

Altos System V™ Series 386  
Reference (M)

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# GUIDE TO YOUR ALTOS SYSTEM V™ SERIES 386 DOCUMENTATION

## RUN-TIME SYSTEM



### Installation

Part numbers: 690-21170-*nnn*  
690-21869-*nnn*

- Installation and upgrade
- Set up Multidrop and UPS



### Using the AOM™ Menu System

Part number: 690-18055-*nnn*

- Easy-to-use menus to access programs
- Menu Manager to add, update, remove menus



### Operations Guide

Part number: 690-21171-*nnn*

- System administration
- Accounting, file systems
- Backups, port setup
- Communications (UUCP)
- Error messages



### Reference (C)

Part number: 690-22869-*nnn*

- Commands (C)



### Reference (M)

Part number: 690-22870-*nnn*

- Miscellaneous files (M)



### User's Guide

Part number: 690-21178-*nnn*  
(Not shipped with the Run-time system)

- Basic concepts and tasks
- Vi, ed, mail, awk, sed
- Shells: sh and csh

## TEXT PROCESSING SYSTEM



### DOCUMENTER'S WORKBENCH™

Part numbers: 690-15843-*nnn*  
690-15844-*nnn*

- Mm macros, reference
- Nroff, troff, tbl, eqn

## DEVELOPMENT SYSTEM

Set part number: 690-21585-000



### Reference (CP, S, F)

- Programming commands (CP)
- System calls, library routines (S)
- File formats (F)



### Programmer's Guide

- Make, SCCS
- Lex, yacc
- Signals, system resources, device drivers
- Adb, sdb
- Shared libraries



### C Compiler Library and User's Guide

- I/O functions, pipes
- Curses, terminfo
- Assembly routines
- As, cc, COFF, lint, ld
- Error processing
- Character and string processing



### C Compiler Language Reference

- Elements of C
- Program structure
- Declarations, expressions
- Statements, functions
- Preprocessor directives



### Macro Assembler User's Guide and Reference

- How to use masm
- Error messages
- Type declarations
- Operands, expressions
- Directives, file control
- Instruction summary

To order the *User's Guide* or any of the above manuals, call 408/434-6688, ext. 3004 and give the manual title and part number.



# Permuted Index

The Permuted Index on the following pages contains a listing of programs, utilities, files, etc. in the Altos System V Run-time and Development Systems. These programs are described in the *Altos System V Reference*. Volume 1 of the Reference contains the Run-time system commands (C) and miscellaneous (M) sections. Volume 2 contains the Development system programming commands (CP), system calls and library routines (S), and file formats (F). Entries in each section are in alphabetical order.

## NOTE

These programs, utilities, files, etc. are subject to change.

The table that follows contains a description of each section and its location.

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<b>Description</b>	<b>Section</b>	<b>Manual</b>
Run-time commands	C	Reference (C)
Miscellaneous -- programs and system files used for system maintenance and to access devices	M	Reference (M)
Programming commands	CP	Reference (CP, S, F)
System calls and library routines for C and assembly language programming	S	Reference (CP, S, F)
File formats -- programs and system files not defined in the M section	F	Reference (CP, S, F)

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	as(CP)	386 Assembler _____	as(CP)
l3tol(S) ltol3(S)	convert between	3-byte integers and long integers _____	l3tol(S)
tk(C)	paginator for Tektronix	4014 _____	tk(C)
	integer and base-64 ASCII string	a64l(S) l64a(S) convert between long _____	a64l(S)
	abs(S) return integer	abort(S) generate an IOT fault _____	abort(S)
ceil(S) fabs(S) floor, ceiling, and		absolute value _____	abs(S)
floor(S) fmod(S) floor, ceiling, and		absolute value functions floor(S) _____	floor(S)
		absolute value functions _____	floor(S)
	requests	abs(S) return integer absolute value _____	abs(S)
	settime(C) change the	accept(C) reject(C) allow/prevent print _____	accept(C)
	touch(C) update	access and modification dates of files _____	settime(C)
	utime(S) set file	access and modification times of a file _____	touch(C)
login(C) give you system		access and modification times _____	utime(S)
	sputl(S) sgetl(S)	access _____	login(C)
	dos(C)	access long integer data _____	sputl(S)
	sadp(M) disk	access MS-DOS files _____	dos(C)
ldfcn(F) common object file		access profiler _____	sadp(M)
sdwaitv(S) synchronize shared data		access routines _____	ldfcn(F)
sdenter(S) sdleave(S) synchronize		access adgetv(S) _____	sdgetv(S)
waitsem(S) nwaitsem(S) wait and check		access to a shared data segment _____	sdenter(S)
	clock(M) provide	access to semaphore resource _____	waitsem(S)
getutent(S) utmpname(S) endutent(S)		access to the time-of-day chip _____	clock(M)
getut(S) setutent(S) getutline(S)		access utmp file entry getut(S) _____	getut(S)
	access(S) determine	access utmp file entry _____	getut(S)
	file	accessibility of a file _____	access(S)
	csplit(C) split files	access(S) determine accessibility of a _____	access(S)
acct(S) enable or disable process		according to context _____	csplit(C)
acct(M) format of per-process		accounting _____	acct(S)
	acct(C)	accounting file _____	acct(M)
	file	accounting system _____	acct(C)
	accounting	acct(C) accounting system _____	acct(C)
trig(S) sin(S) cos(S) tan(S) asin(S)		acct(M) format of per-process accounting	acct(M)
	killall(C) kill all	acct(S) enable or disable process _____	acct(S)
	sar(C) system	acos(S) trigonometric functions _____	trig(S)
	sar(M) system	active processes _____	killall(C)
sact(CP) print current SCCS file edit		activity report package _____	sar(C)
	debugger	activity report package _____	sar(M)
	add.hd(C)	activity _____	sact(CP)
	nl(C)	adb(C) invoke x.out general purpose _____	adb(C)
map badblock(C)		add an additional hard disk _____	add.hd(C)
	lpinit(M)	add line numbers to a file _____	nl(C)
putenv(S) change or		add new bad sectors to the bad sector _____	badblock(C)
	add.hd(C) add an	add new line printers _____	lpinit(M)
upgrade.hd(C) upgrade an		add value to environment _____	putenv(S)
	files	add.hd(C) add an additional hard disk _____	add.hd(C)
admin(CP) create and		additional hard disk _____	add.hd(C)
ua(C) user		additional hard disk _____	upgrade.hd(C)
uadmin(S)		admin(CP) create and administer SCCS _____	admin(CP)
machines		administer SCCS files _____	admin(CP)
	mail alias file	administration program _____	ua(C)
alarm(S) set a process		administrative control _____	uadmin(S)
brk(S) sbrk(S) change data segment space		aftp(C) transfer files between Altos _____	aftp(C)
		aliases(M) mail alias file _____	aliases(M)
		aliashash(M) rebuild data base for _____	aliashash(M)
		alarm clock _____	alarm(S)
		alarm(S) set a process alarm clock _____	alarm(S)
		allocation _____	brk(S)

# Permuted Index

free(S) realloc(S) fast main memory	allocator malloc(S) _____	malloc(S)
malloc(S) main memory	allocator _____	malloc(S)
mallot(S) calloc(S) fast main memory	allocator malloc(S) mallinfo(S) _____	malloc(S)
terminal msg(C)	allow or disallow messages sent to a _____	msg(C)
get and set maximum number of users	allowed to log in numusers(S) _____	numusers(S)
accept(C) reject(C)	allow/prevent print requests _____	accept(C)
aftp(C) transfer files between	Altos machines _____	aftp(C)
lex(CP) generate programs for lexical	analysis _____	lex(CP)
editor output	a.out(F) format of assembler and link ___	a.out(F)
dc(C)	arbitrary precision calculator _____	dc(C)
bc(C)	arbitrary-precision arithmetic language _____	bc(C)
cpio(F) format of cpio	archive _____	cpio(F)
ar(F)	archive file format _____	ar(F)
xar(F)	archive file format _____	xar(F)
the archive header of a member of an	archive file ldahread(S) read _____	ldahread(S)
tar(C)	archive files _____	tar(C)
file ldahread(S) read the	archive header of a member of an archive _____	ldahread(S)
streaming tape	archive(C) save a file system to a _____	archive(C)
ar(CP) maintain	archives and libraries _____	ar(CP)
xar(CP) maintain	archives and libraries _____	xar(CP)
cpio(C) copy file	archives in and out _____	cpio(C)
ranlib(CP) convert	archives to random libraries _____	ranlib(CP)
	ar(CP) maintain archives and libraries _____	ar(CP)
	ar(F) archive file format _____	ar(F)
varargs(F) handles variable	argument list _____	varargs(F)
getopt(S) get option letter from	argument vector _____	getopt(S)
expr(C) evaluate	arguments as an expression _____	expr(C)
echo(C) echo	arguments _____	echo(C)
bc(C) arbitrary-precision	arithmetic language _____	bc(C)
asa(C) interpret	asa carriage control characters _____	asa(C)
characters	asa(C) interpret asa carriage control _____	asa(C)
ascii(M) map of the	ASCII character set _____	ascii(M)
convert between long integer and base-64	ASCII string a64l(S) l64a(S) _____	a64l(S)
	ascii(M) map of the ASCII character set _____	ascii(M)
	as(CP) 386 Assembler _____	as(CP)
time to string ctime(S) tzset(S)	asctime(S) cftime(S) convert date and _____	ctime(S)
trig(S) sin(S) cos(S) tan(S)	asin(S) acos(S) trigonometric functions _____	trig(S)
	asktime(C) set the system time of day _____	asktime(C)
a.out(F) format of	assembler and link editor output _____	a.out(F)
as(CP) 386	Assembler _____	as(CP)
masm(CP) invoke the macro	assembler _____	masm(CP)
assert(S) verify program	assertion _____	assert(S)
	assert(S) verify program assertion _____	assert(S)
setbuf(S) setvbuf(S)	assign buffering to a stream _____	setbuf(S)
trig(S) atan(S)	atan2(S) trigonometric functions _____	trig(S)
trig(S)	atan(S) atan2(S) trigonometric functions _____	trig(S)
later time	at(C) batch(C) execute commands at a _____	at(C)
double-precision number strtod(S)	atof(S) convert string to _____	strtod(S)
strtol(S) atol(S)	atoi(S) convert string to integer _____	strtol(S)
integer strtol(S)	atoi(S) atoi(S) convert string to _____	strtol(S)
sdfget(S) sdfree(S)	attach and detach a shared data segment _____	sdfget(S)
reboot(C)	automatically reboot the system _____	reboot(C)
reboot the system	autoreboot(C) automatically _____	autoreboot(C)
language	awk(C) pattern scanning and processing _____	awk(C)
wait(C) wait completion of	background processes _____	wait(C)
finc(M) fast incremental	backup _____	finc(M)
ckbupscd(M) check file system	backup schedule _____	ckbupscd(M)

frec(M) recover files from a	back-up tape _____	frec(M)
badblock(C) add new bad sectors to the	bad sector map _____	badblock(C)
badblock(C) add new	bad sectors to the bad sector map _____	badblock(C)
bad sector map	badblock(C) add new bad sectors to the	badblock(C)
164a(S) convert between long integer and	banner(C) print large letters _____	banner(C)
of pathnames	base-64 ASCII string a64l(S) _____	a64l(S)
time at(C)	basename(C) dirname(C) deliver portions	basename(C)
language	batch(C) execute commands at a later	at(C)
diff	bc(C) arbitrary-precision arithmetic	bc(C)
cb(CP)	bdiff(C) compare files too large for	bdiff(C)
bessel(S) j0(S) y0(S)	beautify C programs _____	cb(CP)
	Bessel functions _____	bessel(S)
	bessel(S) j0(S) y0(S) Bessel functions	bessel(S)
	bfs(C) scan big files _____	bfs(C)
	big files _____	bfs(C)
	binary input/output _____	fwrite(S)
	binary, or manual for program _____	whereis(C)
	binary search of a sorted table _____	bsearch(S)
	binary search trees tsearch(S) _____	tsearch(S)
	binary semaphore _____	creatsem(S)
	bit _____	reset(C)
	blank lines _____	spc(C)
	block _____	sync(S)
	blocks and inodes _____	df(M)
	blocks in a file _____	sum(C)
	boot program _____	boot(M)
	bootable object file _____	mkboot(M)
	bootable system file with driver symbol	mkunix(M)
	bootable system file with kernel symbol	mkunix(M)
	boot(M) boot program _____	boot(M)
	brc(M) system initialization procedure	brc(M)
	bring system to single-user or shutdown	shutdown(M)
	bring system up multi/single-user mode	multiuser(C)
	brk(S) sbrk(S) change data segment space	brk(S)
	bsearch(S) binary search of a sorted	bsearch(S)
	bsh(C) invoke the Business shell _____	bsh(C)
	buffered input/output package _____	stdio(S)
	buffering to a stream _____	setbuf(S)
	build special files _____	mknod(C)
	Business shell _____	bsh(C)
	Business shell _____	digest(C)
	Business shell menu system _____	menus(M)
	bytes _____	swab(S)
	C compiler _____	cc(CP)
	C compiler _____	xcc(CP)
	C flow graph _____	cflow(CP)
	C Language Preprocessor _____	cpp(CP)
	C language usage and syntax _____	lint(CP)
	C program cross-reference _____	cxref(CP)
	C program debugger _____	ctrace(CP)
	C programs _____	cb(CP)
	C programs _____	xref(CP)
	C programs _____	xstr(CP)
	C source listing from COFF file _____	list(CP)
	C source mkstr(C) _____	mkstr(C)
	C source mkstr(CP) _____	mkstr(CP)
	cal(C) print a calendar _____	cal(C)
fread(S) fwrite(S)		
whereis(C) locate source.		
bsearch(S)		
tfind(S) tdelete(S) twalk(S) manage		
creatsem(S) create a		
reset(C) reset the teletype		
ssp(C) remove consecutive		
sync(S) update super		
df(M) report number of free disk		
sum(C) calculate checksum and count		
boot(M)		
mkboot(M) convert object file to		
table mkunix(M) make		
table mkunix(M) make		
	shutdown(M)	
multiuser(C) singleuser(C)		
allocation		
table		
stdio(S) standard		
setbuf(S) setvbuf(S) assign		
mknod(C)		
bsh(C) invoke the		
digest(C) create menu system(s) for the		
menus(M) format of		
swab(S) swap		
cc(CP) invoke the		
xcc(CP) invoke the XENIX		
cflow(CP) generate		
cpp(CP) the		
lint(CP) check		
cxref(CP) generate		
ctrace(CP)		
cb(CP) beautify		
xref(CP) cross-reference		
xstr(CP) extract strings from		
list(CP) produce		
create an error message file from		
create an error message file from		

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file sum(C)	calculate checksum and count blocks in a	sum(C)
dc(C) arbitrary precision calculator	_____	dc(C)
cal(C) print a calendar	_____	cal(C)
calendar(C) invoke a reminder service	_____	calendar(C)
call another UNIX system	_____	cu(C)
cu(C)	_____	cu(C)
call	_____	stat(F)
stat(F) return data by stat system	_____	stat(F)
malloc(S) mallinfo(S) mallopt(S)	_____	malloc(S)
calls, functions, and libraries	_____	intro(S)
intro(S) introduce system	_____	intro(S)
line printer lp(C)	_____	lp(C)
termcap(M) terminal capability database	_____	termcap(M)
terminfo(M) terminal capability database	_____	terminfo(M)
description	_____	terminfo(M)
captainfo(M) convert termcap to terminfo	_____	captainfo(M)
carriage control characters	_____	asa(C)
asa(C) interpret asa	_____	asa(C)
cat(C) concatenate and display files	_____	cat(C)
cb(CP) beautify C programs	_____	cb(CP)
cc command	_____	gcc(CP)
gcc(CP) create a front end to the C compiler	_____	gcc(CP)
cc(CP) invoke the C compiler	_____	cc(CP)
cd(C) change working directory	_____	cd(C)
cdc(CP) change the delta commentary of	_____	cdc(CP)
SCCS delta	_____	cdc(CP)
absolute value functions floor(S)	_____	floor(S)
ceil(S) fabs(S) floor, ceiling, and	_____	floor(S)
floor(S) ceil(S) fabs(S) floor, ceiling, and absolute value functions	_____	floor(S)
floor(S) fmod(S) floor, ceiling, and absolute value functions	_____	floor(S)
cfow(CP) generate C flow graph	_____	cfow(CP)
ctime(S) convert date and time to	_____	ctime(S)
string ctime(S) tzset(S) asctime(S)	_____	ctime(S)
brk(S) sbrk(S) change data segment space allocation	_____	brk(S)
passwd(C) change login password	_____	passwd(C)
chmod(S) change mode of file	_____	chmod(S)
putenv(S) change or add value to environment	_____	putenv(S)
chown(S) change owner and group of a file	_____	chown(S)
chown(C) chgrp(C) change owner or group ID	_____	chown(C)
directory chmod(C) change permissions of a file or	_____	chmod(C)
nice(S) change priority of a process	_____	nice(S)
chroot(S) change root directory	_____	chroot(S)
chroot(C) change root directory for command	_____	chroot(C)
swap(C) change swap device configuration	_____	swap(C)
of files settime(C) change the access and modification dates	_____	settime(C)
delta cdc(CP) change the delta commentary of SCCS	_____	cdc(CP)
chsize(S) change the file size	_____	chsize(S)
delta(CP) make a delta(CP) change to an SCCS file	_____	delta(CP)
cd(C) change working directory	_____	cd(C)
chdir(S) change working directory	_____	chdir(S)
pipe(S) create an interprocess channel	_____	pipe(S)
ungetc(S) push character back into input stream	_____	ungetc(S)
userid(S) get character login name of the user	_____	userid(S)
getc(S) getw(S) fgetc(S) getchar(S) get character or word from a stream	_____	getc(S)
putc(S) putchar(S) putw(S) fputc(S) put character or word on a stream	_____	putc(S)
ascii(M) map of the ASCII character set	_____	ascii(M)
fgrep(C) search a file for a character string	_____	fgrep(C)
asa(C) interpret asa carriage control characters	_____	asa(C)
toascii(S) tolower(S) translate characters conv(S) toupper(S)	_____	conv(S)
islower(S) iscntrl(S) classify characters ctype(S) isalpha(S)	_____	ctype(S)
ispunct(S) isascii(S) classify characters ctype(S) isdigit(S)	_____	ctype(S)
tr(C) translate characters	_____	tr(C)
wc(C) count lines, words, and characters	_____	wc(C)
chdir(S) change working directory	_____	chdir(S)
waitsem(S) nbwaitsem(S) wait and check access to semaphore resource	_____	waitsem(S)
fsck(C) dfck(C) check and repair file systems	_____	fsck(C)

lint(CP)	check C language usage and syntax _____	lint(CP)
ckbupscd(M)	check file system backup schedule _____	ckbupscd(M)
pwck(M) grpck(M)	check password/group file _____	pwck(M)
permissions file ucheck(M)	check the uucp directories and _____	ucheck(M)
rdchk(S)	check to see if there is data to be read _____	rdchk(S)
labelit(M) copy file system with label	checking volcopy(M) _____	volcopy(M)
by fack	checklist(M) list file systems processed _____	checklist(M)
sum(C) calculate	checksum and count blocks in a file _____	sum(C)
chown(C)	chgrp(C) change owner or group ID _____	chown(C)
times(S) get process and	child process times _____	times(S)
wait(S) wait for	child process to stop or terminate _____	wait(S)
provide access to the time-of-day	chip clock(M) _____	clock(M)
libraries	chkshlib(CP) tool for comparing shared _____	chkshlib(CP)
directory	chmod(C) change permissions of a file or _____	chmod(C)
	chmod(S) change mode of file _____	chmod(S)
ID	chown(C) chgrp(C) change owner or group _____	chown(C)
file	chown(S) change owner and group of a _____	chown(S)
command	chroot(C) change root directory for _____	chroot(C)
	chroot(S) change root directory _____	chroot(S)
	chsize(S) change the file size _____	chsize(S)
schedule	ckbupscd(M) check file system backup _____	ckbupscd(M)
isalpha(S) islower(S) iscntrl(S)	classify characters ctype(S) _____	ctype(S)
isdigit(S) ispunct(S) issascii(S)	classify characters ctype(S) _____	ctype(S)
inir(M)	clean the file system and executes init _____	inir(M)
strclean(M) STREAMS error logger	cleanup program _____	strclean(M)
uucleanup(M) uucp spool directory	cleanup _____	uucleanup(M)
	clear inode _____	clri(M)
	clear terminal screen _____	clear(C)
	clear(C) clear terminal screen _____	clear(C)
inquiries ferror(S) fileno(S)	clearerr(S) feof(S) stream status _____	ferror(S)
csch(C) shell command interpreter with	C-like syntax _____	csch(C)
alarm(S) set a process alarm	clock _____	alarm(S)
time-of-day chip	clock(M) provide access to the _____	clock(M)
STREAMS driver	clock(S) report CPU time used _____	clock(S)
ldclose(S) ldclose(S)	clone(M) open any minor device on _____	clone(M)
close(S)	close a COFF file _____	ldclose(S)
fclose(S) fflush(S)	close a file descriptor _____	close(S)
haltsys(C)	close or flush a stream _____	fclose(S)
directory operations directory(S)	close the file systems and halt the CPU _____	haltsys(C)
	closedir(S) rewinddir(S) seekdir(S) _____	directory(S)
	close(S) close a file descriptor _____	close(S)
	clri(M) clear inode _____	clri(M)
	cmp(C) compare two files _____	cmp(C)
dis(CP) object	code disassembler _____	dis(CP)
ldclose(S) ldclose(S) close a	COFF file _____	ldclose(S)
ldfhead(S) read the file header of a	COFF file _____	ldfhead(S)
list(CP) produce C source listing from	COFF file _____	list(CP)
to line number entries of a section of a	COFF file ldlseek(S) seek _____	ldlseek(S)
relocation entries of a section of a	COFF file ldrseek(S) seek _____	ldrseek(S)
to an indexed/named section header of a	COFF file ldshread(S) read _____	ldshread(S)
the index of a symbol table entry of a	COFF file ldtbindex(S) compute _____	ldtbindex(S)
read an indexed symbol table entry of a	COFF file ldtbread(S) _____	ldtbread(S)
seek to the symbol table of a	COFF file ldtbseek(S) _____	ldtbseek(S)
remove symbols and line numbers from	COFF file ldtbseek(S) _____	ldtbseek(S)
convert an object file from OMF to	COFF file strip(CP) _____	strip(CP)
manipulate line number entries of a	COFF fixobj(CP) _____	fixobj(CP)
ldgetname(S) retrieve symbol name for	COFF function ldhread(S) ldlitem(S) _____	ldhread(S)
	COFF symbol table entry _____	ldgetname(S)

