the teletype modes indicate that tabs are being expanded by the computer rather than being sent to the terminal, programs should not use **ht** or **cbt** even if they are present, since the user may not have the tab stops properly set. If the terminal has hardware tabs which are initially set every *n* spaces when the terminal is powered up, the numeric parameter **it** is given, showing the number of spaces the tabs are set to. This is normally used by the *tset*(C) command to determine whether to set the mode for hardware tab expansion, and whether to set the tab stops. If the terminal has tab stops that can be saved in nonvolatile memory, the terminfo description can assume that they are properly set.

Other capabilities include **is1**, **is2**, and **is3**, initialization strings for the terminal, **iprog**, the path name of a program to be run to initialize the terminal, and **if**, the name of a file containing long initialization strings. These strings are expected to set the terminal into modes consistent with the rest of the terminfo description. They are normally sent to the terminal, by the *tset* program, each time the user logs in. They will be printed in the following order: **is1**; **is2**; setting tabs using **tbc** and **hts**; **if**; running the program **iprog**; and finally **is3**. Most initialization is done with **is2**. Special terminal modes can be set up without duplicating strings by putting the common sequences in **is2** and special cases in **is1** and **is3**. A pair of sequences that does a

harder reset from a totally unknown state can be analogously given as **rs1**, **rs2**, **rf**, and **rs3**, analogous to **is2** and **if**. Commands are normally placed in **rs2** and **rf** only if they produce annoying effects on the screen and are not necessary when logging in. For example, the command to set the vt-100 into 80-column mode would normally be part of **is2**, but it causes an annoying glitch of the screen and is not normally needed since the terminal is usually already in 80 column mode.

If there are commands to set and clear tab stops, they can be given as **tbc** (clear all tab stops) and **hts** (set a tab stop in the current column of every row). If a more complex sequence is needed to set the tabs than can be described by this, the sequence can be placed in **is2** or **if**.

Delays

Certain capabilities control padding in the teletype driver. These are primarily needed by hard copy terminals, and are used by the *tset* program to set teletype modes appropriately. Delays embedded in the capabilities **cr**, **ind**, **cub1**, **ff**, and **tab** will cause the appropriate delay bits to be set in the teletype driver. If **pb** (padding baud rate) is given, these values can be ignored at baud rates below the value of **pb**.

Miscellaneous

If the terminal requires other than a null (zero) character as a pad, then this can be given as **pad**. Only the first character of the **pad** string is used.

If the terminal has an extra "status line" that is not normally used by software, this fact can be indicated. If the status line is viewed as an extra line below the bottom line, into which one can cursor address normally (such as the Heathkit h19's 25th line, or the 24th line of a vt-100 which is set to a 23-line scrolling region), the capability **hs** should be given. Special strings to go to the beginning of the status line and to return from the status line can be given as **tsl** and **fsl**. (**fsl** must leave the cursor position in the same place it was before **tsl**. If necessary, the **sc** and **rc** strings can be included in **tsl** and **fsl** to get this effect.) The parameter **tsl** takes one parameter, which is the column number of the status line the cursor is to be moved to. If escape sequences and other special commands, such as tab, work while in the status line, the flag **eslok** can be given. A string which turns off the status line (or otherwise erases its contents) should be given as **dsl**. If the terminal has commands to save and restore the position of the cursor, give them as **sc** and **rc**. The status line is normally assumed to be the same width as the rest of the screen, e.g., **cols**. If the status line is a different width (possibly because the terminal does not allow an entire line to be loaded) the width, in columns, can be indicated with the numeric parameter **wsl**.

If the terminal can move up or down half a line, this can be indicated with **hu** (half-line up) and **hd** (half-line down). This is primarily useful for superscripts and subscripts on hardcopy terminals. If a hardcopy terminal can eject to the next page (form feed), give this as **ff**

(usually control L).

If there is a command to repeat a given character a given number of times (to save time transmitting a large number of identical characters) this can be indicated with the parameterized string **rep**. The first parameter is the character to be repeated and the second is the number of times to repeat it. Thus, tparm(repeat_char, 'x', 10) is the same as 'xxxxxxxxxx'.

If the terminal has a settable command character, such as the TEKTRONIX 4025, this can be indicated with **cmdch**. A prototype command character is chosen which is used in all capabilities. This character is given in the **cmdch** capability to identify it. The following convention is supported on some XENIX systems: The environment is to be searched for a **CC** variable, and if found, all occurrences of the prototype character are replaced with the character in the environment variable.

Terminal descriptions that do not represent a specific kind of known terminal, such as *switch*, *dialup*, *patch*, and *network*, should include the **gn** (generic) capability so that programs can complain that they do not know how to talk to the terminal.

