

UNIX Reference Guide

UNIX Reference Guide

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SOURCES

This guide has been compiled from the following sources:

- [1] UNIX User's Manual
- [2] Documents for UNIX:
 - **B.4.1 UNIX Shell Tutorial**
 - E.4.1 Source Code Control System User's Guide
 - E.9.1 The Implementation of the LP Spooling System
 - D.5.2 A Tutorial Introduction to ADB
 - D.5.1 SDB-A Symbolic Debugger
 - E.6.1 UNIX Graphics Overview
 - E.6.2 A Tutorial Introduction to the Graphics Editor
 - C.1.1 A TROFF Tutorial
 - C.1.2 NROFF/TROFF User's Manual
 - C.2.1 MM-Memorandum Macros
 - C.2.3 A Macro Package for View Graphs and Slides
 - C.3.1 TBL-A Program to Format Tables
 - C.3.2 Typesetting Mathematics-User's Guide (Second Edition)

ALPHABETICAL INDEX OF COMMANDS

| 300 | handle special functions of DASI 300 terminal |
|---|--|
| 300s | handle special functions of DASI 300s terminal |
| 4014 | paginator for the Tektronix 4014 terminal |
| 450 | |
| | handle special functions of DASI 450 terminal |
| abs | absolute value (see Special Commands: Graphics) |
| accept | allow LP requests (see Special Commands: LP) |
| acctcom | search and print process accounting file(s) |
| adb | debugger (see Special Commands: ADB) |
| admin | create and administer SCCS files (see Special Commands: |
| | SCCS) |
| af | arithmetic function (see Special Commands: Graphics) |
| ar | archive and library maintainer |
| 85 | assembler for PDP-11 |
| 85 | assembler for VAX |
| 858 | interpret carriage control characters |
| awk | pattern scanning and processing language |
| banner | make posters |
| bar | build a bar chart (see Special Commands: Graphics) |
| 1244 C 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | deliver last level of path names |
| basename | |
| be | arbitrary-precision arithmetic language |
| bdiff | diff for big files |
| bel | send the ASCII BEL character to terminal (see Special |
| | Commands: Graphics) |
| bfs | big file scanner |
| break | exit from loop (see Special Commands: Shell) |
| bs | a compiler/interpreter for modest-sized programs |
| bucket | break into buckets (see Special Commands: Graphics) |
| cal | print calendar |
| calendar | reminder service |
| cancel | cancel LP request (see Special Commands: LP) |
| cat | concatenate and print files |
| cb | C program beautifier |
| cc | C compiler |
| cd | change working directory |
| ede | change SCCS delta commentary (see Special Commands: |
| | SCCS) |
| ceil | integer round up (see Special Commands: Graphics) |
| cflow | generate a C flow graph |
| checkcw | check constant-width text for troff (see Text Processing) |
| checkeq | check delimiters input to eqn/neqn (see Text Processing) |
| checkmm | check usage of MM macros and eqn delimiters (see Text |
| checkmm | Processing) |
| chgrp | change group ID of files |
| chmod | change mode of files |
| Contraction of the second s | |
| chown | change owner of files |
| cmp | compare two files |
| col | filter reverse line-feeds (see Text Processing) |
| comb | combine SCCS deltas (see Special Commands: SCCS) |
| comm | select or reject lines common to two sorted files |
| continue | continue loop (see Special Commands: Shell) |
| cor | compute correlation coefficient (see Special Commands: |
| | Graphics) |
| ср | copy files |
| cpio | copy file archives in and out |
| crypt | encode/decode |
| csplit | context split |
| ct | call terminal |
| cu | call another UNIX system |
| cusum | cumulative sum (see Special Commands: Graphics) |
| cut | cut out selected fields of each line of a file |
| cvrtopt | options converter (see Special Commands: Graphics) |
| cw | prepare constant-width text for troff (see Text Processing |

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generate C program cross reference cxref date print or set the date dc desk calculator dd convert and copy a file make SCCS file change (see Special Commands: SCCS) delta remove nroff/troff, tbl, and eqn constructs (see Text deroff Processing) report number of free disk blocks df diff differential file comparator diff3 3-way differential file comparison diffmk mark differences between files (see Text Processing) dircmp directory comparison deliver all but last level of a path name dirname disable LP line printers (see Special Commands: LP) disable print on GCOS printer dpr textual table of contents (see Special Commands: dtoc Graphics) du summarize disk usage echo echo arguments text editor (see Special Commands: Editor) ed ef display editor-formatter for video terminals Extended Fortran Language efl full regular expression pattern search едтер enable LP line printers (see Special Commands: LP) enable set environment for command execution env typeset mathematical text (see Text Processing) ean erase Tektronix screen (see Special Commands: Graphics) erase evaluate command line (see Special Commands: Shell) eval execute (see Special Commands: Shell) exec terminate a shell (see Special Commands: Shell) exit exponential function (see Special Commands: Graphics) exp put variable in the environment (see Special Commands: export Shell) evaluate arguments as an expression expr Fortran 77 compiler f77 provide truth value false retrieve files from GCOS fget search a file for a pattern fgrep determine file type file find files find floor integer round down (see Special Commands: Graphics) fsend send files to GCOS split f77, ratfor, and efl files fenlit gamma function (see Special Commands: Graphics) gamma additive sequence (see Special Commands: Graphics) gas gather real and virtual files gath send troff output to GCOS (see Text Processing) gcat send mail to a GCOS user gcos mail gd GPS (graphical primitive string) dump (see Special Commands: Graphics) graphical editor (see Special Commands: Graphics) ged get SCCS file version (see Special Commands: SCCS) get parse command options getopt draw a graph graph graphics access graphical and statistical commands greek interpret extended character set search a file for a pattern grep GPS to plot filter (see Special Commands: Graphics) gtop graphics utilities (see Special Commands: Graphics) gutil (see bel, cvrtopt, gd, gtop, pd, ptog, quit, remcom, whatis, y00) Tektronix screen print (see Special Commands: Graphics) hardcopy help provide help high/low values (see Special Commands: Graphics) hilo hist build a histogram (see Special Commands: Graphics) handle special functions of HP CRTs hp

hpd

translate GPS to HP7221A Graphics Plotter (see Special Commands: Graphics) hyphen find hyphenated words (see Text Processing) id print user and group ID and names relational data base operator ioin assembler for the KMC11B microprocessor kash terminate a process kill kunb disassembler for the KMC11B microprocessor 14 link editor label axis labels GPS file (see Special Commands: Graphics) generate programs for simple lexical tasks read one line lex line lint a C language program checker list list vector elements (see Special Commands: Graphics) In link files log log function (see Special Commands: Graphics) login sign on get login name logname lorder find ordering relation for an object library Ip print request (see Special Commands: LP) lpadmin configure printing system (see Special Commands: LP) move print queues (see Special Commands: LP) Ipmove Ipr line printer spooler lpsched start print scheduler (see Special Commands: LP) stop print scheduler (see Special Commands: LP) lpshut lpstat print system status (see Special Commands: LP) slope & intercept (see Special Commands: Graphics) Ireg Is list contents of directories m4 a macro processor send mail to users or read mail mail make maintain, update, and regenerate program groups man print entry of UNIX manual (see Text Processing) arithmetic mean (see Special Commands: Graphics) mean mesg permit or inhibit messages make a directory mkdir mm print document using MM macros (see Text Processing) typeset documents (see Text Processing) mmt mod compute modulus (see Special Commands: Graphics) move or rename a file m v mvt troff macro package for typesetting view graphs and slides (see Text Processing) format mathematical text for typewriter-like terminals nean (see Text Processing) net execute a command on the PCL network newfor m change the format of a text file newgrp log in to a new group print news items news nice run a command at low priority nl line numbering filter nm print name list nohup run a command immune to hang-ups and quits nroff format text on typewriter-like terminals (see Text Processing) nusend send files to another UNIX on the NSC network od octal dump equivalent to the command mm - mosd (see Text osdd Processing) compress files pack pair elements (see Special Commands: Graphics) pair change login password nasswd paste merge several files or subsequent lines of one file expand compressed file to standard output pcat pcc portable C compiler plot dump (see Special Commands: Graphics) pd build a pie chart (see Special Commands: Graphics) pie plot a graph (see Special Commands: Graphics) plot

point find point from empirical cumulative density function (see Special Commands: Graphics) power raise to a power (see Special Commands: Graphics) pr print files prime prime numbers (see Special Commands: Graphics) prod internal product (see Special Commands: Graphics) prof display profile data print an SCCS file (see Special Commands: SCCS) DES ps report process status ptog plot to GPS filter (see Special Commands: Graphics) make permuted index (see Text Processing) ptx print working directory name pwd quit terminate session (see Special Commands: Graphics) asort do a quick sort (see Special Commands: Graphics) random sequence (see Special Commands: Graphics) rand rank find number of vector elements (see Special Commands: Graphics) ratfor rational Fortran dialect read read standard input (see Special Commands: Shell) readonly mark variable as "read only" (see Special Commands: Shell) red restricted ed regemp regular expression compile reject prevent LP requests (see Special Commands: LP) remcom remove comments (see Special Commands: Graphics) rjestat RJE status and enquiries rm remove files rmail read mail to users remove SCCS file delta (see Special Commands: SCCS) rmdel rmdir remove directories root take a root (see Special Commands: Graphics) round round to nearest integer (see Special Commands: Graphics) rsh restricted sh sact print current SCCS file editing activity C compiler for stand-alone programs SCC sccsdiff SCCS file comparisons (see Special Commands: SCCS) sdb symbolic debugger (see Special Commands: SDB) sdiff side-by-side difference program sed stream editor send submit RJE job set set or unset flags (see Special Commands: Shell) sh UNIX command interpreter (see Special Commands: Shell) shift positional parameters (see Special Commands: Shell) shift siline generate a line given slope and intercept (see Special Commands: Graphics) sin sine function (see Special Commands: Graphics) size size of an object file sleep suspend execution for an interval SNOBOL interpreter sno sort and/or merge files sort spell find spelling errors (see Text Processing) add words to spelling list (see Text Processing) spellin spellout print information about spelling list (see Text Processing) spline interpolate smooth curve (see Special Commands: Graphics) split split a file into pieces stat statistical network (see Special Commands: Graphics) (see abs, af, bar, bucket, ceil, cor, cusum, exp, floor, gamma, gas, hilo, hist, label, list, log, lreg, mean, mod, pair, pie, plot, point, power, prime, prod, qsort, rand, rank, root, round, siline, sin, subset, title, total, var) strip remove symbols and relocation bits from object program stty set terminal options (see Special Commands: STTY) su become super-user or another user

generate a subset (see Special Commands: Graphics)

subset

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sum and count blocks in a file sum tabs set tabs on a terminal tail deliver the last part of a file tar tape file archiver thl table formatter for nroff or troff (see Text Processing) phototypesetter simulator (see Text Processing) te translate GPS for Tektronix (see Special Commands: td Graphics) tee pipe fitting Tektronix terminal setup (see Special Commands: tekset Graphics) tek 4000 graphical routines for Tektronix terminals (see erase, ged, hardcopy, td, tekset) condition evaluation command test time a command time print process times (see Special Commands: Shell) times time a command and generate a system activity report timex title title a vector (see Special Commands: Graphics) table of contents (see Special Commands: Graphics) toc (see dtoc, ttoc, vtoc) compute sum total (see Special Commands: Graphics) total update access and modification times of a file touch tplot graph filters translate characters tr catch signals (see Special Commands: Shell) trap format text for phototypesetter (see Text Processing) troff trouble submit a trouble report or modification request provide truth value true tsort topological sort table of contents (see Special Commands: Graphics) ttoc get the terminal's name tty ulimit set file size limit (see Special Commands: Shell) umask set file-creation mode mask uname print name of current UNIX unget undo an SCCS get (see Special Commands: SCCS) uniq report repeated lines in a file conversion program units unpack expand compressed files uucp UNIX-to-UNIX file copy uulog UNIX-to-UNIX uucp user log inquiry uuname lists the uucp names of known systems uupick interactive retrieval of transmitted files uustat uucp status inquiry and job control expanded UNIX-to-UNIX file copy uuto UNIX-to-UNIX command execution uux validate SCCS file (see Special Commands: SCCS) val VAL compute variance (see Special Commands: Graphics) VC version control Versatec printer spooler (see Text Processing) VDL vtoc hierarchy chart (see Special Commands: Graphics) await completion of a process wait word count WC identify SCCS files (see Special Commands: SCCS) what whatis graphics documentation (see Special Commands: Graphics) who who is on the system write write to another user construct argument list(s) and execute command XAFES vacc yet another compiler-compiler print command options (see Special Commands: Graphics) **yoo**

SYNOPSES OF COMMANDS

NOTE: Commands that reside in /usr/bin/graf are labelled with "(see Special Commands: Graphics)." To access these commands, first use the graphics command.