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	comb(CP) combine SCCS deltas _____	comb(CP)
	combine SCCS deltas _____	comb(CP)
	nice(C) run a _____	nice(C)
chroot(C) change root directory for	command _____	chroot(C)
env(C) set environment for	command execution _____	env(C)
gencc(CP) create a front end to the cc	command _____	gencc(CP)
nohup(C) run a _____	command immune to hangups and quits _____	nohup(C)
setpgpr(C) execute	command in a new process group _____	setpgpr(C)
sh(C) rsh(C) invoke the shell	command interpreter _____	sh(C)
csh(C) shell	command interpreter with C-like syntax _____	csh(C)
uux(C) execute	command on remote UNIX _____	uux(C)
getopt(C) parse	command options _____	getopt(C)
uuxqt(M) execute remote	command requests _____	uuxqt(M)
system(S) issue a shell	command _____	system(S)
time(C) time a _____	command _____	time(C)
at(C) batch(C) execute	commands at a later time _____	at(C)
cron(C) execute	commands at specified times _____	cron(C)
rc2(M) _____	commands for multi-user environment _____	rc2(M)
install(M) install	commands _____	install(M)
intro(C) introduce	commands _____	intro(C)
intro(CP) introduce software development	commands _____	intro(CP)
rc0(M) _____	commands to stop the operating system _____	rc0(M)
xargs(C) construct and execute	commands _____	xargs(C)
two sorted files	comm(C) select/reject lines common to _____	comm(C)
mcs(CP) manipulate the object file	comment section _____	mcs(CP)
cdc(CP) change the delta	commentary of SCCS delta _____	cdc(CP)
ldfcn(F) _____	common object file access routines _____	ldfcn(F)
cpr(CP) compress a _____	common object file _____	cpr(CP)
ldopen(S) ldaopen(S) open a	common object file for reading _____	ldopen(S)
linenum(F) line number entries in a	common object file _____	linenum(F)
nm(CP) print name list of	common object file _____	nm(CP)
reloc(F) relocation of information for a	common object file _____	reloc(F)
scnhdr(F) section header for a	common object file _____	scnhdr(F)
syms(F) _____	common object file symbol table format _____	syms(F)
conv(CP) convert	common object files _____	conv(CP)
filehdr(F) file header for	common object files _____	filehdr(F)
size(C) print section sizes of	common object files _____	size(C)
seek to the optional file header of a	common object ldohseek(S) _____	ldohseek(S)
comm(C) select/reject lines	common to two sorted files _____	comm(C)
glossary(C) define	common UNIX terms and symbols _____	glossary(C)
ipcs(C) report inter-process	communication facilities status _____	ipcs(C)
stdipc(S) ftok(S) standard interprocess	communication package _____	stdipc(S)
dircmp(C) _____	compare directories _____	dircmp(C)
sdiff(C) _____	compare files side-by-side _____	sdiff(C)
bdiff(C) _____	compare files too large for diff _____	bdiff(C)
infocmp(M) _____	compare or print terminfo descriptions _____	infocmp(M)
diff3(C) _____	compare three files _____	diff3(C)
cmp(C) _____	compare two files _____	cmp(C)
diff(C) _____	compare two text files _____	diff(C)
sccsdiff(CP) _____	compare two versions of an SCCS file _____	sccsdiff(CP)
chkshlib(CP) tool for	comparing shared libraries _____	chkshlib(CP)
regcmp(S) _____	compile a regular expression _____	regcmp(S)
regexp(F) regular expression	compile and match routines _____	regexp(F)
routines regexp(S) _____	compile regular expression and match _____	regexp(S)
regcmp(CP) _____	compile regular expressions _____	regcmp(CP)
tic(C) _____	compile terminfo source _____	tic(C)
cc(CP) invoke the C	compiler _____	cc(CP)

xcc(CP) invoke the XENIX C compiler	xcc (CP)
yacc(CP) invoke a compiler-compiler	yacc(CP)
erf(S) erf(C) error function and complementary error function	erf(S)
wait(C) wait	wait(C)
pack(C) pcat(C) unpack(C)	pack(C)
cprs(CP)	cprs(CP)
entry of a COFF file ldtbindex(S)	ldtbindex(S)
cat(C)	cat(C)
ldunix(M)	ldunix(M)
master(M) master	master(M)
printers(M) print spooler	printers(M)
sysconf(C) get system configuration information	sysconf(C)
sysconf(S) get system configuration information	sysconf(S)
pconfig(C) set port configuration	pconfig(C)
swap(C) change swap device configuration	swap(C)
shutype(M) UPS shutdown configuration utility	shutype(M)
lpadmin(M)	lpadmin(M)
configure the LP spooling system	configure the LP spooling system
connection dial(S)	dial(S)
consecutive blank lines	consecutive blank lines
ssp(C)	ssp(C)
console display	console display
display(M)	display(M)
console keyboard	console keyboard
keyboard (M)	keyboard (M)
constants	constants
math(F) math functions and constants	math(F)
unistd(F) file header for symbolic constants	unistd(F)
file header for implementation-specific constants limits(F)	limits(F)
mkfs(M)	mkfs(M)
xargs(C)	xargs(C)
uutry(M)	uutry(M)
contact remote system with debugging on	contact remote system with debugging on
errprint(M)	errprint(M)
display error log	display error log
recover(C) restore	recover(C)
dump.hd(C) dump	dump.hd(C)
ls(C) list	ls(C)
content	content
csplit(C) split files according to context	csplit(C)
fcntl(S) file control	fcntl(S)
uadmin(S) administrative control	uadmin(S)
uustat(C) uucp status inquiry and job control	uustat(C)
vc(CP) version control	vc(CP)
asa(C) interpret asa carriage control characters	asa(C)
ioctl(S)	ioctl(S)
control device	control device
control fpgetround(S) fpgetmask(S)	fpgetround(S)
control fpgetround(S) fpgetsticky(S)	fpgetround(S)
control fpgetround(S) fpsetmask(S)	fpgetround(S)
control fpgetround(S) fpsetround(S)	fpgetround(S)
control fpgetround(S) fpsetsticky(S)	fpgetround(S)
control initialization	control initialization
init(M)	init(M)
control operations	control operations
msgctl(S) message control operations	msgctl(S)
semctl(S) semaphore control operations	semctl(S)
shmctl(S) shared memory control operations	shmctl(S)
fcntl(F) file control options	fcntl(F)
conv(CP) convert common object files	conv(CP)
term(M)	term(M)
conventional names for terminals	conventional names for terminals
fixobj(CP)	fixobj(CP)
convert an object file from OMF to COFF	convert an object file from OMF to COFF
dd(C)	dd(C)
convert and copy a file	convert and copy a file
ranlib(CP)	ranlib(CP)
convert archives to random libraries	convert archives to random libraries
integers l3tol(S) ltol3(S)	integers l3tol(S) ltol3(S)
convert between 3-byte integers and long	convert between 3-byte integers and long
ASCII string a64l(S) l64a(S)	ASCII string a64l(S) l64a(S)
convert between long integer and base-64	convert between long integer and base-64
conv(CP)	conv(CP)
convert common object files	convert common object files
ctime(S) gmtime(S) localtime(S)	convert date and time to string
ctime(S)	ctime(S)

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ctime(S) tzset(S) asctime(S) cftime(S)	convert date and time to string _____	ctime(S)
ecvt(S)	convert floating-point number to string _	ecvt(S)
scanf(S) fscanf(S) sscanf(S)	convert formatted input _____	scanf(S)
file mkboot(M)	convert object file to bootable object _	mkboot(M)
FORTTRAN ratfor(CP)	convert rational FORTRAN to standard ____	ratfor(CP)
number strtod(S) atof(S)	convert string to double-precision _____	strtod(S)
strtol(S) atol(S) atoi(S)	convert string to integer _____	strtol(S)
captoinfo(M)	convert termcap to terminfo description _	captoinfo(M)
units(C)	convert units _____	units(C)
translate characters	conv(S) toupper(S) toascii(S) tolower(S)	conv(S)
dd(C) convert and	copy a file _____	dd(C)
fcopy(C)	copy a floppy diskette _____	fcopy(C)
cpio(C)	copy file archives in and out _____	cpio(C)
volcopy(M) labelit(M)	copy file system with label checking ____	volcopy(M)
cp(C)	copy files _____	cp(C)
uucp(C) uulog(C) uname(C)	copy files from UNIX to UNIX _____	uucp(C)
copy(C)	copy groups of files _____	copy(C)
tra(C)	copy out a file as it grows _____	tra(C)
public UNIX-to-UNIX system file	copy uuto(C) uupick(C) _____	uuto(C)
	copy(C) copy groups of files _____	copy(C)
core(F) format of	core image file _____	core(F)
	core(F) format of core image file _____	core(F)
sinh(S)	core(S) tanh(S) hyperbolic functions ____	sinh(S)
trigonometric functions trig(S) sin(S)	cos(S) tan(S) asin(S) acos(S) _____	trig(S)
sum(C) calculate checksum and	count blocks in a file _____	sum(C)
wc(C)	count lines, words, and characters _____	wc(C)
	cp(C) copy files _____	cp(C)
cpio(F) format of	cpio archive _____	cpio(F)
	cpio(C) copy file archives in and out ____	cpio(C)
	cpio(F) format of cpio archive _____	cpio(F)
	cpp(CP) the C Language Preprocessor _____	cpp(CP)
	cprs(CP) compress a common object file _	cprs(CP)
	cpset(C) install utilities _____	cpset(C)
close the file systems and halt the	CPU haltsys(C) _____	haltsys(C)
clock(S) report	CPU time used _____	clock(S)
creatsem(S)	create a binary semaphore _____	creatsem(S)
gencc(CP)	create a front end to the cc command ____	gencc(CP)
tmpnam(S) tempnam(S)	create a name for a temporary file _____	tmpnam(S)
one creat(S)	create a new file or rewrite an existing	creat(S)
fork(S)	create a new process _____	fork(S)
mkshlib(CP)	create a shared library _____	mkshlib(CP)
ctags(C)	create a tags file _____	ctags(C)
tee(C)	create a tee in a pipe _____	tee(C)
tmpfile(S)	create a temporary file _____	tmpfile(S)
source mkstr(C)	create an error message file from C ____	mkstr(C)
source mkstr(CP)	create an error message file from C ____	mkstr(CP)
pipe(S)	create an interprocess channel _____	pipe(S)
admin(CP)	create and administer SCCS files _____	admin(CP)
Shell digest(C)	create menu system(s) for the Business _	digest(C)
makedevs(M)	create special device files _____	makedevs(M)
maketty(M)	create tty special files _____	maketty(M)
umask(S) set and get file	creation mask _____	umask(S)
existing one	creat(S) create a new file or rewrite an	creat(S)
	creatsem(S) create a binary semaphore ____	creatsem(S)
	cref(CP) make a cross-reference listing _	cref(CP)
times	cron(C) execute commands at specified ____	cron(C)
crontab(C) manage user	crontab files _____	crontab(C)

	xref(CP)	crontab(C) manage user crontab files	crontab(C)
cxref(CP) generate C program		cross-reference C programs	xref(CP)
cxref(CP) make a functions		cross-reference	cxref(CP)
C-like syntax		cross-reference listing	cxref(CP)
context		crypt(S) password and file encryption	crypt(S)
		csh(C) shell command interpreter with	csh(C)
		csplit(C) split files according to	csplit(C)
		ctags(C) create a tags file	ctags(C)
		ct(C) spawn getty to a remote terminal	ct(C)
	terminal	ctermid(S) generate file name for	ctermid(S)
	date and time to string	ctime(S) gmtime(S) localtime(S) convert	ctime(S)
convert date and time to string		ctime(S) tzset(S) asctime(S) cftime(S)	ctime(S)
		ctrace(CP) C program debugger	ctrace(CP)
		ctype(S) isalpha(S) islower(S)	ctype(S)
iscntrl(S) classify characters		ctype(S) isdigit(S) ispunct(S)	ctype(S)
isascii(S) classify characters		cu(C) call another UNIX system	cu(C)
		current port name	ty(C)
	tty(C) get the	current SCCS file edit activity	sact(CP)
	sact(CP) print	current UNIX information	uname(C)
	uname(C) print the	current UNIX system	uname(S)
	uname(S) get name of	current user id	whoami(C)
	whoami(C) print effective	current user tty slot(S)	tytslot(S)
find the slot in the utmp file of the		current working directory	getcwd(S)
	getcwd(S) get path name of	currents screen image file	scr_dump(F)
	scr_dump(F) format of	curses(S) terminal screen handling and	curses(S)
	optimization package	curves	spline(C)
	spline(C) interpolate smooth	userid(S) get character login name of	userid(S)
	the user	cxref(CP) generate C program	cxref(CP)
	cross-reference	daemon	lpd(M)
	lpd(M) line printer	daemon	atrerr(M)
strerr(M) STREAMS error logger		daemon	xpd(M)
xpd(M) transparent printer		data access	sdgetv(S)
sdgetv(S) sdwaitv(S) synchronize shared		data collector	sadcon(M)
turn on/off		data by stat system call	stat(F)
	stat(F) return	data in memory	plock(S)
plock(S) lock process, text, or		data	prof(CP)
prof(CP) display profile		data region executable	execseg(S)
execseg(S) make a		data segment sdenter(S) sdleave(S)	sdenter(S)
synchronize access to a shared		data segment sdget(S)	sdget(S)
sdfree(S) attach and detach a shared		data segment space allocation	brk(S)
brk(S) sbrk(S) change		data	sputl(S)
sputl(S) sgetl(S) access long integer		data to be read	rdchk(S)
rdchk(S) check to see if there is		data types	types(F)
types(F) primitive system		database	tput(C)
query terminfo		database functions dbm(S)	dbm(S)
dbm(S) fetch(S) nextkey(S) perform		database functions dbm(S)	dbm(S)
firstkey(S) store(S) fetch(S) perform		database	master(M)
master(M) master configuration		database	termcap(M)
termcap(M) terminal capability		database	terminfo(M)
terminfo(M) terminal capability		date and time to string	ctime(S)
ctime(S) gmtime(S) localtime(S) convert		date and time to string ctime(S)	ctime(S)
tzset(S) asctime(S) cftime(S) convert		date	date(C)
date(C) print and set the		date(C) print and set the date	date(C)
		dates of files settime(C)	settime(C)
change the access and modification		dbm(S) dbm(S) dbm(S) dbm(S)	dbm(S)
database functions dbm(S)		dbm(S) dbminit(S) fetch(S) nextkey(S)	dbm(S)
perform database functions		dbm(S) dbminit(S) fetch(S) nextkey(S)	dbm(S)
perform database functions		dbm(S) firstkey(S) store(S) fetch(S)	dbm(S)

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	dc(C) arbitrary precision calculator	dc(C)
	dd(C) convert and copy a file	dd(C)
adb(C) invoke x.out general purpose	debugger	adb(C)
ctrace(CP) C program	debugger	ctrace(CP)
fsdb(M) file system	debugger	fsdb(M)
sdb(C) symbolic	debugger	sdb(C)
uutry(M) contact remote system with	debugging on	uutry(M)
default(M)	default program information directory	default(M)
timezone(M) set	default system time zone	timezone(M)
directory	default(M) default program information	default(M)
glossary(C)	define common UNIX terms and symbols	glossary(C)
sysdef(M) output system	definition	sysdef(M)
basename(C) dirname(C)	deliver portions of pathnames	basename(C)
tail(C)	deliver the last part of a file	tail(C)
change the delta commentary of SCCS	delta cdc(CP)	cdc(CP)
cdc(CP) change the	delta commentary of SCCS delta	cdc(CP)
rm del(CP) remove a	delta from an SCCS file	rm del(CP)
	delta(CP) make a change to an SCCS file	delta(CP)
comb(CP) combine SCCS	deltas	comb(CP)
errstop(C) terminate error-logging	demon	errstop(C)
captainfo(M) convert termcap to terminfo	description	captainfo(M)
infocmp(M) compare or print terminfo	descriptions	infocmp(M)
close(S) close a file	descriptor	close(S)
dup(S) dup2(S) duplicate an open file	descriptor	dup(S)
sdget(S) sdfree(S) attach and	detach a shared data segment	sdget(S)
access(S)	determine accessibility of a file	access(S)
dtype(C)	determine disk type	dtype(C)
file(C)	determine file type	file(C)
fatyp(M)	determine the file system identifier	fatyp(M)
drive sizes(C)	determine the size of a logical disk	sizes(C)
whodo(M)	determine who is doing what	whodo(M)
intro(CP) introduce software	development commands	intro(CP)
swap(C) change swap	device configuration	swap(C)
make devs(M) create special	device files	make devs(M)
fold long lines for finite width output	device fold(C)	fold(C)
devinfo(C) display	device information	devinfo(C)
ioctl(S) control	device	ioctl(S)
devnm(C) identify	device name on which files reside	devnm(C)
clone(M) open any minor	device on STREAMS driver	clone(M)
	devinfo(C) display device information	devinfo(C)
files reside	devnm(C) identify device name on which	devnm(C)
and inodes	df(M) report number of free disk blocks	df(M)
fsck(C)	dfck(C) check and repair file systems	fsck(C)
line connection	dial(S) establish an out-going terminal	dial(S)
bdiff(C) compare files too large for	diff	bdiff(C)
	diff3(C) compare three files	diff3(C)
	diff(C) compare two text files	diff(C)
nice(C) run a command at a	different priority	nice(C)
Business Shell	digest(C) create menu system(s) for the	digest(C)
	dircmp(C) compare directories	dircmp(C)
uuchek(M) check the uuchek	directories and permissions file	uuchek(M)
dircmp(C) compare	directories	dircmp(C)
fleece(C) look for files in home	directories	fleece(C)
unlink(M) link and unlink files and	directories link(M)	link(M)
ls(C) list contents of	directories	ls(C)
mv(C) move (rename) files and	directories	mv(C)
rm(C) rmdir(C) remove files or	directories	rm(C)

cd(C) change working	directory _____	cd(C)
chdir(S) change working	directory _____	chdir(S)
chmod(C) change permissions of a file or	directory _____	chmod(C)
chroot(S) change root	directory _____	chroot(S)
uucleanup(M) uucp spool	directory cleanup _____	uucleanup(M)
default(M) default program information	directory _____	default(M)
dir(M) format of a	directory _____	dir(M)
getdents(S) read	directory entries and put in a file _____	getdents(S)
dirent(F) file system independent	directory entry _____	dirent(F)
unlink(S) remove	directory entry _____	unlink(S)
chroot(C) change root	directory for command _____	chroot(C)
get path name of current working	directory getcwd(S) _____	getcwd(C)
mkdir(C) make a	directory _____	mkdir(C)
mkdir(S) make a	directory _____	mkdir(S)
pwd(C) print working	directory name _____	pwd(C)
closedir(S) rewinddir(S) seekdir(S)	directory operations directory(S) _____	directory(S)
telldir(S) readdir(S) opendir(S)	directory operations directory(S) _____	directory(S)
mknod(S) make a	directory, or a special or ordinary file _____	mknod(S)
rmdir(S) remove a	directory _____	rmdir(S)
seekdir(S) directory operations	directory(S) closedir(S) rewinddir(S) _____	directory(S)
opendir(S) directory operations	directory(S) telldir(S) readdir(S) _____	directory(S)
directory entry	dirent(F) file system independent _____	dirent(F)
basename(C)	dir(M) format of a directory _____	dir(M)
disable(C)	dirname(C) deliver portions of pathnames _____	basename(C)
acct(S) enable or	disable logins on a port _____	disable(C)
msg(C) allow or	disable process accounting _____	acct(S)
dis(CP) object code	disable(C) disable logins on a port _____	disable(C)
set terminal type, modes, speed, line	disallow messages sent to a terminal _____	msg(C)
add.hd(C) add an additional hard	disassembler _____	dis(CP)
df(M) report number of free	discipline uugetty(M) _____	uugetty(M)
determine the size of a logical	dis(CP) object code disassembler _____	dis(CP)
restore.hd(C) restore a hard	disk _____	add.hd(C)
options(M) floppy	disk blocks and inodes _____	df(M)
layout(M) manage hard	disk drive sizefs(C) _____	sizefs(C)
maintain	disk from tape _____	restore.hd(C)
dump.hd(C) dump contents of a hard	disk installation menu _____	options(M)
dtype(C) determine	disk partitions _____	layout(M)
upgrade.hd(C) upgrade an additional hard	disk partitions _____	fdisk(C)
du(C) summarize	disk to tape _____	dump.hd(C)
fcopy(C) copy a floppy	disk type _____	dtype(C)
format(C) format a floppy	disk _____	upgrade.hd(C)
system console	disk usage _____	du(C)
see(C)	diskette _____	fcopy(C)
devinfo(C)	diskette _____	format(C)
vi(C) invoke a screen-oriented	display _____	display(M)
errprint(M)	display a file _____	see(C)
cat(C) concatenate and	display device information _____	devinfo(C)
hd(C)	display editor _____	vi(C)
od(C)	display error log contents _____	errprint(M)
prof(CP)	display files _____	cat(C)
set up terminal to print screen	display files in hexadecimal format _____	hd(C)
hdr(C)	display files in octal format _____	od(C)
who(C)	display profile data _____	prof(CP)
hypot(S) Euclidean	display pscreen(C) _____	pscreen(C)
	display selected parts of an object file _____	hdr(C)
	display who is on the system _____	who(C)
	distance function _____	hypot(S)



nlist(S) get	entries from name list _____	nlist(S)
linenum(F) line number	entries in a common object file _____	linenum(F)
ldlitem(S) manipulate line number	entries of a COFF function ldlread(S) _____	ldlread(S)
ldlseek(S) seek to line number	entries of a section of a COFF file _____	ldlseek(S)
ldrseek(S) seek to relocation	entries of a section of a COFF file _____	ldrseek(S)
utmp(M) wtmp(M) format of utmp and wtmp	entries _____	utmp(M)
file system independent directory	entry dirent(F) _____	dirent(F)
endgrent(S) setgrent(S) get group file	entry getgrent(S) fgetgrent(S) _____	getgrent(S)
getgrnam(S) getgrgid(S) get group file	entry getgrent(S) _____	getgrent(S)
setpwent(S) get password file	entry /fgetpwent(S) endpwent(S) _____	getpwent(S)
getpwnuid(S) get password file	entry getpwent(S) getpwnam(S) _____	getpwent(S)
utmpname(S) endutent(S) access utmp file	entry getut(S) getutent(S) _____	getut(S)
getutline(S) access utmp file	entry getut(S) setutent(S) _____	getut(S)
symbol name for COFF symbol table	entry ldgetname(S) retrieve _____	ldgetname(S)
compute the index of a symbol table	entry of a COFF file ldtbindex(S) _____	ldtbindex(S)
ldtbread(S) read an indexed symbol table	entry of a COFF file _____	ldtbread(S)
putpwent(S) write password file	entry _____	putpwent(S)
unlink(S) remove directory	entry _____	unlink(S)
execution	env(C) set environment for command _____	env(C)
profile(M) set up	environ(M) user environment _____	environ(M)
fpgetmask(S) IEEE floating point	environment at login time _____	profile(M)
fpgetsticky(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpsetmask(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpsetround(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpaetsticky(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
environ(M) user	environment _____	environ(M)
env(C) set	environment for command execution _____	env(C)
getenv(S) return value for	environment name _____	getenv(S)
printenv(C) print out the	environment _____	printenv(C)
putenv(S) change or add value to	environment _____	putenv(S)
rc2(M) commands for multi-user	environment _____	rc2(M)
numbers drand48(S)	erand48(S) generate pseudo-random _____	drand48(S)
error function erf(S)	erfc(S) error function and complementary	erf(S)
complementary error function	erf(S) erfc(S) error function and _____	erf(S)
sys_nerr(S) sys_errlist(S)	errno(S) system error messages _____	sys_nerr(S)
function erf(S) erfc(S)	error function and complementary error _____	erf(S)
erfc(S) error function and complementary	error function erf(S) _____	erf(S)
errprint(M) display	error log contents _____	errprint(M)
strclean(M) STREAMS	error logger cleanup program _____	strclean(M)
strerr(M) STREAMS	error logger daemon _____	strerr(M)
log(M) interface to STREAMS	error logging _____	log(M)
mkstr(C) create an	error message file from C source _____	mkstr(C)
mkstr(CP) create an	error message file from C source _____	mkstr(CP)
perror(S) system	error messages _____	perror(S)
sys_errlist(S) errno(S) system	error messages sys_nerr(S) _____	sys_nerr(S)
find spelling	errors _____	spell(C)
matherr(S)	error-handling function _____	matherr(S)
errstop(C) terminate	error-logging demon _____	errstop(C)
errprint(M) display error log contents	errprint(M) display error log contents _____	errprint(M)
errstop(C) terminate error-logging demon	errstop(C) terminate error-logging demon _____	errstop(C)
connection dial(S)	establish an out-going terminal line _____	dial(S)
setmnt(C) establish	establish /etc/mnttab table _____	setmnt(C)
end(S) edata(S)	/etc/mnttab table _____	setmnt(C)
hypot(S)	etext(S) last locations in program _____	end(S)
test(C)	Euclidean distance function _____	hypot(S)
	evaluate an expression _____	test(C)