If the terminal uses XON/XOFF handshaking for flow control, give **xon**. Padding information should still be included so that routines can make better decisions about costs, but actual pad characters will not be transmitted.

If the terminal has a "meta key" which acts as a shift key, setting the 8th bit of any character transmitted, this fact can be indicated with **km**. Otherwise, software will assume that the 8th bit is parity and it will usually be cleared. If strings exist to turn this "meta mode" on and off, they can be given as **smm** and **rmm**.

If the terminal has more lines of memory than will fit on the screen at once, the number of lines of memory can be indicated with **lm**. A value of **lm#0** indicates that the number of lines is not fixed, but that there is still more memory than fits on the screen.

If the terminal is one of those supported by the UNIX virtual terminal protocol, the terminal number can be given as **vt**.

Media copy strings that control an auxiliary printer connected to the terminal can be given as **mc0**: print the contents of the screen, **mc4**: turn off the printer, and **mc5**: turn on the printer. When the printer is on, all text sent to the terminal will be sent to the printer. It is undefined whether the text is also displayed on the terminal screen when the printer is on. A variation **mc5p** takes one parameter, and leaves the printer on for as many characters as the value of the parameter, then turns the printer off. The parameter should not exceed 255. All text, including **mc4**, is transparently passed to the printer while an **mc5p** is in effect.

Strings to program function keys can be given as **pfkey**, **pfloc**, and **pfx**. Each of these strings takes two parameters: the function key number to program (from 0 to 10) and the string to program it with. Function key numbers out of this range may program undefined keys in a terminal dependent manner. The difference between the capabilities is that **pfkey** causes pressing the given key to be the same as the user typing the given string; **pfloc** causes the string to be executed by the terminal in local; and **pfx** causes the string to be transmitted to the computer.

Glitches and Unusual Capabilities

Hazeltine terminals, which do not allow '~' characters to be displayed should indicate **hz**.

Terminals that ignore a linefeed immediately after an **am** wrap, such as the Concept and vt-100, should indicate **xenl**.

If **el** is required to get rid of standout (instead of merely writing normal text on top of it), **xhp** should be given.

Teleray terminals, where tabs turn all characters moved over to blanks, should indicate **xt** (destructive tabs). This glitch is also taken to mean that it is not possible to position the cursor on top of a "magic cookie", that to erase standout mode it is instead necessary to use delete and insert line.

The Beehive Superbee, which is unable to correctly transmit the escape or control C characters, has **xsb**, indicating that the f1 key is used for escape and f2 for control C. (Only certain Superbees have this problem, depending on the ROM.)

Other specific terminal problems may be corrected by adding more capabilities of the form **x***x*.

Similar Terminals

If there are two very similar terminals, one can be defined as being just like the other with certain exceptions. The string capability **use** can be given with the name of the similar terminal. The capabilities given before **use** override those in the terminal type invoked by **use**. A capability can be cancelled by placing **xx@** to the left of the capability definition, where xx is the capability. For example, the entry

2621-nl, smkx@, rmkx@, use=2621,

defines a 2621-nl that does not have the **smkx** or **rmkx** capabilities, and hence does not turn on the function key labels when in visual mode. This is useful for different modes for a terminal, or for different user preferences.

Files

/usr/lib/terminfo/?/*
files containing terminal descriptions compiled by *tic*(C)

See Also

terminfo(S), terminfo(F), tic(C)

Notes

Neither *vi*, *tset*, nor any other XENIX command presently uses *terminfo*. It is intended that a full integration of *termcap* and *terminfo* will be provided in a future version of XENIX.

Name

termio - General terminal interface.

Description

All asynchronous communications ports use the same general interface, no matter what hardware is involved. The remainder of this section discusses the common features of this interface.

When a terminal file is opened, it normally causes the process to wait until a connection is established. In practice, users' programs seldom open these files; they are opened by *getty* (M) and become a user's standard input, output, and error files. The very first terminal file opened by the process group leader of a terminal file not already associated with a process group becomes the "control terminal" for that process group. The control terminal plays a special role in handling quit and interrupt signals, as discussed below. The control terminal is inherited by a child process during a *fork* (S). A process can break this association by changing its process group using *setpgrp* (S).

A terminal associated with one of these files ordinarily operates in full-duplex mode. Characters can be entered at any time, even while output is occurring, and are only lost when the system's character input buffers become completely full, which is rare, or when the user has accumulated the maximum allowed number of input characters that have not yet been read by some program. Currently, this limit is 256 characters. When the input limit is reached, all the saved characters are thrown away without notice.

Normally, terminal input is processed in units of lines. A line is delimited by a newline (ASCII LF) character, an end-of-file (ASCII EOT) character, or an end-of-line character. This means that a program attempting to read will be suspended until an entire line has been entered. Also, no matter how many characters are requested in the read call, one line will be returned at most. It is not, however, necessary to read a whole line at once; any number of characters may be requested in a read, even one, without losing information.