300 [+12] [-n] [-dt,l,c]

300s [+12] [-n] [-dt,l,c]

| +12 | print in 12-pitch, 6 lines/inch |
|---------|--|
| -n_ | increments per half-line space (e.g., -2 for 2 increments per half line) |
| -dt.l.c | delay factors: $t = tabs$, $l = length$, $c = character$ |

4014 [-t] [-n] [-cN] [-pL] [file]

| -t | don't wait between pages |
|-----|--|
| -n | print at current cursor position; never erase screen |
| -cN | divide screen into N columns, wait after last column |
| -pL | set page length to L |

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abs (see Special Commands: Graphics)

accept (see Special Commands: LP)

acctcom [-b] [-f] [-h] [-i] [-k] [-m] [-r] [-t] [-v] [-1 line] [-u user] [-g group] [-d nun/dd] [-s time] [-e time]

| - n pattern] [| -H factor [[-O time] [-C time] [file] |
|-----------------------|--|
| -b -f | read backwards, showing latest commands first print the <i>fork/exec</i> flag and system exit status columns in the output |
| - h | show fraction of total available CPU time consumed by process during its execution |
| -i | print columns containing I/O counts in output |
| -k | show total kcore-minutes |
| -m . | show mean core size (the default) |
| -r | show CPU factor (user-time/system-time + user-time) |
| -t | show separate system and user CPU times |
| — v | exclude column headings from the output |
| -1 line | show only dev/line processes |
| -u user | show only processes belonging to user |
| -g group | show only processes belonging to group |
| -d mm/dd | show only processes occurring on the given month and day |
| -s time | show only processes existing on or after time |
| -e time | show only processes existing on or before time |
| -n pattern | show only commands matching <i>pattern</i> that may be a regular expression |
| -H factor | show only processes exceeding factor |
| -O time | show only processes with operating system CPU time that exceeds <i>time</i> |
| −C time | show only processes that exceed <i>time</i> that indicates the total CPU time |
| | |

adb (see Special Commands: ADB)

admin (see Special Commands: SCCS)

af (see Special Commands: Graphics)

ar {d|r|q|t|p|m|x} [v|u|a|i|b|c|1] ... [posname] ... afile name ...

| d | delete named files from archive file |
|---|---|
| r | replace named files in archive file |
| q | quickly append named files to end of archive file |

| t | print table of contents of archive file |
|---------|---|
| р | print named files in archive |
| m | move named files to end of archive |
| x | extract named files |
| v | print long listing of all info about files (verbose) |
| u | replace files with modified dates later than archive files when used with r |
| 8 | new files are to be placed after posname |
| i | new files are to be placed before posname |
| b | new files are to be placed before posname |
| с | suppress normal message produced when afile is created |
| 1 | place temporary files in local directory |
| posname | archive position name |
| afile | name of archive file |
| name | constituent file in archive file |

as [-] [-o objfile] files

treat all undefined symbols as global
 o objfile place output of assembly in objfile

as [-d124] [-o objfile] [name]

| — d | specify number of bytes assembled for offsets (default |
|------------|--|
| | -d4) |
| -o objfile | place output of assembly in <i>objfile</i> |

asa files

Interprets first char. of each line in files as follows:

| blank | single space before printing |
|-------|------------------------------|
| 0 | double space before printing |
| 1 | new page before printing |
| + | overprint previous line |

awk [-Fc] [prog |-f file] [parameters] [files]

| use character c as field separator |
|--|
| set of patterns appears literally as prog |
| set of patterns is contained in file |
| parameters in the form $x = \dots y = \dots$, etc., may be passed to <i>awk</i> |
| |

banner strings

bar (see Special Commands: Graphics)

basename string [suffix]

bc [-c] [-1] [files]

 -c
 compile only

 -1
 use arbitrary precision math library

bdiff file1 file2 [n] [-s]

don't print diagnostics

bel (see Special Commands: Graphics)

bfs [-] name

suppress printing of sizes

bs [file [args]]

bucket (see Special Commands: Graphics)

cal [month] year

calendar [-] consult calendar file in every user's login directory cancel (see Special Commands: LP) cat [-u] [-s] files output not buffered in blocks silence messages about nonexistent files - 5 cb [-s] [-j] [-1 leng] [file] canonical form -5 put together split lines -j split lines that are longer than leng -1 cc [-c] [-p] [-f] [-g] [-dn] [-O] [-S] [-E] [-P] [-C][-Dname = def] [-Uname] [-Idir] [-Bstring] [-t[p012al]] [options] files -c suppress loading prepare object files for profiling - D -1 use floating-point interpreter -g cause compiler to generate info needed for use of sdb (VAX only) -dn this option passed through to as (VAX only) -0 optimize object code -S put assembler code in .s file -E just preprocess -P just preprocess, output to .i file -C don't strip comments -Dname = defdefine name to preprocessor -Uname remove initial definition of name - Idir look for include files in dir also

 -Bstring
 string is prefix for names of substitute compiler passes

 -t[p012al]
 designate substitute compiler passes

 options
 remaining options are either loader options or C-compatible object program names

cd [directory]

cdc (see Special Commands: SCCS)

ceil (see Special Commands: Graphics)

cflow [-r] [-ix] [-i_] [-dnum] files

| -r | show callers of each function |
|-------|---|
| -ix | include external and static names (excluded by default) |
| -i_ | include names that start with a _ (excluded by default) |
| -dnum | cut off graph at depth num (very large by default) |

checkcw (see Text Processing)

checkeq (see Text Processing)

checkmm (see Text Processing)

chgrp group file ...

chmod mode file ... {mode may be symbolic $[ugoa] \{+-=\} \{rwxst\}$

chown owner file

chroot newroot command

clri filesystem i-number ...

cmp [-1] [-s] file1 file2

-1 -s print byte number (decimal) and differing bytes (octal) for each difference

print nothing for differing files; return codes only

col (see Text Processing)

comb (see Special Commands: SCCS)

comm [-[123]] file1 file2

| -1 | don't print lines only in file1 |
|----|---|
| -2 | don't print lines only in file2 |
| -3 | don't print lines common to file1 and file2 |

cor (see Special Commands: Graphics)

cp file1 [file2] ... target

cpio -o [acBv]

| -0 | copy out |
|----|---|
| 8 | reset access times of input files after copied |
| c | write header info in ASCII char. form for portability |
| B | input/output blocked 5120 bytes to the record |
| v | print list of file names (verbose) |

cpio -i [BbcdfmrsStuv6] [filename patterns]

| -i | copy in |
|----|---|
| B | input/output blocked 5120 bytes to the record |
| b | swap both bytes and half-words (use only with $-i$) |
| c | write header info in ASCII char. form for portability |
| d | create directories |
| f | copy in all files except those in patterns |
| m | retain previous file modification time |
| r | interactively rename files |
| t | print table of contents of input |
| 8 | swap bytes (use only with -i option) |
| S | swap half-words (use only with -i option) |
| u | copy unconditionally |
| ۷ | print list of file names (verbose) |
| 6 | process old-format file (i.e., UNIX Sixth Edition) |

cpio -p [adlmruv] directory

| -р | pass copies out and in a single operation |
|----|--|
| 8 | reset access times of input files after copied |
| d | create directories |
| 1 | link files |
| m | retain previous file modification time |
| r | interactively rename files |
| u | copy unconditionally |
| v | print list of file names (verbose) |
| | |

crypt [password]

csplit [-s] [-k] [-f prefix] file arg1 [... argn]

| —s | suppress printing of character counts for each file created |
|------------|---|
| - k | leave created files intact if error occurs |
| -f prefix | name created files prefix00 prefixn |

ct [-h] [-v] [-wn] [-sspeed] telno

| -h | will not hang up current line |
|------------|--|
| — v | send a running narrative to standard error |
| -wn | wait n minutes for a line |
| -s speed | set data rate; speed is expressed in baud |

| -s speed | transmission speed |
|------------|---|
| -1 line | specify line device |
| — h | supports calls to computer systems which expect terminals to be in half-duplex mode |
| -t | dial ASCII terminal set to auto-answer |
| -0 | send odd parity |
| —e | send even parity |
| | |