# Permuted Index

expr(C) evaluate arguments as an expression \_\_\_\_\_ expr(C)  
 ex(C) invoke a text editor \_\_\_\_\_ ex(C)  
 file exec(S) execvp(S) execlp(S) execl(S) execute a \_\_\_\_\_ exec(S)  
 execute a file exec(S) execvp(S) execlp(S) execl(S) execute a \_\_\_\_\_ exec(S)  
 execvp(S) execlp(S) execl(S) execv(S) execl(S) execute a file exec(S) \_\_\_\_\_ exec(S)  
 execv(S) execl(S) execute a file exec(S) execvp(S) execlp(S) execl(S) \_\_\_\_\_ exec(S)  
 execseg(S) make a data region executable \_\_\_\_\_ execseg(S)  
 executable \_\_\_\_\_ execseg(S)  
 execute a file exec(S) execvp(S) \_\_\_\_\_ exec(S)  
 execute a regular expression \_\_\_\_\_ regex(S)  
 execute command in a new process group \_\_\_\_\_ setpgpr(C)  
 execute command on remote UNIX \_\_\_\_\_ uux(C)  
 execute commands at a later time \_\_\_\_\_ at(C)  
 execute commands at apecified times \_\_\_\_\_ cron(C)  
 execute commands \_\_\_\_\_ xargs(C)  
 execute remote command requests \_\_\_\_\_ uuxqt(M)  
 executes init \_\_\_\_\_ inir(M)  
 execution \_\_\_\_\_ env(C)  
 execution for a short interval \_\_\_\_\_ nap(S)  
 execution for an interval \_\_\_\_\_ sleep(C)  
 execution for interval \_\_\_\_\_ sleep(S)  
 execution profile \_\_\_\_\_ monitor(S)  
 execution time profile \_\_\_\_\_ profil(S)  
 execvp(S) execlp(S) execl(S) execv(S) \_\_\_\_\_ exec(S)  
 execv(S) execl(S) execute a file \_\_\_\_\_ exec(S)  
 existing one \_\_\_\_\_ creat(S)  
 exit value \_\_\_\_\_ false(C)  
 exit value \_\_\_\_\_ true(C)  
 exit(S) terminate process \_\_\_\_\_ exit(S)  
 expand files \_\_\_\_\_ pack(C)  
 exponential, logarithm, and power \_\_\_\_\_ exp(S)  
 exponential, logarithm, and square root \_\_\_\_\_ exp(S)  
 expr(C) evaluate arguments as an \_\_\_\_\_ expr(C)  
 expression and match routines \_\_\_\_\_ regexp(S)  
 expression compile and match routines \_\_\_\_\_ regexp(F)  
 expression egrep(C) search \_\_\_\_\_ egrep(C)  
 expression \_\_\_\_\_ expr(C)  
 expression \_\_\_\_\_ regcmp(S)  
 expression \_\_\_\_\_ regex(S)  
 expression \_\_\_\_\_ test(C)  
 expressions \_\_\_\_\_ regcmp(CP)  
 exp(S) pow(S) log(S) exponential, \_\_\_\_\_ exp(S)  
 exp(S) sqrt(S) exponential, logarithm, \_\_\_\_\_ exp(S)  
 extract strings from C programs \_\_\_\_\_ xstr(CP)  
 fabs(S) floor, ceiling, and absolute \_\_\_\_\_ floor(S)  
 facilities status ipc(S) \_\_\_\_\_ ipc(S)  
 facility \_\_\_\_\_ help(C)  
 factor a number \_\_\_\_\_ factor(C)  
 factor(C) factor a number \_\_\_\_\_ factor(C)  
 false(C) return with a nonzero exit \_\_\_\_\_ false(C)  
 fast find \_\_\_\_\_ ff(M)  
 fast incremental backup \_\_\_\_\_ finc(M)  
 fast main memory allocator \_\_\_\_\_ malloc(S)  
 fast main memory allocator malloc(S) \_\_\_\_\_ malloc(S)  
 fault \_\_\_\_\_ abort(S)  
 fclose(S) fflush(S) close or flush a \_\_\_\_\_ fclose(S)  
 fcntl(F) file control options \_\_\_\_\_ fcntl(F)

nlist(S) get	entries from name list _____	nlist(S)
linenum(F) line number	entries in a common object file _____	linenum(F)
ldlitem(S) manipulate line number	entries of a COFF function ldlread(S) _____	ldlread(S)
ldlseek(S) seek to line number	entries of a section of a COFF file _____	ldlseek(S)
ldrseek(S) seek to relocation	entries of a section of a COFF file _____	ldrseek(S)
utmp(M) wtmp(M) format of utmp and wtmp	entries _____	utmp(M)
file system independent directory	entry dirent(F) _____	dirent(F)
endgrent(S) setgrent(S) get group file	entry getgrent(S) fgetgrent(S) _____	getgrent(S)
getgrnam(S) getgrgid(S) get group file	entry getgrent(S) _____	getgrent(S)
setpwent(S) get password file	entry /fgetpwent(S) endpwent(S) _____	getpwent(S)
getpwuid(S) get password file	entry getpwent(S) getpwnam(S) _____	getpwent(S)
utmpname(S) endutent(S) access utmp file	entry getut(S) getutent(S) _____	getut(S)
getutline(S) access utmp file	entry getut(S) setutent(S) _____	getut(S)
symbol name for COFF symbol table	entry ldgetname(S) retrieve _____	ldgetname(S)
compute the index of a symbol table	entry of a COFF file ldtbindex(S) _____	ldtbindex(S)
ldtbread(S) read an indexed symbol table	entry of a COFF file _____	ldtbread(S)
putpwent(S) write password file	entry _____	putpwent(S)
unlink(S) remove directory	entry _____	unlink(S)
execution	env(C) set environment for command _____	env(C)
profile(M) set up	environ(M) user environment _____	environ(M)
fpgetmask(S) IEEE floating point	environment at login time _____	profile(M)
fpgetsticky(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpsetmask(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpsetround(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
fpsetsticky(S) IEEE floating point	environment control fpgetround(S) _____	fpgetround(S)
environ(M) user	environment _____	environ(M)
env(C) set	environment for command execution _____	env(C)
getenv(S) return value for	environment name _____	getenv(S)
printenv(C) print out the	environment _____	printenv(C)
putenv(S) change or add value to	environment _____	putenv(S)
rc2(M) commands for multi-user	environment _____	rc2(M)
numbers drand48(S)	erand48(S) generate pseudo-random _____	drand48(S)
error function erf(S)	erfc(S) error function and complementary	erf(S)
complementary error function	erf(S) erfc(S) error function and _____	erf(S)
sys_nerr(S) sys_errlist(S)	errno(S) system error messages _____	sys_nerr(S)
function erf(S) erfc(S)	error function and complementary error _____	erf(S)
erfc(S) error function and complementary	error function erf(S) _____	erf(S)
errprint(M) display	error log contents _____	errprint(M)
strclean(M) STREAMS	error logger cleanup program _____	strclean(M)
strerr(M) STREAMS	error logger daemon _____	strerr(M)
log(M) interface to STREAMS	error logging _____	log(M)
mkstr(C) create an	error message file from C source _____	mkstr(C)
mkstr(CP) create an	error message file from C source _____	mkstr(CP)
perror(S) system	error messages _____	perror(S)
sys_errlist(S) errno(S) system	error messages sys_nerr(S) _____	sys_nerr(S)
find spelling	errors _____	spell(C)
matherr(S)	error-handling function _____	matherr(S)
errstop(C) terminate	error-logging demon _____	errstop(C)
connection dial(S)	errprint(M) display error log contents _____	errprint(M)
setmnt(C)	errstop(C) terminate error-logging demon _____	errstop(C)
setmnt(C) establish	establish an out-going terminal line _____	dial(S)
end(S) edata(S)	establish /etc/mnttab table _____	setmnt(C)
hypot(S)	/etc/mnttab table _____	setmnt(C)
test(C)	etext(S) last locations in program _____	end(S)
	Euclidean distance function _____	hypot(S)
	evaluate an expression _____	test(C)

# Permuted Index

expr(C) evaluate arguments as an expression \_\_\_\_\_ expr(C)  
 ex(C) invoke a text editor \_\_\_\_\_ ex(C)  
 file exec(S) execvp(S) execlp(S) execl(S) execute a \_\_\_\_\_ exec(S)  
 execute a file exec(S) execvp(S) execlp(S) execl(S) execute a \_\_\_\_\_ exec(S)  
 execvp(S) execlp(S) execl(S) execute a file exec(S) \_\_\_\_\_ exec(S)  
 execl(S) execute a file exec(S) \_\_\_\_\_ exec(S)  
 exec(S) execvp(S) execlp(S) execl(S) \_\_\_\_\_ exec(S)  
 execseg(S) make a data region executable \_\_\_\_\_ execseg(S)  
 executable \_\_\_\_\_ execseg(S)  
 execseg(S) make a data region \_\_\_\_\_ execseg(S)  
 execlp(S) execl(S) execv(S) execl(S) execute a file exec(S) execvp(S) \_\_\_\_\_ exec(S)  
 execute a regular expression \_\_\_\_\_ regex(S)  
 regex(S) execute a regular expression \_\_\_\_\_ regex(S)  
 setpgrp(C) execute command in a new process group \_\_\_\_\_ setpgrp(C)  
 uux(C) execute command on remote UNIX \_\_\_\_\_ uux(C)  
 at(C) batch(C) execute commands at a later time \_\_\_\_\_ at(C)  
 cron(C) execute commands at specified times \_\_\_\_\_ cron(C)  
 xargs(C) construct and execute commands \_\_\_\_\_ xargs(C)  
 uuxqt(M) execute remote command requests \_\_\_\_\_ uuxqt(M)  
 inir(M) clean the file system and executes init \_\_\_\_\_ inir(M)  
 env(C) set environment for command execution \_\_\_\_\_ env(C)  
 nap(S) suspend execution for a short interval \_\_\_\_\_ nap(S)  
 sleep(C) suspend execution for an interval \_\_\_\_\_ sleep(C)  
 sleep(S) suspend execution for interval \_\_\_\_\_ sleep(S)  
 monitor(S) prepare execution profile \_\_\_\_\_ monitor(S)  
 profil(S) execution time profile \_\_\_\_\_ profil(S)  
 execl(S) execute a file exec(S) execvp(S) execlp(S) execl(S) execv(S) \_\_\_\_\_ exec(S)  
 exec(S) execvp(S) execlp(S) execl(S) execute a file \_\_\_\_\_ exec(S)  
 creat(S) create a new file or rewrite an existing one \_\_\_\_\_ creat(S)  
 false(C) return with a nonzero exit value \_\_\_\_\_ false(C)  
 true(C) return with a zero exit value \_\_\_\_\_ true(C)  
 exit(S) terminate process \_\_\_\_\_ exit(S)  
 pack(C) pcact(C) unpack(C) compress and expand files \_\_\_\_\_ pack(C)  
 functions exp(S) pow(S) log(S) exponential, logarithm, and power \_\_\_\_\_ exp(S)  
 functions exp(S) sqrt(S) exponential, logarithm, and square root \_\_\_\_\_ exp(S)  
 expression expr(C) evaluate arguments as an \_\_\_\_\_ expr(C)  
 regexp(S) compile regular expression and match routines \_\_\_\_\_ regexp(S)  
 regexp(F) regular expression compile and match routines \_\_\_\_\_ regexp(F)  
 file for pattern using full regular expression egrep(C) search \_\_\_\_\_ egrep(C)  
 expr(C) evaluate arguments as an expression \_\_\_\_\_ expr(C)  
 regcmp(S) compile a regular expression \_\_\_\_\_ regcmp(S)  
 regex(S) execute a regular expression \_\_\_\_\_ regex(S)  
 test(C) evaluate an expression \_\_\_\_\_ test(C)  
 regcmp(CP) compile regular expressions \_\_\_\_\_ regcmp(CP)  
 logarithm, and power functions exp(S) log(S) exponential, \_\_\_\_\_ exp(S)  
 and square root functions exp(S) sqrt(S) exponential, logarithm, \_\_\_\_\_ exp(S)  
 xstr(CP) extract strings from C programs \_\_\_\_\_ xstr(CP)  
 value functions floor(S) ceil(S) fabs(S) floor, ceiling, and absolute \_\_\_\_\_ floor(S)  
 report inter-process communication facilities status ipc(C) \_\_\_\_\_ ipc(C)  
 help(C) system help facility \_\_\_\_\_ help(C)  
 factor(C) factor a number \_\_\_\_\_ factor(C)  
 factor(C) factor a number \_\_\_\_\_ factor(C)  
 false(C) return with a nonzero exit \_\_\_\_\_ false(C)  
 value ff(M) fast find \_\_\_\_\_ ff(M)  
 ff(M) fast incremental backup \_\_\_\_\_ finc(M)  
 finc(M) fast main memory allocator \_\_\_\_\_ malloc(S)  
 malloc(S) free(S) realloc(S) fast main memory allocator malloc(S) \_\_\_\_\_ malloc(S)  
 mallinfo(S) mallopt(S) calloc(S) abort(S) generate an IOT \_\_\_\_\_ abort(S)  
 abort(S) generate an IOT \_\_\_\_\_ abort(S)  
 stream fclose(S) fflush(S) close or flush a \_\_\_\_\_ fclose(S)  
 stream fclose(S) fflush(S) close or flush a \_\_\_\_\_ fclose(S)  
 fcntl(F) file control options \_\_\_\_\_ fcntl(F)

	fcntl(S) file control _____	fcntl(S)
	fcopy(C) copy a floppy diskette _____	fcopy(C)
	fdisk(C) _____	fdisk(C)
UNIX DOS disk partitions	fdopen(S) freopen(S) open a stream _____	fopen(S)
	features and files _____	intro(M)
fopen(S)	feof(S) stream status inquiries _____	feof(S)
intro(M) introduce miscellaneous	ferror(S) fileno(S) clearerr(S) feof(S) _____	ferror(S)
ferror(S) fileno(S) clearerr(S)	fetch(S) nextkey(S) perform database _____	dbm(S)
stream status inquiries	fetch(S) perform database functions _____	dbm(S)
functions dbm(S) dbminit(S)	few lines of a stream _____	head(C)
dbm(S) firstkey(S) store(S)	fflush(S) close or flush a stream _____	fclose(S)
head(C) print the first	ff(M) fast find _____	ff(M)
fclose(S)	fgetc(S) getchar(S) get character or _____	getc(S)
word from a stream	fgetgrent(S) endgrent(S) setgrent(S) get	getgrent(S)
getc(S) getw(S)	fgetpwent(S) endpwent(S) setpwent(S) get	getpwent(S)
group file entry	fgets(S) get a string from a stream _____	gets(S)
getgrent(S)	fgrep(C) search a file for a character _____	fgrep(C)
password file entry	file access and modification times _____	utime(S)
getpwent(S)	file access routines _____	ldfcn(F)
gets(S)	file _____	access(S)
string	file _____	acct(M)
utime(S) set	file archives in and out _____	cpio(C)
ldfcn(F) common object	file as it grows _____	tra(C)
access(S) determine accessibility of a	file _____	chmod(S)
acct(M) format of per-process accounting	file comment section _____	chown(S)
cpio(C) copy	file control _____	fcntl(S)
tra(C) copy out a	file control options _____	fcntl(F)
chmod(S) change mode of	file copy uuto(C) _____	uuto(C)
chown(S) change owner and group of a	file _____	core(F)
mcs(CP) manipulate the object	file creation mask _____	cprn(CP)
fcntl(S)	file _____	umask(S)
fcntl(F)	file _____	ctags(C)
uupick(C) public UNIX-to-UNIX system	file _____	dd(C)
core(F) format of core image	file _____	delta(CP)
cprn(CP) compress a common object	file descriptor _____	close(S)
umask(S) set and get	file descriptor _____	dup(S)
ctags(C) create a tags	file dump(CP) _____	dump(CP)
dd(C) convert and copy a	file edit activity _____	sact(CP)
delta(CP) make a change to an SCCS	file encryption functions _____	crypt(S)
close(S) close a	file entry getgrent(S) fgetgrent(S) _____	getgrent(S)
dup(S) dup2(S) duplicate an open	file entry getgrent(S) _____	getgrent(S)
dump selected parts of an object	file entry getpwent(S) fgetpwent(S) _____	getpwent(S)
sact(CP) print current SCCS	file entry getpwent(S) _____	getpwent(S)
crypt(S) password and	file entry getut(S) getutent(S) _____	getut(S)
endgrent(S) setgrent(S) get group	file entry getut(S) _____	getut(S)
getgrnam(S) getgrgid(S) get group	file entry _____	putpwent(S)
endpwent(S) setpwent(S) get password	file exec(S) execvp(S) execlp(S) _____	exec(S)
getpwnam(S) getpwnid(S) get password	file for a character string _____	fgrep(C)
utmpname(S) endutent(S) access utmp	file for a pattern _____	grep(C)
setutent(S) getutline(S) access utmp	file for pattern using full regular _____	egrep(C)
putpwent(S) write password	file for reading ldopen(S) _____	ldopen(S)
execle(S) execv(S) execl(S) execute a	file format _____	ar(F)
fgrep(C) search a	file format _____	xar(F)
grep(C) search a	file formats _____	intro(F)
expression	file from C source _____	mkstr(C)
egrep(C) search	file from C source _____	mkstr(CP)
ldopen(S) open a common object		
ar(F) archive		
xar(F) archive		
intro(F) introduction to		
mkstr(C) create an error message		
mkstr(CP) create an error message		

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fixobj(CP) convert an object	file from OMF to COFF _____	fixobj(CP)
get(CP) get a version of an SCCS	file _____	get(CP)
read directory entries and put in a	file getdents(S) _____	getdents(S)
group(M) format of the group	file _____	group(M)
display selected parts of an object	file hdr(C) _____	hdr(C)
filehdr(F)	file header for common object files _____	filehdr(F)
constants limits(F)	file header for implementation-specific _____	limits(F)
unistd(F)	file header for symbolic constants _____	unistd(F)
ldfread(S) read the	file header of a COFF file _____	ldfread(S)
ldohseek(S) seek to the optional	file header of a common object _____	ldohseek(S)
split(C) split a	file into pieces _____	split(C)
archive header of a member of an archive	file ldahread(S) read the _____	ldahread(S)
ldclose(S) ldaclose(S) close a COFF	file _____	ldclose(S)
read the file header of a COFF	file ldhread(S) _____	ldhread(S)
number entries of a section of a COFF	file ldlseek(S) seek to line _____	ldlseek(S)
entries of a section of a COFF	file ldraseek(S) seek to relocation _____	ldrseek(S)
indexed/named section header of a COFF	file ldshread(S) read an _____	ldshread(S)
index of a symbol table entry of a COFF	file ldtbindex(S) compute the _____	ldtbindex(S)
an indexed symbol table entry of a COFF	file ldtbread(S) read _____	ldtbread(S)
seek to the symbol table of a COFF	file ldtbseek(S) _____	ldtbseek(S)
line number entries in a common object	file linenum(F) _____	linenum(F)
link(S) link to a	file _____	link(S)
produce C source listing from COFF	file list(CP) _____	list(CP)
ln(C) make a link to a	file _____	ln(C)
mem(M) kmem(M) memory image	file _____	mem(M)
convert object file to bootable object	file mkboot(M) _____	mkboot(M)
a directory, or a special or ordinary	file mknod(S) make _____	mknod(S)
ctermid(S) generate	file name for terminal _____	ctermid(S)
mktemp(S) make a unique	file name _____	mktemp(S)
nl(C) add line numbers to a	file _____	nl(C)
nm(CP) print name list of common object	file _____	nm(CP)
null(M) null	file _____	null(M)
ttyslot(S) find the slot in the utmp	file of the current user _____	ttyslot(S)
more(C) view a	file one full screen at a time _____	more(C)
chmod(C) change permissions of a	file or directory _____	chmod(C)
fuser(M) identify processes using a	file or file structure _____	fuser(M)
creat(S) create a new	file or rewrite an existing one _____	creat(S)
passwd(M) password	file _____	passwd(M)
for CRTs	file perusal filter _____	pg(C)
fseek(S) ftell(S) rewind(S) reposition a	file pointer in a stream _____	fseek(S)
lseek(S) move read/write	file pointer _____	lseek(S)
printers(M) print spooler configuration	file _____	printers(M)
prx(CP) print an SCCS	file _____	prx(CP)
pwck(M) grpck(M) check password/group	file _____	pwck(M)
read(S) read from	file _____	read(S)
locking(S) lock/unlock a	file region for read/write _____	locking(S)
of information for a common object	file reloc(F) relocation _____	reloc(F)
rev(C) reverse lines of a	file _____	rev(C)
rmel(CP) remove a delta from an SCCS	file _____	rmel(CP)
compare two versions of an SCCS	file sccsdiff(CP) _____	sccsdiff(CP)
sccsfile(F) format of an SCCS	file _____	sccsfile(F)
section header for a common object	file scnhdr(F) _____	scnhdr(F)
format of curses screen image	file scr_dump(F) _____	scr_dump(F)
see(C) display a	file _____	see(C)
chsize(S) change the	file size _____	chsize(S)
stat(S) fstat(S) get	file status _____	stat(S)
find the printable strings in an object	file strings(C) _____	strings(C)

symbols and line numbers from COFF	file strip(CP) remove _____	strip(CP)
identify processes using a file or	file structure fuser(M) _____	fuser(M)
mount(C) umount(C) mount/unmount a	file structure _____	mount(C)
calculate checksum and count blocks in a	file sum(C) _____	sum(C)
syms(F) common object	file symbol table format _____	syms(F)
inir(M) clean the	file system and executes init _____	inir(M)
ckbupacd(M) check	file system backup schedule _____	ckbupacd(M)
fsdb(M)	file system debugger _____	fsdb(M)
recover(C) restore contents of a	file system from tape _____	recover(C)
fsinfo(M) report information about a	file system _____	fsinfo(M)
fstyp(M) determine the	file system identifier _____	fstyp(M)
dirent(F)	file system independent directory entry _	dirent(F)
statfs(S) fstatfs(S) get	file system information _____	statfs(S)
mkfs(M) construct a	file system _____	mkfs(M)
mount(S) mount a	file system _____	mount(S)
quot(C) summarize	file system ownership _____	quot(C)
ustat(S) get	file system statistics _____	ustat(S)
fsstat(M) report	file system status _____	fsstat(M)
fstab(M)	file system table _____	fstab(M)
mnttab(M) mounted	file system table _____	mnttab(M)
archive(C) save a	file system to a streaming tape _____	archive(C)
sysfs(S) get	file system type information _____	sysfs(S)
volcopy(M) labelit(M) copy	file system with label checking _____	volcopy(M)
haltsys(C) close the	file systems and halt the CPU _____	haltsys(C)
fsck(C) dfsck(C) check and repair	file systems _____	fsck(C)
labelit(C) provide labels for	file systems _____	labelit(C)
umountall(C) mount/unmount multiple	file systems mountall(C) _____	mountall(C)
checklist(M) list	file systems processed by fsck _____	checklist(M)
tail(C) deliver the last part of a	file _____	tail(C)
tmpfile(S) create a temporary	file _____	tmpfile(S)
tempnam(S) create a name for a temporary	file tmpnam(S) _____	tmpnam(S)
mkboot(M) convert object	file to bootable object file _____	mkboot(M)
tsort(C) sort a	file topologically _____	tsort(C)
access and modification times of a	file touch(C) update _____	touch(C)
uucico(M)	file transport program for uucp system _	uucico(M)
uusched(M) scheduler for the uucp	file transport program _____	uusched(M)
ftw(S) walk a	file tree _____	ftw(S)
ttys(M) login terminals	file _____	ttys(M)
file(C) determine	file type _____	file(C)
unget(CP) undo a previous get of an SCCS	file _____	unget(CP)
uniq(C) report repeated lines in a	file _____	uniq(C)
the uucp directories and permissions	file uucpcheck(M) check _____	uucpcheck(M)
val(CP) validate an SCCS	file _____	val(CP)
mkunix(M) make bootable system	file with driver symbol table _____	mkunix(M)
mkunix(M) make bootable system	file with kernel symbol table _____	mkunix(M)
write(S) write on a	file _____	write(S)
file(C) determine file type _____	file(C) _____	file(C)
umask(C) set	file-creation mode mask _____	umask(C)
files	filehdr(F) file header for common object	filehdr(F)
status inquiries ferrord(S)	fileno(S) clearerr(S) feof(S) stream _	ferrord(S)
csplit(C) split	files according to context _____	csplit(C)
admin(CP) create and administer SCCS	files _____	admin(CP)
link(M) unlink(M) link and unlink	files and directories _____	link(M)
mv(C) move (rename)	files and directories _____	mv(C)
aftp(C) transfer	files between Altos machines _____	aftp(C)
bfs(C) scan big	files _____	bfs(C)
cat(C) concatenate and display	files _____	cat(C)