Erase and kill processing is normally done during input. By default, a Ctrl-H or BACKSPACE erases the last character typed, except that it will not erase beyond the beginning of the line. By default, a Ctrl-U kills (deletes) the entire input line, and optionally outputs a newline character. Both these characters operate on a key-stroke basis, independent of any backspacing or tabbing that may have been done. Both the erase and kill characters may be entered literally by preceding them with the escape character (\). In this case, the escape character is not read. The erase and kill characters may be changed (see *stty* (C)).

Certain characters have special functions on input. These functions and their default character values are summarized as follows:

INTR (Rubout or ASCII DEL) Generates an *interrupt* signal which is sent to all processes with the associated control terminal. Normally, each such process is forced to terminate, but arrangements may be made either to ignore the signal or to receive a trap to an agreed-upon location; see *signal*(S).

QUIT (Ctrl-\ or ASCII FS) Generates a *quit* signal. Its treatment is identical to the interrupt signal except that, unless a receiving process has made other arrangements, it will not only be terminated, but a core image file (called **core**) will be created in the current working directory.

SWTCH (ASCII NUL) Is used by the job control facility, *shl*(C), to change the current layer to the control layer.

ERASE (Ctrl-H) Erases the preceding character. It will not erase beyond the start of a line, as delimited by a NL, EOF, or EOL character.

KILL (Ctrl-U) Deletes the entire line, as delimited by a NL, EOF, or EOL character.

EOF (Ctrl-D or ASCII EOT) May be used to generate an end-of-file from a terminal. When received, all the characters waiting to be read are immediately passed to the program, without waiting for a newline, and the EOF is discarded. Thus, if there are no characters waiting, which is to say the EOF occurred at the beginning of a line, zero characters will be passed back, which is the standard end-of-file indication.

NL (ASCII LF) Is the normal line delimiter. It cannot be changed or escaped.

EOL (ASCII NUL) Is an additional line delimiter, like NL. It is not normally used.

STOP (Ctrl-S or ASCII DC3) Temporarily suspends output. It is useful with CRT terminals to prevent output from disappearing before it can be read. While output is suspended, STOP characters are ignored and not read.

START (Ctrl-Q or ASCII DC1) Resumes output which has been suspended by a STOP character. While output is not suspended, START characters are ignored and not read. The START/STOP characters cannot be changed or escaped.

The character values for INTR, QUIT, SWTCH, ERASE, KILL, EOF, and EOL may be changed to suit individual tastes. The ERASE, KILL, and EOF characters may be escaped by a preceding backslash (\) character,

in which case no special function is carried out.

When the carrier signal from the dataset drops, a "hangup" signal is sent to all processes that have this terminal as the control terminal. Unless other arrangements have been made, this signal causes the processes to terminate. If the hangup signal is ignored, any subsequent read returns with an end-of-file indication. Thus, programs that read a terminal and test for an end-of-file can terminate appropriately when hung up on.

When one or more characters are written, they are transmitted to the terminal as soon as the previously typed characters have been entered. Input characters are echoed by putting them in the output queue as they arrive. If a process produces characters more rapidly than they can be typed, it will be suspended when its output queue exceeds a given limit. When the queue has drained down to the given threshold, the program is resumed.

Several *ioctl* (S) system calls apply to terminal files. The primary calls use the following structure, defined in the file **<termio.h>**:

```
#define NCC     8
struct  termio {
        unsigned short  c_iflag;    /* input modes */
        unsigned short  c_oflag;    /* output modes */
        unsigned short  c_cflag;    /* control modes */
        unsigned short  c_lflag;    /* local modes */
        char            c_line;     /* line discipline */
        unsigned char   c_cc[NCC];/* control chars */
};
```

The special control characters are defined by the array *c_cc*. The relative positions and initial values for each function are as follows:

0	VINTR	DEL
1	VQUIT	FS
2	VERASE	Ctrl-H
3	VKILL	Ctrl-U
4	VEOF/VMIN	EOT
5	VEOL/VTIME	NUL
6	Reserved	
7	VSWTCH	NUL

The *c_iflag* field describes the basic terminal input control:

IGNBRK	0000001	Ignores break condition
BRKINT	0000002	Signals interrupt on break
IGNPAR	0000004	Ignores characters with parity errors
PARMRK	0000010	Marks parity errors
INPCK	0000020	Enables input parity check
ISTRIP	0000040	Strips character
INLCR	0000100	Maps NL to CR on input

IGNCR	0000200	Ignores CR
ICRNL	0000400	Maps CR to NL on input
IUCLC	0001000	Maps uppercase to lowercase on input
IXON	0002000	Enables start/stop output control
IXANY	0004000	Enables any character to restart output
IXOFF	0010000	Enables start/stop input control
CTSFLOW	0020000	Enables CTS protocol for a modem line
RTSFLOW	0040000	Enables RTS signaling for a modem line

If IGNBRK is set, the break condition (a character framing error with data all zeros) is ignored, that is, not put on the input queue and therefore not read by any process. Otherwise, if BRKINT is set the break condition will generate an interrupt signal and flush both the input and output queues. If IGNPAR is set, characters with other framing and parity errors are ignored.