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```
cut -clist [file1 file2 ...]
```

-clist specify char. positions

| it -flist [-dchar] [-s] [file1 file2 | |
|--------------------------------------|--|
|--------------------------------------|--|

| -flist | list field positions |
|--------|-----------------------------------|
| -dchar | specify field delimiter |
| -s _ | suppress lines with no delimiters |

cvrtopt (see Special Commands: Graphics)

cw (see Text Processing)

cxref [-c] [-t] [-o file] [-s]

| -c | print combined cross-reference of all input files |
|---------|---|
| -t | format listing for 72-column (terminal) width |
| -o file | direct output to named file |
| -s | operate "silently" |

date [MMDDhhmm[yy]] [+format]

dc [file]

cu

dd [option = value] ...

options are:

| if | input file |
|-------|---|
| of | output file |
| ibs | input block size; default: 512 |
| obs | output block size; default: 512 |
| bs | block size |
| cbs | conversion block size |
| skip | skip <i>n</i> input records |
| seek | skip n output records |
| count | copy only <i>n</i> input records |
| conv | ascii, ebcdic, ibm, lcase, ucase, swab, sync, noerror |

delta (see Special Commands: SCCS)

deroff (see Text Processing)

df [-t] [-f] [filesystems]

| -t | report total allocated block figures |
|----|---|
| -f | print actual count of blocks in free list |

diff [-efbh] file1 file2

| -e | output ed script (of a, c, and d commands) to make file2 |
|----|--|
| | from file1 |
| -f | produce -e script in reverse order (not useful with ed) |
| -b | ignore trailing blanks |
| -h | produce fast half-hearted job; no size limits |
| | |

diff3 [-ex3] file1 file2 file3

| —e output ed script to add changes between file2 and j file1 | |
|---|---|
| -x | produce script to incorporate changes flagged ==== |
| -3 | produce script to incorporate changes flagged ====3 |

diffmk (see Text Processing)

dircmp [-d] [-s] dir1 dir2

| -d | compare files with same name in both directories |
|----|--|
| —s | suppress messages about identical files |

dirname string

disable (see Special Commands: LP)

| -c | copy files before returning to user |
|--------------|---|
| -r | remove files after sending |
| -fname | use name to identify files when reporting by mail |
| -iMxxxx,Myyy | xxxx and yyy are GCOS job and bin numbers |
| — m | report completion by mail (default) |
| — n | don't report completion |
| -sn | use GCOS service grade n (default 2) |

dtoc (see Special Commands: Graphics)

du [-ars] [names]

| -a | generate entry for all files under name |
|----|--|
| -r | generate messages for unreadable files/dir |
| -s | print only grand total for each name |

echo [arg] ...

ed (see Special Commands: Editor)

ef [-tfile] [-f[yes|no]] [-m] [-d] [-r] [-ifile] [-hstring] [file]

| -tfile | use file as terminal descriptor file |
|------------|---|
| -f[yes no] | indicate whether file is formatted or unformatted |
| — m | turn on message area on second line of display |
| -d | display rulers within the text |
| -r | display ruler continuously on second line |
| -ifile | read sequence of ef commands from named file |
| -hstring | display string in upper right corner of screen |

efl [-w] [-#] [-C]

| -w | suppress warning messages |
|----|---------------------------|
| -# | suppress comments |
| -C | include comments |

egrep [-v] [-c] [-l] [-n] [-b] [-eexpr] [-ffile] [expr] [files]

| — v | print all lines but those that match |
|------------|--|
| -c | print only count of matching lines |
| -1 | print only names of files with matching lines |
| — n | print matching lines with line numbers |
| -b | print matching lines with disk block numbers |
| -eexpr | same as a simple expr; use when expr starts with a - |
| -ffile | file containing expr |
| expr | regular expression to be searched for |
| | |

enable (see Special Commands: LP)

env [-] [name = value] ... [command args]

ignore inherited environment

eqn (see Text Processing)

erase (see Special Commands: Graphics)

exp (see Special Commands: Graphics)

expr expression operator expression where operator can be:

| where oper | allo dan be. |
|-------------|---|
| / | return the first <i>expression</i> if it is neither null nor 0, otherwise return the second <i>expression</i> |
| \& | return the first <i>expression</i> if neither <i>expression</i> is null or 0, otherwise return 0 |
| = \> \> | >=, \<, \<= . != |
| , , , , , , | compare integer or lexical values |
| +, - | perform addition or subtraction of integer-valued |
| *, /, % | multiply, divide, or find remainder of the integer-valued expressions |
| : | return the number of matched characters between expressions |
| | [-0] [-S] [-o output] [-f] [-g] [-onetrip] [-1] [-I[24s]] [-U] [-u] [-w] [-F] [-m] [-E x] |
| - c | suppress link editing and produce a .o file for each source file |
| — p | prepare object files for profiling |
| -0 | invoke an object-code optimizer |
| -s | compile named programs |
| -o output | name the final output file output instead of a.out |
| -f | load programs with the floating point interpreter |
| -g | generate additional information needed for use of <i>sdb</i> (VAX only) |
| -onetrip | compile DO loops that are performed at least once if reached |
| -1 | same as -onetrip |
| - 66 | suppress extensions for Fortman 66 compatibility |

| ing |
|-----|
| - |
| |
| |
| |
| |
| |
| |
| |
| |

false

f77

fget [-a] [-b] [-ddir] [-iMxxxx,Myyy] [-m] [-n] [-o] [-t] [-sn] [-ucat] files

| -a | files are ASCII (default) |
|--------------|--|
| -b | files are binary |
| -d dir | dir is the UNIX destination directory |
| -iMxxxx,Myyy | xxxx and yyy are GCOS job and bin numbers |
| - m | report forwarding of request to GCOS by mail (default) |
| - n | don't report forwarding of request to GCOS |
| -0 | print GCOS on-line accounting output |
| -t | don't print GCOS on-line accounting output (default) |

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| -sn | use GCOS service grade n (default 1) |
|---|---|
| -ucat | cat is the GCOS catalog name |
| fgrep [-v] [-x] [- | c] [-1] [-n] [-b] [-ffile] [string list] [files] |
| — v p | rint all lines but those that match |
| —х р | rint only lines that match in their entirety |
| | rint only count of matching lines |
| | rint only names of files with matching lines |
| | rint matching lines with line numbers |
| | rint matching lines with disk block numbers |
| | ile containing string list |
| | st of strings to be searched for |
| file [-f] files | and the state of the second state of the second state |
| | arg. is taken to be a file containing the names of to be examined |
| find path-name-list ex | |
| | e of the following primitives, m means more than n, |
| -n means less t | |
| -name filename | true if filename matches current file |
| -perm onum | true if permission flags $= onum$ (octal) |
| -type c | true if file type is b,c,d,f |
| -links n | true if file has n links |
| -user uname | true if file belongs to uname |
| -group gname -size n | true if file belongs to gname true if file is n blocks long |
| -atime n | true if file was accessed in n days |
| - mtime n | true if file has been modified in <i>n</i> days |
| -exec command | |
| -ok command | like -exec but asks |
| -print | true; prints current path name |
| - newer file | true if file was modified before file |
| -ctime n | true if file has been changed in n days |
| -cpio device | write current file on <i>device</i> in <i>cpio</i> format (5,120 byte records) |
| combined with th | he following operators: |
| | x not |
| -a infix | |
| -o infix | |
| () pare | ntheses for grouping; must be escaped with \setminus |
| floor (see Special Co | |
| fsend [-a] [-b] [- [-o] [-t] [-sn] [| c] [-r] [-fname] [-iMxxxx,Myyy] [-m] [-n] -ucat] [-x] files |
| -a | files are ASCII (default) |

| -a | files are ASCII (default) |
|--------------|---|
| -b | files are binary |
| -c | copy files before returning to user |
| -r | remove files after sending |
| -fname | use name to identify files when reporting by mail |
| -iMxxxx,Myyy | xxxx and yyy are GCOS job and bin numbers |
| -m | report completion by mail (default) |
| -n | don't report completion |
| -0 | print GCOS on-line accounting output |
| -t | don't print GCOS on-line accounting output |
| | (default) |
| -sn | use GCOS service grade n (default 1) |
| -ucat | cat is the GCOS catalog name |
| -x | archive files on GCOS |

fsplit [-f] [-r] [-e] [-s] files

| -f | files are 177 (default) |
|----|--|
| -r | files are ratfor |
| —е | files are efl |
| -8 | truncate (77 lines to 72 chars and strin trailing blanks |

gamma (see Special Commands: Graphics)

gas (see Special Commands: Graphics)

gath [-ih] files

| -i | don't interpret control lines |
|----|-------------------------------|
| -h | print output with tabs |

gcat (see Text Processing)

gcosmail [-fname] [-iMxxxx,Myyy] [-m] [-n] [-o] [-t] [-sn] GCOS_user_id...

| -fname | use name to identify files when reporting by mail |
|--------------|---|
| -iMxxxx,Myyy | xxxx and yyy are GCOS job and bin numbers |
| - m | report completion of transmission by mail (default) |
| — n | don't report completion of transmission |
| -0 | print GCOS on-line accounting output |
| -t | don't print GCOS on-line accounting output |
| | (default) |
| -sn | use GCOS service grade n (default 1) |

gd (see Special Commands: Graphics)

ged (see Special Commands: Graphics)

get (see Special Commands: SCCS)

getopt optstring arg...

graph [-a] [-b] [-c] [-g] [-1] [-m] [-s] [-x[1]] [-y[1]] [-h]<math>[-w] [-r] [-u] [-t]

| -a | supply abscissas automatically |
|------------|---|
| -b | break graph after each label in input |
| -c | char. string given by next arg. is default label for each point |
| -g | grid style |
| -1 | label for graph |
| — m | mode (style) of connecting lines |
| -s | save screen |
| -x[] | if I is present, the x axis is logarithmic |
| -y[1] | similarly for the y axis |
| -h | next arg. is fraction of space for height |
| -w | similarly for width |
| -r | next arg. is fraction of space to move right before plotting |
| — u | similarly, to move up before plotting |
| -t | transpose horizontal and vertical axes |

graphics (see Special Commands: Graphics)

greek [-Tterminal]

-Tterminal type of terminal

| grep | [-v] | [-c] | [-] | [-n] | [-b] | [-s] | expression | [files] |
|------|------|------|-----|------|------|------|------------|---------|
|------|------|------|-----|------|------|------|------------|---------|

| — v | print all lines but those that match |
|-----|---|
| -c | print only count of matching lines |
| -1 | print only names of files with matching lines |

-n -b -s expression print matching lines with line numbers print matching lines with disk block numbers suppress error messages about unreadable files regular expression to be searched for

| gtop (see Special Commands: Graphics | Graphics | s: C | ommands | al | Speci | (see | gtop |
|--------------------------------------|----------|------|---------|----|-------|------|------|
|--------------------------------------|----------|------|---------|----|-------|------|------|

gutil (see Special Commands: Graphics)

hardcopy (see Special Commands: Graphics)

help [arg] ...

hilo (see Special Commands: Graphics)

hist (see Special Commands: Graphics)

hp [-e] [-m]

-e -m indicates terminal has display enhancements request minimization of output by removal of blank lines

hpd (see Special Commands: Graphics)

hyphen (see Text Processing)

id

join [-an] [-e s] [-jn m] [-o list] [-tc] file1 file2

| -an | produce line for each unpairable line in file n |
|---------|---|
| -e s | replace empty output fields by string s |
| -jn m | join on mth field of file n |
| -o list | join fields specified in list |
| -tc | use character c as separator (tab character) |

kasb [name] [-o name1] [-d name2]

| name | input file |
|----------|--|
| -o namel | name1 will be the output of the assembler |
| -d name2 | the assembler is to be used in debug mode and name2 is the device file name of microprocessor |

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kill [-signo] processid ...

kunb [name] [-o name1]

| name | input file | | | | | |
|----------|-----------------------------------|--|--|--|--|--|
| -o namel | namel is to contain output listin | | | | | |

label (see Special Commands: Graphics)

ld [-sulxXrdnim] [-o name] [-t name] [-V num] files

| -s | strip output |
|------------|--|
| -u | enter following arg. as undefined in symbol table |
| -1 | abbreviation for a library name |
| -x | enter only external symbols in symbol table |
| -x | save local symbols except those whose names begin with L |
| -r | generate relocation bits in output file |
| -d | force definition of common storage |
| - n | text in output file will be read-only and shared among all users executing the file |
| -i | when output file is executed, the program text and data areas will be kept in separate address spaces |
| - m | print names of all files and archive members used to create the output file |
| -o name | the name arg. after -0 is used as the name of the <i>ld</i> |

lex [-rctvn] [file] ...

| -r | ratfor actions |
|------------|---|
| -c | C actions (default) |
| -t | write lex.yy.c program to standard output |
| — v | generate summary statistics |
| — n | no summary statistics |
| | |

line

lint [-abchnpuvx] files

| <u>-a</u> | suppress complaints about assignments of long values to variables that are not long |
|------------|--|
| -b | suppress report break statements that cannot be reached |
| -c | suppress complaints about casts which have questionable portability |
| — h | do not apply number of heuristic tests to attempt to intuit bugs, improve style, and reduce waste |
| — n | do not check compatibility against standard or portable lint library |
| -р | attempt to check portability to IBM and GCOS dialects of C |
| — u | suppress complaints about functions and variables used and not defined, or defined and not used |
| <u> </u> | suppress complaints about unused arguments in functions |
| -x | do not report variables referred to by external declarations, but never used |
| | |

list (see Special Commands: Graphics)

In file1 [file2 ...] target

log (see Special Commands: Graphics)

logname

lorder files

lp (see Special Commands: LP)

Ipadmin (see Special Commands: LP)

Ipmove (see Special Commands: LP)

lpr [-c] [-r] [-m] [-n] [name ...]

| -c | make copy of file to be sent before returning to user |
|------------|---|
| -r | remove file after sending it |
| - m | report completion of printing by mail |

-n do not report completion of printing by mail (default)

lpsched (see Special Commands: LP)

lpshut (see Special Commands: LP)

lpstat (see Special Commands: LP)

Ireg (see Special Commands: Graphics)

| Is | - | logtasd | rucifp | name | | | |
|----|---|---------|--------|------|--|--|--|
|----|---|---------|--------|------|--|--|--|

| -1 | list in long format |
|----|--|
| -0 | same as -1 except group is not printed |
| -g | same as -1 except that owner is not printed |
| -t | sort by last time modified |
| -8 | list all entries |
| -5 | give size in blocks |
| -d | list directory name, not its contents |
| -r | list in reverse order |
| -u | use time of last access |
| -c | use time of last modification to inode |
| -i | print i-number in first column of report for each file listed |
| -f | interpret all arguments as directories |
| -р | put a slash after the file name if that file is a directory |
| | |

m4 [-e] [-s] [-Bint] [-Hint] [-Sint] [-Tint] [files]

| -e | operate interactively |
|-------|--|
| -s | enable line sync output for C preprocessor |
| -Bint | change size of push-back and arg. collection buffers |
| -Hint | change size of symbol table hash array |
| -Sint | change size of call stack |
| -Tint | change size of token buffer |

mail persons

mail [-erpq] [-f file]

| -e | do not print mail |
|--------|---|
| -r | print by first-in, first-out order |
| -p | print without prompting for disposition |
| -q | terminate after interrupts |
| -ffile | use file (e.g., mbox) instead of default mailfile |

make [-f makefile] [-p] [-i] [-k] [-s] [-r] [-n] [-b] [-e] [-m] [-t] [-d] [-q] [names]

| -f makefile | specify makefile name |
|-------------|---|
| -p | print macro definitions and target descriptions |
| -i | ignore returning error codes |
| -k | abandon work on current entry; continue unrelated entries |
| -s | suppress printing of executed lines |
| -r | do not use built-in rules |
| -n | print without execution |
| -b | compatibility mode for old makefiles |
| -e | environment variables override assignments within makefiles |
| - m | print memory map |
| -t | touch target files |
| — d | debug mode |
| -q | question |

man (see Text Processing)

mean (see Special Commands: Graphics)

mesg [n] [y]

| n | inhibit messages | | |
|---|--------------------------|--|--|
| у | allow messages (default) | | |

mkdir dirname ...

mm (see Text Processing)

mmt (see Text Processing)

mod (see Special Commands: Graphics)

mv file1 [file2 ...] target

mvt (see Text Processing)

neqn (see Text Processing)

newform [-s] [-itabspec] [-otabspec] [-bn] [-en] [-pn] [-an] [-f] [-cchar] [-ln] [files]

| -s | shear off chars. up to first tab and append 1-8 (max.) to |
|-----------|---|
| | end of line |
| -itabspec | input tab specification |
| -otabspec | output tab specification |
| -bn | truncate n chars. from beginning of line |
| -en | truncate n chars. from end of line |
| -pn | prepend n chars. to beginning of line |
| -an | append n chars. to end of line |
| -f | write tab specification line on standard output first |
| -ck | change prepend/append char. to k |
| -ln | set effective line length to n chars. |
| | |

newgrp [-] [group]

change to the environment user gets on login

news [-a] [-n] [-s] [items]

| - <u>a</u> | print all items, regardless of age |
|------------|-------------------------------------|
| -n | report names of current items only |
| -s | report how many current items exist |

net system [command[args]]

nice [-increment] command [args]

nl [-htype] [-btype] [-ftype] [-vstart#] [-lincr] [-p] [-lnum] [-ssep] [-wwidth] [-nformat] [-ddelim] file

| -btype spe -ftype spe -vstart# ini -p do -lnum nu -ssep sec -wwidth wid -nformat lin -dxx ch: | cify which logical page headers are to be numbered cify which logical page body lines are to be numbered cify which logical page footers are to be numbered that value used to number logical page lines rement value used to number logical page lines not restart numbering at logical page delimiters mber of blank lines to be considered as one marate line number and corresponding text line th is number of chars. to be used for line number e numbering format anges page delimiters from default to user specified tracters |
|---|---|
|---|---|

nm [-gnoprsu] [files]

| -g | print only global (external) symbols |
|-----|---|
| — n | sort numerically |
| -0 | prepend file or archive element name to each output line rather than only once |
| -p | don't sort; print in symbol-table order |
| -r | sort in reverse order |
| -s | sort according to size of external symbol |
| —u | print only undefined symbols |
| | |

nohup command [args]

nroff (see Text Processing)

nusend -d dest [-a acct] [-m] [-e] [-s] [-c] [-u destuser] [[-f destfile] srcfile] [-1cmd [cmdfile]] ...

| -d dest | destination |
|------------|--|
| -a acct | account number |
| — m | report by mail when file transfer is complete |
| —е | report by mail only when an error occurred during |
| | transfer |
| -s | silent |
| -c | сору |
| - u | use destination user's login name for all succeeding files |
| -f | use destination file name for succeeding file |
| -lcmd | cmd is sent to remote machine for execution |

od [-bcdosx] [file] [[+]offset[.] [b]]

| -b | interpret bytes in octal |
|----|--|
| -c | interpret bytes in ASCII |
| -d | interpret words in unsigned decimal |
| -0 | interpret words in octal |
| -s | interpret 16-bit words in signed decimal |
| -x | interpret words in hex |

osdd (see Text Processing)

pack [-] name ...

print number of times each byte used, its relative frequency, and code for the byte

pair (see Special Commands: Graphics)

passwd name

paste [-s] [-d list] files

| — <u>s</u> | merge subsequent lines rather than one from each input |
|------------|--|
| | file |
| -d list | replace the tab char. by one or more alternate chars. |

pcat name ...

pcc (see cc above)

pd (see Special Commands: Graphics)

pie (see Special Commands: Graphics)

plot (see Special Commands: Graphics)

point (see Special Commands: Graphics)

power (see Special Commands: Graphics)