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select/reject lines common to two sorted	cmp(C) compare two	files _____	cmp(C)
conv(CP) convert common object	diff(C) compare two text	files comm(C) _____	comm(C)
copy(C) copy groups of	dos(C) access MS-DOS	files _____	conv(CP)
cp(C) copy	filehdr(F) file header for common object	files _____	copy(C)
crontab(C) manage user crontab	find(C) find	files _____	cp(C)
diff3(C) compare three	hlp(C) hlpR(C) filter	files _____	crontab(C)
diff(C) compare two text	frec(M) recover	files for printing on LaserJet printer	diff3(C)
files _____	uucp(C) uulog(C) uname(C) copy	files from a back-up tape _____	diff(C)
files _____	fspec(F) format specification in text	files from UNIX to UNIX _____	dos(C)
files _____	fsplit(CP) split ratfor	files _____	filehdr(F)
files _____	hd(C) display	files in hexadecimal format _____	find(C)
files _____	fleece(C) look for	files in home directories _____	files for printing on LaserJet printer
files _____	od(C) display	files in octal format _____	frec(M)
files _____	introduce miscellaneous features and	files intro(M) _____	uucp(C)
files _____	lockf(S) record locking on	files _____	fspec(F)
files _____	makedevs(M) create special device	files _____	fsplit(CP)
files _____	makettys(M) create tty special	files _____	hd(C)
files _____	mknod(C) build special	files _____	fleece(C)
files _____	pr(C) print	files on the standard output _____	od(C)
files _____	rm(C) rmdir(C) remove	files or directories _____	intro(M)
files _____	pcat(C) unpack(C) compress and expand	files pack(C) _____	lockf(S)
files _____	devnm(C) identify device name on which	files reside _____	makedevs(M)
files _____	the access and modification dates of	files settime(C) change _____	makettys(M)
files _____	sdiff(C) compare	files side-by-side _____	mknod(C)
files _____	print section sizes of common object	files size(C) _____	pr(C)
files _____	sort(C) sort and merge	files _____	files on the standard output
files _____	tar(C) archive	files _____	files or directories
files _____	lpr(C) route named	files to printer spooler _____	files pack(C)
files _____	bdiff(C) compare	files too large for diff _____	files reside
files _____	what(C) identify	files _____	files settime(C) change
files _____	fxlist(S) get name list entries from	files xlist(S) _____	files side-by-side
files _____	printer hlp(C) hlpR(C)	files _____	files size(C)
files _____	ff(M) fast	files _____	files _____
files _____	find(C)	files _____	files _____
files _____	finger(C)	files _____	files _____
files _____	look(C)	files _____	files _____
files _____	ttyname(S) isatty(S)	files _____	files _____
files _____	library lorder(CP)	files _____	files _____
files _____	file strings(C)	files _____	files _____
files _____	current user ttyslot(S)	files _____	files _____
files _____	fold(C) fold long lines for	files _____	files _____
files _____	database functions dbm(S)	files _____	files _____
files _____	OMF to COFF	files _____	files _____
files _____	directories	files _____	files _____
files _____	fpgetround(S) fpgetmask(S) IEEE	files _____	files _____
files _____	floating point environment control	files _____	files _____
files _____	fpgetround(S) fpgetsticky(S) IEEE	files _____	files _____
files _____	floating point environment control	files _____	files _____

fpgetround(S) fpsetmask(S) IEEE	floating point environment control	fpgetround(S)
fpgetround(S) fpsetround(S) IEEE	floating point environment control	fpgetround(S)
fpgetround(S) fpsetsticky(S) IEEE	floating point environment control	fpgetround(S)
isnan(S) isnanf(S) isnand(S) test for	floating point NaN	isnan(S)
ecvt(S) convert	floating-point number to string	ecvt(S)
modf(S) ldexp(S) manipulate parts of	floating-point numbers frexp(S)	frexp(S)
functions floor(S) ceil(S) fabs(S)	floor, ceiling, and absolute value	floor(S)
functions floor(S) fmod(S)	floor, ceiling, and absolute value	floor(S)
and absolute value functions	floor(S) ceil(S) fabs(S) floor, ceiling,	floor(S)
absolute value functions	floor(S) fmod(S) floor, ceiling, and	floor(S)
options(M)	floppy disk installation menu	options(M)
fcopy(C) copy a	floppy diskette	fcopy(C)
format(C) format a	floppy diskette	format(C)
cflow(CP) generate C	flow graph	cflow(CP)
fclose(S) fflush(S) cclose or	flush a stream	fclose(S)
value functions floor(S)	fmod(S) floor, ceiling, and absolute	floor(S)
	fmt(C) simple text formatter	fmt(C)
device fold(C)	fold long lines for finite width output	fold(C)
output device	fold(C) fold long lines for finite width	fold(C)
stream	fopen(S) fdopen(S) freopen(S) open a	fopen(S)
	fork(S) create a new process	fork(S)
format(C)	format a floppy diskette	format(C)
ar(F) archive file	format	ar(F)
hd(C) display files in hexadecimal	format	hd(C)
od(C) display files in octal	format	od(C)
dir(M)	format of a directory	dir(M)
filesystem(M)	format of a system volume	filesystem(M)
inode(M)	format of an inode	inode(M)
sccsfile(F)	format of an SCCS file	sccsfile(F)
output a.out(F)	format of assembler and link editor	a.out(F)
menus(M)	format of Business Shell menu system	menus(M)
core(F)	format of core image file	core(F)
cpio(F)	format of cpio archive	cpio(F)
scr_dump(F)	format of curses screen image file	scr_dump(F)
acct(M)	format of per-process accounting file	acct(M)
group(M)	format of the group file	group(M)
utmp(M) wtmp(M)	format of utmp and wtmp entries	utmp(M)
fspec(F)	format specification in text files	fspec(F)
syms(F) common object file symbol table	format	syms(F)
xar(F) archive file	format	xar(F)
	format(C) format a floppy diskette	format(C)
intro(F) introduction to file	formats	intro(F)
scanf(S) fscanf(S) sscanf(S) convert	formatted input	scanf(S)
vprintf(S) vfprintf(S) vprintf(S) print	formatted output of varargs list	vprintf(S)
printf(S) sprintf(S) fprintf(S) print	formatted output	printf(S)
fmt(C) simple text	formatter	fmt(C)
convert rational FORTRAN to standard	FORTRAN ratfor(CP)	ratfor(CP)
ratfor(CP) convert rational	FORTRAN to standard FORTRAN	ratfor(CP)
environment control fpgetround(S)	fpgetmask(S) IEEE floating point	fpgetround(S)
point environment control	fpgetround(S) fpgetmask(S) IEEE floating	fpgetround(S)
floating point environment control	fpgetround(S) fpgetsticky(S) IEEE	fpgetround(S)
point environment control	fpgetround(S) fpsetmask(S) IEEE floating	fpgetround(S)
floating point environment control	fpgetround(S) fpsetround(S) IEEE	fpgetround(S)
floating point environment control	fpgetround(S) fpsetsticky(S) IEEE	fpgetround(S)
environment control fpgetround(S)	fpgetsticky(S) IEEE floating point	fpgetround(S)
printf(S) sprintf(S)	fprintf(S) print formatted output	printf(S)
environment control fpgetround(S)	fpsetmask(S) IEEE floating point	fpgetround(S)

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environment control `fpgetround(S)` `fpsetround(S)` IEEE floating point \_\_\_\_\_ `fpgetround(S)`  
environment control `fpgetround(S)` `fpsetsticky(S)` IEEE floating point \_\_\_\_\_ `fpgetround(S)`  
stream `putc(S)` `putchar(S)` `putw(S)` `fputc(S)` put character or word on a \_\_\_\_\_ `putc(S)`  
\_\_\_\_\_ `puts(S)` `fputs(S)` put a string on a stream \_\_\_\_\_ `puts(S)`  
\_\_\_\_\_ `fread(S)` binary input/output \_\_\_\_\_ `fwrite(S)`  
\_\_\_\_\_ `frec(M)` recover files from a back-up \_\_\_\_\_ `frec(M)`  
\_\_\_\_\_ `df(M)` report number of free disk blocks and inodes \_\_\_\_\_ `df(M)`  
\_\_\_\_\_ `allocator malloc(S)` `free(S)` `realloc(S)` fast main memory \_\_\_\_\_ `malloc(S)`  
\_\_\_\_\_ `fopen(S)` `fdopen(S)` `freopen(S)` open a stream \_\_\_\_\_ `fopen(S)`  
parts of floating-point numbers `frexp(S)` `modf(S)` `ldexp(S)` manipulate \_\_\_\_\_ `frexp(S)`  
\_\_\_\_\_ `from(C)` list who my mail is from \_\_\_\_\_ `from(C)`  
\_\_\_\_\_ `gcc(CP)` create a front end to the cc command \_\_\_\_\_ `gcc(CP)`  
\_\_\_\_\_ `input scanf(S)` `fscanf(S)` `scanf(S)` `sscanf(S)` convert formatted \_\_\_\_\_ `scanf(S)`  
list file systems processed by `fack` `checklist(M)` \_\_\_\_\_ `checklist(M)`  
\_\_\_\_\_ `systems` `fack(C)` `dfck(C)` check and repair file \_\_\_\_\_ `fsck(C)`  
\_\_\_\_\_ `fsdb(M)` file system debugger \_\_\_\_\_ `fsdb(M)`  
file pointer in a stream `fseek(S)` `ftell(S)` `rewind(S)` reposition a \_\_\_\_\_ `fseek(S)`  
\_\_\_\_\_ `file system` `fsinfo(M)` report information about a \_\_\_\_\_ `fsinfo(M)`  
\_\_\_\_\_ `files` `fspec(F)` format specification in text \_\_\_\_\_ `fspec(F)`  
\_\_\_\_\_ `fsplit(CP)` split ratfor files \_\_\_\_\_ `fsplit(CP)`  
\_\_\_\_\_ `fstab(M)` report file system status \_\_\_\_\_ `fstab(M)`  
\_\_\_\_\_ `fstab(M)` file system table \_\_\_\_\_ `fstab(M)`  
\_\_\_\_\_ `statfs(S)` `fstatfs(S)` get file system information \_\_\_\_\_ `statfs(S)`  
\_\_\_\_\_ `stat(S)` `fstat(S)` get file status \_\_\_\_\_ `stat(S)`  
\_\_\_\_\_ `identifier` `fstyp(M)` determine the file system \_\_\_\_\_ `fstyp(M)`  
\_\_\_\_\_ `pointer in a stream` `fseek(S)` `ftell(S)` `rewind(S)` reposition a file \_\_\_\_\_ `fseek(S)`  
\_\_\_\_\_ `communication package` `stdipc(S)` `ftok(S)` standard interprocess \_\_\_\_\_ `stdipc(S)`  
\_\_\_\_\_ `ftw(S)` walk a file tree \_\_\_\_\_ `ftw(S)`  
egrep(C) search file for pattern using \_\_\_\_\_ `full regular expression` \_\_\_\_\_ `egrep(C)`  
\_\_\_\_\_ `more(C)` view a file one full screen at a time \_\_\_\_\_ `more(C)`  
\_\_\_\_\_ `function erf(S)` `erfc(S)` error function and complementary error \_\_\_\_\_ `erf(S)`  
error function and complementary error \_\_\_\_\_ `function erf(S)` `erfc(S)` \_\_\_\_\_ `erf(S)`  
\_\_\_\_\_ `gamma(S)` log gamma function \_\_\_\_\_ `gamma(S)`  
\_\_\_\_\_ `hypot(S)` Euclidean distance function \_\_\_\_\_ `hypot(S)`  
manipulate line number entries of a COFF \_\_\_\_\_ `function ldread(S)` `ldlitem(S)` \_\_\_\_\_ `ldread(S)`  
\_\_\_\_\_ `matherr(S)` error-handling function \_\_\_\_\_ `matherr(S)`  
\_\_\_\_\_ `prof(F)` profile within a function \_\_\_\_\_ `prof(F)`  
\_\_\_\_\_ `math(F)` math functions and constants \_\_\_\_\_ `math(F)`  
\_\_\_\_\_ `intro(S)` introduce system cells, functions, and libraries \_\_\_\_\_ `intro(S)`  
\_\_\_\_\_ `bessel(S)` `j0(S)` `y0(S)` Bessel functions \_\_\_\_\_ `bessel(S)`  
\_\_\_\_\_ `crypt(S)` password and file encryption functions \_\_\_\_\_ `crypt(S)`  
\_\_\_\_\_ `fetch(S)` `nextkey(S)` perform database functions `dbm(S)` `dbm(S)` `dbm(S)` \_\_\_\_\_ `dbm(S)`  
\_\_\_\_\_ `store(S)` `fetch(S)` perform database functions `dbm(S)` `firstkey(S)` \_\_\_\_\_ `dbm(S)`  
log(S) exponential, logarithm, and power functions `exp(S)` `pow(S)` \_\_\_\_\_ `exp(S)`  
exponential, logarithm, and square root functions `exp(S)` `sqrt(S)` \_\_\_\_\_ `exp(S)`  
\_\_\_\_\_ `functions floor(S)` `ceil(S)` `fabs(S)` \_\_\_\_\_ `floor(S)`  
\_\_\_\_\_ `functions floor(S)` `fmod(S)` \_\_\_\_\_ `floor(S)`  
\_\_\_\_\_ `functions` \_\_\_\_\_ `sinh(S)`  
\_\_\_\_\_ `functions` \_\_\_\_\_ `trig(S)`  
\_\_\_\_\_ `trig(S)` `atan(S)` `atan2(S)` trigonometric functions `trig(S)` `sin(S)` `cos(S)` \_\_\_\_\_ `trig(S)`  
\_\_\_\_\_ `tan(S)` `asin(S)` `acos(S)` trigonometric functions `trig(S)` `sin(S)` `cos(S)` \_\_\_\_\_ `trig(S)`  
\_\_\_\_\_ `or file structure` `fuser(M)` identify processes using a file \_\_\_\_\_ `fuser(M)`  
\_\_\_\_\_ `fwrite(S)` `fread(S)` binary input/output \_\_\_\_\_ `fwrite(S)`  
\_\_\_\_\_ `files` `xlist(S)` `fxlist(S)` get name list entries from \_\_\_\_\_ `xlist(S)`  
\_\_\_\_\_ `gamma(S)` log gamma function \_\_\_\_\_ `gamma(S)`  
\_\_\_\_\_ `gamma(S)` log gamma function \_\_\_\_\_ `gamma(S)`  
\_\_\_\_\_ `command` `gcc(CP)` create a front end to the cc \_\_\_\_\_ `gcc(CP)`  
\_\_\_\_\_ `adb(C)` invoke x.out general purpose debugger \_\_\_\_\_ `adb(C)`

termio(M)	general terminal interface _____	termio(M)
random(C)	generate a random number _____	random(C)
mkvers(CP)	generate a what string _____	mkvers(CP)
makekey(M)	generate an encryption key _____	makekey(M)
abort(S)	generate an IOT fault _____	abort(S)
cflow(CP)	generate C flow graph _____	cflow(CP)
cxref(CP)	generate C program cross-reference _____	cxref(CP)
ctermid(S)	generate file name for terminal _____	ctermid(S)
ncheck(M)	generate path names from inode numbers _____	ncheck(M)
lex(CP)	generate programs for lexical analysis _____	lex(CP)
drand48(S) erand48(S)	generate pseudo-random numbers _____	drand48(S)
/mrand48(S) nrand48(S) lrand48(S)	generate pseudo-random numbers _____	drand48(S)
/seed48(S) srand48(S) jrand48(S)	generate pseudo-random numbers _____	drand48(S)
rand(S) srand(S) simple random-number	generator _____	rand(S)
stream getc(S) getw(S) fgetc(S)	getchar(S) get character or word from a _____	getc(S)
character or word from a stream	get(CP) get a version of an SCCS file _____	get(CP)
working directory	getc(S) getw(S) fgetc(S) getchar(S) get _____	getc(S)
put in a file	getcwd(S) get path name of current _____	getcwd(S)
group IDs getuid(S)	getdents(S) read directory entries and _____	getdents(S)
name	getegid(S) get real/effective user or _____	getuid(S)
group IDs getuid(S)	getenv(S) return value for environment _____	getenv(S)
group IDs getuid(S)	geteuid(S) get real/effective user or _____	getuid(S)
setgrent(S) get group file entry	getgid(S) get real/effective user or _____	getuid(S)
group file entry	getgrent(S) fgetgrent(S) endgrent(S) _____	getgrent(S)
setgrent(S) getgrnam(S)	getgrent(S) getgrnam(S) getgrgid(S) get _____	getgrent(S)
entry getgrent(S)	getgrgid(S) get group file entry _____	getgrent(S)
	getgrnam(S) getgrgid(S) get group file _____	getgrent(S)
	getlogin(S) get login name _____	getlogin(S)
	getmsg(S) get next message off a stream _____	getmsg(S)
	getopt(C) parse command options _____	getopt(C)
argument vector	getopt(S) get option letter from _____	getopt(S)
	getpas(S) read a password _____	getpas(S)
and parent process IDs	getpid(S) get process, process group, _____	getpid(S)
setpwent(S) get password file entry	getpwent(S) fgetpwent(S) endpwent(S) _____	getpwent(S)
password file entry	getpwent(S) getpwnam(S) getpwuid(S) get _____	getpwent(S)
file entry getpwent(S)	getpwnam(S) getpwuid(S) get password _____	getpwent(S)
	getpw(S) get name from UID _____	getpw(S)
getpwent(S) getpwnam(S)	getpwuid(S) get password file entry _____	getpwent(S)
input	gets(C) get a string from the standard _____	gets(C)
stream	gets(S) fgets(S) get a string from a _____	gets(S)
speed and terminal settings used by	getty gettydefs(M) _____	gettydefs(M)
ct(C) spawn	getty to a remote terminal _____	ct(C)
used by getty	gettydefs(M) speed and terminal settings _____	gettydefs(M)
	getty(M) set terminal mode _____	getty(M)
user or group IDs	getuid(S) getegid(S) get real/effective _____	getuid(S)
user or group IDs	getuid(S) geteuid(S) get real/effective _____	getuid(S)
user or group IDs	getuid(S) getgid(S) get real/effective _____	getuid(S)
access utmp file entry getut(S)	getutent(S) utmpname(S) endutent(S) _____	getut(S)
getut(S) setutent(S)	getutline(S) access utmp file entry _____	getut(S)
endutent(S) access utmp file entry	getut(S) getutent(S) utmpname(S) _____	getut(S)
utmp file entry	getut(S) setutent(S) getutline(S) access _____	getut(S)
character or word from a stream getc(S)	getw(S) fgetc(S) getchar(S) get _____	getc(S)
login(C)	give you system access _____	login(C)
symbols	glossary(C) define common UNIX terms and _____	glossary(C)
time to string ctime(S)	gmtime(S) localtime(S) convert date and _____	ctime(S)
setjmp(S) longjmp(S) non-local	goto _____	setjmp(S)
cflow(CP) generate C flow	graph _____	cflow(CP)

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graph(C) draw a	graph _____	graph(C)
plot(S)	graph(C) draw a graph _____	graph(C)
getpid(S) get process. process	graphics interface subroutines _____	plot(S)
fgetgrent(S) endgrent(S) setgrent(S) get	grep(C) search a file for a pattern _____	grep(C)
getgrent(S) getgrnam(S) getgrgid(S) get	group. and parent process IDs _____	getpid(S)
group(M) format of the	group file entry getgrent(S) _____	getgrent(S)
id(C) print user and	group file _____	getgrent(S)
chown(C) chgrp(C) change owner or	group ID _____	group(M)
setpggrp(S) set process	group ID and names _____	id(C)
getegid(S) get real/effective user or	group ID _____	chown(C)
geteuid(S) get real/effective user or	group IDs getuid(S) _____	setpggrp(S)
getgid(S) get real/effective user or	group IDs getuid(S) _____	getuid(S)
setuid(S) set user and	group IDs getuid(S) _____	getuid(S)
newgrp(C) log user into a new	group IDs _____	setuid(S)
chown(S) change owner and	group _____	newgrp(C)
kill(S) send a signal to a process or a	group of a file _____	chown(S)
execute command in a new process	group of processes _____	kill(S)
	group setpggrp(C) _____	setpggrp(C)
copy(C) copy	group(M) format of the group file _____	group(M)
make(C) maintain. update. and regenerate	groups of files _____	copy(C)
tra(C) copy out a file as it	groups of programs _____	make(C)
pwck(M)	grows _____	tra(C)
ssignal(S)	grpck(M) check password/group file _____	pwck(M)
haltsys(C) close the file systems and	gsignal(S) software signals _____	ssignal(S)
halt the CPU	halt the CPU _____	haltsys(C)
haltsys(C) close the file systems and	haltsys(C) close the file systems and _____	haltsys(C)
varargs(F)	handles variable argument list _____	varargs(F)
curse(S) terminal screen	handling and optimization package _____	curse(S)
nohup(C) run a command immune to	hangups and quits _____	nohup(C)
add.hd(C) add an additional	hard disk _____	add.hd(C)
restore.hd(C) restore a	hard disk from tape _____	restore.hd(C)
layout(M) manage	hard disk partitions _____	layout(M)
dump.hd(C) dump contents of a	hard disk to tape _____	dump.hd(C)
upgrade.hd(C) upgrade an additional	hard disk _____	upgrade.hd(C)
find spelling errors	hashcheck(C) _____	spell(C)
find spelling errors	hashmake(C) _____	spell(C)
hsearch(S) hdestroy(S) hcreate(S) manage	hash search tables _____	hsearch(S)
generate	hashing encryption _____	crypt(S)
hsearch(S) hdestroy(S)	hcreate(S) manage hash search tables _____	hsearch(S)
format	hd(C) display files in hexadecimal _____	hd(C)
search tables hsearch(S)	hdestroy(S) hcreate(S) manage hash _____	hsearch(S)
object file	hdr(C) display selected parts of an _____	hdr(C)
stream	head(C) print the first few lines of a _____	head(C)
scnhdr(F) section	header for a common object file _____	scnhdr(F)
filehdr(F) file	header for common object files _____	filehdr(F)
constants limits(F) file	header for implementation-specific _____	limits(F)
unistd(F) file	header for symbolic constants _____	unistd(F)
ldfthread(S) read the file	header of a COFF file _____	ldfthread(S)
read an indexed/named section	header of a COFF file ldfthread(S) _____	ldfthread(S)
ldohseek(S) seek to the optional file	header of a common object _____	ldohseek(S)
ldahread(S) read the archive	header of a member of an archive file _____	ldahread(S)
help(C) system	help facility _____	help(C)
	help(C) system help facility _____	help(C)
hd(C) display files in	hexadecimal format _____	hd(C)
fleece(C) look for files in	home directories _____	fleece(C)
printing on LaserJet printer	hplp(C) hplpR(C) filter files for _____	hplp(C)

LaserJet printer hplp(C) hplpR(C) filter files for printing on \_\_\_ hplp(C)  
 hash search tables hsearch(S) hdestroy(S) hcreate(S) manage hsearch(S)  
 sinh(S) cosh(S) tanh(S) hyperbolic functions \_\_\_\_\_ sinh(S)  
 hypot(S) Euclidean distance function \_\_\_\_\_ hypot(S)  
 ID and names \_\_\_\_\_ id(C)  
 ID \_\_\_\_\_ id(C)  
 chown(C) chgrp(C) change owner or group chown(C)  
 queue, semaphore set, shared memory id ipcrm(C) remove message \_\_\_\_\_ ipcrm(C)  
 setpggrp(S) set process group id \_\_\_\_\_ setpggrp(S)  
 whoami(C) print effective current user id \_\_\_\_\_ whoami(C)  
 id(C) print user and group ID and names \_ id(C)  
 fstyp(M) determine the file system identifier \_\_\_\_\_ fstyp(M)  
 shmget(S) get shared memory segment identifier \_\_\_\_\_ shmget(S)  
 reside devnm(C) identify device name on which files \_\_\_\_\_ devnm(C)  
 what(C) identify files \_\_\_\_\_ what(C)  
 structure fuser(M) identify processes using a file or file \_ fuser(M)  
 process group, and parent process IDs getpid(S) get process. \_\_\_\_\_ getpid(S)  
 get real/effective user or group IDs getuid(S) getegid(S) \_\_\_\_\_ getuid(S)  
 get real/effective user or group IDs getuid(S) geteuid(S) \_\_\_\_\_ getuid(S)  
 get real/effective user or group IDs getuid(S) getgid(S) \_\_\_\_\_ getuid(S)  
 setuid(S) set user and group IDs \_\_\_\_\_ setuid(S)  
 fpgetround(S) fpgetmask(S) IEEE floating point environment control \_ fpgetround(S)  
 fpgetround(S) fpgetsticky(S) IEEE floating point environment control \_ fpgetround(S)  
 fpgetround(S) fpsetmask(S) IEEE floating point environment control \_ fpgetround(S)  
 fpgetround(S) fpsetround(S) IEEE floating point environment control \_ fpgetround(S)  
 fpgetround(S) fpsetsticky(S) IEEE floating point environment control \_ fpgetround(S)  
 core(F) format of core image file \_\_\_\_\_ core(F)  
 mem(M) kmem(M) memory image file \_\_\_\_\_ mem(M)  
 scr\_dump(F) format of curses screen image file \_\_\_\_\_ scr\_dump(F)  
 nohup(C) run a command immune to hangups and quits \_\_\_\_\_ nohup(C)  
 limits(F) file header for implementation-specific constants \_\_\_\_\_ limits(F)  
 finc(M) fast incremental backup \_\_\_\_\_ finc(M)  
 dirent(F) file system independent directory entry \_\_\_\_\_ dirent(F)  
 file ldtbindex(S) compute the index of a symbol table entry of a COFF \_ ldtbindex(S)  
 file ldtbread(S) read an indexed symbol table entry of a COFF \_ ldtbread(S)  
 file ldshread(S) read an indexed/named section header of a COFF \_ ldshread(S)  
 descriptions infocmp(M) compare or print terminfo \_\_\_ infocmp(M)  
 fsinfo(M) report information about a file system \_\_\_\_\_ fsinfo(M)  
 finger(C) find information about users \_\_\_\_\_ finger(C)  
 devinfo(C) display device information \_\_\_\_\_ devinfo(C)  
 default(M) default program information directory \_\_\_\_\_ default(M)  
 reloc(F) relocation of information for a common object file \_\_\_ reloc(F)  
 lpstat(C) print LP status information \_\_\_\_\_ lpstat(C)  
 statfs(S) fstatfs(S) get file system information \_\_\_\_\_ statfs(S)  
 sysconf(C) get system configuration information \_\_\_\_\_ sysconf(C)  
 sysconf(S) get system configuration information \_\_\_\_\_ sysconf(S)  
 sysfs(S) get file system type information \_\_\_\_\_ sysfs(S)  
 uname(C) print the current UNIX information \_\_\_\_\_ uname(C)  
 drive(C) drive information written during manufacturing drive(C)  
 executes init inir(M) clean the file system and \_\_\_\_\_ inir(M)  
 clean the file system and executes init inir(M) \_\_\_\_\_ inir(M)  
 init inir(M) \_\_\_\_\_ inir(M)  
 inittab(M) script for the init processes \_\_\_\_\_ inittab(M)  
 special login program invoked by init sulogin(M) \_\_\_\_\_ sulogin(M)  
 init(M) process control initialization \_\_\_\_\_ init(M)  
 brc(M) system initialization procedure \_\_\_\_\_ brc(M)  
 popen(S) pclose(S) initiate pipe to/from a process \_\_\_\_\_ popen(S)  
 init(M) process control initialization \_ init(M)  
 inittab(M) script for the init processes inittab(M)