If PARMRK is set, a character with a framing or parity error which is not ignored is read as the 3-character sequence: 0377, 0, X, where X is the data of the character received in error. To avoid ambiguity in this case, if ISTRIP is not set, a valid character of 0377 is read as 0377, 0377. If PARMRK is not set, a framing or parity error which is not ignored is read as the character NUL (0).

If INPCK is set, input parity checking is enabled. If INPCK is not set, input parity checking is disabled. This allows output parity generation without input parity errors.

If ISTRIP is set, valid input characters are first stripped to 7-bits, otherwise all 8-bits are processed.

If INLCR is set, a received NL character is translated into a CR character. If IGNCR is set, a received CR character is ignored (not read). Otherwise, if ICRNL is set, a received CR character is translated into a NL character.

If IUCLC is set, a received uppercase alphabetic character is translated into the corresponding lowercase character.

If IXON is set, start/stop output control is enabled. A received STOP character will suspend output and a received START character will restart output. All start/stop characters are ignored and not read. If IXANY is set, any input character will restart output which has been suspended.

If IXOFF is set, the system will transmit START characters when the input queue is nearly empty and STOP characters when nearly full.

If CTSFLOW or RTSFLOW are set, IXON and IXANY should also be set so that these two types of flow control do not interfere with each other.

The initial input control value is all bits clear.

The *c_oflag* field specifies the system treatment of output:

OPOST	0000001	Postprocesses output
OLCUC	0000002	Maps lowercase to uppercase on output
ONLCR	0000004	Maps NL to CR-NL on output
OCRNL	0000010	Maps CR to NL on output
ONOCR	0000020	No CR output at column 0
ONLRET	0000040	NL performs CR function
OFILL	0000100	Uses fill characters for delay
OFDEL	0000200	Fills is DEL, else NUL
NLDLY	0000400	Selects newline delays:
NL0	0	
NL1	0000400	
CRDLY	0003000	Selects carriage return delays:
CR0	0	
CR1	0001000	
CR2	0002000	
CR3	0003000	
TABDLY	0014000	Selects horizontal tab delays:
TAB0	0	
TAB1	0004000	
TAB2	0010000	
TAB3	0014000	Expands tabs to spaces
BSDLY	0020000	Selects backspace delays:
BS0	0	
BS1	0020000	
VTDLY	0040000	Selects vertical tab delays:
VT0	0	
VT1	0040000	
FFDLY	0100000	Selects form feed delays:
FF0	0	
FF1	0100000	

If OPOST is set, output characters are post-processed as indicated by the remaining flags, otherwise characters are transmitted without change.

If OLCUC is set, a lowercase alphabetic character is transmitted as the corresponding uppercase character. This function is often used in conjunction with IUCLC.

If ONLCR is set, the NL character is transmitted as the CR-NL character pair. If OCRNL is set, the CR character is transmitted as the NL character. If ONOCR is set, no CR character is transmitted when at column 0 (first position). If ONLRET is set, the NL character is assumed to perform the carriage return function and the column pointer is set to 0 and the delays specified for CR will be used. Otherwise, the NL character is assumed to perform the linefeed function; the column pointer will remain unchanged. The column pointer is also set to 0 if the CR character is actually transmitted.

The delay bits specify how long transmission stops to allow for mechanical or other movement when certain characters are sent to the terminal. In all cases, a value of 0 indicates no delay. If OFILL is set, fill characters will be transmitted for delay instead of a timed delay. This is useful for high baud rate terminals which need only a minimal delay. If OFDEL is set, the fill character is DEL, otherwise NUL.

If a form feed or vertical tab delay is specified, it lasts for about 2 seconds.

Newline delay lasts about 0.10 seconds. If ONLRET is set, the carriage return delays are used instead of the newline delays. If OFILL is set, 2 fill characters will be transmitted.

Carriage return delay type 1 is dependent on the current column position, type 2 is about 0.10 seconds, and type 3 is about 0.15 seconds. If OFILL is set, delay type 1 transmits 2 fill characters, and type 2 transmits 4 fill characters.