| pr $[+n]$ | [-n] [-a] [| -m] [-d] [- | -ecn] [-icn] | [-ncn] [-1 | wn] [-on] |
|-----------|-------------|--------------|--------------|------------|-----------|
| [-ln] | [-h hdr] [- | p] [-f] [-r] | [-t] [-sc] | [files] | |

| +n | begin printing at page n |
|--------|---|
| -n | produce n-column output |
| -a | print multicolumn output across the page |
| - m | merge and print all files simultaneously |
| -d | double-space the output |
| -ecn | expand input tabs to char. positions |
| -icn | insert output tabs for white space to char. positions |
| -ncn | provide n-digit line numbering (default for n is 5) |
| -wn | set width of line to n char. positions |
| -on | offset each line by n char. positions (default is 0) |
| -ln | set length of page to n lines |
| -h hdr | print hdr instead of file name |

| p f r t sc | pause before printing each page use form-feed char. for new pages print no diagnostic reports upon failure to open files do not print header or trailer separate columns by single char. c instead of by |
|--|--|
| | appropriate number of spaces |
| orime (see Spec | cial Commands: Graphics) |
| orod (see Specie | al Commands: Graphics) |
| orof [-v] [-a] | [-1] [-low [-high]] [file] |
| — v | suppress printing and produce graphic version of profile on standard output for display by the <i>tplot</i> filters |
| -a -1 | report all symbols, not just externals list output by symbol value |
| ors (see Special | Commands: SCCS) |
| os [-adefl] [-o wapdev] [-t tlist] [-u | c corefile] [-g glist] [-n namelist] [-p plist] [-s |
| -a | print data on all processes, except process group leaders and processes not associated with a terminal |
| — d | print information about all processes except process group leaders |
| -e | print information about all processes |
| -f | generate a full listing |
| -1 | generate long listing |
| -c corefile | use the file corefile in place of /dev/mem |
| -g glist | restrict listing to data about processes whose process groups are in glist |
| -n namelis | t alternate namelist (/unix is the default) |
| - p plist | restrict listing to data about processes whose process ID numbers are given in <i>plist</i> |
| -s swapdev | |
| -t tlist | restrict listing to data about processes associated with terminals given in <i>tlist</i> |
| — u ulist | restrict listing to data about processes whose user ID numbers are given in <i>ulist</i> |
| ton Ican Englis | (Commands: Graphics) |

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ptog (see Special Commands: Graphics)

ptx (see Text Processing)

pwd

F

P P S

quit (see Special Commands: Graphics)

qsort (see Special Commands: Graphics)

rand (see Special Commands: Graphics)

rank (see Special Commands: Graphics)

ratfor [-C] [-h] [-6x]

| -C | copy comments |
|-----|--|
| — h | convert quoted strings to 27H convention |
| -6x | use x as continuation character |

red [-] [-x] [file]

-x

suppress printing of informational messages handle encrypted file

regcmp [-] files

place output in file.c

reject (see Special Commands: LP)

remcom (see Special Commands: Graphics)

rjestat [host] ... [-shost] [-chost cmd] ...

| host | print status of line to host |
|------------|---|
| -shost | after all arguments are processed, start interactive status console to host |
| -chost cmd | interpret cmd as if entered in status console mode to host |

rm [-fri] files

| $-\mathbf{f}$ | do not ask about mode |
|---------------|----------------------------------|
| -r | delete directory recursively |
| -i | asks whether to delete each file |

rmail persons

rmdel (see Special Commands: SCCS)

rmdir dir

root (see Special Commands: Graphics)

round (see Special Commands: Graphics)

rsh [flags] [name [arg1 ...]]

sact files

scc [+[lib]] [option] ... [file] ...

sccsdiff (see Special Commands: SCCS)

sdb (see Special Commands: SDB)

sdiff [-w n] [-1] [-s] [-o output] file1 file2

| $-\mathbf{w} n$ | char. width of output line |
|-----------------|---|
| -1 | only print left side of any identical lines |
| —s | do not print identical lines |
| -o output | place result in file output |

sed [-n] [-e script] [-f sfile] [files]

| — n | suppress default output | | |
|------------|-----------------------------------|--|--|
| -e script | script to be applied to each line | | |
| -f sfile | take script from file sfile | | |

send arg

sh (see Special Commands: Shell)

siline (see Special Commands: Graphics)

sin (see Special Commands: Graphics)

size [object ...]

sleep time

sno [files]

| ort [-cmubdf | inrtx] [+pos1 [-pos2]] [-o output] [names] |
|--------------|---|
| -c | just check order, don't sort |
| — m | merge only |
| — u | suppress all but one in sets of equal lines |
| —b | ignore leading blanks (spaces and tabs) |
| — d | arrange in dictionary order |
| -f | fold upper-case letters onto lower case |
| -i | ignore chars. outside ASCII range 040-0176 in non- numeric comparisons |
| — n | sort by numerical value |
| -r | reverse sense of comparisons |
| -tx | "tab character" separating fields is x |
| -o name | place output in file name |

spell (see Text Processing)

/usr/lib/spell/spellin (see Text Processing)

/usr/lib/spell/spellout (see Text Processing)

spline (see Special Commands: Graphics)

split [-n] [file [name]]

-n split file into n-line pieces

stat (see Special Commands: Graphics)

strip name ...

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stty (see Special Commands: STTY)

su [-] [name [arg ...]]

change environment to one that would be expected if user actually logged in again

subset (see Special Commands: Graphics)

sum [-r] file -r

use alternate algorithm in computing checksum

tabs [tabspec] [+mn] [-Ttype]

| +mn | margin | | |
|--------|---------------|--|--|
| -Ttype | terminal type | | |

tail $[\pm [number][lbc] [-f] [file]$

| ±nl | n lines from start or end of file |
|-----|--|
| ±nb | n blocks from start or end of file |
| ±nc | n characters from start or end of file |
| -f | monitor growth of file |

tar [key] [names]

key is a string containing at most one function and optionally several modifiers; functions are:

| r | write files on end of tape |
|---------|-----------------------------|
| x | extract from tape |
| t | list |
| u | update |
| c | create new tape (implies r) |
| modifie | rs arc: |

| 0,,7 | tape drive | | |
|------|------------|--|--|
| v | verbose | | |

w f b wait for user response use next argument as tape use next argument as blocking factor complain on unresolved links

tbl (see Text Processing)

tc (see Text Processing)

td (see Special Commands: Graphics)

tee [-i] [-a] [file] ...

-i ignore interrupts -a append output to files, do not overwrite

tekset (see Special Commands: Graphics)

test expr [expr]

where expr can be:

| -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 |
| -p file | truc if file exists and is a named pipe |
| -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 open file whose file descriptor number is fildes is |
| | associated with a terminal device |
| -z sl | true if length of string sl is zero |
| -n sl | true if length of string sl is non-zero |
| s1 = s2 | true if strings sl and s2 are identical |
| s1 = s2 | true if strings sl and s2 are not identical |
| sl | true if sl is not the null string |
| n1 -eq n2 | true if the integers nl and n2 are algebraically equal |
| | (similarly with -ne, -gt, -ge, -lt and -le) |
| h. | any high with the following assurtant |

expr may be combined with the following operators:

| 1 | unary negation operator | |
|----------|--------------------------|--|
| -a | binary and operator | |
| -0 | binary or operator | |
| (expr) | parentheses for grouping | |

time command

timex command

title (see Special Commands: Graphics)

total (see Special Commands: Graphics)

touch [-amc] [MMDDhhmm[yy]] files

| - <u>a</u> | update access times |
|------------|---|
| - m | update modification times |
| -c | do not create file if it did not previously exist |

tplot [-Tterminal [-e raster]]

known terminals are:

| | 24 |
|--|---|
| DASI 300 DASI 300s DASI 450 Tektronix 4014 Versatec D1200A | × |
| send scan-converted file raster to plotter | |
| ng1 [string2]] | |
| complement <i>string1</i> chars. with ASCII codes 001-377 delete all input chars. in <i>string1</i> make repeated chars. on <i>string2</i> one character | |
| Processing) | |
| | |
| | |
| | |
| al Commands: Graphics) | |
| | |
| inhibit printing but allow exit code | |
| | |
| -n] [-r] [-v] [-m] [-a] | |
| print the system name print the <i>uucp</i> node name print the current release of the system print the current version of the system print machine hardware name print all of the above information | |
| cial Commands: SCCS) | |
| n] [-n]] [input [output]] | |
| output just the lines not repeated in original file write one copy of repeated lines output count with each line ignore first n chars. in each line ignore first n fields in each line | |
| | |
| | |
|] [-c] [-C] [-m] [nuser] [-esys] source-file | |
| make necessary directories for file copy do not make intermediate directories for file copy use source file when copying out rather than copying fi to spool directory copy source file to spool directory send mail to requester when copy is complete notify user on remote system that file was sent send uucp command to system sys | ile |
| | DASI 300s DASI 450 Tektronix 4014 Versatec D1200A send scan-converted file raster to plotter ngl [string2]] complement string1 chars. with ASCII codes 001-377 delete all input chars. in string1 make repeated chars. on string2 one character Processing) al Commands: Graphics) inhibit printing but allow exit code -n] [-r] [-v] [-m] [-n] print the system name print the system name print the current release of the system print the current release of the system print machine hardware name print all of the above information clal Commands: SCCS) n] [-n]] [input [output]] output just the lines not repeated in original file write one copy of repeated lines output count with each line ignore first n chars. in each line ignore first n fields in each line ignore first n fields in each line ignore first n fields in each line ignore file when copying out rather than copying for to spool directory copy source file to spool directory send mail to requester when copy is complete notify user on remote system that file was sent |

uulog [-ssys] [-uuser] ...

| -ssys | print data about work involving system sys |
|---------|---|
| - uuser | print data about work done for specified user |

uuname

uupick [-ssystem]

-ssystem search PUBDIR for files sent from system

uustat [-mmch] [-kjobn] [-chour] [-uuser] [-ssys] [-ohour] [-yhour] [-jall] [-v]

| report status of accessibility of machine mch |
|---|
| kill uucp request whose job number is jobn |
| remove status entries which are older than hour hours |
| report status of all uucp requests issued by user |
| report status of uucp requests which communicate with |
| sys |
| report status of all <i>uucp</i> requests which are older than <i>hour</i> hours |
| report status of all <i>uucp</i> requests younger than <i>how</i> hour report status of all <i>uucp</i> requests |
| report uucp status verbosely |
| |

uuto [-p] [-m]

p copy source file into spool directory before transmission
 m send mail to sender when copy is complete

uux [-] command-string

val (see Special Commands: SCCS)

var (see Special Commands: Graphics)

vc [-a] [-t] [-cchar] [-s] [keyword = value ... keyword = value]

| -a | replace keyword in all text lines | |
|--------|--|--|
| -t | ignore all chars. from beginning of line up to and | |
| | including first tab char. | |
| -cchar | control char. in place of : | |
| -s | silence warning messages | |

vpr (see Text Processing)

vtoc (see Special Commands: Graphics)

wait

wc [-lwc] [names]

| - | 1 | number | of | lines |
|---|---|--------|----|--------|
| - | w | number | of | words |
| - | c | number | of | chars. |

what (see Special Commands: SCCS)

whatis (see Special Commands: Graphics)

who [who-file] [am i]

write user [tty]

xargs [flags] [command [initial-args]]

yacc [-vd] grammar

-vprepare y.output file-dgenerate y.tab.h file

yoo (see Special Commands: Graphics)

SPECIAL COMMANDS

SHELL

sh [-ceiknrstuvx] [args]

| e | if non-interactive, exit if command fails |
|---------|--|
| i | shell is interactive |
| k | place all keyword args. in environment for a command |
| n | read commands but do not execute them |
| r | shell is restricted |
| S | read commands from standard input |
| t | exit after reading and executing one command |
| u | treat unset variables as error when substituting |
| v | print shell input lines as they are read |
| x | print commands and args. when executed |
| cstring | read commands from string |

Special Characters

I

F

P

| or ^ | pipe |
|--|--|
| 1 | command separator |
| & | return without waiting for preceding command to finish |
| <u>&&</u> | only execute following command if previous command returned 0 exit value (logical "and") |
| Ш | only execute following command if previous command returned non-zero exit value (logical "or") |
| · · · | take enclosed characters literally |
| *···* | literal except for command and parameter substitution |
| | in-line command execution |
| 1 | escapes special meaning of following character |
| put-Output | |
| [d]< | use next argument as standard input with file descriptor d; default 0 |
| [d]> | use next argument as standard output with file descriptor d; default 1 |
| [d] >> | same as > but append to file if it exists |
| [d]<&digit | duplicate input file desc. d from digit (standard input if omitted) |
| [d]>&digit | duplicate output file desc. d from digit (standard output if omitted) |
| [d] <&- | close standard input |
| [d] > & - | close standard output |
| [d]< <arg< th=""><th>use as standard shell input up to a line that contains only arg</th></arg<> | use as standard shell input up to a line that contains only arg |
| [d]<<\arg | same as above, but do not perform any parameter substitution on that input |
| $[d] << -[\backslash]arg$ | same as above, but strip leading tabs from that input |
| ile Name Generation | |
| ? | match single character |
| | match any string of characters (including null) |
| [] | match a class of characters; a pair of characters separated by a - matches |
| | all characters lexically between the pair |
| [1] | match all characters not enclosed |
| arameter Substitution | |
| \$n | replace n with positional parameter n ($n < 10$) |
| S+ | \$1 \$2 |
| \$@ | \$1 \$2 |
| "\$ * " | "\$1 \$2" |

\$1 \$2 ... "\$1 \$2 ..."

\$# 5-\$? 22 \$1 name = value \${parm} \${parm: - word }
\${parm: = word } S{parm: ? word }

"S@"

\${parm: + word }

\$HOME

SPATH SCDPATH SMAIL SPS1 SPS2 SIFS STERM

Control Commands

(list)

{ list; }

break [n] continue [n]

exit [n]

#

. file

break [n]

exit [n]

shift[n]

test

times

options supplied on invocation or by the set command exit value returned by last command process number of this shell process number of last background command set variable braces delimit shell variable name use parm if set and non-null; otherwise word if parm not set or null, set it to word and use it use parm if set and non-null; otherwise print word and exit use word if parm is set and non-null; otherwise nothing default argument for cd; defaults to login directory search path for commands search path for cd mail file primary prompt string; default \$ secondary prompt string; default >

number of positional parameters

"\$1" "\$2" ...

field separators; default are blank, tab, new-line terminal type (see term(7))

for name [in word ...] do list done case word in [pat1 [| pat2] ...) list ;;] ... esac if list then list [elif list then list] ... [else list] fi while list do list done until list do list done execute list in a subshell list is simply executed exit from for or while n levels do next iteration of n-th for or while exit with return value n null command start of comment **Special Commands** read and execute commands from file as if in-line

exit from enclosing for or while loop cd [arg ...] continue [n] change current directory to arg resume next iteration of enclosing for or while loop eval [arg ...] arg ... is evaluated and executed exec [arg ...] execute arg cause shell to exit with status specified by n export [name ...] export name to environment of commands read standard input and assign to name read name ... readonly [name ...] mark name read-only set -ek ... [args] set flags (see sh); positional parameters are set from args unset flags (see sh); positional parameters are set from args set +ek ... [args] rename positional parameters; $1 = n+1 \dots$; default n = 1evaluate conditional expressions print accumulated process times trap [arg] [n] execute arg if signal n is received ulimit [n] change the file size limit to n file creation rwx permissions mask is one's umask [000] complement of octal ooo

wait [pid]

wait for process pid; if no pid, all children

EDITOR

ed [-] [-x] [file]

suppress printing of informational messages all files are encrypted

Regular Expressions (re)

\c [str]

C

 $\begin{bmatrix} str \end{bmatrix}$ re* $re \{m,n\}$ $\langle re \rangle$ $\langle n$ \$

string of re's null-re &

Addresses

S n r /re / ?re ? $addr \pm n$ $\pm [n]$ addr \pm Commands (.)a (.,.)c (. .)d e [filename] E [filename] f [filename] (1,\$)g/re/commands (1,\$)G/re/commands h H (.)i (.,.+1)j (.)kx (.,.)| (.,.)**m**a (. , .)**n** . , .)p (P q 0 (\$)r[filename] (.,.)s/re /repl / . , .)s/re /repl /g ((.,.)ta (. .)u (1,\$) v/re /commands (1,\$)V/re /commands (1,\$)w [filename] X (\$) =**!UNIX** command (.+1)new-line

the character c the character c (when c requires escaping) any character except new-line any one of the characters in str; a-b means all characters lexically between a and b any character except those in str or a new-line zero or more occurrences of the one-char re m to n (incl.) occurrences of one-char re re (see next line for usage) *n*-th *re* enclosed in $\langle \ldots \rangle$ beginning of line end of line concatenation of re's last re encountered place matched string in replacement same as last replacement current line last line n-th line line marked with name xfirst line searching forward containing re first line searching backward containing re addr + (or -) n. + (or -) n; default 1addr + (or · -) 1 append change delete edit unconditional edit; no diagnostics remembered name global interactive global explain briefly the most recent ? diag. print brief explanations for all ? diags. insert join mark addressed line with xlist (displays control chars.) move (after a) print with line numbers print toggle prompting quit quit immediately; no diagnostics read substitute substitute globally move copy (after a) undo previous substitution like g, but process lines that don't match like G, but process lines that don't match write encrypt line number execute command print next line

SCCS

 $\begin{array}{l} admin \ [-n] \ [-i[name]] \ [-rrel] \ [-t[name]] \ [-fflag [val]] \ [-dflag [val]] \ [-dflag [val]] \ [-alogin] \ [-elogin] \ [-m[mrlist]] \ [-y[comment]] \ [-h] \ [-z] \ files \end{array}$

| - n | create new SCCS file |
|---|---|
| - i(name) | source file for new SCCS file |
| - rrel | release of initial delta |
| - t[name] | file containing descriptive text |
| - fflag[val] | set flag, flag value |
| - dflag[val] | remove flag and its value |
| - alogin | add login name or group ID allowed to make deltas |
| - elogin | erase login name or group ID no longer allowed to |
| - m[mrlist] - y[comment] - h - z | make deltas MR numbers authorizing file creation comment for the initial delta check for file corruption file check-sum recomputed and stored |

cdc [-rSID] [-m[mrlist]] [-y[comment]] files

| -rSID | SCCS ID of delta to be changed |
|------------------------------|--------------------------------|
| - m [<i>mrlist</i>] | add (MR#) or delete (!MR#) |
| -y[comment] | add new delta comment |

comb [-o] [-s] [-pSID] [-clist] files

| -0 | access reconstructed file at release of delta to be created |
|--------|---|
| -s | produce report of file name, size after combining, |
| - 010 | original size |
| - pSID | SCCS ID string of oldest delta to be preserved |
| -clist | list of deltas to be preserved |

delta [-rSID] [-s] [-n] [-glist] [-m[mrlist]] [-y[comment]] [-p]
files

| -rSID | identify which delta to be made to SCCS file |
|-------------|---|
| -s | suppress informational messages |
| -n | specifies retention of edited g-file |
| -glist | specify list of deltas to be ignored |
| -m[mrlist] | indicate MR number |
| -y[comment] | arbitrary text describing reason for making delta |
| -p | print SCCS file differences before and after delta is |