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clear(M) clear	inode _____	cli(M)
inode(M) format of an	inode _____	inode(M)
ncheck(M) generate path names from	inode numbers _____	ncheck(M)
report number of free disk blocks and	inode(M) format of an inode _____	inode(M)
gets(C) get a string from the standard	inodes df(M) _____	df(M)
line(C) read one line of	input _____	gets(C)
line(C) read one line of	input _____	line(C)
fscanf(S) sscanf(S) convert formatted	input scanf(S) _____	scanf(S)
ungetc(S) push character back into	input stream _____	ungetc(S)
fwrite(S) fread(S) binary	input/output _____	fwrite(S)
poll(S) STREAMS	input/output multiplexing _____	poll(S)
stdio(S) standard buffered	input/output package _____	stdio(S)
clearerr(S) feof(S) stream status	inquiries ferror(S) fileno(S) _____	ferror(S)
uustat(C) uucp status	inquiry and job control _____	uustat(C)
install(M)	install commands _____	install(M)
cpset(C)	install utilities _____	cpset(C)
options(M) floppy disk	installation menu _____	options(M)
abs(S) return	install(M) install commands _____	install(M)
a64l(S) l64a(S) convert between long	integer absolute value _____	abs(S)
sput1(S) sget1(S) access long	integer and base-64 ASCII string _____	a64l(S)
atoi(S) atoi(S) convert string to	integer data _____	sput1(S)
l3tol(S) ltol3(S) convert between 3-byte	integer strtol(S) _____	strtol(S)
convert between 3-byte integers and long	integers and long integers _____	l3tol(S)
plot(S) graphics	integers l3tol(S) ltol3(S) _____	l3tol(S)
termio(M) general terminal	interface subroutines _____	plot(S)
log(M)	interface _____	termio(M)
spline(C)	interface to STREAMS error logging _____	log(M)
characters asa(C)	interpolate smooth curves _____	spline(C)
sh(C) rsh(C) invoke the shell command	interpret asa carriage control _____	asa(C)
cah(C) shell command	interpreter _____	sh(C)
pipe(S) create an	interpreter with C-like syntax _____	cah(C)
status ipc(C) report	interprocess channel _____	pipe(S)
stdipc(S) ftok(S) standard	inter-process communication facilities _____	ipc(C)
nap(S) suspend execution for a short	interprocess communication package _____	stdipc(S)
sleep(C) suspend execution for an	interval _____	nap(S)
sleep(S) suspend execution for	interval _____	sleep(C)
	interval _____	sleep(S)
	intro(C) introduce commands _____	intro(C)
commands	intro(CP) introduce software development	intro(CP)
intro(C)	introduce commands _____	intro(C)
files intro(M)	introduce miscellaneous features and _____	intro(M)
intro(CP)	introduce software development commands _____	intro(CP)
libraries intro(S)	introduce system calls, functions, and _____	intro(S)
intro(F)	introduction to file formats _____	intro(F)
features and files	intro(F) introduction to file formats _____	intro(F)
functions, and libraries	intro(M) introduce miscellaneous _____	intro(M)
yacc(CP)	intro(S) introduce system calls, _____	intro(S)
m4(CP)	invoke a compiler-compiler _____	yacc(CP)
calendar(C)	invoke a macro processor _____	m4(CP)
vi(C)	invoke a reminder service _____	calendar(C)
ex(C)	invoke a screen-oriented display editor _____	vi(C)
bsh(C)	invoke a text editor _____	ex(C)
cc(CP)	invoke the Business shell _____	bsh(C)
ed(C) red(C)	invoke the C compiler _____	cc(CP)
edit(C)	invoke the ed text editor _____	ed(C)
ld(CP)	invoke the edit text editor _____	edit(C)
	invoke the link editor _____	ld(CP)

xld(CP)	invoke the link editor	xld(CP)
masm(CP)	invoke the macro assembler	masm(CP)
sh(C) rsh(C)	invoke the shell command interpreter	sh(C)
sed(C)	invoke the stream editor	sed(C)
adb(C)	invoke x.out general purpose debugger	adb(C)
sulogin(M) special login program	invoked by init	sulogin(M)
	ioctl(S) control device	ioctl(S)
abort(S) generate an	IOT fault	abort(S)
set, shared memory id	ipcrm(C) remove message queue, semaphore	ipcrm(C)
communication facilities status	ipcs(C) report inter-process	ipcs(C)
classify characters ctype(S)	isalpha(S) islower(S) iscntrl(S)	ctype(S)
ctype(S) isdigit(S) ispunct(S)	isascii(S) classify characters	ctype(S)
ttyname(S)	isatty(S) find name of a terminal	ttyname(S)
ctype(S) isalpha(S) islower(S)	iscntrl(S) classify characters	ctype(S)
classify characters ctype(S)	isdigit(S) ispunct(S) isascii(S)	ctype(S)
characters ctype(S) isalpha(S)	islower(S) iscntrl(S) classify	ctype(S)
isnan(S) isnanf(S)	isnand(S) test for floating point NaN	isnan(S)
point NaN isnan(S)	isnanf(S) isnand(S) test for floating	isnan(S)
floating point NaN	isnan(S) isnanf(S) isnand(S) test for	isnan(S)
characters ctype(S) isdigit(S)	ispunct(S) isascii(S) classify	ctype(S)
system(S)	issue a shell command	system(S)
bessel(S)	j0(S) y0(S) Bessel functions	bessel(S)
uustat(C) uucp status inquiry and	job control	uustat(C)
join(C)	join two relations	join(C)
	join(C) join two relations	join(C)
numbers drand48(S) seed48(S) srand48(S)	jrnd48(S) generate pseudo-random	drand48(S)
ldunix(M) configurable	kernel linker	ldunix(M)
mkunix(M) make bootable system file with	kernel symbol table	mkunix(M)
makekey(M) generate an encryption	key	makekey(M)
killall(C)	kill all active processes	killall(C)
	killall(C) Kill all active processes	killall(C)
	kill(C) terminate a process	kill(C)
group of processes	kill(S) send a signal to a process or a	kill(S)
mem(M)	knem(M) memory image file	mem(M)
integers and long integers	l3tol(S) ltol3(S) convert between 3-byte	l3tol(S)
base-64 ASCII string a64l(S)	l64a(S) convert between long integer and	a64l(S)
labelit(M) copy file system with	label checking volcopy(M)	volcopy(M)
systems	labelit(C) provide labels for file	labelit(C)
checking volcopy(M)	labelit(M) copy file system with label	volcopy(M)
labelit(C) provide	labels for file systems	labelit(C)
awk(C) pattern scanning and processing	language	awk(C)
bc(C) arbitrary-precision arithmetic	language	bc(C)
nawk(C) pattern scanning and processing	language	nawk(C)
cpp(CP) the C	Language Preprocessor	cpp(CP)
lint(CP) check C	language usage and syntax	lint(CP)
bdiff(C) compare files too	large for diff	bdiff(C)
banner(C) print	large letters	banner(C)
hplpR(C) filter files for printing on	LaserJet printer hplp(C)	hplp(C)
	last(C) print last record of user logins	last(C)
at(C) batch(C) execute commands at a	later time	at(C)
	layout(M) manage hard disk partitions	layout(M)
ldclose(S)	ldaclose(S) close a COFF file	ldclose(S)
member of an archive file	ldahread(S) read the archive header of a	ldahread(S)
reading ldopen(S)	ldaopen(S) open a common object file for	ldopen(S)
	ldclose(S) ldaclose(S) close a COFF file	ldclose(S)
	ld(CP) invoke the link editor	ld(CP)
floating-point numbers frexp(S) modf(S)	ldexp(S) manipulate parts of	frexp(S)

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routines	ldfcn(F) common object file access	ldfcn(F)
COFF file	ldhread(S) read the file header of a	ldhread(S)
COFF symbol table entry	ldgetname(S) retrieve symbol name for	ldgetname(S)
entries of a COFF function	ldlitem(S) manipulate line number	ldlread(S)
number entries of a COFF function	ldlread(S) ldlitem(S) manipulate line	ldlread(S)
of a section of a COFF file	ldlseek(S) seek to line number entries	ldlseek(S)
header of a common object	ldohseek(S) seek to the optional file	ldohseek(S)
object file for reading	ldopen(S) ldaopen(S) open a common	ldopen(S)
a section of a COFF file	ldrseek(S) seek to relocation entries of	ldrseek(S)
section header of a COFF file	ldshread(S) read an indexed/named	ldshread(S)
symbol table entry of a COFF file	ldtbindex(S) compute the index of a	ldtbindex(S)
entry of a COFF file	ldtbread(S) read an indexed symbol table	ldtbread(S)
a COFF file	ldtbseek(S) seek to the symbol table of	ldtbseek(S)
	ldunix(M) configurable kernel linker	ldunix(M)
leave(C) remind you when you have to	leave	leave(C)
leave	leave(C) remind you when you have to	leave(C)
getopt(S) get option	letter from argument vector	getopt(S)
banner(C) print large	letters	banner(C)
analysis	lex(CP) generate programs for lexical	lex(CP)
lex(CP) generate programs for	lexical analysis	lex(CP)
lsearch(S)	lfind(S) linear search and update	lsearch(S)
ar(CP) maintain archives and	libraries	ar(CP)
chkshlib(CP) tool for comparing shared	libraries	chkshlib(CP)
introduce system calls, functions, and	libraries intro(S)	intro(S)
ranlib(CP) convert archives to random	libraries	ranlib(CP)
xar(CP) maintain archives and	libraries	xar(CP)
find ordering relation for object	library lorder(CP)	lorder(CP)
mkshlib(CP) create a shared	library	mkshlib(CP)
shuttype(S) get and set UPS shutdown	limits	shuttype(S)
ulimit(S) get and set user	limits	ulimit(S)
implementation-specific constants	limits(F) file header for	limits(F)
dial(S) establish an out-going terminal	line connection	dial(S)
set terminal type, modes, speed,	line discipline ugetty(M)	ugetty(M)
file linenum(F)	line number entries in a common object	linenum(F)
ldlread(S) ldlitem(S) manipulate	line number entries of a COFF function	ldlread(S)
COFF file ldlseek(S) seek to	line number entries of a section of a	ldlseek(S)
strip(CP) remove symbols and	line numbers from COFF file	strip(CP)
nl(C) add	line numbers to a file	nl(C)
line(C) read one	line of input	line(C)
lpd(M)	line printer daemon	lpd(M)
cancel(C) send/cancel requests to LP	line printer lp(C)	lp(C)
turn on/off	line printer scheduler	lpon(M)
lpdisable(C) enable/disable LP	line printers lpenable(C)	lpenable(C)
lpinit(M) add new	line printers	lpinit(M)
lsearch(S) lfind(S)	linear search and update	lsearch(S)
	line(C) read one line of input	line(C)
common object file	linenum(F) line number entries in a	linenum(F)
comm(C) select/reject	lines common to two sorted files	comm(C)
fold(C) fold long	lines for finite width output device	fold(C)
uniq(C) report repeated	lines in a file	uniq(C)
look(C) find	lines in a sorted list	look(C)
num(C) number	lines	num(C)
rev(C) reverse	lines of a file	rev(C)
head(C) print the first few	lines of a stream	head(C)
ssp(C) remove consecutive blank	lines	ssp(C)
wc(C) count	lines, words, and characters	wc(C)
link(M) unlink(M)	link and unlink files and directories	link(M)

ld(CP) invoke the	link editor _____	ld(CP)
a.out(F) format of assembler and	link editor output _____	a.out(F)
xld(CP) invoke the	link editor _____	xld(CP)
link(S)	link to a file _____	link(S)
ln(C) make a	link to a file _____	ln(C)
ldunix(M) configurable kernel	linker _____	ldunix(M)
and directories	link(M) unlink(M) link and unlink files _____	link(M)
	link(S) link to a file _____	link(S)
syntax	lint(CP) check C language usage and _____	lint(CP)
ls(C)	list contents of directories _____	ls(C)
xlist(S) fxlist(S) get name	list entries from files _____	xlist(S)
checklist(M)	list file systems processed by fsck _____	checklist(M)
look(C) find lines in a sorted	list _____	look(C)
niist(S) get entries from name	list _____	niist(S)
nm(CP) print name	list of common object file _____	nm(CP)
terminals(M)	list of supported terminals _____	terminals(M)
varargs(F) handles variable argument	list _____	varargs(F)
print formatted output of varargs	list vprintf(S) vfprintf(S) vsprintf(S) _____	vprintf(S)
from(C)	list who my mail is from _____	from(C)
xnm(CP) print name	list _____	xnm(CP)
COFF file	list(CP) produce C source listing from _____	list(CP)
cref(CP) make a cross-reference	listing _____	cref(CP)
list(CP) produce C source	listing from COFF file _____	list(CP)
	ln(C) make a link to a file _____	ln(C)
string ctime(S) gmtime(S)	localtime(S) convert date and time to _____	ctime(S)
program whereis(C)	locate source, binary, or manual for _____	whereis(C)
end(S) edata(S) etext(S) last	locations in program _____	end(S)
lock(S)	lock a process in primary memory _____	lock(S)
plock(S)	lock process, text, or data in memory _____	plock(S)
	lockf(S) record locking on files _____	lockf(S)
lockf(S) record	locking on files _____	lockf(S)
read/write	locking(S) lock/unlock a file region for _____	locking(S)
	lock(S) lock a process in primary memory _____	lock(S)
locking(S)	lock/unlock a file region for read/write _____	locking(S)
errprint(M) display error	log contents _____	errprint(M)
gamma(S)	log gamma function _____	gamma(S)
set maximum number of users allowed to	log in numusers(S) get and _____	numusers(S)
newgrp(C)	log user into a new group _____	newgrp(C)
exp(S) pow(S) log(S) exponential.	logarithm, and power functions _____	exp(S)
exp(S) sqrt(S) exponential.	logarithm, and square root functions _____	exp(S)
strclean(M) STREAMS error	logger cleanup program _____	strclean(M)
strerr(M) STREAMS error	logger daemon _____	strerr(M)
log(M) interface to STREAMS error	logging _____	log(M)
sizefs(C) determine the size of a	logical disk drive _____	sizefs(C)
getlogin(S) get	login name _____	getlogin(S)
logname(C) get	login name _____	logname(C)
cuserid(S) get character	login name of the user _____	cuserid(S)
logname(S) return	login name of user _____	logname(S)
passwd(C) change	login password _____	passwd(C)
sulogin(M) special	login program invoked by init _____	sulogin(M)
ttys(M)	login terminals file _____	ttys(M)
profile(M) set up environment at	login time _____	profile(M)
	login(C) give you system access _____	login(C)
last(C) print last record of user	logins _____	last(C)
disable(C) disable	logins on a port _____	disable(C)
enable(C) enable	logins on a port _____	enable(C)
logging	log(M) interface to STREAMS error _____	log(M)

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	logname(C) get login name _____	logname(C)
	logname(S) return login name of user _____	logname(S)
functions exp(S) pow(S)	log(S) exponential, logarithm, and power	exp(S)
	longjmp(S) non-local goto _____	setjmp(S)
	look for files in home directories _____	fleece(C)
	look(C) find lines in a sorted list _____	look(C)
	lorder(CP) find ordering relation for _____	lorder(CP)
lp(C) cancel(C) send/cancel requests to	LP line printer _____	lp(C)
lpenable(C) lpdisable(C) enable/disable	LP line printers _____	lpenable(C)
lpsched(M) lpshut(M) start/stop the	LP request scheduler _____	lpsched(M)
lpsched(M) lpmove(M) move	LP requests _____	lpsched(M)
lpadmin(M) configure the	LP spooling system _____	lpadmin(M)
	LP status information _____	lpstat(C)
	lpadmin(M) configure the LP spooling _____	lpadmin(M)
	lp(C) cancel(C) send/cancel requests to _____	lp(C)
	lpdisable(C) enable/disable LP line _____	lpenable(C)
	lpd(M) line printer daemon _____	lpd(M)
	lpenable(C) lpdisable(C) enable/disable _____	lpenable(C)
	lpinit(M) add new line printers _____	lpinit(M)
	lpmove(M) move LP requests _____	lpsched(M)
	lpon(M) line printer scheduler _____	lpon(M)
	lpr(C) route named files to printer _____	lpr(C)
	lpsched(M) lpmove(M) move LP requests _____	lpsched(M)
	lpshut(M) lpshut(M) start/stop the LP _____	lpsched(M)
	lpshut(M) start/stop the LP request _____	lpsched(M)
	lpstat(C) print LP status information _____	lpstat(C)
drand48(S) mrand48(S) nrand48(S)	lrand48(S) generate pseudo-random/ _____	drand48(S)
	ls(C) list contents of directories _____	ls(C)
	lsearch(S) lfind(S) linear search and _____	lsearch(S)
	lseek(S) move read/write file pointer _____	lseek(S)
	ltol3(S) convert between 3-byte integers _____	l3tol(S)
	m4(CP) invoke a macro processor _____	m4(CP)
	machine-dependent values _____	values(F)
ftp(C) transfer files between Altos	machines _____	ftp(C)
	macro assembler _____	masm(CP)
	macro processor _____	m4(CP)
	mail _____	enroll(C)
	mail(C) system _____	mail(C)
	mail alias file _____	aliases(M)
aliashash(M) rebuild data base for	mail alias file _____	aliashash(M)
	mail(C) system mail _____	mail(C)
	mail is from _____	from(C)
	main memory allocator _____	malloc(S)
	main memory allocator _____	malloc(S)
malloc(S) free(S) realloc(S) fast	main memory allocator malloc(S) _____	malloc(S)
mallinfo(S) mallopt(S) calloc(S) fast	maintain archives and libraries _____	ar(CP)
	maintain archives and libraries _____	xar(CP)
	maintain, update, and regenerate groups _____	make(C)
	make(C) maintain, update, and regenerate _____	make(C)
	makedevs(M) create special device files _____	makedevs(M)
	makekey(M) generate an encryption key _____	makekey(M)
	makettys(M) create tty special files _____	makettys(M)
	mallinfo(S) mallopt(S) calloc(S) fast _____	malloc(S)
	malloc(S) free(S) realloc(S) fast main _____	malloc(S)
	malloc(S) main memory allocator _____	malloc(S)
calloc(S) fast main memory allocator	malloc(S) mallinfo(S) mallopt(S) _____	malloc(S)
allocator malloc(S) mallinfo(S)	mallopt(S) calloc(S) fast main memory _____	malloc(S)

tsearch(S) tfind(S) tdelete(S) twalk(S)	manage binary search trees _____	tsearch(S)
layout(M)	manage hard disk partitions _____	layout(M)
hsearch(S) hdestroy(S) hcreate(S)	manage hash search tables _____	hsearch(S)
crontab(C)	manage user crontab files _____	crontab(C)
sigrelse(S) sigignore(S) signal	management sigset(S) sighold(S) _____	sigset(S)
sigset(S) sigpause(S) signal	management _____	sigset(S)
function ldread(S) lditem(S)	manipulate line number entries of a COFF	ldread(S)
numbers frexp(S) modf(S) ldexp(S)	manipulate parts of floating-point _____	frexp(S)
section mcs(CP)	manipulate the object file comment _____	mcs(CP)
whereis(C) locate source, binary, or	manual for program _____	whereis(C)
sysaltos(S)	manufacturer specific system requests _____	sysaltos(S)
drive information written during	manufacturing drive(C) _____	drive(C)
add new bad sectors to the bad sector	map badblock(C) _____	badblock(C)
ascii(M)	map of the ASCII character set _____	ascii(M)
umask(C) set file-creation mode	mask _____	umask(C)
umask(S) set and get file creation	mask _____	umask(S)
	masm(CP) invoke the macro assembler _____	masm(CP)
master(M)	master configuration database _____	master(M)
regexp(F) regular expression compile and	master(M) master configuration database _____	master(M)
regexp(S) compile regular expression and	match routines _____	regexp(F)
math(F)	match routines _____	regexp(S)
	math functions and constants _____	math(F)
in numusers(S) get and set	matherr(S) error-handling function _____	matherr(S)
comment section	math(F) math functions and constants _____	math(F)
ldahread(S) read the archive header of a	maximum number of users allowed to log _____	numusers(S)
memory(S)	mcs(CP) manipulate the object file _____	mcs(CP)
memory(S) memset(S) memcpy(S) memcmp(S)	member of an archive file _____	ldahread(S)
memory(S) memset(S) memcpy(S)	memccpy(S) memory operations _____	memory(S)
operations memory(S) memset(S)	memchr(S) memory operations _____	memory(S)
	memcmp(S) memchr(S) memory operations _____	memory(S)
	memcpy(S) memcmp(S) memchr(S) memory _____	memory(S)
	mem(M) kmem(M) memory image file _____	mem(M)
malloc(S) free(S) realloc(S) fast main	memory allocator _____	malloc(S)
malloc(S) main	memory allocator _____	malloc(S)
mallopt(S) calloc(S) fast main	memory allocator malloc(S) mallinfo(S) _____	malloc(S)
shmctl(S) shared	memory control operations _____	shmctl(S)
message queue, semaphore set, shared	memory id ipcrm(C) remove _____	ipcrm(C)
mem(M) kmem(M)	memory image file _____	mem(M)
lock(S) lock a process in primary	memory _____	lock(S)
memory(S) memcpy(S)	memory operations _____	memory(S)
memset(S) memcpy(S) memcmp(S) memchr(S)	memory operations memory(S) _____	memory(S)
shmop(S) shared	memory operations _____	shmop(S)
plock(S) lock process, text, or data in	memory _____	plock(S)
shmsgt(S) get shared	memory segment identifier _____	shmsgt(S)
	memory(S) memcpy(S) memory operations _____	memory(S)
memchr(S) memory operations	memory(S) memset(S) memcpy(S) memcmp(S) _____	memory(S)
memory operations memory(S)	memory(S) memcpy(S) memcmp(S) memchr(S) _____	memory(S)
options(M) floppy disk installation	menu _____	options(M)
menus(M) format of Business Shell	menu system _____	menus(M)
digest(C) create	menu system(s) for the Business Shell _____	digest(C)
system	menus(M) format of Business Shell menu _____	menus(M)
sort(C) sort and	merge files _____	sort(C)
to a terminal	msg(C) allow or disallow messages sent _____	msg(C)
msgctl(S)	message control operations _____	msgctl(S)
mkstr(C) create an error	message file from C source _____	mkstr(C)
mkstr(CP) create an error	message file from C source _____	mkstr(CP)
getmsg(S) get next	message off a stream _____	getmsg(S)