Horizontal tab delay type 1 is dependent on the current column position. Type 2 is about 0.10 seconds. Type 3 specifies that tabs are to be expanded into spaces. If OFILL is set, 2 fill characters will be transmitted for any delay.

Backspace delay lasts about 0.05 seconds. If OFILL is set, 1 fill character will be transmitted.

The actual delays depend on line speed and system load.

The initial output control value is all bits clear.

The *c_cflag* field describes the hardware control of the terminal:

CBAUD	0000017	Baud rate:
B0	0	Hang up
B50	0000001	50 baud
B75	0000002	75 baud
B110	0000003	110 baud
B134	0000004	134.5 baud
B150	0000005	150 baud
B200	0000006	200 baud
B300	0000007	300 baud

B600	0000010	600 baud
B1200	0000011	1200 baud
B1800	0000012	1800 baud
B2400	0000013	2400 baud
B4800	0000014	4800 baud
B9600	0000015	9600 baud
EXTA	0000016	External A
EXTB	0000017	External B
CSIZE	0000060	Character size:
CS5	0	5 bits
CS6	0000020	6 bits
CS7	0000040	7 bits
CS8	0000060	8 bits
CSTOPB	0000100	Sends two stop bits, else one
CREAD	0000200	Enables receiver
PARENB	0000400	Parity enable
PARODD	0001000	Odd parity, else even
HUPCL	0002000	Hangs up on last close
CLOCAL	0004000	Local line, else dial-up
LOBLK	0010000	Block layer output

The CBAUD bits specify the baud rate. The zero baud rate, B0, is used to hang up the connection. If B0 is specified, the data-terminal-ready signal will not be asserted. Without this signal, the line is disconnected if it is connected through a modem. For any particular hardware, impossible speed changes are ignored.

The CSIZE bits specify the character size in bits for both transmission and reception. This size does not include the parity bit, if any. If CSTOPB is set, 2 stop bits are used, otherwise 1 stop bit. For example, at 110 baud, 2 stops bits are required.

If PARENB is set, parity generation and detection is enabled and a parity bit is added to each character. If parity is enabled, the PARODD flag specifies odd parity if set, otherwise even parity is used.

If CREAD is set, the receiver is enabled. Otherwise no characters will be received.

If HUPCL is set, the line will be disconnected when the last process with the line open closes it or terminates. That is, the data-terminal-ready signal will not be asserted.

If CLOCAL is set, the line is assumed to be a local, direct connection with no modem control. The data-terminal-ready and request-to-send signals are asserted, but incoming modem signals are ignored. If CLOCAL is not set, modem control is assumed. This means the data-terminal-ready and request-to-send signals are asserted. Also, the

carrier-detect signal must be returned before communications can proceed.

If LOBLK is set, the output of a job control layer will be blocked when it is not the current layer. Otherwise the output generated by that layer will be multiplexed onto the current layer.

The initial hardware control value after open is B9600, CS8, CREAD, HUPCL.

The *c_lflag* field of the argument structure is used by the line discipline to control terminal functions. The basic line discipline (0) provides the following:

ISIG	0000001	Enable signals
ICANON	0000002	Canonical input (erase and kill processing)
XCASE	0000004	Canonical upper/lower presentation
ECHO	0000010	Enables echo
ECHOE	0000020	Echoes erase character as BS-SP-BS
ECHOK	0000040	Echoes NL after kill character
ECHONL	0000100	Echoes NL
NOFLSH	0000200	Disables flush after interrupt or quit
XCLUDE	0100000	Exclusive use of the line

If ISIG is set, each input character is checked against the special control characters INTR, SWTCH, and QUIT. If an input character matches one of these control characters, the function associated with that character is performed. If ISIG is not set, no checking is done. Thus, these special input functions are possible only if ISIG is set. These functions may be disabled individually by changing the value of the control character to an unlikely or impossible value (e.g., 0377).

If ICANON is set, canonical processing is enabled. This enables the erase and kill edit functions, and the assembly of input characters into lines delimited by NL, EOF, and EOL. If ICANON is not set, read requests are satisfied directly from the input queue. A read will not be satisfied until at least VMIN characters have been received or the timeout value VTIME has expired and at least one character has been input. This allows fast bursts of input to be read efficiently while still allowing single character input. (See the discussion of VMIN and VTIME below.)

The VMIN and VTIME values are stored in the position for the EOF and EOL characters respectively. VMIN and VTIME are interpreted as EOF and EOL if ICANON is set. Default VMIN and VTIME values are stored in the **/usr/include/sys/termio.h** file. To change these values, set ICANON to off and use *stty*(C) to change the VMIN and VTIME values as represented by EOF and EOL. The TIME value represents tenths of seconds.