| | applied in a <i>diff</i> format |

get [-rSID] [-ccutoff] [-ilist] [-xlist] [-aseq no.] [-k] [-e] [-l[p]] [-p] [-m] [-n] [-s] [-b] [-g] [-t] files (see Identification Keywords below)

| -rSID -ccutoff | SCCS ID string of delta to be retrieved cutoff date-time |
|--------------------|---|
| - ilist - xlist | list of deltas to be included in creation of generated file list of deltas to be excluded in the creation of generated file |
| —aseq no. —k | delta sequence number of SCCS file delta to be retrieved suppress replacement of identification keywords in retrieved text by their value |
| -e | allow change to SCCS file via a subsequent use of delta |
| -l[p] | delta summary written into an <i>l-file</i> |
| -р | write retrieved text from SCCS file written on standard output |
| — m | each text line retrieved from SCCS file preceded by SID of the delta that inserted the text line in the SCCS file |
| -n | precede each generated text line with %M% identification keyword value |
| -s | suppress all output normally written on the standard output |
| -b | used with $-e$ key-letter to indicate that new delta should have an SID in a new branch |

| -g -t | suppress actual retrieval of text from SCCS file access most recently created ("top") delta in a given release, or release and level |
|-------------------------------------|---|
| prs [-d[dataspe | [c]] [-r[SID]] [-e] [-1] [-a] files |
| -d dataspec | specify output data specification (see Data Keywords |
| -r[<i>SID</i>] -e | below) SCCS ID of delta for which data is desired print data for deltas created <i>earlier</i> than and including the delta designated via -r key-letter |
| -1 -a | request data for all deltas created <i>later</i> than and including delta designated via the -r key-letter print data for both removed and existing deltas |
| rmdel -rSID na | me |
| sact files | |
| sccsdiff -rSID | -rSID2 [-p] [-sn] files |
| -rSID[12] -p -sn | SID1 and SID2 specify deltas that are to be compared pipe output through pr segment size that bdiff will pass to diff |
| unget [-rSID] | [-s] [-n] files |
| — r <i>SID</i> — s — n | identify which delta is no longer intended suppress printout of intended delta's <i>SID</i> retain gotten file |
| val - | |
| val [-s] [-rSII | D] [-mname] [-ytype] files |
| – s – rSID – mname – ytype | silence diagnostic message check whether specified <i>SID</i> is in file <i>name</i> is compared with SCCS %M% keyword in <i>file</i> <i>type</i> is compared with SCCS %Y% keyword in <i>file</i> |
| what files | |
| Identification K | eywords (Reference: get) |
| | |
| Keyword in text | Value substituted by get |
| %M% | module name |
| %I% %R% | %R%.%L%.%B%.%S% release |
| %L% | level |
| % B % | branch |
| %S% | sequence |
| %D% | current date (YY/MM/DD) |
| %H% %T% | current date (MM/DD/YY) current time (HH:MM:SS) |
| %E% | date newest applied delta was created (YY/MM/DD) |
| %G% | date newest applied delta was created (MM/DD/YY) |
| %U% | time newest applied delta was created (HH:MM:SS) |
| %¥% | module type: value of the t flag in the SCCS file |
| %F% | SCCS file name |
| %P% | fully qualified SCCS file name |
| %Q% %C% | value of the q flag in the file current line number |
| %€% %Z% | 4 characters $(@(#))$ used to construct strings recognizable by what |
| %W% | %Z%%M% <horizontal-tab>%I%</horizontal-tab> |
| % A % | %Z%%Y% %M% %I%%Z% |
| | |

Data Keywords (Reference: prs)

k

| Keyword in <i>dataspec</i> | Value substituted by prs |
|-------------------------------|-----------------------------------|
| :Dt: | :DT: :l: :D: :T: :P: :DS: :DP: |
| :DL: | :Li:/:Ld:/:Lu: |
| :Li: | lines inserted by delta |
| :Ld: | lines deleted by delta |
| :Lu: | lines unchanged by delta |
| :DT: | delta type |
| :1: | :R:::L:::B:::S: |
| :R: | release number |
| :K: :L: | level number |
| :D: :B: | branch number |
| | |
| :S: | sequence number |
| :D: | :Dy:/:Dm:/:Dd: |
| :Dy: | year delta created |
| :Dm: | month delta created |
| :Dd: | day delta created |
| :T: | :Th:::Tm:::Ts: |
| :Th: | hour delta created |
| :Tm: | minutes delta created |
| :Ts: | seconds delta created |
| :P: | programmer who created delta |
| :DS: | delta sequence number |
| :DP: | predecessor delta sequence number |
| :DI: | :Dn:/:Dx:/:Dg: |
| :Dn: | deltas included (sequence number) |
| :Dx: | deltas excluded (sequence number) |
| :Dg: | deltas ignored (sequence number) |
| :MR: | MR numbers for delta |
| :C: | comments for delta |
| :UN: | user names |
| :FL: | flag list |
| :Y: | module-type flag |
| :MF: | MR validation flag |
| :MP: | MR validation pgm name |
| :KF: | keyword err/warn flag |
| :BF: | branch flag |
| :J: | joint edit flag |
| :LK: | locked releases |
| :Q: | user defined keyword |
| :M: | module name |
| :FB: | floor boundary |
| :CB: | ceiling boundary |
| :Ds: | default SID |
| :ND: | null delta flag |
| :FD: | file descriptive text |
| :BD: | body |
| :GB: | gotten body |
| :W: | what string: :Z::M: \t:I: |
| :A: | what string: :Z::Y: :M: :I::Z: |
| :Z: | what string delimiter: @(#) |
| :F: | SCCS file name |
| :PN: | SCCS file path name |
| | |
| | |
STTY

stty [-a] [-g] [options]

—a —g report all of the option settings report current settings in form that can be used as an argument to another stty command

Control Modes

| parenb (-parenb) | enable (disable) parity generation and detection |
|-------------------|--|
| parodd (-parodd) | select odd (even) parity |
| cs5 cs6 cs7 cs8 | select character size (see tty(4)) |
| 0 | hang up phone line immediately |
| 50 75 110 134 150 | 200 300 600 1200 1800 2400 4800 9600 exta extb set terminal baud rate to number given |
| hupel (-hupel) | hang up (do not hang up) DATA-PHONE® connection on last close |
| hup (-hup) | same as hupel (-hupel) |
| cstopb (-cstopb) | use two (one) stop bits per character |
| cread (-cread) | enable (disable) the receiver |
| clocal (-clocal) | assume a line without (with) modem control |
| | |

Input Modes

| ignbrk (-ignbrk) brkint (-brkint) ignpar (-ignpar) | ignore (do not ignore) break on input signal (do not signal) INTR on break ignore (do not ignore) parity errors) mark (do not mark) parity errors (see <i>tty</i> (4)) |
|--|--|
| | |
| inpck (-inpck) | enable (disable) input parity checking |
| istrip (-istrip) | strip (do not strip) input characters to seven bits |
| inler (-inler) | map (do not map) new-lines (NL) to carriage returns (CR) on input |
| igner (-igner) | ignore (do not ignore) CR on input |
| icrnl (-icrnl) | map (do not map) CR to NL on input |
| iucle (-iucle) | map (do not map) upper-case alphabetics to lower case on input |
| ixon (-ixon) | enable (disable) START/STOP output control. |
| | Output is stopped by sending an ASCII DC3 and started by sending an ASCII DC1 |
| ixany (-ixany) | allow any character (only DC1) to restart output |
| ixoff (-ixoff) | request that the system send (not send) |
| , | START/STOP characters when the input queue is nearly empty/full |
| | |

Output Modes

| opost (-opost) | post-process output (do not post-process output; ignore all other output modes) |
|---------------------|--|
| olcuc (-olcuc) | map (do not map) lower-case alphabetics to upper case on output |
| onler (-onler) | map (do not map) NL to CR-NL on output |
| ocrnl (-ocrnl) | map (do not map) CR to NL on output |
| onocr (-onocr) | do not (do) output CRs at column zero |
| oniret (-oniret) | on the terminal NL performs (does not perform) |
| | the CR function |
| ofill (-ofill) | use fill characters (use timing) for delays |
| ofdel (-ofdel) | fill characters are DELs (NULs) |
| cr0 cr1 cr2 cr3 | select style of delay for carriage returns (see tty(4)) |
| nl0 nl1 | select style of delay for line-feeds (see tty(4)) |
| tab0 tab1 tab2 tab3 | select style of delay for horizontal tabs (see $tty(4)$) |
| bs0 bs1 | select style of delay for backspaces (see tty(4)) |
| ff0 ff1 | select style of delay for form-feeds (see tty(4)) |
| vt0 vt1 | select style of delay for vertical tabs (see $tty(4)$) |

Local Modes

| isig (-isig) | |
|--------------|--|
|--------------|--|

icanon (-icanon)

processing)

xcase (-xcase)

echo (-echo) echoe (-echoe)

canonical (unprocessed) upper/lower-case presentation echo back (do not echo back) every character typed echo (do not echo) ERASE character as a backspace-space-backspace string. Note: this mode will erase the ERASEed character on many CRT terminals; however, it does not keep track of column position and, as a result, may be confusing on escaped characters, tabs, and backspaces. echo (do not echo) NL after KILL character the same as echok (-echok); obsolete echo (do not echo) NL disable (enable) flush after INTR or QUIT

enable (disable) the checking of characters against the special control characters INTR and QUIT

enable (disable) canonical input (ERASE and KILL

echok (-echok) lfkc (-lfkc) echonl (-echonl) noflsh (-noflsh)

Control Assignments

| control | -ch | ara | icter | C |
|---------|-----|-----|-------|---|
|---------|-----|-----|-------|---|

set control-character to c, where control-character is erase, kill, intr, quit, cof, col, min, or time (min and time are used with -icanon; see tty(4)). If c is preceded by an (escaped from the shell) caret interpreted as DEL and $^{-}$ is interpreted set line discipline to i (0 < i < 127)

line i

Combination Modes

| evenp or parity | enable parenb and cs7 |
|--------------------|---|
| oddp | enable parenb, cs7, and parodd |
| -parity, -evenp, | or -oddp |
| | disable parenb, and set cs8 |
| raw (-raw or cool | ked) |
| | enable (disable) raw input and output (no ERASE, |
| | KILL, INTR, OUIT, EOT, or output post processing) |
| nl (-nl) | unset (set) icrnl, onlcr. In addition -nl unsets |
| | inler, igner, oernl, and onlret |
| Icase (-lcase) | set (unset) xcase, iuclc, and olcuc |
| LCASE (-LCASH | E) same as lcase (-lcase) |
| tabs (-tabs or tab | 3) preserve (expand to spaces) tabs when printing |
| ek | reset ERASE and KILL characters back to the default |
| | # and @ |
| sane | resets all modes to some reasonable values |
| term | set all modes suitable for the terminal type term. |

where term is one of tty33, tty37, vt05, tn 300, ti700, or tek

LINE PRINTER SPOOLER

/usr/lib/accept destinations

destinations printer or a class of printers

cancel [ids] [printers]

ids

request id returned by lp

disable [-c] [-r[reason]] printers

cancel requests currently printing -0 -r[reason] associates a reason with deactivation of printers

enable printers

lp [-c] [-ddest] [-m] [-nnumber] [-ooption] [-ttitle] [-w] files

| -c | copy files before printing |
|------------|--|
| -ddest | route output to destination |
| — m | send mail after files have been printed |
| - n number | print number copies |
| -ooption | specifies printer-dependent or class-dependent options |
| -ttitle | print title on banner page |
| — w | write to user's terminal after printing |
| | |

/usr/lib/lpadmin - pprinter [-cclass] [-eprinter/] [-h] [-linterface] [-1] [-mmodel] [-rclass] [-vdevice]

| -pprinter | printer to which all options refer |
|-------------|--|
| -cclass | insert printer into class |
| -eprinter1 | causes printer to use printerl's interface program |
| -h | printer is hard-wired |
| -linterface | supply a new interface program for printer |
| -1 | printer is a login terminal |
| - mmodel | use model interface program for printer |
| -rclass | remove printer from class |
| -vdevice | associate device with printer |
| | |

/usr/lib/lpadmin -xdest

-xdest remove destination from the LP system

/usr/lib/lpadmin -d[dest]

-d[dest] make dest the new system default destination

/usr/lib/lpmove requests dest

/usr/lib/lpsched

/usr/lib/lpshut

lpstat [-a[list]] [-c[list]] [-d] [-o[list]] [-p[list]] [-r] [-s] [-t] [-u[list]] [-v[list]]

| -a[list] | print acceptance status of destinations for requests |
|---------------------|---|
| -c[list] | print class names and their members |
| -d | print system default destination |
| -o[list] | print status of output requests |
| -p[list] | print status of printers |
| - r | print status of lpsched |
| -s | print status summary |
| -t | print all status information |
| $-\mathbf{u}[list]$ | print status of output requests for users |
| — v [list] | print names of printers and path names of devices associated with them |

/usr/lib/reject [-r[reason]] destinations

-r[reason] associate reason with preventing lp from accepting requests

ADB

adb [-w] [objfil [corfil]] -w create objfil and corfil

General Command Format

[addr] [, count] [command] [;]

Commands

| 9[Comment] | mint from al:01 |
|--|--|
| ? [format] | print from <i>objfil</i> |
| /[format] | print from corfil |
| = [format] | print address |
| new-line | repeat last command |
| [?/]I value mask | mask words until <i>value</i> is found (L used for 4 bytes) |
| [?/]w value | write 2 byte value at addr (W writes 4 bytes) |
| [?/]m bl el fl [?/] | modify map |
| >name | assign dot to name |
| 1 | escape to system |
| \$ <file< td=""><td>read commands from file</td></file<> | read commands from file |
| \$>file | output to file |
| \$r | print general registers |
| Sf | print general registers |
| Sb | print all breakpoints |
| Sa | print ALGOL 68 stack back-trace |
| Sc | print C stack back-trace |
| SC | |
| Se | print C stack back-trace and automatic variables print external variables |
| Sw Sw | |
| | set page width; default 80 |
| \$s | set symbol match limit to addr; default 255 |
| \$0 | input base is octal |
| \$d | reset input base |
| \$q | exit |
| Sv | print adb variables in octal |
| Sm | print address map |
| :b[c] | set breakpoint; execute breakpoint $c-1$ times |
| :d | delete breakpoint |
| r [args] | run objfil with args |
| :c[s] | continue subprocess with signal s; default previous |
| :s[s] | single-step subprocess with signal s; default previous |
| :k | kill subprocess |

Printing Formats

| | c, where n is a repeat count for format c chosen from the following: |
|---|---|
| | (* indicates upper-case C used for field twice as long) |
| | ((n) is temporary increment of dot) |
| 0 | print in octal * (2) |
| 9 | print in signed octal * (2) |
| d | print in decimal * (2) |
| x | print in hexadecimal * (2) |
| u | print unsigned decimal * (2) |
| f | print floating point * (4) |
| c | print character (1) |
| C | print character using @ as escape char. (1) |
| s | print characters until 0 encountered (n) |
| S | print characters using (a) as escape (n) |
| b | print byte in octal (1) |
| Y | print date format (4) |
| i | print machine instruction (n) |

| | print dot in symbolic form (0) |
|----------|---|
| | / = data, ? = text, = = absolute |
| р | print in symbolic form (2) |
| t | print tab (0) |
| r | print a space (0) |
| n | print a new-line (0) |
| н. н | print enclosed string (0) |
| ~ | decrement dot by current incr ; print nothing |
| + | increment dot by 1; print nothing |
| - | decrement dot by 1; print nothing |
| | |

Expressions

used for addr and count

| | value of dot |
|--------------------|--|
| 1. · | |
| + | + incr |
| | . – incr |
| | last addr typed |
| [0#]integer | number; $0 = octal$, $# = hexadecimal$ |
| integer.fraction | 32 bit floating point number |
| cccc | up to 4 ASCII characters |
| < name | value of name ; name as follows: |
| | 0 last value printed |
| | 1 last offset part of instr. source |
| | 2 previous value of 1 |
| | r0 r5 sp pc psregisters |
| | b data segment base addr |
| | d data segment size |
| | e entry point |
| | m magic number |
| | s stack segment size |
| | t text segment size |
| symbol | value from symbol table in objfil |
| | initial _ or ~ will be added if needed |
| routine.name | variable name in C routine |
| (exp) | value of exp |
| *exp | contents of corfil at exp |
| @exp | contents of objfil at exp |
| -exp | integer negation |
| ~ exp | bitwise complement |
| el op e2 | op is one of $[+ - * \%]$ (% = division) |
| el & e2 | bitwise conjunction |
| e1 e2 | bitwise disjunction |
| el # e2 | el rounded up to multiple of e2 |
| e1 & e2 e1 e2 | bitwise conjunction bitwise disjunction |

SDB

sdb [objfil [corfil [directory]]] (VAX and 3B-20 only)

Printing Lengths and Formats

Length (1)

| b h l number | onc byte two bytes (half word) four bytes (long word) string length for formats s and a |
|-----------------------|---|
| Format (m) | |
| c | character |
| d | decimal |
| u | decimal, unsigned |
| 0 | octal |
| x | hexadecimal |
| f | 32 bit single precision floating point |
| g | 64 bit double precision floating point |
| S | assume variable is string pointer; print characters starting at address pointed to by the variable |
| 8 | print characters starting at variable's address |
| р | pointer to procedure |
| i | assembler instruction; addresses printed symbolically |
| I | assembler instruction; addresses printed numerically |

Commands

| t | print stack trace of terminated or stopped program |
|----------------------|---|
| Т | print top line of stack trace |
| variable/lm | print top into or states trace print value of variable according to length and format <i>lm</i> |
| linenumber ? Im | print address specified by <i>linenumber</i> from a.out |
| variable = lm | print address of variable in the given length and format |
| linenumber = lm | print address of <i>linenumber</i> in the given length and format |
| number = lm | print value of <i>number</i> in given length and format |
| variable!value | set variable to given value |
| x | print machine registers and current machine instruction |
| X | print current machine instruction |
| e procedure | set current file to file containing procedure |
| e file-name | set current file to file-name |
| /regular expression/ | search forward from current line for line matching regular expression |
| ?regular expression? | scarch backward for line containing a string matching regular expression |
| p | print current line |
| Z | print current line followed by next 9 lines |
| control-D | scroll; print next 10 lines; set current line to last line printed |
| w | window; print 10 lines around current line |
| number | set current line to given line number; print it |
| count + | advance current line by count and print it |
| count- | retreat current line by count and print it |
| count r args | run program with arguments arg; ignore cour breakpoints |
| count R | run program with no arguments; ignore coun breakpoints |

linenumber c count

linenumber C count

linenumber g count

count s count S i

I

k linenumber b commands B linenumber d D l linenumber a lcommand

new-line M M[?/][*] b e f "string Q V Q

signal that caused program to stop continue with signal that caused program to stop; ignore count breakpoints continue after breakpoint resuming at given line; ignore count breakpoints 1 single-step; run program through count lines single-step, but step through subroutine calls single-step by one machine-language instruction; ignore signal single-step by one machine-language instruction with signal that stopped program kill debugged program set breakpoint at given line print list of currently active breakpoints delete breakpoint at given line delete all breakpoints print last executed line announce; equivalent to "linenumber b I" or "linenumber b T command interpreted by sh print next source line or next core location print address maps set new values for address map print given string exit debugger print version number print list of procedures and files being debugged toggle debug output

continue after breakpoint or interrupt; ignore

GRAPHICS

boundaries

| abs [-ci] | |
|--------------------|--|
| ci | columns |
| af [-citv] | |
| ci | columns |
| t | titled output |
| ٧ | verbose |
| bar [-a b f g r | i wi xf xa yf ya ylf yhf] |
| a b | suppress axes bold |
| f | suppress frame |
| g | suppress grid |
| ri . | region |
| wi xf | width in percent x origin |
| XR | suppress x-axis label |
| уſ | y origin |
| ya ylf | suppress y-axis label y-axis lower bound |
| yhf | y-axis high bound |
| bel | |
| bucket [-ai ci | Ffile ii hf lf ni] |
| ni | average size |
| ci | columns |
| Ffile | file containing bucket boundar |
| ii hf | interval high |
| lf | low |
| n/ | number |
| ceil [-ci] | |
| ci | columns |
| cor [-Ffile] | |
| Ffile | file containing base vector |
| cusum [—ci] | |
| ci | columns |
| cvrtopt [= sstri | ng fstring istring tstring] [args] |
| sstring | accept string values |
| fstring istring | accept floating point numbers accept integers as values |
| tstring | two letter option name |
| dtoc [directory] | |
| erase | |
| exp [-ci] | |
| ci | columns |
| floor [-ci] | |
| ci | columns |
| | |

| gamma [-ci] | |
|-------------------|---|
| ci | columns |
| gas [-ci if ni s | ſţ] |