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putmsg(S) send a message on a stream \_\_\_\_\_ putmsg(S)  
 msgop(S) message operations \_\_\_\_\_ msgop(S)  
 msgget(S) get message queue \_\_\_\_\_ msgget(S)  
 memory id ipcrm(C) remove message queue, semaphore set, shared \_\_\_\_\_ ipcrm(C)  
 perror(S) system error messages \_\_\_\_\_ perror(S)  
 msg(C) allow or disallow messages sent to a terminal \_\_\_\_\_ msg(C)  
 strace(M) print STREAMS trace messages \_\_\_\_\_ strace(M)  
 sys\_errlist(S) errno(S) system error messages sys\_nerr(S) \_\_\_\_\_ sys\_nerr(S)  
 clone(M) open any minor device on STREAMS driver \_\_\_\_\_ clone(M)  
 intro(M) introduce miscellaneous features and files \_\_\_\_\_ intro(M)  
 bootable object file mkboot(M) convert object file to \_\_\_\_\_ mkboot(M)  
 mkdir(C) make a directory \_\_\_\_\_ mkdir(C)  
 mkdir(S) make a directory \_\_\_\_\_ mkdir(S)  
 mkfs(M) construct a file system \_\_\_\_\_ mkfs(M)  
 mknod(C) build special files \_\_\_\_\_ mknod(C)  
 mknod(S) make a directory, or a special \_\_\_\_\_ mknod(S)  
 mkshlib(CP) create a shared library \_\_\_\_\_ mkshlib(CP)  
 or ordinary file  
 from C source mkstr(C) create an error message file \_\_\_\_\_ mkstr(C)  
 from C source mkstr(CP) create an error message file \_\_\_\_\_ mkstr(CP)  
 driver symbol table mktemp(S) make a unique file name \_\_\_\_\_ mktemp(S)  
 kernel symbol table mkunix(M) make bootable system file with \_\_\_\_\_ mkunix(M)  
 mkunix(M) make bootable system file with \_\_\_\_\_ mkunix(M)  
 mkvers(CP) generate a what string \_\_\_\_\_ mkvers(CP)  
 mnttab(M) mounted file system table \_\_\_\_\_ mnttab(M)  
 mode mode \_\_\_\_\_ getty(M)  
 mode mask \_\_\_\_\_ umask(C)  
 bring system up multi/single-user mode multiuser(C) singleuser(C) \_\_\_\_\_ multiuser(C)  
 chmod(S) change mode of file \_\_\_\_\_ chmod(S)  
 setmodem(C) set up tty port for a modem \_\_\_\_\_ setmodem(C)  
 uugetty(M) set terminal type. modes, speed, line discipline \_\_\_\_\_ uugetty(M)  
 tset(C) set terminal modes \_\_\_\_\_ tset(C)  
 setmode(C) printer modes utility \_\_\_\_\_ setmode(C)  
 floating-point numbers frexp(S) modf(S) ldexp(S) manipulate parts of \_\_\_\_\_ frexp(S)  
 settime(C) change the access and modification dates of files \_\_\_\_\_ settime(C)  
 touch(C) update access and modification times of a file \_\_\_\_\_ touch(C)  
 utime(S) set file access and modification times \_\_\_\_\_ utime(S)  
 monitor(S) prepare execution profile \_\_\_\_\_ monitor(S)  
 time more(C) view a file one full screen at a \_\_\_\_\_ more(C)  
 mount(S) mount a file system \_\_\_\_\_ mount(S)  
 multiple file systems mountall(C) umountall(C) mount/unmount \_\_\_\_\_ mountall(C)  
 structure mount(C) umount(C) mount/unmount a file \_\_\_\_\_ mount(C)  
 mnttab(M) mounted file system table \_\_\_\_\_ mnttab(M)  
 mount(S) mount a file system \_\_\_\_\_ mount(S)  
 mount(C) umount(C) mount/unmount a file structure \_\_\_\_\_ mount(C)  
 mountall(C) umountall(C) mount/unmount multiple file systems \_\_\_\_\_ mountall(C)  
 lpached(M) lpmove(M) move LP requests \_\_\_\_\_ lpached(M)  
 lseek(S) move read/write file pointer \_\_\_\_\_ lseek(S)  
 mv(C) move (rename) files and directories \_\_\_\_\_ mv(C)  
 generate pseudo-random/ drand48(S) mrand48(S) nrand48(S) lrand48(S) \_\_\_\_\_ drand48(S)  
 dos(C) access MS-DOS files \_\_\_\_\_ dos(C)  
 msgctl(S) message control operations \_\_\_\_\_ msgctl(S)  
 msgget(S) get message queue \_\_\_\_\_ msgget(S)  
 msgop(S) message operations \_\_\_\_\_ msgop(S)  
 multiple file systems mountall(C) \_\_\_\_\_ mountall(C)  
 multiplexing poll(S) \_\_\_\_\_ poll(S)  
 multi/single-user mode multiuser(C) \_\_\_\_\_ multiuser(C)  
 multi-user environment rc2(M) \_\_\_\_\_ rc2(M)

up multi/single-user mode	multiuser(C) singleuser(C) bring system	multiuser(C)
directories	mv(C) move (rename) files and	mv(C)
tmpnam(S) tmpnam(S) create a	name for a temporary file	tmpnam(S)
ldgetname(S) retrieve symbol	name for COFF symbol table entry	ldgetname(S)
ctermid(S) generate file	name for terminal	ctermid(S)
getpw(S) get	name from UID	getpw(S)
getenv(S) return value for environment	name	getenv(S)
getlogin(S) get login	name	getlogin(S)
xlist(S) fxlist(S) get	name list entries from files	xlist(S)
nlist(S) get entries from	name list	nlist(S)
nm(CP) print	name list of common object file	nm(CP)
xnm(CP) print	name list	xnm(CP)
logname(C) get login	name	logname(C)
mktemp(S) make a unique file	name	mktemp(S)
ttyname(S) isatty(S) find	name of a terminal	ttyname(S)
uname(S) get	name of current UNIX system	uname(S)
getcwd(S) get path	name of current working directory	getcwd(S)
cuserid(S) get character login	name of the user	cuserid(S)
logname(S) return login	name of user	logname(S)
devnm(C) identify device	name on which files reside	devnm(C)
pwd(C) print working directory	name	pwd(C)
tty(C) get the current port	name	tty(C)
lpr(C) route	named files to printer spooler	lpr(C)
term(M) conventional	names for terminals	term(M)
ncheck(M) generate path	names from inode numbers	ncheck(M)
id(C) print user and group ID and	names	id(C)
isnanand(S) test for floating point	NaN isnan(S) isnanf(S)	isnan(S)
interval	nap(S) suspend execution for a short	nap(S)
language	nawk(C) pattern scanning and processing	nawk(C)
semaphore resource waitsem(S)	nbwaitsem(S) wait and check access to	waitsem(S)
numbers	ncheck(M) generate path names from inode	ncheck(M)
getmsg(S) get	newgrp(C) log user into a new group	newgrp(C)
dbm(S) dbmini(S) fetch(S)	next message off a stream	getmsg(S)
priority	nextkey(S) perform database functions	dbm(S)
	nice(C) run a command at a different	nice(C)
	nice(S) change priority of a process	nice(S)
	nl(C) add line numbers to a file	nl(C)
	nlist(S) get entries from name list	nlist(S)
file	nm(CP) print name list of common object	nm(CP)
and quits	nohup(C) run a command immune to hangups	nohup(C)
setjmp(S) longjmp(S)	non-local goto	setjmp(S)
false(C) return with a	nonzero exit value	false(C)
pseudo-random/ drand48(S) mrand48(S)	nrand48(S) lrand48(S) generate	drand48(S)
null(M)	null file	null(M)
	null(M) null file	null(M)
linenum(F) line	number entries in a common object file	linenum(F)
ldlread(S) ldliitem(S) manipulate line	number entries of a COFF function	ldlread(S)
file ldlseek(S) seek to line	number entries of a section of a COFF	ldlseek(S)
factor(C) factor a	number	factor(C)
num(C)	number lines	num(C)
df(M) report	number of free disk blocks and inodes	df(M)
numusers(S) get and set maximum	number of users allowed to log in	numusers(S)
random(C) generate a random	number	random(C)
convert string to double-precision	number strtod(S) atof(S)	strtod(S)
ecvt(S) convert floating-point	number to string	ecvt(S)
erand48(S) generate pseudo-random	numbers drand48(S)	drand48(S)
lrnd48(S) generate pseudo-random	numbers /rand48(S) nrnd48(S)	drand48(S)

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jrاند48(S) generate pseudo-random	numbers drاند48(S) seed48(S) srاند48(S) _drاند48(S)
manipulate parts of floating-point	numbers frexp(S) modf(S) ldexp(S) _____ frexp(S)
strip(CP) remove symbols and line	numbers from COFF file _____ strip(CP)
ncheck(M) generate path names from inode	numbers _____ ncheck(M)
nl(C) add line	numbers to a file _____ nl(C)
	num(C) number lines _____ num(C)
of users allowed to log in	numusers(S) get and set maximum number _____ numusers(S)
dis(CP)	object code disassembler _____ dis(CP)
ldfcn(F) common	object file access routines _____ ldfcn(F)
mcs(CP) manipulate the	object file comment section _____ mcs(CP)
cprs(CP) compress a common	object file _____ cprs(CP)
dump(CP) dump selected parts of an	object file _____ dump(CP)
ldopen(S) ldaopen(S) open a common	object file for reading _____ ldopen(S)
fixobj(CP) convert an	object file from OMF to COFF _____ fixobj(CP)
hdr(C) display selected parts of an	object file _____ hdr(C)
line number entries in a common	object file linenum(F) _____ linenum(F)
convert object file to bootable	object file mkboot(M) _____ mkboot(M)
nm(CP) print name list of common	object file _____ nm(CP)
relocation of information for a common	object file reloc(F) _____ reloc(F)
scnhdr(F) section header for a common	object file _____ scnhdr(F)
find the printable strings in an	object file strings(C) _____ strings(C)
syms(F) common	object file symbol table format _____ syms(F)
mkboot(M) convert	object file to bootable object file _____ mkboot(M)
conv(CP) convert common	object files _____ conv(CP)
filehdr(F) file header for common	object files _____ filehdr(F)
size(C) print section sizes of common	object files _____ size(C)
to the optional file header of a common	object ldohseek(S) seek _____ ldohseek(S)
lorder(CP) find ordering relation for	object library _____ lorder(CP)
od(C) display files in	octal format _____ od(C)
	od(C) display files in octal format _____ od(C)
fixobj(CP) convert an object file from	OMF to COFF _____ fixobj(CP)
ldopen(S) ldaopen(S)	open a common object file for reading _____ ldopen(S)
opensem(S)	open a semaphore _____ opensem(S)
fopen(S) fdopen(S) freopen(S)	open a stream _____ fopen(S)
clone(M)	open any minor device on STREAMS driver _____ clone(M)
dup(S) dup2(S) duplicate an	open file descriptor _____ dup(S)
open(S)	open for reading or writing _____ open(S)
directory(S) telldir(S) readdir(S)	opendir(S) directory operations _____ directory(S)
	open(S) open for reading or writing _____ open(S)
	opensem(S) open a semaphore _____ opensem(S)
rc0(M) commands to stop the	operating system _____ rc0(M)
rewinddir(S) seekdir(S) directory	operations directory(S) closedir(S) _____ directory(S)
readdir(S) opendir(S) directory	operations directory(S) telldir(S) _____ directory(S)
memory(S) memccpy(S) memory	operations _____ memory(S)
memcpy(S) memcmp(S) memchr(S) memory	operations memory(S) memset(S) _____ memory(S)
msgctl(S) message control	operations _____ msgctl(S)
msgop(S) message	operations _____ msgop(S)
semctl(S) semaphore control	operations _____ semctl(S)
semop(S) semaphore	operations _____ semop(S)
shmctl(S) shared memory control	operations _____ shmctl(S)
shmop(S) shared memory	operations _____ shmop(S)
strdup(S) strpbrk(S) strcmp(S) string	operations string(S) strcat(S) _____ string(S)
strcpy(S) strlen(S) strchr(S) string	operations string(S) strncmp(S) _____ string(S)
string(S) strspn(S) strtok(S) string	operations _____ string(S)
curse(S) terminal screen handling and	optimization package _____ curse(S)
getopt(S) get	option letter from argument vector _____ getopt(S)
ldohseek(S) seek to the	optional file header of a common object _____ ldohseek(S)

fcntl(F) file control	options _____	fcntl(F)
stty(C) set the	options for a port _____	stty(C)
xtty(C) set the	options for a port _____	xtty(C)
getopt(C) parse command	options _____	getopt(C)
getopts(C) parse command	options _____	getopts(C)
lorder(CP) find	options(M) floppy disk installation menu	options(M)
make a directory, or a special or	ordering relation for object library _____	lorder(CP)
dial(S) establish an	ordinary file mknod(S) _____	mknod(S)
format of assembler and link editor	out-going terminal line connection _____	dial(S)
fold(C) fold long lines for finite width	output a.out(F) _____	a.out(F)
vfprintf(S) vsprintf(S) print formatted	output device _____	fold(C)
pr(C) print files on the standard	output of varargs list vprintf(S) _____	vprintf(S)
sprintf(S) fprintf(S) print formatted	output _____	pr(C)
syadef(M)	output printf(S) _____	printf(S)
chown(S) change	output system definition _____	syadef(M)
chown(C) chgrp(C) change	owner and group of a file _____	chown(S)
quot(C) summarize file system	owner or group ID _____	chown(C)
screen handling and optimization	ownership _____	quot(C)
sar(M) system activity report	package curses(S) terminal _____	curses(S)
stdio(S) standard buffered input/output	package _____	sar(M)
standard interprocess communication	package _____	stdio(S)
expand files	package stdipc(S) ftok(S) _____	stdipc(S)
tk(C)	pack(C) pcat(C) unpack(C) compress and _____	pack(C)
get process, process group, and	paginator for Tektronix 4014 _____	tk(C)
getopt(C)	parent process IDs getpid(S) _____	getpid(S)
getopts(C)	parse command options _____	getopt(C)
tail(C) deliver the last	parse command options _____	getopts(C)
layout(M) manage hard disk	part of a file _____	tail(C)
dump(CP) dump selected	partitions _____	layout(M)
hdr(C) display selected	parts of an object file _____	dump(CP)
frexp(S) modf(S) ldexp(S) manipulate	parts of an object file _____	hdr(C)
crypt(S)	parts of floating-point numbers _____	frexp(S)
fgetpwent(S) endpwent(S) setpwent(S) get	passwd(C) change login password _____	passwd(C)
getpwent(S) getpwnam(S) getpwuid(S) get	passwd(M) password file _____	passwd(M)
putpwent(S) write	passwd and file encryption functions _____	crypt(S)
passwd(M)	password file entry getpwent(S) _____	getpwent(S)
getpas(S) read a	password file entry _____	getpwent(S)
passwd(C) change login	password file _____	passwd(M)
pwck(M) grpck(M) check	password _____	getpas(S)
getcwd(S) get	password _____	passwd(C)
ncheck(M) generate	password/group file _____	pwck(M)
dirname(C) deliver portions of	path name of current working directory _____	getcwd(S)
grep(C) search a file for a	path names from inode numbers _____	ncheck(M)
awk(C)	pathnames basename(C) _____	basename(C)
nawk(C)	pattern _____	grep(C)
egrep(C) search file for	pattern scanning and processing language	awk(C)
files pack(C)	pattern scanning and processing language	nawk(C)
process popen(S)	pattern using full regular expression _____	egrep(C)
dbm(S) dbminit(S) fetch(S) nextkey(S)	pause(S) suspend process until signal _____	pause(S)
dbm(S) firstkey(S) store(S) fetch(S)	pcat(C) unpack(C) compress and expand _____	pack(C)
check the uucp directories and	pclose(S) initiate pipe to/from a _____	popen(S)
chmod(C) change	pconfig(C) set port configuration _____	pconfig(C)
	perform database functions _____	dbm(S)
	perform database functions _____	dbm(S)
	permissions file ucheck(M) _____	ucheck(M)
	permissions of a file or directory _____	chmod(C)

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acct(M) format of	per-process accounting file _____	acct(M)
	pererror(S) system error messages _____	pererror(S)
	pg(C) file perusal filter _____	pg(C)
split(C) split a file into	pieces _____	split(C)
tee(C) create a tee in a	pipe _____	tee(C)
popen(S) pclose(S) initiate	pipe to/from a process _____	popen(S)
	pipe(S) create an interprocess channel _____	pipe(S)
memory	plock(S) lock process, text, or data in _____	plock(S)
	plot(S) graphics interface subroutines _____	plot(S)
fpgetround(S) fpgetmask(S) IEEE floating	point environment control _____	fpgetround(S)
fpgetsticky(S) IEEE floating	point environment control fpgetround(S) _____	fpgetround(S)
fpgetround(S) fpsetmask(S) IEEE floating	point environment control _____	fpgetround(S)
fpsetround(S) IEEE floating	point environment control fpgetround(S) _____	fpgetround(S)
fpsetsticky(S) IEEE floating	point environment control fpgetround(S) _____	fpgetround(S)
isnanf(S) isnand(S) test for floating	point NaN isnan(S) _____	isnan(S)
ftell(S) rewind(S) reposition a file	pointer in a stream fseek(S) _____	fseek(S)
lseek(S) move read/write file	pointer _____	lseek(S)
multiplexing	poll(S) STREAMS input/output _____	poll(S)
a process	popen(S) pclose(S) initiate pipe to/from _____	popen(S)
pconfig(C) set	port configuration _____	pconfig(C)
disable(C) disable logins on a	port _____	disable(C)
enable(C) enable logins on a	port _____	enable(C)
setmodem(C) set up tty	port for a modem _____	setmodem(C)
tty(C) get the current	port name _____	tty(C)
stty(C) set the options for a	port _____	stty(C)
xtty(C) set the options for a	port _____	xtty(C)
basename(C) dirname(C) deliver	portions of pathnames _____	basename(C)
log(S) exponential, logarithm, and	power functions exp(S) pow(S) _____	exp(S)
and power functions exp(S)	pow(S) log(S) exponential, logarithm, _____	exp(S)
	pr(C) print files on the standard output _____	pr(C)
dc(C) arbitrary	precision calculator _____	dc(C)
monitor(S)	prepare execution profile _____	monitor(S)
cpp(CP) the C Language	Preprocessor _____	cpp(CP)
unget(CP) undo a	previous get of an SCCS file _____	unget(CP)
lock(S) lock a process in	primary memory _____	lock(S)
types(F)	primitive system data types _____	types(F)
cal(C)	print a calendar _____	cal(C)
yes(C)	print a string repeatedly _____	yes(C)
prs(CP)	print an SCCS file _____	prs(CP)
date(C)	print and set the date _____	date(C)
sact(CP)	print current SCCS file edit activity _____	sact(CP)
whoami(C)	print effective current user id _____	whoami(C)
pr(C)	print files on the standard output _____	pr(C)
vprintf(S) vfprintf(S) vsprintf(S)	print formatted output of varargs list _____	vprintf(S)
printf(S) sprintf(S) fprintf(S)	print formatted output _____	printf(S)
banner(C)	print large letters _____	banner(C)
last(C)	print last record of user logins _____	last(C)
lpstat(C)	print LP status information _____	lpstat(C)
nm(CP)	print name list of common object file _____	nm(CP)
xnm(CP)	print name list _____	xnm(CP)
printenv(C)	print out the environment _____	printenv(C)
accept(C) reject(C) allow/prevent	print requests _____	accept(C)
pscreen(C) set up terminal to	print screen display _____	pscreen(C)
files size(C)	print section sizes of common object _____	size(C)
printers(M)	print spooler configuration file _____	printers(M)
strace(M)	print STREAMS trace messages _____	strace(M)
infocmp(M) compare or	print terminfo descriptions _____	infocmp(M)

uname(C)	print the current UNIX information	uname(C)
head(C)	print the first few lines of a stream	head(C)
id(C)	print user and group ID and names	id(C)
pwd(C)	print working directory name	pwd(C)
strings(C)	find the printable strings in an object file	strings(C)
	printenv(C) print out the environment	printenv(C)
lpd(M)	line printer daemon	lpd(M)
xpd(M)	transparent printer daemon	xpd(M)
filter files for printing on LaserJet	printer hplp(C) hplpR(C)	hplp(C)
send/cancel requests to LP line	printer lp(C) cancel(C)	lp(C)
	printer modes utility	setmode(C)
setmode(C)	printer scheduler	lpon(M)
turn on/off line	printer spooler	lpr(C)
lpr(C)	route named files to printers	lpr(C)
lpdisable(C)	enable/disable LP line printers	lpenable(C)
lpinit(M)	add new line printers(M)	lpinit(M)
file	printers(M) print spooler configuration	printers(M)
formatted output	printf(S) sprintf(S) fprintf(S) print	printf(S)
hplp(C) hplpR(C)	filter files for printing on LaserJet printer	hplp(C)
nice(C)	run a command at a different priority	nice(C)
nice(S)	change priority of a process	nice(S)
brc(M)	system initialization procedure	brc(M)
acct(S)	enable or disable process accounting	acct(S)
alarm(S)	set a process alarm clock	alarm(S)
times(S)	get process and child process times	times(S)
init(M)	process control initialization	init(M)
exit(S)	terminate process	exit(S)
fork(S)	create a new process	fork(S)
getpid(S)	get process, process group, and parent process IDs	getpid(S)
setpggrp(S)	set process group id	setpggrp(S)
setpggrp(C)	execute command in a new process group	setpggrp(C)
get process, process group, and parent	process IDs getpid(S)	getpid(S)
lock(S)	lock a process in primary memory	lock(S)
kill(C)	terminate a process	kill(C)
nice(S)	change priority of a process	nice(S)
kill(S)	send a signal to a process or a group of processes	kill(S)
pclose(S)	initiate pipe to/from a process	pclose(S)
process IDs getpid(S)	get process, process group, and parent process status	getpid(S)
ps(C)	report process status	ps(C)
plock(S)	lock process, text, or data in memory	plock(S)
times(S)	get process and child process times	times(S)
wait(S)	wait for child process to stop or terminate	wait(S)
ptrace(S)	process trace	ptrace(S)
pause(S)	suspend process until signal	pause(S)
checklist(M)	list file systems processed by fsck	checklist(M)
inittab(M)	script for the init processes	inittab(M)
killall(C)	kill all active processes	killall(C)
send a signal to a process or a group of	processes kill(S)	kill(S)
fuser(M)	identify processes using a file or file structure	fuser(M)
wait(C)	wait completion of background processes	wait(C)
awk(C)	pattern scanning and processing language	awk(C)
nawk(C)	pattern scanning and processing language	nawk(C)
m4(CP)	invoke a macro processor	m4(CP)
list(CP)	produce C source listing from COFF file	list(CP)
prof(CP)	display profile data	prof(CP)
prof(F)	profile within a function	prof(F)
prof(CP)	display profile data	prof(CP)
monitor(S)	prepare execution profile	monitor(S)

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profil(S) execution time	profile _____	profil(S)
prof(F) time	profile within a function _____	prof(F)
	profile(M) set up environment at login _____	profile(M)
	profil(S) execution time profile _____	profil(S)
assert(S) verify	program assertion _____	assert(S)
boot(M) boot	program _____	boot(M)
cxref(CP) generate C	program cross-reference _____	cxref(CP)
ctrace(CP) C	program debugger _____	ctrace(CP)
edata(S) etext(S) last locations in	program end(S) _____	end(S)
tapeutil(C) utility	program for a streaming tape drive _____	tapeutil(C)
uucico(M) file transport	program for uucp system _____	uucico(M)
default(M) default	program information directory _____	default(M)
sulogin(M) special login	program invoked by init _____	sulogin(M)
strclean(M) STREAMS error logger cleanup	program _____	strclean(M)
ua(C) user administration	program _____	ua(C)
scheduler for the uucp file transport	program uusched(M) _____	uusched(M)
locate source, binary, or manual for	program whereis(C) _____	whereis(C)
cb(CP) beautify C	programs _____	cb(CP)
lex(CP) generate	programs for lexical analysis _____	lex(CP)
update, and regenerate groups of	programs make(C) maintain, _____	make(C)
xref(CP) cross-reference C	programs _____	xref(CP)
xstr(CP) extract strings from C	programs _____	xstr(CP)
clock(M)	provide access to the time-of-day chip _____	clock(M)
labelit(C)	provide labels for file systems _____	labelit(C)
	prs(CP) print an SCCS file _____	prs(CP)
	ps(C) report process status _____	ps(C)
screen display	pscreen(C) set up terminal to print _____	pscreen(C)
drand48(S) erand48(S) generate	pseudo-random numbers _____	drand48(S)
nrand48(S) lrand48(S) generate	pseudo-random numbers /rand48(S) _____	drand48(S)
seed48(S) srand48(S) jrand48(S) generate	pseudo-random numbers drand48(S) _____	drand48(S)
	ptrace(S) process trace _____	ptrace(S)
uuto(C) uupick(C)	public UNIX-to-UNIX system file copy _____	uuto(C)
adb(C) invoke x.out general	purpose debugger _____	adb(C)
ungetc(S)	push character back into input stream _____	ungetc(S)
puts(S) fputs(S)	put a string on a stream _____	puts(S)
putc(S) putchar(S) putw(S) fputc(S)	put character or word on a stream _____	putc(S)
getdents(S) read directory entries and	put in a file _____	getdents(S)
character or word on a stream putc(S)	putchar(S) putw(S) fputc(S) put _____	putc(S)
character or word on a stream	putc(S) putchar(S) putw(S) fputc(S) put _____	putc(S)
environment	putenv(S) change or add value to _____	putenv(S)
	putmsg(S) send a message on a stream _____	putmsg(S)
	putpwent(S) write password file entry _____	putpwent(S)
stream	puts(S) fputs(S) put a string on a _____	puts(S)
on a stream putc(S) putchar(S)	putw(S) fputc(S) put character or word _____	putc(S)
file	pwck(M) grpck(M) check password/group _____	pwck(M)
	pwd(C) print working directory name _____	pwd(C)
	qsort(S) quicker sort _____	qsort(S)
	query terminfo database _____	tput(C)
magget(S) get message	queue _____	magget(S)
ipcrm(C) remove message	queue, semaphore set, shared memory id _____	ipcrm(C)
qsort(S)	quicker sort _____	qsort(S)
run a command immune to hangups and	quits nohup(C) _____	nohup(C)
	quot(C) summarize file system ownership _____	quot(C)
ranlib(CP) convert archives to	random libraries _____	ranlib(CP)
random(C) generate a	random number _____	random(C)
rand(S) srand(S) simple	random(C) generate a random number _____	random(C)
	random-number generator _____	rand(S)

generator	rand(S) srand(S) simple random-number	__ rand(S)
libraries	ranlib(CP) convert archives to random	__ ranlib(CP)
fsplit(CP) split	ratfor files	__ fsplit(CP)
standard FORTRAN	ratfor(CP) convert rational FORTRAN to	__ ratfor(CP)
ratfor(CP) convert	rational FORTRAN to standard FORTRAN	__ ratfor(CP)
system	rc0(M) commands to stop the operating	__ rc0(M)
environment	rc2(M) commands for multi-user	__ rc2(M)
to be read	rdchk(S) check to see if there is data	__ rdchk(S)
getpas(S)	read a password	__ getpas(S)
COFF file ldtbread(S)	read an indexed symbol table entry of a	__ ldtbread(S)
a COFF file ldshread(S)	read an indexed/named section header of	__ ldshread(S)
getdents(S)	read directory entries and put in a file	__ getdents(S)
read(S)	read from file	__ read(S)
line(C)	read one line of input	__ line(C)
check to see if there is data to be	read rdchk(S)	__ rdchk(S)
an archive file ldshread(S)	read the archive header of a member of	__ ldshread(S)
ldfhread(S)	read the file header of a COFF file	__ ldfhread(S)
operations directory(S) telldir(S)	readdir(S) opendir(S) directory	__ directory(S)
ldaopen(S) open a common object file for	reading ldopen(S)	__ ldopen(S)
open(S) open for	reading or writing	__ open(S)
lseek(S) move	read(S) read from file	__ read(S)
locking(S) lock/unlock a file region for	read/write file pointer	__ lseek(S)
getuid(S) geteuid(S) get	read/write	__ locking(S)
getuid(S) geteuid(S) get	real/effective user or group IDs	__ getuid(S)
getuid(S) getgid(S) get	real/effective user or group IDs	__ getuid(S)
getuid(S) getgid(S) get	real/effective user or group IDs	__ getuid(S)
malloc(S) free(S)	realloc(S) fast main memory allocator	__ malloc(S)
autoreboot(C) automatically	reboot the system	__ autoreboot(C)
reboot(C) automatically	reboot the system	__ reboot(C)
shutdown(S) reboot(S) shutdown or	reboot the system	__ shutdown(S)
system	reboot(C) automatically reboot the	__ reboot(C)
shutdown(S)	reboot(S) shutdown or reboot the system	__ shutdown(S)
signal(S) specify what to do on	receipt of signal	__ signal(S)
lockf(S)	record locking on files	__ lockf(S)
last(C) print last	record of user logins	__ last(C)
script(C) make a	record of your terminal session	__ script(C)
frec(M)	recover files from a back-up tape	__ frec(M)
system from tape	recover(C) restore contents of a file	__ recover(C)
ed(C)	red(C) invoke the ed text editor	__ ed(C)
make(C) maintain, update, and	regcmp(CP) compile regular expressions	__ regcmp(CP)
match routines	regcmp(S) compile a regular expression	__ regcmp(S)
match routines	regenerate groups of programs	__ make(C)
execseg(S) make a data	regex(F) regular expression compile and	__ regex(F)
locking(S) lock/unlock a file	regex(S) compile regular expression and	__ regex(S)
regex(S) compile	regex(S) execute a regular expression	__ regex(S)
routines regex(F)	region executable	__ execseg(S)
search file for pattern using full	region for read/write	__ locking(S)
regcmp(S) compile a	regular expression and match routines	__ regex(S)
regex(S) execute a	regular expression compile and match	__ regex(F)
regcmp(CP) compile	regular expression egrep(C)	__ egrep(C)
accept(C)	regular expression	__ regcmp(S)
lorder(CP) find ordering	regular expression	__ regex(S)
join(C) join two	regular expressions	__ regcmp(CP)
COFF file ldrseek(S) seek to	reject(C) allow/prevent print requests	__ accept(C)
	relation for object library	__ lorder(CP)
	relations	__ join(C)
	relocation entries of a section of a	__ ldrseek(S)