If XCASE and ICANON are set, an uppercase letter is accepted on input by preceding it with a \ character, and is output preceded by a \ character. In this mode, the following escape sequences are generated on output and accepted on input:

For:	Use:
`	\'
|	\!
~	\^
{	\(
}	\)
\	\\

For example, **A** is input as **\a**, **\n** as **\\n**, and **\N** as **\\\n**.

If ECHO is set, characters are echoed as received.

When ICANON is set, the following echo functions are possible. If ECHO and ECHOE are set, the erase character is echoed as ASCII BS SP BS, which will clear the last character from a CRT screen. If ECHOE is set and ECHO is not set, the erase character is echoed as ASCII SP BS. If ECHOK is set, the NL character will be echoed after the kill character to emphasize that the line will be deleted. Note that an escape character preceding the erase or kill character removes any special function. If ECHONL is set, the NL character will be echoed even if ECHO is not set. This is useful for terminals set to local echo (so-called half duplex). Unless escaped, the EOF character is not echoed. Because EOT is the default EOF character, this prevents terminals that respond to EOT from hanging up.

If NOFLSH is set, the normal flush of the input and output queues associated with the quit and interrupt characters will not be done.

If XCLUDE is set, any subsequent attempt to open the TTY device using *open*(S) will fail for all users except the super-user. If the call fails, it returns EBUSY in *errno*. XCLUDE is useful for programs which must have exclusive use of a communications line. It is not intended for the line to the program's controlling terminal. XCLUDE must be cleared before the setting program terminates, otherwise subsequent attempts to open the device will fail.

VMIN represents the minimum number of characters that should be received when the read is satisfied (i.e., the characters are returned to the user). VTIME is a timer of 0.10 second granularity used to time-out bursty and short-term data transmissions. The four possible values for VMIN and VTIME and their interactions are:

VMIN > 0, VTIME > 0
In this case, VTIME serves as an inter-character timer activated after the first character is received, and reset upon receipt of each character. VMIN and VTIME interact as follows:

As soon as one character is received the inter-character timer is started.

If VMIN characters are received before the inter-character timer expires the read is satisfied.

If the timer expires before VMIN characters are received the characters received to that point are returned to the user.

A *read*(S) operation will sleep until the VMIN and VTIME mechanisms are activated by the receipt of the first character; thus, at least one character must be returned.

VMIN > 0, VTIME = 0
In this case, because VTIME = 0, the timer plays no role and only VMIN is significant. A *read*(S) operation is not satisfied until VMIN characters are received.

VMIN = 0, VTIME > 0
In this case, because VMIN = 0, VTIME no longer serves as an inter-character timer, but now serves as a read timer that is activated as soon as the *read*(S) operation is processed. A *read*(S) operation is satisfied as soon as a single character is received or the timer expires, in which case, the *read*(S) operation will not return any characters.

VMIN = 0, VTIME = 0
In this case, return is immediate. If characters are present, they will be returned to the user.

The initial line-discipline control value is all bits clear.

The primary *ioctl* (S) system calls have the form:

```
ioctl (fildes, command, arg)
struct termio *arg;
```

The commands using this form are:

TCGETA Gets the parameters associated with the terminal and stores them in the *termio* structure referenced by **arg**.

TCSETA Sets the parameters associated with the terminal from the structure referenced by **arg**. The change is immediate.

TCSETAW Waits for the output to drain before setting the new parameters. This form should be used when changing parameters that will affect output.

TCSETAF Waits for the output to drain, then flushes the input queue and sets the new parameters.

Additional *ioctl* (S) calls have the form:

```
ioctl (fildes, command, arg)
int arg;
```

The commands using this form are:

TCSBRK Waits for the output to drain. If *arg* is 0, then sends a break (zero bits for 0.25 seconds).

TCXONC Starts/stops control. If *arg* is 0, suspends output; if 1, restarts suspended output.

TCFLSH If *arg* is 0, flushes the input queue; if 1, flushes the output queue; if 2, flushes both the input and output queues.

Files

/dev/tty

/dev/tty*

/dev/console

See Also

fork(S), ioctl(S), mapchan(F), mapchan(M), read(S), setgprp(S), signal(S), stty(C), tty(M)

Name

timtbl - Create a time locale table.

Syntax

timtbl [*specfile*]

Description

The utility *timtbl* is provided to allow new LC_TIME locales to be defined. It reads a specification file, which contains definitions of the way in which time and date information is presented for a particular locale, and produces a binary table file, to be read by *setlocale* (S), which determines the behavior of the *strftime* (S) routine.