| ci | columns |
| if | interval |
| ni | number |
| sf | start |
| ý | terminate |
| gd [gps(5) files] | |
| ged [-euRrn] | [gps(5) files] |
| e | do not erase screen before initial display |
| r <i>n</i> | display region number n |
| u | display entire GPS universe |
| | (GPS is graphical primitive string) |
| R | restricted shell invoked on use of ! |
| graphics [-r] | (entry point for GRAPHICS) |
| r | invoke restricted shell |
| gtop [-rn u] [g | aps(5) files] |
| r <i>n</i> | translate objects in GPS region n |
| u | translate all objects in GPS universe |
| hardcopy | |
| hilo [-h l o ox | : oy] |
| h | high only |
| 1 | low only |
| 0 | option form |
| ox | option form with x prepended |
| oy | option form with y prepended |
| hist [-a b f g | ti xf xa yf ya ylf yhf] |
| я | suppress axes |
| b | bold |
| f | suppress frame |
| g | suppress grid |
| ri | region |
| xf | x origin |
| xa | suppress x-axis label |
| уſ | y origin |
| ya | suppress y-axis label |
| ylf | y-axis lower bound |
| yhf | y-axis high bound |
| hpd [-cn pn rn | a sn u xdx xvn yvn] [gps(5) files] |
| cn | select char. set n between 0 and 5 inclusive |
| p <i>n</i> | select pen numbered n between 1 and 25 inclusive |
| rn | window on GPS region n between 1 and 25 inclusive |
| sn | slant characters n degrees clockwise from vertical |
| u , | window on entire GPS universe |
| xdn | set x displacement of view-port's lower left corner to n inches |
| xvn | set width of view-port to n inches |
| yd <i>n</i> | set y displacement of view-port's lower left corner to n |
| yvn | inches set height of view-port to <i>n</i> inches |
| | |
| | |

| lab | el [-b c F <i>fil</i> | ehprix xuyyr] |
|------|---|---|
| | b | bar chart input |
| | c | retain case |
| | Ffile | label File |
| | h p | histogram input plot input |
| | ri ri | rotation |
| | x | x-axis |
| | xu | upper x-axis |
| | у | y-axis |
| | yr | right y-axis |
| list | [-ci dstring |] |
| | ci | columns |
| | dstring | delimiter(s) |
| log | [-ci bf] | |
| | ci | columns |
| | bf | base |
| Ires | g [-Ffile i o | s] |
| | Ffile | file containing base vector |
| | i | intercept only |
| | 0 | option form for siline |
| | S | slope only |
| me | an [-ff ni p | ſ |
| | ſſ | fraction |
| | ni | number |
| | ₽ſ | percent |
| mo | d [-ci mf] | |
| | ci | columns |
| | mſ | modulus |
| pai | r [-ci Ffile : | x <i>i</i>] |
| | ci | columns |
| | Ffile | file containing base vector |
| | xi | x group size |
| pd | [plot(5) files] | |
| | | |
| pie | | ppi ri v xi yi] |
| | b o | bold values outside pie |
| | p | value as percentage($:=100$) |
| | pn <i>i</i> | value as percentage(: = i) |
| | ppi | draw percent of pie |
| | ri | region |
| | v | no values |
| | xi | origin |
| | yi | origin |
| | t [—a b c <i>stri</i> f ya yif yhf y | ng d f Ffile g m ri xf xa xif xhf xlf xni xt ylf yni yt] |
| | a b | suppress axes bold |
| | o cstring | plotting characters |
| | d | disconnected |
| | f | suppress frame |
| | Ffile | file containing x vector |
| | g | suppress grid |
| | | |

| m | mark points |
|-----|---------------------------|
| ri | region |
| xf | x origin |
| xa | suppress x-axis label |
| xif | x interval |
| xhf | x high bound |
| xlf | x low bound |
| xni | number of ticks on x-axis |
| xt | suppress x-axis title |
| yf | y origin |
| ya | suppress y-axis label |
| yif | y interval |
| yh/ | y high bound |
| ylf | y low bound |
| yni | number of ticks on y-axis |
| yt | suppress y-axis title |

point [-ff ni pf s]

| ſſ | fraction |
|----|--------------|
| ni | number |
| pf | percent |
| s | sorted input |

power [-ci pf]

| ci | columns |
|----|---------|
| p/ | power |

prime [-ci hi li ni]

| ci | columns |
|----|---------|
| hi | high |
| li | low |
| ni | number |

prod

ptog [plot(5) files]

quit

qsort [-ci]

1

| rand [-ci hf lf mf ni : | si] |
|-------------------------|-----|
| ci columi h/ high | ns |

| IJ | IOW |
|----|------------|
| m∫ | multiplier |
| ni | number |
| si | seed |
| | |

rank

remcom [files]

root [-ci rf]

| ci | columns |
|----|---------|
| rf | root |

round [-ci pi si]

| ci | columns |
|----|----------------------------|
| pi | places after decimal point |
| si | significant digits |

siline [-ci if ni sf] ci columns if intercept ni number of positive integers sf slope sin [-ci] ci columns spline [-a] [-k] [-n] [-p] [-x]supply abscissas automatically -k next arg. taken as constant for boundary value computation n intervals between limits -n-p make output periodic next 1 (2) args. are low and high x limits -x subset [-af bf ci Ffile ii lf nl np pf si ti] af above bf below ci columns file with master vector Ffile interval ii V leave nl master contains element numbers to leave np master contains element numbers to pick pf pick start si ti terminate td [-erregionu] [gps(5) files] e do not crase screen before initial display **r**n display region number n display entire GPS universe 11 tekset title [-b c lstring vstring ustring] b title bold c retain case lower title Istring vstring vector title ustring upper title total ttoc mm-file var vtoc [-chnimsvn] [TTOC file] use text as entered (default upper-case) c hn. horizontal interbox space is n% of box width i suppress the box id suppress the box mark m do not compact boxes horizontally 8 vertical interbox space is n% of box height vn whatis [-o] [names] just print command options 0 yoo file

Graphical Editor (GED)

Construct Commands

| Arc | [-echo,style,weight] points |
|----------|--|
| Box | [-echo,style,weight] points |
| Circle | [-echo,style,weight] points |
| Hardware | [-echo] text points |
| Lines | [-echo,style,weight] points |
| Text | [-angle,echo,height,midpoint,rightpoint, text,weight] text points |
| | |

(- (universe or view) or points)
[-angle,echo,height,style,weight]
(- (universe or view) or points)
[-echo,points,x] points pivot destination
[-echo,points,x] points pivot destination
[-angle,echo,kopy,x] points pivot destination

points

| (| - | (universe | ог | view) | or | points |) |
|---|---|-----------|----|-------|----|--------|---|
| 1 | | /1 1 11 1 | | | | | |

- ((labelled-points or universe or view) or points)
- ((home or universe or region) or [-x] pivot destination)
- [-view] points

[-out] points

[-angle,echo,height,midpoint,rightpoint, text,weight] filename [destination]

[-angle.echo.factor.height,kopy,midpoint, points,rightpoint,style,text,weight,x] filename

list ged commands

Edit Commands

Delete Edit

Kopy Move Rotate Scale

View Commands

coordinates erase new-display object-handles point-handles

view

x zoom

Other Commands

quit or Quit read

set

write !unix command ?

TEXT PROCESSING

SYNOPSES OF COMMANDS

| checkcw | $\left[-\mathbf{l}\mathbf{x}\mathbf{x}\right]$ | $[-\mathbf{r}x\mathbf{x}]$ | files |
|---------|--|----------------------------|-------|
|---------|--|----------------------------|-------|

| -lxx | the one- or two-character string xx is left delimiter |
|------|---|
| -rxx | right delimiter |
| | (See also CW section below.) |

checkeq [files]

(See also EQN section below.)

checkmm [files]

(See also MM Macros section below.)

col [-bfpx]

| -b | print only 1 character in any position | |
|----|---|--|
| -f | allow half-line motions | |
| -р | pass unknown escape sequences to output | |
| -x | do not convert white spaces to tabs | |

cw [-lxx] [-rxx] [-fn] [-t] [+t] [-d] [files]

| -lxx | the one- or two-character string xx becomes left delimiter |
|------|--|
| | (default is no delimiter) |
| -rxx | right delimiter |
| -fn | CW font mounted in font position n (default 3) |
| -t | turn transparent mode off |
| +t | turn transparent mode on (default) |
| -d | print current option settings on file descriptor 2 |
| | (See also CW section below) |

deroff [-w] [-mx] [files]

| — w | print word list |
|-----|--|
| -mx | x = m (MM macros), s (MS macros), or l (ml forces |
| | mm option; delete lists associated with MM macros) |

diffmk name1 name2 name3

eqn [-dxy] [-pn] [-sn] [-fn] [files]

| -dxy | set delimiters to x and y |
|------|---|
| -pn | change point size factor of subscripts and superscripts |
| -sn | change point size to n |
| -fn | use font number n |
| - | revert to the standard input |
| | (See also EON and NEON section below.) |

gcat [-ph] [-st] [-tx] [-du] [-c] [-r] [-fname] [-iMxxxx,Myyy] [-m] [-n] [-o] [-t] [-sn] files

| -ph | sent troff output to the GCOS phototypesetter |
|--------------|---|
| -st | sent troff output to the GCOS STARE |
| -tx | sent troff output to the GCOS line printer |
| -du | sent troff output (dummied up to make format |
| | correct) to the GCOS line printer |
| -c | copy files before returning to user |
| -r | remove files after sending |
| -fname | use name to identify files when reporting by mail |
| -iMxxxx,Myyy | xxxx and yyy are GCOS job and bin numbers |
| -m | report completion of transmission by mail (default) |
| -n | don't report completion of transmission |
| -0 | print GCOS on-line accounting output |
| -t | don't print GCOS on-line accounting output |
| | (default) |
| -sn | use GCOS service grade n (default 1) |
| | |

hyphen

| | c] [-Tterm] [-t] [-s] [-Tst] [-T4014] [-Ttek]] [-d] [-y] [nroff/troff options] entries |
|----------------------------------|--|
| -12 | 12-pitch terminal |
| -c | invoke col |
| -Tterm | format entry using <i>nroff</i> (default is 450-see <i>term</i> (7)) |
| -t | typeset entry in default format (8.5"×11") |
| —s | typeset entry in small format $(6'' \times 9'')$ |
| -Tst | direct output to a STARE facility using gcat |
| -T4014 | direct output to a Tektronix 4014 terminal using tc |
| -Ttek | same as -T4014 |
| -Тур | direct output to a Versatec printer using vpr |
| -w | print path names of manual entries, not the entries |
| | themselves |
| — d | search current directory rather than /usr/man; entry |
| | must be full file name |
| — y | use non-compacted version of UNIX User's Manual |
| , | macros |
| entries | each entry or set of entries may be optionally preceded by |
| | a UNIX User's Manual section number |
| | (See also UNIX User's Manual Macros section below.) |
| | (See also offix eser s manual macros section below.) |
| | [-t] [-c] [-E] [-y] [-Tterm] [nroff options] [files] |
| -12 | 12-pitch terminal |
| —e | invoke neqn and have it read the /usr/pub/eqnchar file |
| -t | invoke tbl |
| -c | invoke <i>col</i> |
| -E | invoke the -e option of nroff |
| — y | use non-compacted version of MM macros |
| -Tterm | prepare output for terminal term |
| - | read standard input instead of files |
| | (See also MM Macros section below.) |
| mmt [-e] [-t] [troff options] | [-y] [-a] [-Tst] [-T4014] [-Ttek] [-Tvp] files] |
| -e | invoke eqn and have it read the /usr/pub/eqnchar file |
| -t | invoke tbl |
| — y | use non-compacted version of MM macros |
| -a | direct output to your terminal using the $-a$ option of |
| | troff |
| -Tst | direct output to a STARE facility using gcat |
| -T4014 | direct output to a Tektronix 4014 terminal using te |
| -Ttek | same as -T4014 |
| -Tvp | direct output to a Versatec printer using vpr |
| | read standard input instead of files |
| | (See also MM Macros section below.) |
| | |
| mvt [-e] [-t] [files] | [-a] [-Tst] [-T4014] [-Ttek] [-Tvp] [troff options] |
| —e | invoke eqn and have it read the /usr/pub/eqnchar file |
| -t | invoke the |
| -a | direct output to your terminal using the $-a$ option of |
| • | troff |
| -Tst | direct output to a STARE facility using gcat |
| -T4014 | direct output to a Tektronix 4014 terminal using tc |
| Ttek | |
| | same as -T4014 |
| —Tvp | direct output to a Versatec printer using vpr |
| | read standard input instead of files |
| | |

(See also View Graph Macros section below.)

neqn (scc eqn above)

| |] [-olist] [-nn] [-sn] [-ran] [-i] [-q] [-z] -Tname] [-e] [-h] [-un] [files] |
|------------------|---|
| -cname -olist | use compacted macro package print only pages whose page numbers appear in <i>list</i> of |
| 011.51 | numbers and ranges, separated by commas |
| - n <i>n</i> | number first generated page n |
| -sn | stop every n pages |
| -ran | set register a to n |
| —i | read standard input after files are exhausted |
| -q | invoke simultaneous input-output mode of .rd |
| -z | print only messages generated by .tm requests |
| - mname | use name macro package |
| -Tname | prepare output for specified terminal |
| —e | produce equally spaced words in adjusted lines |
| - h | replace spaces with tabs |
| -un | set emboldening factor for third font position to n |
| - | revert to the standard input |
| | (See also Troff Characters section below.) |

osdd files

ptx [-f] [-t] [-w n] [-g n] [-o only] [-i ignore] [-b break] [-r]
[input[output]]

| -f | fold upper-case and lower-case letters for sorting |
|-----------------|--|
| -t | prepare output for phototypesetter |
| $-\mathbf{w} n$ | width of output line |
| -g n | gap widths within a line |
| -o only | use only keywords in only file |
| -i ignore | do not use keywords in the ignore file |
| -b break | use chars. in break file to separate words |
| -r | reference identifier |

spell [-v] [-b] [-x] [+localfile] [files]

| — v | print words not literally in spelling list |
|------------|--|
| -b | check British spelling |
| -x | print plausible stems with = for each word |
| +localfile | user-provided file of sorted list of words |

/usr/lib/spell/spellin [list]

/usr/lib/spell/spellout [-d] list

print words present in hash list

tbl [-TX] [files]

-d

| -TX | output full vertical line motions only |
|-----|--|
| _ | revert to the standard input |
| | (See also TBL section below.) |

tc [-t] [-sn] [-pl] [file]

| -t | don't wait between pages |
|-----|--------------------------|
| -sn | skip first n pages |
| -p/ | set page length to l |

troff [-olist] [-nn] [-sn] [-ran] [-i] [-q] [-z] [-cname] [-mname] [-kname] [-t] [-f] [-w] [-b] [-a] [-pn] [-g] [-Tname] [files]

| V | |
|---------------------|--|
| -olist | print only pages whose page numbers appear in <i>list</i> of numbers and ranges, separated by commas |
| - n <i>n</i> | number first generated page n |
| -sn | stop every n pages |
| -ran | set register a to n |
| -i | read standard input after files are exhausted |
| -a | invoke simultaneous input-output mode of .rd |

| -z | print only diagnostics and .tm messages |
|----------|---|
| -cname | use compacted macro package name |
| - mname | use uncompacted macro package name |
| -kname | compact macro package name |
| -t | direct output to standard output, not phototypesetter |
| -f | don't feed paper and stop phototypesetter at end of run |
| -w | wait until phototypesetter is available |
| -b | report whether phototypesetter is busy or available |
| -a | send printable ASCII approximation to standard output |
| -pn | print all chars. in point size n |
| -g | send output to remote typesetter via gcat |
| -Tname | name is the make of typesetter |
| - | revert to the standard input |
| | (See also Troff Characters section below.) |
| 1 . 1 | |
| [-c][-r] | $[-\mathbf{m}] [-\mathbf{n}] [-\mathbf{f}] [-\mathbf{p}[-eraster]] [-\mathbf{t}] [-nF]$ |
| -c | make copy of file to be sent before returning to |
| | |

| user |
|---|
| remove file after sending |
| report when printing is complete by mail |
| do not report when printing is complete (default) |
| use next arg. as dummy file name when reporting completion. |
| use plot filter vplot to output file produced by graph pipe troff -t output through vcat |
| for <i>n</i> between 1 and 4, assume font <i>F</i> is mounted in font position <i>n</i> , where <i>F</i> is R , I , B , or S |
| |

vpr

TROFF CHARACTERS

Standard Fonts

ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 0123456789

\$! % & () * + . , : ; / ? = [] |

| • | (open quote) | 1/4 | \(14 | • | \(de |
|---|---------------|-----|------|---|------|
| • | (close quote) | 1/2 | \(12 | † | \(dg |
| - | -(minus) | 3/4 | \(34 | , | \(fm |
| - | (hy or - | fi | \(fi | ¢ | \(ct |
| - | \(em | fl | \(fl | ® | \(rg |
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| | \(sq | ffi | \(Fi | | |
| _ | \(ru | ffl | \(Fl | | |

Special Font

@#"<>{}~^

| | | · " | ~~ () | | |
|---|---------------|--------------------|---------------|----------|------|
| 1 | \e | В | \(* B | × | \(mu |
| + | \(pl | Г | \(*G | ÷ | \(di |
| — | \(mi | Δ | \(*D | ± | \(+- |
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| π | \(*p | ≥ | \(>= | 1 | \(lb |
| ρ | \(*r | ≤ | \(<= | 1 | \(rt |
| σ | \(* s | = | \(== | 1 | \(rb |
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| ¥ | \(* q | T | \(ua | [| \(lc |
| ω | \(* w | I | \(da | 1 | \(rc |
| Α | \(* A | | | | |
| | | | | | |

MM MACROS

[] = optional argument; () = default value Format & Abstract Beginning Macros (in order of invocation): .ND date new date .TL [chg#] [file#] title follows on next line alternate first-page format .AF [co-name] .AU name [initials] [loc] [dept] [ext] [room] [arg] ... author info. .AT author-title title to follow signer's name (up to 9 args.) .TM [number] technical memorandum numbers .AS [0 1 2] [indent] abstract start of TM and release paper only 0 = abstract on cover-sheet and first page 1 = abstract only on cover-sheet 2-abstract only on Memorandum for File cover sheet AE abstract end .NS notation start (also allowed on MFF cover sheet-see Ending Macros below) .NE notation end (also allowed on MFF cover sheet-see Ending Macros below) .OK [keyword ...] other keywords .MT ["" 0 1 2 3 4 5 string] [name or 1] document type 0 = "" = no type (internal letter) 1 = memorandum for file (default) 2 = programmer's notes 3 = engineer's notes4 = released paper 5 = external letter string = string
name = addressee's name 1 - list affiliation of each author (in released paper style only) .MT must occur after all cover-sheet information Ending Macros (trailing information): .FC [closing] formal closing .SG [initials] [1] signature line .NS [" 0123456789 string] notation start = Copy to (default) 0 = Copy to 1 = Copy (with att.) to 2 = Copy (without att.) to 3 = Att. 4 = Atts. 5 = Enc. 6 = Encs. 7 = Under Separate Cover 8 = Letter to 9 = Memorandum to string = Copy (string) to .NE notation end approval signature .AV name .CS [pgs] [other] [tot] [figs] [tbls] [ref] cover sheet .TX user exit for table-of-contents titles .TY user exit for table-of-contents header .TC [s[lev]] [spac] lev [tab] [head] ... table-of-contents **Headings & Paragraphs** .P [012] paragraph 0 = left-justified (default) 1 = indented 2 = indented except after .H, .LE, .DE .H [1 2 3 4 5 6 7] [h-text] [footnote mark] numbered headings .HU h-text unnumbered headings

.HM [1 0001 A a I i] ... heading mark style 1 = arabic 0001 - arabic with leading 0's A = upper-case alphabetic $\mathbf{a} =$ lower-case alphabetic I = upper-case Roman i = lower-case Roman .HX dlev rlev h-text .HY dlev rlev h-text .HZ dlev rlev h-text .HZ dlev rlev h-text Lists Presence of x on list-start macros = no space between items AL [1 A a I i] [t-indent] [x] auto-incremented start (1) .BL [t-indent] [x] bullet start .DL [t-indent] [x] dash start marked start [mark-width+1] .ML mark [t-indent] [x] .RL [t-indent] [x] reference start (6) .VL t-indent [m-indent] [x] variable-item start list item follows .LI [mark] [1] 1 = mark is to be prefixed to the current mark LE [1] list end: 1 = output white space after list (no white) .LB t-indent m-indent pad type [mark] [0 1] [0 1] list begin *type*: 1 = .2 = 3 = (4 = 5 = 4 = 5 = 4 = 1)6th arg = blank before each item; 7th arg = blank before list LC [lev] clear list-status up to level Displays, Tables, Equations, & Footnotes .DS [LICCB] [N F] [n] start static display L = no indentI = indent from left C = center each lineCB = center as a block N = no-fill $\mathbf{F} = fill$ n =indent from right *n* spaces .DF [L I C CB] [N F] [n] start floating display; args. same as .DS .DE end display .FG [title] [override] [0 1 2] figure caption 0 = prefix with override 1 = suffix 2 = replace.TS [H] start table; H = multi page table (must be used when specifying arg. H to .TS) .TH [N] N = suppress table headers unless on top of new page (See TBL section below.) .TE end table .TB [title] [override] [0 1 2] table caption .EX [title] [override] [0 1 2] exhibit caption .EQ [label] start equation display .EN end equation display (See EQN and NEQN section below.) .EC [title] [override] [0 1 2] equation caption start footnote .FS [lab] end footnote .FE .FD [0-11] [1] footnote format 1st arg = set up formatting style for footnote text 2nd arg = reset footnote counter on 1st-level heading **Page Headers & Footers**

.PH "left center right" page header .OH "left center right" odd-page header .EH "left center right" even-page header .PF "left center right" page footer