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object file	reloc(F)	relocation of information for a common	reloc(F)
common object file	reloc(F)	relocation of information for a	reloc(F)
leave(C)	remind you when you have to leave		leave(C)
calendar(C) invoke a	reminder service		calendar(C)
uuxqt(M) execute	remote command requests		uuxqt(M)
uutry(M) contact	remote system with debugging on		uutry(M)
ct(C) spawn getty to a	remote terminal		ct(C)
uux(C) execute command on	remote UNIX		uux(C)
rm(1) rmdir(CP)	remove a delta from an SCCS file		rm(1)
rmdir(S)	remove a directory		rmdir(S)
ssp(C)	remove consecutive blank lines		ssp(C)
unlink(S)	remove directory entry		unlink(S)
rm(C) rmdir(C)	remove files or directories		rm(C)
shared memory id ipcrm(C)	remove message queue, semaphore set,		ipcrm(C)
COFF file strip(CP)	remove symbols and line numbers from		strip(CP)
mv(C) move	(rename) files and directories		mv(C)
fack(C) dfack(C) check and	repair file systems		fack(C)
uniq(C) report	repeated lines in a file		uniq(C)
yes(C) print a string	repeatedly		yes(C)
clock(S)	report CPU time used		clock(S)
fsstat(M)	report file system status		fsstat(M)
fainfo(M)	report information about a file system		fainfo(M)
facilities status ipcs(C)	report inter-process communication		ipcs(C)
inodes df(M)	report number of free disk blocks and		df(M)
sar(C) system activity	report package		sar(C)
sar(M) system activity	report package		sar(M)
ps(C)	report process status		ps(C)
uniq(C)	report repeated lines in a file		uniq(C)
fseek(S) ftell(S) rewind(S)	reposition a file pointer in a stream		fseek(S)
lpsched(M) lpshut(M) start/stop the LP	request scheduler		lpsched(M)
accept(C) reject(C) allow/prevent print	requests		accept(C)
lpsched(M) lpmove(M) move LP	requests		lpsched(M)
sysaltos(S) manufacturer specific system	requests		sysaltos(S)
lp(C) cancel(C) send/cancel	requests to LP line printer		lp(C)
uuxqt(M) execute remote command	requests		uuxqt(M)
reset(C)	reset the teletype bit		reset(C)
	reset(C) reset the teletype bit		reset(C)
identify device name on which files	reside devnm(C)		devnm(C)
wait and check access to semaphore	resource waitsem(S) nwaitsem(S)		waitsem(S)
restore.hd(C)	restore a hard disk from tape		restore.hd(C)
tape recover(C)	restore contents of a file system from		recover(C)
tape	restore.hd(C) restore a hard disk from		restore.hd(C)
table entry ldgetname(S)	retrieve symbol name for COFF symbol		ldgetname(S)
stat(F)	return data by stat system call		stat(F)
abs(S)	return integer absolute value		abs(S)
logname(S)	return login name of user		logname(S)
getenv(S)	return value for environment name		getenv(S)
false(C)	return with a nonzero exit value		false(C)
true(C)	return with a zero exit value		true(C)
	rev(C) reverse lines of a file		rev(C)
	reverse lines of a file		rev(C)
operations directory(S) closedir(S)	rewinddir(S) seekdir(S) directory		directory(S)
stream fseek(S) ftell(S)	rewind(S) reposition a file pointer in a		fseek(S)
creat(S) create a new file or	rewrite an existing one		creat(S)
directories	rm(C) rmdir(C) remove files or		rm(C)
uucp link	rmail(C) receives mail from		rmail(C)
file	rm(1) rmdir(CP) remove a delta from an SCCS		rm(1)

rm(C)	rmdir(C) remove files or directories	rm(C)
	rmdir(S) remove a directory	rmdir(S)
chroot(S) change	root directory	chroot(S)
chroot(C) change	root directory for command	chroot(C)
exponential, logarithm, and square	root functions exp(S) sqrt(S)	exp(S)
lpr(C)	route named files to printer spooler	lpr(C)
ldfcn(F) common object file access	routines	ldfcn(F)
regular expression compile and match	routines regexp(F)	regexp(F)
compile regular expression and match	routines regexp(S)	regexp(S)
interpreter sh(C)	rsh(C) invoke the shell command	sh(C)
nice(C)	run a command at a different priority	nice(C)
quits nohup(C)	run a command immune to hangups and	nohup(C)
activity	sact(CP) print current SCCS file edit	sact(CP)
system activity	sadcon(M) data collector	sadcon(M)
	sar(C) system activity report package	sar(C)
	sar(M) system activity report package	sar(M)
archive(C)	save a file system to a streaming tape	archive(C)
allocation brk(S)	sbrk(S) change data segment space	brk(S)
bfs(C)	scan big files	bfs(C)
formatted input	scanf(S) fscanf(S) sscanf(S) convert	scanf(S)
awk(C) pattern	scanning and processing language	awk(C)
nawk(C) pattern	scanning and processing language	nawk(C)
cdc(CP) change the delta commentary of	SCCS delta	cdc(CP)
comb(CP) combine	SCCS deltas	comb(CP)
delta(CP) make a change to an	SCCS file	delta(CP)
sact(CP) print current	SCCS file edit activity	sact(CP)
get(CP) get a version of an	SCCS file	get(CP)
prs(CP) print an	SCCS file	prs(CP)
rm del(CP) remove a delta from an	SCCS file	rm del(CP)
sccsdiff(CP) compare two versions of an	SCCS file	sccsdiff(CP)
sccsfile(F) format of an	SCCS file	sccsfile(F)
unget(CP) undo a previous get of an	SCCS file	unget(CP)
val(CP) validate an	SCCS file	val(CP)
admin(CP) create and administer	SCCS files	admin(CP)
SCCS file	sccsdiff(CP) compare two versions of an	sccsdiff(CP)
turn on/off	sccsfile(F) format of an SCCS file	sccsfile(F)
ckbupscd(M) check file system backup	scheduler for line printer	lpon(M)
turn on/off	schedule	ckbupscd(M)
program uusched(M)	scheduler for line printer	lpon(M)
lpshut(M) start/stop the LP request	scheduler for the uucp file transport	uusched(M)
object file	scheduler lpsched(M)	lpsched(M)
image file	schhdr(F) section header for a common	schhdr(F)
more(C) view a file one full	scr_dump(F) format of curses screen	scr_dump(F)
clear(C) clear terminal	screen at a time	more(C)
pscreen(C) set up terminal to print	screen	clear(C)
curses(S) terminal	screen display	pscreen(C)
scr_dump(F) format of curses	screen handling and optimization package	curses(S)
vi(C) invoke a	screen image file	scr_dump(F)
inittab(M)	screen-oriented display editor	vi(C)
session	script for the init processes	inittab(M)
to a shared data segment	script(C) make a record of your terminal	script(C)
data segment sdget(S)	sdb(C) symbolic debugger	sdb(C)
shared data segment	sdenter(S) sdleave(S) synchronize access	sdenter(S)
data access	sdfree(S) attach and detach a shared	sdget(S)
	sdget(S) sdfree(S) attach and detach a	sdget(S)
	sdgetv(S) sdwaitv(S) synchronize shared	sdgetv(S)
	sdiff(C) compare files side-by-side	sdiff(C)

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shared data segment scenter(S)      sdleave(S) synchronize access to a \_\_\_\_\_ scenter(S)  
     access sdgetv(S)                  sdwaitv(S) synchronize shared data      sdgetv(S)  
     fgrep(C)                          search a file for a character string \_\_\_\_\_ fgrep(C)  
     grep(C)                          search a file for a pattern \_\_\_\_\_ grep(C)  
     lsearch(S) lfind(S) linear          search and update \_\_\_\_\_ lsearch(S)  
     regular expression egrep(C)        search file for pattern using full \_\_\_\_\_ egrep(C)  
     bsearch(S) binary                  search of a sorted table \_\_\_\_\_ bsearch(S)  
 hdestroy(S) hcreate(S) manage hash    search tables hsearch(S) \_\_\_\_\_ hsearch(S)  
 tdelete(S) twalk(S) manage binary    search trees tsearch(S) tfind(S) \_\_\_\_\_ tsearch(S)  
     enroll(C) xsend(C) xget(C)        secret mail \_\_\_\_\_ enroll(C)  
     scnhdr(F)                          section header for a common object file \_ scnhdr(F)  
 ldshread(S) read an indexed/named    section header of a COFF file \_\_\_\_\_ ldshread(S)  
 manipulate the object file comment    section mcs(CP) \_\_\_\_\_ mcs(CP)  
 seek to line number entries of a      section of a COFF file ldseek(S) \_\_\_\_\_ ldseek(S)  
     seek to relocation entries of a    section of a COFF file ldrseek(S) \_\_\_\_\_ ldrseek(S)  
     size(C) print                      section sizes of common object files \_\_\_ size(C)  
     add new bad sectors to the bad     sector map badblock(C) \_\_\_\_\_ badblock(C)  
     badblock(C) add new bad          sectors to the bad sector map \_\_\_\_\_ badblock(C)  
     sed(C) invoke the stream editor    sed(C) \_\_\_\_\_ sed(C)  
     see(C) display a file \_\_\_\_\_ see(C)  
 pseudo-random numbers drand48(S)    seed48(S) srand48(S) jrand48(S) generate drand48(S)  
     of a COFF file ldseek(S)          seek to line number entries of a section ldseek(S)  
     of a COFF file ldrseek(S)        seek to relocation entries of a section \_ ldrseek(S)  
     common object ldohseek(S)        seek to the optional file header of a \_ ldohseek(S)  
     ldtbseek(S)                      seek to the symbol table of a COFF file \_ ldtbseek(S)  
 directory(S) closedir(S) rewinddir(S) seekdir(S) directory operations \_\_\_\_\_ directory(S)  
     shmget(S) get shared memory        segment identifier \_\_\_\_\_ shmget(S)  
     synchronize access to a shared data segment scenter(S) sdleave(S) \_\_\_\_\_ scenter(S)  
     attach and detach a shared data    segment sdget(S) sdfree(S) \_\_\_\_\_ sdget(S)  
     brk(S) sbrk(S) change data        segment space allocation \_\_\_\_\_ brk(S)  
     dump(CP) dump                      selected parts of an object file \_\_\_\_\_ dump(CP)  
     hdr(C) display                      selected parts of an object file \_\_\_\_\_ hdr(C)  
     files comm(C)                      select/reject lines common to two sorted comm(C)  
     semctl(S)                          semaphore control operations \_\_\_\_\_ semctl(S)  
     creatsem(S) create a binary        semaphore \_\_\_\_\_ creatsem(S)  
     opensem(S) open a                  semaphore \_\_\_\_\_ opensem(S)  
     semop(S)                          semaphore operations \_\_\_\_\_ semop(S)  
     nwaitsem(S) wait and check access to semaphore resource waitsem(S) \_\_\_\_\_ waitsem(S)  
     semget(S) get set of              semaphores \_\_\_\_\_ semget(S)  
     semctl(S) semaphore control operations \_ semctl(S)  
     semget(S) get set of semaphores \_\_\_\_\_ semget(S)  
     semop(S) semaphore operations \_\_\_\_\_ semop(S)  
     semaphore set, shared memory id \_\_\_\_\_ ipcrm(C)  
     send a message on a stream \_\_\_\_\_ putmsg(S)  
     send a signal to a process or a group of kill(S)  
     send/cancel requests to LP line printer \_ lp(C)  
     sent to a terminal \_\_\_\_\_ msg(C)  
     service \_\_\_\_\_ calendar(C)  
     session \_\_\_\_\_ script(C)  
     set a process alarm clock \_\_\_\_\_ alarm(S)  
     set and get file creation mask \_\_\_\_\_ umask(S)  
     set \_\_\_\_\_ ascii(M)  
     set default system time zone \_\_\_\_\_ timezone(M)  
     set environment for command execution \_ env(C)  
     set file access and modification times \_ utime(S)  
     set file-creation mode mask \_\_\_\_\_ umask(C)  
     set maximum number of users allowed to \_ numusers(S)

rm(C)	rmdir(C) remove files or directories	rm(C)
	rmdir(S) remove a directory	rmdir(S)
chroot(S) change	root directory	chroot(S)
chroot(C) change	root directory for command	chroot(C)
exponential, logarithm, and square	root functions exp(S) sqrt(S)	exp(S)
lpr(C)	route named files to printer spooler	lpr(C)
ldfcn(F) common object file access	routines	ldfcn(F)
regular expression compile and match	routines regexp(F)	regexp(F)
compile regular expression and match	routines regexp(S)	regexp(S)
interpreter sh(C)	rsh(C) invoke the shell command	sh(C)
nice(C)	run a command at a different priority	nice(C)
quits nohup(C)	run a command immune to hangups and	nohup(C)
activity	sact(CP) print current SCCS file edit	sact(CP)
system activity	sadcon(M) data collector	sadcon(M)
	sar(C) system activity report package	sar(C)
	sar(M) system activity report package	sar(M)
archive(C)	save a file system to a streaming tape	archive(C)
allocation brk(S)	sbrk(S) change data segment space	brk(S)
bfs(C)	scan big files	bfs(C)
formatted input	scanf(S) fscanf(S) sscanf(S) convert	scanf(S)
awk(C) pattern	scanning and processing language	awk(C)
nawk(C) pattern	scanning and processing language	nawk(C)
cdc(CP) change the delta commentary of	SCCS delta	cdc(CP)
comb(CP) combine	SCCS deltas	comb(CP)
delta(CP) make a change to an	SCCS file	delta(CP)
sact(CP) print current	SCCS file edit activity	sact(CP)
get(CP) get a version of an	SCCS file	get(CP)
prc(CP) print an	SCCS file	prc(CP)
rm del(CP) remove a delta from an	SCCS file	rm del(CP)
sccsdiff(CP) compare two versions of an	SCCS file	sccsdiff(CP)
sccsfile(F) format of an	SCCS file	sccsfile(F)
unget(CP) undo a previous get of an	SCCS file	unget(CP)
val(CP) validate an	SCCS file	val(CP)
admin(CP) create and administer	SCCS files	admin(CP)
SCCS file	sccsdiff(CP) compare two versions of an	sccsdiff(CP)
	sccsfile(F) format of an SCCS file	sccsfile(F)
turn on/off	scheduler for line printer	lpon(M)
ckbupscd(M) check file system backup	schedule	ckbupscd(M)
turn on/off	scheduler for line printer	lpon(M)
program usched(M)	scheduler for the uucp file transport	usched(M)
lpshut(M) start/stop the LP request	scheduler lpsched(M)	lpsched(M)
object file	schhdr(F) section header for a common	schhdr(F)
image file	scr_dump(F) format of curses screen	scr_dump(F)
more(C) view a file one full	screen at a time	more(C)
clear(C) clear terminal	screen	clear(C)
pscreen(C) set up terminal to print	screen display	pscreen(C)
curses(S) terminal	screen handling and optimization package	curses(S)
scr_dump(F) format of curses	screen image file	scr_dump(F)
vi(C) invoke a	screen-oriented display editor	vi(C)
inittab(M)	script for the init processes	inittab(M)
session	script(C) make a record of your terminal	script(C)
	sdb(C) symbolic debugger	sdb(C)
to a shared data segment	sdenter(S) sdleave(S) synchronize access	sdenter(S)
data segment sdget(S)	sdfree(S) attach and detach a shared	sdget(S)
shared data segment	sdget(S) sdfree(S) attach and detach a	sdget(S)
data access	sdgetv(S) sdwaitv(S) synchronize shared	sdgetv(S)
	sdiff(C) compare files side-by-side	sdiff(C)

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shared data segment scenter(S)      sdleave(S) synchronize access to a \_\_\_\_\_ scenter(S)  
     access sdgetv(S)                  sdwaitv(S) synchronize shared data \_\_\_\_\_ sdgetv(S)  
     fgrep(C)                          search a file for a character string \_\_\_\_\_ fgrep(C)  
     grep(C)                          search a file for a pattern \_\_\_\_\_ grep(C)  
     lsearch(S) lfind(S) linear          search and update \_\_\_\_\_ lsearch(S)  
     regular expression egrep(C)        search file for pattern using full \_\_\_\_\_ egrep(C)  
     bsearch(S) binary                  search of a sorted table \_\_\_\_\_ bsearch(S)  
 hdestroy(S) hcreate(S) manage hash    search tables hsearch(S) \_\_\_\_\_ hsearch(S)  
 tdelete(S) twalk(S) manage binary    search trees tsearch(S) tfind(S) \_\_\_\_\_ tsearch(S)  
     enroll(C) xsend(C) xget(C)        secret mail \_\_\_\_\_ enroll(C)  
     scnhdr(F)                          section header for a common object file \_ scnhdr(F)  
 ldshread(S) read an indexed/named    section header of a COFF file \_\_\_\_\_ ldshread(S)  
 manipulate the object file comment    section mcs(CP) \_\_\_\_\_ mcs(CP)  
 seek to line number entries of a      section of a COFF file ldseek(S) \_\_\_\_\_ ldseek(S)  
     seek to relocation entries of a    section of a COFF file ldrseek(S) \_\_\_\_\_ ldrseek(S)  
     size(C) print                      section sizes of common object files \_ size(C)  
     add new bad sectors to the bad    sector map badblock(C) \_\_\_\_\_ badblock(C)  
     badblock(C) add new bad          sectors to the bad sector map \_\_\_\_\_ badblock(C)  
     sed(C) invoke the stream editor    sed(C) \_\_\_\_\_ sed(C)  
     see(C) display a file \_\_\_\_\_ see(C)  
 pseudo-random numbers drand48(S)    seed48(S) srand48(S) jrand48(S) generate drand48(S)  
     of a COFF file ldseek(S)          seek to line number entries of a section ldseek(S)  
     of a COFF file ldrseek(S)        seek to relocation entries of a section \_ ldrseek(S)  
     common object ldohseek(S)        seek to the optional file header of a \_ ldohseek(S)  
     ldtbseek(S)                      seek to the symbol table of a COFF file \_ ldtbseek(S)  
 directory(S) closedir(S) rewinddir(S) seekdir(S) directory operations \_\_\_\_\_ directory(S)  
     shmget(S) get shared memory      segment identifier \_\_\_\_\_ shmget(S)  
     synchronize access to a shared data segment scenter(S) sdleave(S) \_\_\_\_\_ scenter(S)  
     attach and detach a shared data    segment sdget(S) sdfree(S) \_\_\_\_\_ sdget(S)  
     brk(S) sbrk(S) change data        segment space allocation \_\_\_\_\_ brk(S)  
     dump(CP) dump                    selected parts of an object file \_\_\_\_\_ dump(CP)  
     hdr(C) display                    selected parts of an object file \_\_\_\_\_ hdr(C)  
     files comm(C)                    select/reject lines common to two sorted comm(C)  
     semctl(S)                          semaphore control operations \_\_\_\_\_ semctl(S)  
     creatsem(S) create a binary        semaphore \_\_\_\_\_ creatsem(S)  
     opensem(S) open a                semaphore \_\_\_\_\_ opensem(S)  
     semop(S)                          semaphore operations \_\_\_\_\_ semop(S)  
     nbwaitsem(S) wait and check access to semaphore resource waitsem(S) \_\_\_\_\_ waitsem(S)  
     semget(S) get set of              semaphores \_\_\_\_\_ semget(S)  
     semctl(S) semaphore control operations \_ semctl(S)  
     semget(S) get set of semaphores \_\_\_\_\_ semget(S)  
     semop(S) semaphore operations \_\_\_\_\_ semop(S)  
     semphre set, shared memory id \_\_\_\_\_ ipcrm(C)  
     send a message on a stream \_\_\_\_\_ putmsg(S)  
     send a signal to a process or a group of kill(S)  
     send/cancel requests to LP line printer \_ lp(C)  
     sent to a terminal \_\_\_\_\_ mesg(C)  
     service \_\_\_\_\_ calendar(C)  
     session \_\_\_\_\_ script(C)  
     set a process alarm clock \_\_\_\_\_ alarm(S)  
     set and get file creation mask \_\_\_\_\_ umask(S)  
     set \_\_\_\_\_ ascii(M)  
     set default system time zone \_\_\_\_\_ timezone(M)  
     set environment for command execution \_ env(C)  
     set file access and modification times \_ utime(S)  
     set file-creation mode mask \_\_\_\_\_ umask(C)  
     log in numusers(S) get and        set maximum number of users allowed to \_ numusers(S)

semget(S) get	set of semaphores _____	semget(S)
pconfig(C)	set port configuration _____	pconfig(C)
setpgpr(S)	set process group id _____	setpgpr(S)
ipcrm(C) remove message queue, semaphore	set, shared memory id _____	ipcrm(C)
tabs(C)	set tabs on a terminal _____	tabs(C)
getty(M)	set terminal mode _____	getty(M)
tset(C)	set terminal modes _____	tset(C)
discipline ugetty(M)	set terminal type, modes, speed, line _____	ugetty(M)
date(C) print and	set the date _____	date(C)
stty(C)	set the options for a port _____	stty(C)
xTTY(C)	set the options for a port _____	xTTY(C)
asktime(C)	set the system time of day _____	asktime(C)
stime(S)	set time _____	stime(S)
profile(M)	set up environment at login time _____	profile(M)
pscreen(C)	set up terminal to print screen display _____	pscreen(C)
setmodem(C)	set up tty port for a modem _____	setmodem(C)
shuttype(S) get and	set UPS shutdown limits _____	shuttype(S)
setuid(S)	set user and group IDs _____	setuid(S)
ulimit(S) get and	set user limits _____	ulimit(S)
a stream	setbuf(S) setvbuf(S) assign buffering to _____	setbuf(S)
getgrent(S) fgetgrent(S) endgrent(S)	setgrent(S) get group file entry _____	getgrent(S)
	setjmp(S) longjmp(S) non-local goto _____	setjmp(S)
	setmnt(C) establish /etc/mnttab table _____	setmnt(C)
	setmode(C) printer modes utility _____	setmode(C)
	setmodem(C) set up tty port for a modem _____	setmodem(C)
process group	setpgpr(C) execute command in a new _____	setpgpr(C)
	setpgpr(S) set process group id _____	setpgpr(S)
getpwent(S) fgetpwent(S) endpwent(S)	setpwent(S) get password file entry _____	getpwent(S)
modification dates of files	settime(C) change the access and _____	settime(C)
settings used by getty	settings used by getty _____	gettydefs(M)
file entry getut(S)	setuid(S) set user and group IDs _____	setuid(S)
setbuf(S)	setutent(S) getutline(S) access utmp _____	getut(S)
sputl(S)	setvbuf(S) assign buffering to a stream _____	setbuf(S)
sdgetv(S) sdwaitv(S) synchronize	sgetl(S) access long integer data _____	sputl(S)
sdleave(S) synchronize access to a	shared data access _____	sdgetv(S)
sdget(S) sdfree(S) attach and detach a	shared data segment scenter(S) _____	scenter(S)
chkshlib(CP) tool for comparing	shared data segment _____	sdget(S)
mkshlib(CP) create a	shared libraries _____	chkshlib(CP)
shmctl(S)	shared library _____	mkshlib(CP)
remove message queue, semaphore set,	shared memory control operations _____	shmctl(S)
shmop(S)	shared memory id ipcrm(C) _____	ipcrm(C)
shmget(S) get	shared memory operations _____	shmop(S)
interpreter	shared memory segment identifier _____	shmget(S)
bash(C) invoke the Business	sh(C) rsh(C) invoke the shell command _____	sh(C)
sh(C) rsh(C) invoke the	shell _____	bsh(C)
syntax csh(C)	shell command interpreter _____	sh(C)
system(S) issue a	shell command interpreter with C-like _____	csh(C)
create menu system(s) for the Business	shell command _____	system(S)
menus(M) format of Business	Shell digest(C) _____	digest(C)
	Shell menu system _____	menus(M)
	shl(C) shell layers _____	shl(C)
operations	shmctl(S) shared memory control _____	shmctl(S)
identifier	shmget(S) get shared memory segment _____	shmget(S)
	shmop(S) shared memory operations _____	shmop(S)
nap(S) suspend execution for a	short interval _____	nap(S)
the system	shutdown(S) reboot(S) shutdown or reboot _____	shutdown(S)
shutype(M) UPS	shutdown configuration utility _____	shutype(M)