The information supplied in the specification file consists of lines in the following format:

item = *string*

The "=" can be separated from the item and string fields by zero or more space or tab characters. The following values are meaningful for *item*:

DATE_FMT	specification of the format string for representing the date. It will contain "%" directives representing variable items such as the month number, as used in the format string for *strftime* (S).
TIME_FMT	specification of the format string for representing the time of day.
F_NOON	string indicating 12-hour clock times before midday, e.g. "AM".
A_NOON	string indicating 12-hour clock times after midday, e.g. "PM".
D_T_FMT	string for formatting combined date and time.
DAY_1	full name of the first day of the week (Sunday).
.	.
.	.
.	.
DAY_7	full name of the seventh day of the week.

ABDAY_1 abbreviated name of the first day of the week, e.g. "Sun".

.
.
.

ABDAY_7 abbreviated name of the seventh day of the week.

MON_1 full name of the first month in the Gregorian calendar.

.
.
.

MON_12 full name of the twelfth month.

ABMON_1 abbreviated name of the first month.

.
.
.

ABMON_12 full name of the twelfth month.

The *string* is a sequence of characters surrounded by quotes ("). Characters within the string can be specified both literally and using "\" escapes; the following three strings are equivalent:

```
"Tuesday"          - literal
"\x54ue\x73da\x79" - hexadecimal escapes
"\124ue\163da\171" - octal escapes
```

The *string*s for the *item*s DATE_FMT , TIME_FMT and D_T_FMT will also include " % " directives as detailed in the *strftime* (S) manual page, to specify variable portions of the string.

All characters following a hash (" # ") are treated as a comment and ignored up to the end of the line, unless the hash is within a quoted string.

The various *item*s may be specified in any order. If any items are not specified, a warning message will be produced, and the null string ("") substituted.

The binary table output is placed in a file named "time", within the current directory. This file should be copied or linked to the correct place in the *setlocale* file tree (see *locale* (M)). To prevent accidental corruption of the output data, the file is created with no write permission; if the timtbl utility is run in a directory containing a write-protected "ctype" file, the utility will ask if the existing file should be replaced - any response other than "yes" or "y" will cause **timtbl** to terminate without overwriting the existing file.

If the *specfile* argument is missing, the specification information is read from the standard input.

See Also

chrtbl(M), locale(M), numtbl(M), setlocale(S), strftime(S)

Diagnostics

If the input table file cannot be opened for reading, processing will terminate with the error message, "Cannot open specification file".

Any lines in the specification file which are syntactically incorrect, or contain an unrecognized value for the *item*, will cause an error message to be issued to the standard error output, specifying the line number on which the error was detected. The line will be ignored, and processing will continue.

If a particular *item* is specified more than once, a warning message will be produced, and processing will continue.

If the specification file does not contain specifications for all possible *item*s, a warning message will be produced.

If the output file, *time* , cannot be opened for writing, processing will terminate with the error message, "Cannot create table file".

Any error conditions encountered will cause the program to exit with a non-zero return code; successful completion is indicated with a zero return code.

Notes

The strings D_FMT , T_FMT , AM_STR and PM_STR may be used as alternatives to DATE_FMT , TIME_FMT , F_NOON and A_NOON respectively, if required. These alternatives are provided for consistency with the identifiers used by *nl_langinfo* (S).

Name

trchan - Translate character sets

Syntax

trchan [**-ciko**] *mapfile*

Description

trchan performs mapping as a filter, using the same format of *mapfile* as *mapchan*(M) (described in *mapchan*(F)). This allows a file consisting of one internal character set to be "translated" to another internal character set.

trchan reads standard input, maps it, and writes to standard output. A *mapfile* must be given on the command line. Errors cause *trchan* to stop processing unless **-c** is specified.

The following options can be used with *trchan :*

-c causes errors to be echoed on *stderr*, and processing is continued.

-i specifies that the "input" section of the *mapfile* is used when translating data.

-k specifies that the "dead" and "compose" sections of the *mapfile* are used when translating data.

-o specifies that the "output" section of the *mapfile* is used when translating data.

The **-i**, **-k** and **-o** options can be specified in any combination; if none are specified, *trchan* uses the entire *mapfile*, as if all three were specified together.

Files

/usr/lib/mapchan/*

See Also

ascii(M), mapchan(F), mapchan(M)

Notes

trchan currently ignores the **control** sections of the *mapfile*.

Name

tty - Special terminal interface.

Description

The file **/dev/tty** is, in each process, a synonym for the control terminal associated with the process group of that process, if any. It is useful for programs or shell sequences that wish to be sure of writing messages on the terminal no matter how output has been redirected. It can also be used for programs that demand the name of a file for output, when typed output is desired, and when it is tiresome to find out what terminal is currently in use.

The general terminal interface is described in *termio*(M).

Files

/dev/tty
/dev/tty*

See Also

termio(M)

Name

TZ - Time zone environment variable.