```
.OF " left center right ".
.EF " left center right "
                                   odd-page footer
                                    even-page footer
    RS
                                    bottom-block start
    BE
                                    bottom-block end
    .PX
                                    user exit for page-header
    TP
                                    top of page macro
Miscellaneous
    .B [arg] [prev-font-arg]
                                  bold (up to 6 args.)
    .I [arg] [prev-font-arg]
                                 italic (up to 6 args.)
    .R
                                  return to roman font
      the following are for alternating fonts and
      all take 1 to 6 args .:
    .IB, .BI, .RI, .IR, .RB, .BR
.PM [P N BP BR] proprietary marking
                P = PRIVATE
                N =NOTICE
                BP = BTL PROPRIETARY
                BR = RESTRICTED
    without arg., turn off proprietary marking
.RD [prompt] [diversion] [string] stop code macro
    .RP [0 1] [0 1 2 3]
                                  reference page
      1st arg .:
         0 = reset reference counter (default)
         1 = do not reset reference counter
      2nd arg .:
         0 = cause a .SK after (default)
         1 = do not cause a .SK after
         2 = do not cause a .SK before
         3 = do not cause a .SK before or after
    .RS/.RF
                     automatic numbered references
    .WC [N WF -WF FF -FF WD -WD FB -FB] width control
      for footnotes and displays when using 2 columns:
                normal mode (-WF, -FF, -WD)
        N
         WF
                 footnotes always wide
         -WF
                 footnotes follow page style
        FF
                 first footnote determines width of
                   remaining footnotes on that page
          -FF
                footnotes follow setting of WF, -WF
         WD
                 always wide displays
          WD
                displays follow page style
         FB
                 floating display causes break (default)
          -FR
                 floating display does not cause break
    .SP [lines]
                     skip down
    .SK [pages]
                     skip pages (next page)
    .OP
                     force odd page start
    .20
                     two-column
    .10
                     onc-column
    .SA [arg]
                     set right-margin justification
                        arg = 0 sets default to off arg = 1 sets default to on
                        no arg reverts to current default
    .SM string1 [string2] [string3] reduce size of string1 by 1 point
                        if string3 omitted; otherwise, reduce size
                        of string2 by 1 point
                      set hyphenation character
    .HC c
    .S [point size] [vert. spacing] set point size and vertical spacing
               defaults: point size=10, vert. spacing=12p
               args. 1 and 2:
                  n = new value
                  \pm n = increment to current value
                  \mathbf{D} = default
                  C = current value
                  P = previous value
   .VM [top] [bottom]
                                 vertical margins
```

.nP

double-line indent on paragraph start

Registers

Note: An asterisk following a register name indicates that that register can be set *only* from the command line or *before* the MM macro definitions are read by the formatter.

| A * | handle preprinted forms and the Bell System logo (0) | | |
|------------|---|--|--|
| Au | inhibit author information on first page (1) | | |
| C* | copy type (Original, DRAFT, etc.) (0) | | |
| Cl Cp | contents level (2) | | |
| D* | placement of figures, tables, equations & exhibits (1) debug flag (0) | | |
| De | display eject register for floating displays (0) | | |
| Df | display format register for floating displays (5) | | |
| Ds | static display pre- & post-space (1) | | |
| E * | control font of the Subject/Date/From fields | | |
| Ec | equation counter | | |
| Ej | page-ejection flag for headings (0) | | |
| Eq | equation label placement (0) | | |
| Ex | exhibit counter | | |
| Fg | figure counter | | |
| Fs H1H7 | footnote separation (1) | | |
| H1H7 Hb | heading counters heading break level (after .H and .HU) (2) | | |
| Hc | heading centering level for .H and .HU (0) | | |
| Hi | heading temporary indent (after .H and .HU) (1) | | |
| Hs | heading space level (after .H and .HU) (2) | | |
| Ht | heading type: 0 = concatenated numbers, | | |
| | 1=single numbers (0) | | |
| Hu | heading level for unnumbered heading (2) | | |
| Ну | hyphenation control: $0 =$ no hyphenation (0) | | |
| L* | length of page (66v) | | |
| Le | list of equations | | |
| Lf | list of figures (1) | | |
| Li Ls | list indent (5 troff), (6 nroff) list level down to which there is spacing between | | |
| LS | items (6) | | |
| Lt | list of tables (1) | | |
| Lx | list of exhibits (1) | | |
| N * | numbering style (0) | | |
| Np | numbered paragraphs: | | |
| 0* | 0=unnumbered, 1=numbered (0) | | |
| Oc | offset of page page numbering style for table-of-contents: | | |
| | 0=lower-case roman, 1=arabic (0) | | |
| Of | figure caption style (0) | | |
| P | page number, managed by MM (0) | | |
| Pi | paragraph indent (5) | | |
| Ps | paragraph spacing (1) | | |
| Pt | paragraph type (0) | | |
| Pv | PRIVATE header: 0=do not print PRIVATE, | | |
| Df | 1=on first page only, 2=on all pages (0) | | |
| Rf S* | reference counter, used by .RS macro troff default point size (10) | | |
| Si | display indent (5) | | |
| 51 T * | type of <i>nroff</i> output device (0) | | |
| Tb | table counter | | |
| Ū* | underlining style (nroff) for .H and .HU (0) | | |
| W * | width of page (line and title length) | | |
| | | | |

Strings

| BU | bullet |
|----------|---|
| Ci | indent of heading levels in the table of contents |
| DT | date |
| EM | em-dash |
| F | footnote numberer |
| HF | heading level font string; 1=roman, 2=italic, 3=bold (3 3 2 2 2 2 2) |
| HP | point sizes of the various heading levels |
| Le | title of the list of equations |
| Lf | title of the list of figures |
| Lt | title of the list of tables |
| Lx | title of the list of exhibits |
| RE | SCCS SID of MM macros |
| Rf | reference numberer |
| Rp | title of the reference page |
| Tm | trademark |
| <u> </u> | grave accent |
| - | acute accent |
| | circumflex |
| ~ | tilde |
| : | lower-case umlaut |
| ; | upper-case umlaut |
| , | cedilla |
| | |

Location Strings

AK, AL, ALF, CB, CH, CP, DR, pFJ, HL, HO, HOH, HP, IH, IN, INH, IW, MH, MV, PY, RD, RR, WB, WH, WV.

Reserved Names

Users of the MM macros who define their own names for strings, macros, and registers should only use names that either consist of a single lower-case letter, or of a lower-case letter followed by any character *other than* a lower-case letter. The names c2 and nP are an exception to this: they are already used.

VIEW GRAPH MACROS

[] = optional argument; () = default value

Foil-start macros:

.VS [#] [who] [date] Start a square view graph

.Vw, .Vh, .VW, .VH, .Sw, .Sh, .SW, .SH Same as .VS, except that they start view graphs (V) or slides (S) that are small wide (w), small high (h), large wide (W), or large high (H). Recommended: .VS for square view graphs and slides, .Sw (and, if necessary, .Sh) for 35mm slides.

Level macros:

| .A [no-pre-space] | return to left margin |
|--------------------------------------|---|
| .B [mark [size]] | go to first indent level (default <i>mark</i> is large bullet); s is point size increment (0) |
| .C [mark [size]] .D [mark [size]] | go to second indent level (default <i>mark</i> is cm-dash) go to third indent level (default <i>mark</i> is small bullet) |

Text-control macros:

| print string as a centered, enlarged title indent all text other than titles by in. Takes effect |
|--|
| when the next level macro is called. If second argument is given, .A is called immediately and the third argument is passed to it. |
| change point size and/or line length. The first |
| argument has the same effect as the first argument |
| to the MM macro of the same name. The second |
| argument sets the line length. |
| literally underline strl and concatenate str2 to it. |
| Not recommended. |
| |

Default-setting macros:

| . DV [a[b[c[d]]]] | set the amount of pre-space for level macros. |
|--------------------------|--|
| | Arguments must be dimensioned (.5v .5v .5v 0v) |
| .DF [n name] | set font positions: takes up to four pairs of |
| | arguments of the form "2 I", etc. Must precede |
| | the first break in the input file (1 H 2 I 3 B 4 S). |
| | |

Miscellaneous:

The MV package accepts the following upper-case synonyms for the corresponding lower-case traff requests:

AD, .BR, .CE, .FI, .HY, .NA, .NF, .NH, .NX, .SO, .SP, .TA, .TI

The Tm string produces a trademark symbol.

UNIX USER'S MANUAL MACROS

[] = optional argument; () = default value

In what follows, the *text* argument consists of up to six "words"; if null, the entire next input text line is used as *text*.

The in argument, if omitted, is set to its previous value.

| .TH [t][s][c][n] | set title and entry heading; $t = $ title, $s =$ section number, $c =$ extra commentary, $n =$ new manual name |
|--------------------------|--|
| .SH [text] | place subhead text here |
| .SS [text] | place sub-subhead text here |
| .B [text] | make text bold |
| .I [text] | make text italic |
| .SM [text] .RI [a][b] | make text 1 point smaller than default point size concatenate roman a with italic b: |
| | alternate these two fonts up to six arguments; |
| | similar macros alternate between any two of roman, |
| | italic, and bold: |
| | .IR, .RB, .BR, .IB, .BI |
| .Р | begin paragraph with normal font, point size, and indent |
| .HP [in] | begin paragraph with hanging indent |
| .TP [in] | begin indented paragraph with hanging tag; next input |
| .IP [t][in] | line is the tag same as .TP <i>in</i> with tag <i>t</i> ; if <i>t</i> is null, begin indented |
| *## [+][+/+] | paragraph |
| .RS [in] | increase relative indent (initially zero) |
| .RE [k] | return to kth relative indent level |
| | R] proprietary marking |
| P= | PRIVATE |
| | NOTICE |
| | BTL PROPRIETARY |
| | RESTRICTED out arg., turn off proprietary marking |
| .DT | restore default tab settings |
| .PD [v] | set interparagraph distance v vertical spaces; |
| | default is 0.4v in troff, 1v in nroff |
| | |
| Strings | |
| R | (Reg.) in nroff |
| S | revert to default type size |
| Tm | trademark |
| | |
| Registers | |
| IN | left margin indent relative to subheads |
| LL | line length including IN |
| PD | current interparagraph distance |
| | |

TBL

Tbl Input Format:

.TS options; format. data .TE

Tables are often enclosed within .DS (or .DF) and .DE macros.

Options:

| center | center |
|-------------|-------------------------------------|
| expand | expand to line length |
| box | enclose in a box |
| allbox | box all entries |
| doublebox | enclose in two boxes |
| tab(c) | change tab character to c |
| linesize(n) | make all lines of thickness n |
| delim(xy) | recognize x and y as eqn delimiters |
| ; | end of options |

Format:

| 1 | L | left-adjusted column |
|---|---|---------------------------|
| r | R | right-adjusted column |
| ¢ | C C | centered column |
| r | N N | number column |
| | A | left-adjusted subcolumn |
| 5 | S | horizontally spanned item |
| t | Т | push vertical span to top |
| 1 | v | vertical line spacing |
| 1 | • | vertically spanned item |
| U | I U | move item ½ line up |
| 2 | Z | zero-width item |
| | | horizontal line |
| - | = | double horizontal line |
| 1 | | vertical line |
| 1 | l i i i i i i i i i i i i i i i i i i i | double vertical line |
| b | B | boldface item |
| i | I | italic item |
| f | F | font change |
| P | n Pn | point-size change |
| ¥ | $\mathbf{W}(n) \ \mathbf{W}(n)$ | column width |
| n | n | space between columns |
| e | E | equal-width columns |
| | | end of format |
| | | |

Data:

| T { T } | text block | |
|-----------------------|---|--|
| _ | short horizontal line | |
| \Rx | repeat x across column | |
| 1- | above item spans downward into this row | |
| .T& | start new format | |
| .TS, .TH, ar | nd .TE (see MM Macros above) | |

EQN AND NEQN

Eqn/neqn Input Format:

```
.DS (or .DF)
.EQ
equation
.EN
.DE
```

.EQ delim xy .EN x equation y

Keywords:

sub, sup, over, sqrt , ... from ... to ... left { [| (floor ceiling, right }] |) floor ceiling pile { ... above ... }, lpile, cpile, rpile dot, dotdot, hat, bar, tilde, under, vec, dyad roman, italic, bold, fat, font f, gfont f, size n, gsize n delim, define, tdefine, ndefine mark, lineup up, down, fwd, back matrix { col { ... above ... } col { ... above ... } }, lcol, ccol, rcol sum, int, integral, prod, union, inter >=, <=, !=, ==,->, <-, >>, <<, approx +. sin, cos, tan, tanh, sinh, cosh for, if arc, times, lim, max, min, log, ln, exp prime, cdot, del, half upper-case and lower-case Greek infinity, inf, partial, grad, nothing

Symbols defined in /usr/pub/eqnchar:

| ciplus | ⊕ | | 11 | square | |
|----------|----------|----------|-------------------|---------|-----------|
| citimes | 8 | langle | (| circle | 0 |
| wig | ~ | rangle | 5 | blot | |
| -wig | ~ | hbar | 'n | bullet | ٠ |
| > wig | 2 | ppd | T | prop | œ |
| < wig | \$ | <-> | \leftrightarrow | empty | ø |
| =wig | 2 | <=> | + | member | € |
| star | * | < | * | nomem | ¢ |
| bigstar | * | > | * | cup | U |
| =dot | <u> </u> | ang | L | cap | \cap |
| orsign | V | rang | L | incl | |
| andsign | ٨ | 3dot | | subset | \subset |
| =del | ≜ | thf | | supset | \supset |
| oppA | ¥ | quarter | 1/4 | !subset | ⊆ |
| oppE | Э | 3quarter | 3/4 | !supset | ⊇ |
| angstrom | Å | degree | 0 | scrL | Q |
| ==< | ≦ | ==> | ≥ | | |

CW

[] = optional argument; () = default value

CW requests:

| .CW [args] | start of text to be printed in constant width |
|---------------|---|
| .CN [args] | end of text to be printed in constant width |
| .CD [args] | set CW defaults; optional args on the .CW, .CN, and .CD control lines have exactly the same format and meaning as the arguments available on the cw command line, except for the files argument. |
| .CP arg1 arg2 | argn concatenate all arguments, printing the odd- numbered arguments in the constant-width font and the even-numbered ones in the prevailing font; arguments are delimited just like arguments to troff macros. |
| .PC arg/ arg2 | . argn same as .PC, except that odd-numbered args are printed in the prevailing font, while the even- numbered ones are in the constant width font |

Special CW character names:

| \(ct | "cents" sign |
|------|-------------------------------------|
| \(no | EBCDIC "not" sign |
| \(<- | left arrow |
| \(-> | right arrow |
| \(da | down arrow |
| \(fm | a vertical single quote |
| \(dg | control-shift indicator |
| \(sq | visible space indicator |
| \(hy | hyphen (synonym for the minus sign) |

ASCII Character Set

|000 |010 |020 |030 |040 |050 |050 |070 1100 1110 120 130 140 170 160 150 P HO × 0 sp car dle 00 s q nu |041 |051 |061 |071 021 03 01 |101 |111 |121 |121 |131 |131 |131 |141 |141 |151 |151 |151 00 × D P 2 5 em ht sol |032 |042 |052 |062 022 012 072 002 102 112 122 122 132 132 142 142 152 162 172 N R N nl stx ₿ sub dc2 |033 |043 |053 |063 |063 |073 |103 |113 |113 |113 |113 |153 |153 |153 013 003 vt dc3 etx esc 5 × C ... w + |014 |024 |034 |044 |054 |054 004 |1104 |114 |124 |124 |134 |134 |144 |154 |164 d ٨ 4 eo H r D np dc fs 69 075 045 035 |005 |015 |025 115 055 065 125 105 165 155 145 || m C M H S 1 28 50 nak Cr enq 176 076 066 056 046 036 026 016 006 166 |106 |116 |126 |136 156 146 V 20 ack < Z T 9 TS syn SO 027 167 037 047 057 067 01 137 10 177 117 \$0 sn del W 0 09 1 9 ... ~ bel si etb