Syntax

TZ=*sssn*[*ddd*[*m*][;*start*[/*time*],*end*[/*time*]]] ; export TZ

setenv TZ *sssn*[*ddd*[*m*][;*start*[/*time*],*end*[/*time*]]]

/etc/tz

Description

TZ is the shell environment variable for the time zone of the system and is set in the files **/etc/rc**, **/.profile**, and **/etc/default/login**.

The shell script **/etc/tz**, generally run during installation, prompts for the correct time zone and makes the changes in the appropriate files.

/etc/tz also prompts for the dates when time is shifted from standard to daylight time and back, and for the number of hours to shift (partial hours in the form of hh:mm:ss are acceptable).

Users living in a time zone different than that of the host machine may change *TZ* in their **$HOME/.profile** or **$HOME/.login** files.

TZ contains the following information:

(*sss*) One to nine letters designating the standard time zone.

(*n*) Number of hours past Greenwich mean time for the standard time (partial hours are valid e.g. 12:30:01). Positive hours are west of Greenwich, negative numbers are east of Greeenwich.

(*ddd*) One to nine letters designating the local daylight savings time (summer time) zone. If not present, summer time is assumed not to apply.

(*m*) Number of hours past Greenwich mean time for the summer time (partial hours are valid e.g. 11:30:01). Positive hours are west of Greenwich, negative numbers are east of Greeenwich. If *m* is not given, the distance to GMT during summer time is assumed to be one hour less than during standard time.

(*start*) The rule defining the day summer time begins. In the southern hemisphere, the ending day will be earlier in the year than the starting day.

(*end*) The rule defining the day summer time ends.

(*time*) The time of day the change to and from summer time occurs. The default is 02:00:00 local time.

The rules for defining the **start** and **end** of summer time are as follows:

J*n*	1 based Julian day *n* ($1 \le n \le 365$)*
n	0 based Julian day *n* ($0 \le n \le 364$)*
W*n.d*	day *d* ($0 \le d \le 6$)** of week *n* ($1 \le n \le 53$)†
M*m.n.d*	day *d* of week *n* ($1 \le n \le 5$)‡ of month *m* ($1 \le m \le 12$)

* Leap days (February 29) are never counted; that is, February 28 (J59) is immediately followed by March 1 (J60) even in leap years.

** Sunday is the first day of the week (0). If *d* is omitted, Sunday is assumed. Note that *d* is optional.

† The 5th week of the month is always the last week containing day *d*, whether there are actually 4 or 5 weeks containing day *d*.

‡ The 53rd week of the year is always the last week containing day *d*, whether there are actually 52 or 53 weeks containing day *d*.

If **start** and **end** are omitted, current U.S. law is assumed.

For the simple expression of Eastern Standard/Daylight Time *TZ* is set as follows:

TZ=EST5EDT ; export TZ
(for *sh*(C) and *vsh*(C))

setenv TZ EST5EDT
(for *csh*(C))

The fully expressed *TZ* string for Eastern Standard/Daylight Time, using the current U.S. law of changing to daylight saving time on the first Sunday in April, and back to standard time on the last Sunday in October at 2:00 a.m. local time, would be:

TZ=EST05:00:00EDT04:00:00;M4.1.0/02:00:00,M10.5.0/02:00:00

To change the time zone for the entire system, run the shell script **/etc/tz** (as root) or use an editor to change the variable *TZ* in the files **/etc/rc**, **/.profile** and **/etc/default/login**. In **/etc/rc** the line changing the time zone (see the *sh* example above) must occur before the **/etc/asktime** command. The *TZ* variable in **/etc/default/login** causes the time zone to be set correctly on logging in and for programs such as *uucico*.

Files

/etc/rc
/etc/default/login
/etc/tz
$HOME/.profile
$HOME/.login

See Also

environ(M), date(C), ctime(S)

Notes

The *date* (C) automatically switches from Standard Time to Summer Time (Daylight Saving Time). Leap days are properly accounted for.

Changes to *TZ* are immediately effective, (i.e. if a process changes the *TZ* variable, the next call to a *ctime* (S) routine returns a value based on the new value of the variable).

Permuted Index

Commands, System Calls, Library Routines and File Formats

This permuted index is derived from the "Name" description lines found on each reference manual page. Each *index* line shows the title of the entry to which the line refers, followed by the reference manual section letter where the page is found.

To use the *permuted index* search the middle column for a key word or phrase. The right hand column contains the name and section letter of the manual page that documents the key word or phrase. The left column contains additional useful information about the command. Commands or routines are also listed in the context of the *index* line, followed by a colon (:). This denotes the "beginning" of the sentence. Notice that in many cases, the lines wrap, starting in the middle column and ending in the left column. A slash (/) indicates that the description line is truncated.

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