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shuttype(S) get and set UPS	shutdown limits _____	shuttype(S)
shutdn(S) reboot(S)	shutdown or reboot the system _____	shutdn(S)
bring system to single-user or	shutdown shutdown(M) _____	shutdown(M)
or shutdown	shutdown(M) bring system to single-user _____	shutdown(M)
limits	shuttype(S) get and set UPS shutdown _____	shuttype(S)
utility	shutype(M) UPS shutdown configuration _____	shutype(M)
sdiff(C) compare files	side-by-side _____	sdiff(C)
signal management sigset(S)	sighold(S) sigrelse(S) sigignore(S) _____	sigset(S)
sigset(S) sighold(S) sigrelse(S)	sigignore(S) signal management _____	sigset(S)
sighold(S) sigrelse(S) sigignore(S)	signal management sigset(S) _____	sigset(S)
sigset(S) sigpause(S)	signal management _____	sigset(S)
pause(S) suspend process until	signal _____	pause(S)
specify what to do on receipt of	signal signal(S) _____	signal(S)
processes kill(S) send a	signal to a process or a group of _____	kill(S)
of signal	signal(S) specify what to do on receipt _____	signal(S)
ssignal(S) gsignal(S) software	signals _____	ssignal(S)
sigset(S)	sigpause(S) signal management _____	sigset(S)
management sigset(S) sighold(S)	sigrelse(S) sigignore(S) signal _____	sigset(S)
sigignore(S) signal management	sigset(S) sighold(S) sigrelse(S) _____	sigset(S)
	sigset(S) sigpause(S) signal management _____	sigset(S)
	simple random-number generator _____	rand(S)
rand(S) srand(S)	simple text formatter _____	fmt(C)
fmt(C)	single-user or shutdown _____	shutdown(M)
shutdown(M) bring system to	singleuser(C) bring system up _____	multiuser(C)
multi/single-user mode multiuser(C)	sinh(S) cosh(S) tanh(S) hyperbolic _____	sinh(S)
functions	sin(S) cos(S) tan(S) asin(S) acos(S) _____	trig(S)
trigonometric functions trig(S)	size _____	chsize(S)
chsize(S) change the file	size of a logical disk drive _____	sizefs(C)
sizefs(C) determine the	size(C) print section sizes of common _____	size(C)
object files	sizefs(C) determine the size of a _____	sizefs(C)
logical disk drive	sizes of common object files _____	size(C)
size(C) print section	sleep(C) suspend execution for an _____	sleep(C)
interval	sleep(S) suspend execution for interval _____	sleep(S)
	slot in the utmp file of the current _____	ttyslot(S)
user ttyslot(S) find the	smooth curves _____	spline(C)
spline(C) interpolate	software development commands _____	intro(CP)
intro(CP) introduce	software signals _____	signal(S)
signal(S) gsignal(S)	sort a file topologically _____	tsort(C)
tsort(C)	sort and merge files _____	sort(C)
sort(C)	sort _____	qsort(S)
qsort(S) quicker	sort(C) sort and merge files _____	sort(C)
	sorted files comm(C) _____	comm(C)
select/reject lines common to two	sorted list _____	look(C)
look(C) find lines in a	sorted table _____	bsearch(S)
bsearch(S) binary search of a	source, binary, or manual for program _____	whereis(C)
whereis(C) locate	source listing from COFF file _____	list(CP)
list(CP) produce C	source mkatr(C) _____	mkatr(C)
create an error message file from C	source mkatr(CP) _____	mkatr(CP)
create an error message file from C	source _____	tic(C)
tic(C) compile terminfo	space allocation _____	brk(S)
brk(S) sbrk(S) change data segment	spawn getty to a remote terminal _____	ct(C)
ct(C)	special device files _____	madevds(M)
madevds(M) create	special files _____	makettyts(M)
makettyts(M) create tty	special files _____	mknod(C)
mknod(C) build	special login program invoked by init _____	sulogin(M)
sulogin(M)	special or ordinary file _____	mknod(S)
mknod(S) make a directory, or a	specific system requests _____	sysaltos(S)
sysaltos(S) manufacturer		

fspec(F) format	specification in text files _____	fspec(F)
cron(C) execute commands at	specified times _____	cron(C)
signal(S)	specify what to do on receipt of signal _____	signal(S)
getty gettydefs(M)	speed and terminal settings used by _____	gettydefs(M)
uugetty(M) set terminal type, modes,	speed, line discipline _____	uugetty(M)
find spelling errors	spell(C) _____	spell(C)
	spline(C) interpolate smooth curves _____	spline(C)
	split(C) split a file into pieces _____	split(C)
	csplit(C) split files according to context _____	csplit(C)
	fsplit(CP) split ratfor files _____	fsplit(CP)
	split(C) split a file into pieces _____	split(C)
uucleanup(M) uucp	spool directory cleanup _____	uucleanup(M)
printers(M) print	spooler configuration file _____	printers(M)
lpr(C) route named files to printer	spooler _____	lpr(C)
lpadmin(M) configure the LP	spooling system _____	lpadmin(M)
output printf(S)	sprintf(S) fprintf(S) print formatted _____	printf(S)
data	sputl(S) sgetl(S) access long integer _____	sputl(S)
square root functions exp(S)	sqrt(S) exponential, logarithm, and _____	exp(S)
sqrt(S) exponential, logarithm, and	square root functions exp(S) _____	exp(S)
pseudo-random/ drand48(S) seed48(S)	srand48(S) jrand48(S) generate _____	drand48(S)
rand(S)	srand(S) simple random-number generator _____	rand(S)
scanf(S) fscanf(S)	sacanf(S) convert formatted input _____	scanf(S)
	ssignal(S) gsignal(S) software signals _____	ssignal(S)
	ssp(C) remove consecutive blank lines _____	ssp(C)
stdio(S)	standard buffered input/output package _____	stdio(S)
ratfor(CP) convert rational FORTRAN to	standard FORTRAN _____	ratfor(CP)
gets(C) get a string from the	standard input _____	gets(C)
package stdipc(S) ftok(S)	standard interprocess communication _____	stdipc(S)
pr(C) print files on the	standard output _____	pr(C)
lpsched(M) lpshut(M)	start/stop the LP request scheduler _____	lpsched(M)
stat(F) return data by	stat system call _____	stat(F)
information	stat(F) return data by stat system call _____	stat(F)
ustat(S) get file system	statfs(S) statfs(S) get file system _____	statfs(S)
	statistics _____	ustat(S)
	stat(S) fstat(S) get file status _____	stat(S)
fsstat(M) report file system	status _____	fsstat(M)
lpstat(C) print LP	status information _____	lpstat(C)
fileno(S) clearerr(S) feof(S) stream	status inquiries ferror(S) _____	ferror(S)
uustat(C) uucp	status inquiry and job control _____	uustat(C)
inter-process communication facilities	status ipc(C) report _____	ipc(C)
ps(C) report process	status _____	ps(C)
stat(S) fstat(S) get file	status _____	stat(S)
package	stdio(S) standard buffered input/output _____	stdio(S)
communication package	stdipc(S) ftok(S) standard interprocess _____	stdipc(S)
	stime(S) set time _____	stime(S)
wait(S) wait for child process to	stop or terminate _____	wait(S)
rc0(M) commands to	stop the operating system _____	rc0(M)
functions dbm(S) firstkey(S)	store(S) fetch(S) perform database _____	dbm(S)
	strace(M) print STREAMS trace messages _____	strace(M)
string operations string(S)	strcat(S) strdup(S) strpbrk(S) strcmp(S)	string(S)
string(S) strncmp(S) strcpy(S) strlen(S)	strchr(S) string operations _____	string(S)
program	strclean(M) STREAMS error logger cleanup _____	strclean(M)
string(S) strcat(S) strdup(S) strpbrk(S)	strcmp(S) string operations _____	string(S)
operations string(S) strncmp(S)	strcpy(S) strlen(S) strchr(S) string _____	string(S)
operations string(S) strcat(S)	strdup(S) strpbrk(S) strcmp(S) string _____	string(S)
sed(C) invoke the	stream editor _____	sed(C)
fclose(S) fflush(S) close or flush a	stream _____	fclose(S)

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fopen(S) fdopen(S) freopen(S) open a	stream _____	fopen(S)
rewind(S) reposition a file pointer in a	stream fseek(S) ftell(S) _____	fseek(S)
getchar(S) get character or word from a	stream getc(S) getw(S) fgetc(S) _____	getc(S)
getmsg(S) get next message off a	stream _____	getmsg(S)
gets(S) fgets(S) get a string from a	stream _____	gets(S)
head(C) print the first few lines of a	stream _____	head(C)
fputc(S) put character or word on a	stream putc(S) putchar(S) putw(S) _____	putc(S)
putmsg(S) send a message on a	stream _____	putmsg(S)
puts(S) fputs(S) put a string on a	stream _____	puts(S)
setvbuf(S) assign buffering to a	stream setbuf(S) _____	setbuf(S)
error(S) fileno(S) clearerr(S) feof(S)	stream status inquiries _____	feof(S)
ungetc(S) push character back into input	stream _____	ungetc(S)
archive(C) save a file system to a	streaming tape _____	archive(C)
tapeutil(C) utility program for a	streaming tape drive _____	tapeutil(C)
clone(M) open any minor device on	STREAMS driver _____	clone(M)
strclean(M) _____	STREAMS error logger cleanup program _____	strclean(M)
strerr(M) _____	STREAMS error logger daemon _____	strerr(M)
log(M) interface to _____	STREAMS error logging _____	log(M)
poll(S) _____	STREAMS input/output multiplexing _____	poll(S)
strace(M) print _____	STREAMS trace messages _____	strace(M)
_____	strerr(M) STREAMS error logger daemon _____	strerr(M)
between long integer and base-64 ASCII	string a64l(S) l64a(S) convert _____	a64l(S)
localtime(S) convert date and time to	string ctime(S) gmtime(S) _____	ctime(S)
ctime(S) convert date and time to	string ctime(S) tzset(S) asctime(S) _____	ctime(S)
ecvt(S) convert floating-point number to	string _____	ecvt(S)
fgrep(C) search a file for a character	string _____	fgrep(C)
gets(S) fgets(S) get a	string from a stream _____	gets(S)
gets(C) get a	string from the standard input _____	gets(C)
mkvers(CP) generate a what	string _____	mkvers(CP)
puts(S) fputs(S) put a	string on a stream _____	puts(S)
strcat(S) strdup(S) strpbrk(S) strcmp(S)	string operations string(S) _____	string(S)
strncmp(S) strcpy(S) strlen(S) strchr(S)	string operations string(S) _____	string(S)
string(S) strspn(S) strtok(S)	string operations _____	string(S)
yes(C) print a	string repeatedly _____	yes(C)
strtod(S) atof(S) convert	string to double-precision number _____	strtod(S)
strtol(S) atol(S) atoi(S) convert	string to integer _____	strtol(S)
xstr(CP) extract	strings from C programs _____	xstr(CP)
strings(C) find the printable	strings in an object file _____	strings(C)
strcmp(S) string operations	string(S) strcat(S) strdup(S) strpbrk(S)	string(S)
strchr(S) string operations	string(S) strncmp(S) strcpy(S) strlen(S)	string(S)
_____	string(S) strspn(S) strtok(S) string _____	string(S)
_____	strings(C) find the printable strings in	strings(C)
numbers from COFF file	strip(CP) remove symbols and line _____	strip(CP)
string(S) strncmp(S) strcpy(S)	strlen(S) strchr(S) string operations _____	string(S)
string operations string(S)	strcmp(S) strcpy(S) strlen(S) strchr(S)	string(S)
string(S) strcat(S) strdup(S)	strpbrk(S) strcmp(S) string operations _____	string(S)
string(S) _____	strspn(S) strtok(S) string operations _____	string(S)
double-precision number	strtod(S) atof(S) convert string to _____	strtod(S)
string(S) strspn(S)	strtok(S) string operations _____	string(S)
to integer	strtol(S) atol(S) atoi(S) convert string	strtol(S)
identify processes using a file or file	structure fuser(M) _____	fuser(M)
mount(C) umount(C) mount/unmount a file	structure _____	mount(C)
_____	stty(C) set the options for a port _____	stty(C)
plot(S) graphics interface	subroutines _____	plot(S)
another user	su(C) make the user a super-user or _____	su(C)
by init	sulogin(M) special login program invoked	sulogin(M)
blocks in a file	sum(C) calculate checksum and count _____	sum(C)

du(C)	summarize disk usage _____	du(C)
quot(C)	summarize file system ownership _____	quot(C)
sync(S) update	super block _____	sync(S)
sync(C) update the	super-block _____	sync(C)
su(C) make the user a	super-user or another user _____	su(C)
terminals(M) list of	supported terminals _____	terminals(M)
nap(S)	suspend execution for a short interval _____	nap(S)
sleep(C)	suspend execution for an interval _____	sleep(C)
sleep(S)	suspend execution for interval _____	sleep(S)
pause(S)	suspend process until signal _____	pause(S)
swab(S)	swap bytes _____	swab(S)
swab(C) change	swap bytes _____	swab(S)
	swap device configuration _____	swab(C)
	swap(C) change swap device configuration _____	swab(C)
ldgetname(S) retrieve	symbol name for COFF symbol table entry _____	ldgetname(S)
retrieve symbol name for COFF	symbol table entry ldgetname(S) _____	ldgetname(S)
ldtbindex(S) compute the index of a	symbol table entry of a COFF file _____	ldtbindex(S)
ldtbread(S) read an indexed	symbol table entry of a COFF file _____	ldtbread(S)
syms(F) common object file	symbol table format _____	syms(F)
make bootable system file with driver	symbol table mkunix(M) _____	mkunix(M)
make bootable system file with kernel	symbol table mkunix(M) _____	mkunix(M)
ldtbseek(S) seek to the	symbol table of a COFF file _____	ldtbseek(S)
unistd(F) file header for	symbolic constants _____	unistd(F)
sdb(C)	symbolic debugger _____	sdb(C)
strip(CP) remove	symbols and line numbers from COFF file _____	strip(CP)
glossary(C) define common UNIX terms and	symbols _____	glossary(C)
format	syms(F) common object file symbol table _____	syms(F)
	sync(C) update the super-block _____	sync(C)
segment scenter(S) sdleave(S)	synchronize access to a shared data _____	scenter(S)
sdgetv(S) sdwaitv(S)	synchronize shared data access _____	sdgetv(S)
	sync(S) update super block _____	sync(S)
shell command interpreter with C-like	syntax csh(C) _____	csh(C)
lint(CP) check C language usage and	syntax _____	lint(CP)
requests	sysaltos(S) manufacturer specific system	sysaltos(S)
information	sysconf(C) get system configuration _____	sysconf(C)
information	sysconf(S) get system configuration _____	sysconf(S)
	sysdef(M) output system definition _____	sysdef(M)
messages sys_nerr(S)	sys_errlist(S) errno(S) system error _____	sys_nerr(S)
information	sysfs(S) get file system type _____	sysfs(S)
system error messages	sys_nerr(S) sys_errlist(S) errno(S) _____	sys_nerr(S)
login(C) give you	system access _____	login(C)
acct(C) accounting	system _____	acct(C)
	system activity data collection _____	sadcon(M)
sar(C)	system activity report package _____	sar(C)
sar(M)	system activity report package _____	sar(M)
inir(M) clean the file	system and executes init _____	inir(M)
ckbupscd(M) check file	system backup schedule _____	ckbupscd(M)
stat(F) return data by stat	system call _____	stat(F)
intro(S) introduce	system calls, functions, and libraries _____	intro(S)
sysconf(C) get	system configuration information _____	sysconf(C)
sysconf(S) get	system configuration information _____	sysconf(S)
cu(C) call another UNIX	system _____	cu(C)
types(F) primitive	system data types _____	types(F)
fsdb(M) file	system debugger _____	fsdb(M)
sysdef(M) output	system definition _____	sysdef(M)
perorr(S)	system error messages _____	perorr(S)
sys_nerr(S) sys_errlist(S) errno(S)	system error messages _____	sys_nerr(S)

# Permuted Index

uuto(C) uupick(C) public UNIX-to-UNIX	system file copy _____	uuto(C)
mkunix(M) make bootable	system file with driver symbol table _____	mkunix(M)
mkunix(M) make bootable	system file with kernel symbol table _____	mkunix(M)
recover(C) restore contents of a file	system from tape _____	recover(C)
report information about a file	system fsinfo(M) _____	fsinfo(M)
help(C)	system help facility _____	help(C)
fstyp(M) determine the file	system identifier _____	fstyp(M)
dirent(F) file	system independent directory entry _____	dirent(F)
statfs(S) fstatfs(S) get file	system information _____	statfs(S)
brc(M)	system initialization procedure _____	brc(M)
lpadmin(M) configure the LP spooling	system _____	lpadmin(M)
mail(C)	system mail _____	mail(C)
menus(M) format of Business Shell menu	system _____	menus(M)
mkfs(M) construct a file	system _____	mkfs(M)
mount(S) mount a file	system _____	mount(S)
quot(C) summarize file	system ownership _____	quot(C)
rc0(M) commands to stop the operating	system _____	rc0(M)
reboot(C) automatically reboot the	system _____	reboot(C)
sysaltos(S) manufacturer specific	system requests _____	sysaltos(S)
reboot(S) shutdown or reboot the	system shutdn(S) _____	shutdn(S)
ustat(S) get file	system statistics _____	ustat(S)
fsstat(M) report file	system status _____	fsstat(M)
fstab(M) file	system table _____	fstab(M)
mnttab(M) mounted file	system table _____	mnttab(M)
asktime(C) set the	system time of day _____	asktime(C)
timezone(M) set default	system time zone _____	timezone(M)
archive(C) save a file	system to a streaming tape _____	archive(C)
shutdown(M) bring	system to single-user or shutdown _____	shutdown(M)
sysfs(S) get file	system type information _____	sysfs(S)
uname(S) get name of current UNIX	system _____	uname(S)
multiuser(C) singleuser(C) bring	system up multi/single-user mode _____	multiuser(C)
file transport program for uucp	system uucico(M) _____	uucico(M)
filesystem(M) format of a	system volume _____	filesystem(M)
who(C) display who is on the	system _____	who(C)
uutry(M) contact remote	system with debugging on _____	uutry(M)
volcopy(M) labelit(M) copy file	system with label checking _____	volcopy(M)
haltsys(C) close the file	systems and halt the CPU _____	haltsys(C)
digest(C) create menu	system(s) for the Business Shell _____	digest(C)
fsck(C) dfscck(C) check and repair file	systems _____	fsck(C)
labelit(C) provide labels for file	system(S) issue a shell command _____	system(S)
mountall(C) mount/unmount multiple file	systems _____	labelit(C)
checklist(M) list file	systems mountall(C) _____	mountall(C)
bsearch(S) binary search of a sorted	systems processed by fsck _____	checklist(M)
retrieve symbol name for COFF symbol	table _____	bsearch(S)
compute the index of a symbol	table entry ldgetname(S) _____	ldgetname(S)
ldtbread(S) read an indexed symbol	table entry of a COFF file ldtbindex(S) _____	ldtbindex(S)
syms(F) common object file symbol	table entry of a COFF file _____	ldtbread(S)
fstab(M) file system	table format _____	syms(F)
bootable system file with driver symbol	table _____	fstab(M)
bootable system file with kernel symbol	table mkunix(M) make _____	mkunix(M)
mnttab(M) mounted file system	table mkunix(M) make _____	mkunix(M)
ldtbseek(S) seek to the symbol	table _____	mnttab(M)
setmnt(C) establish /etc/mnttab	table of a COFF file _____	ldtbseek(S)
hcreate(S) manage hash search	table _____	setmnt(C)
tabs(C) set	tables hsearch(S) hdestroy(S) _____	hsearch(S)
	tabs on a terminal _____	tabs(C)
	tabs(C) set tabs on a terminal _____	tabs(C)

ctags(C) create a	tags file _____	ctags(C)
tail(C) deliver the last part of a file	_____	tail(C)
sinh(S) cosh(S)	_____	sinh(S)
functions trig(S) sin(S) cos(S)	_____	trig(S)
save a file system to a streaming	tape archive(C) _____	archive(C)
utility program for a streaming	tape drive tpeutil(C) _____	tpeutil(C)
dump contents of a hard disk to	tape dump.hd(C) _____	dump.hd(C)
frec(M) recover files from a back-up	tape _____	frec(M)
restore contents of a file system from	tape recover(C) _____	recover(C)
restore.hd(C) restore a hard disk from	tape _____	restore.hd(C)
streaming tape drive	tapeutil(C) utility program for a _____	tapeutil(C)
_____	tar(C) archive files _____	tar(C)
trees tsearch(S) tfind(S)	tdelete(S) twalk(S) manage binary search	tsearch(S)
tee(C) create a	tee in a pipe _____	tee(C)
_____	tee(C) create a tee in a pipe _____	tee(C)
tk(C) paginator for	Tektronix 4014 _____	tk(C)
reset(C) reset the	teletype bit _____	reset(C)
directory operations directory(S)	telldir(S) readdir(S) opendir(S) _____	directory(S)
file tmpnam(S)	tempnam(S) create a name for a temporary	tmpnam(S)
tmpfile(S) create a	temporary file _____	tmpfile(S)
tmpnam(S) tmpnam(S) create a name for a	temporary file _____	tmpnam(S)
captainfo(M) convert	termcap to terminfo description _____	captainfo(M)
_____	termcap(M) terminal capability database	termcap(M)
termcap(M)	terminal capability database _____	termcap(M)
terminfo(M)	terminal capability database _____	terminfo(M)
ct(C) spawn getty to a remote	terminal _____	ct(C)
ctermid(S) generate file name for	terminal _____	ctermid(S)
termio(M) general	terminal interface _____	termio(M)
dial(S) establish an out-going	terminal line connection _____	dial(S)
virtual	terminal management _____	vt(M)
allow or disallow messages sent to a	terminal msg(C) _____	msg(C)
getty(M) set	terminal mode _____	getty(M)
tset(C) set	terminal modes _____	tset(C)
clear(C) clear	terminal screen _____	clear(C)
optimization package curses(S)	terminal screen handling and _____	curses(S)
script(C) make a record of your	terminal session _____	script(C)
gettydefs(M) speed and	terminal settings used by getty _____	gettydefs(M)
tabs(C) set tabs on a	terminal _____	tabs(C)
pscreen(C) set up	terminal to print screen display _____	pscreen(C)
ttyname(S) isatty(S) find name of a	terminal _____	ttyname(S)
discipline uugetty(M) set	terminal type, modes, speed, line _____	uugetty(M)
ttys(M) login	terminals file _____	ttys(M)
terminals(M) list of supported	terminals _____	terminals(M)
term(M) conventional names for	terminals _____	term(M)
_____	terminals(M) list of supported terminals	terminals(M)
kill(C)	terminate a process _____	kill(C)
errstop(C)	terminate error-logging demon _____	errstop(C)
exit(S)	terminate process _____	exit(S)
wait for child process to stop or	terminate wait(S) _____	wait(S)
query	terminfo database _____	tput(C)
captainfo(M) convert termcap to	terminfo description _____	captainfo(M)
infocmp(M) compare or print	terminfo descriptions _____	infocmp(M)
tic(C) compile	terminfo source _____	tic(C)
_____	terminfo(M) terminal capability database	terminfo(M)
_____	termio(M) general terminal interface	termio(M)
_____	term(M) conventional names for terminals	term(M)
glossary(C) define common UNIX	terms and symbols _____	glossary(C)

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isnan(S) isnanf(S) isnand(S)	test for floating point NaN _____	isnan(S)
	test(C) evaluate an expression _____	test(C)
ed(C) red(C) invoke the ed	text editor _____	ed(C)
edit(C) invoke the edit	text editor _____	edit(C)
ex(C) invoke a	text editor _____	ex(C)
diff(C) compare two	text files _____	diff(C)
fspec(F) format specification in	text files _____	fspec(F)
fmt(C) simple	text formatter _____	fmt(C)
plock(S) lock process.	text, or data in memory _____	plock(S)
binary search trees tsearch(S)	tfind(S) tdelete(S) twalk(S) manage _____	tsearch(S)
	tic(C) compile terminfo source _____	tic(C)
	time(C) time a command _____	time(C)
clock(M) provide access to the	time-of-day chip _____	clock(M)
cron(C) execute commands at specified	times _____	cron(C)
	time(S) get time _____	time(S)
touch(C) update access and modification	times of a file _____	touch(C)
times(S) get process and child process	times _____	times(S)
set file access and modification	times utime(S) _____	utime(S)
times	times(S) get process and child process _____	times(S)
	timezone(M) set default system time zone _____	timezone(M)
	tk(C) paginator for Tektronix 4014 _____	tk(C)
	tmpfile(S) create a temporary file _____	tmpfile(S)
temporary file	tmpnam(S) tmpnam(S) create a name for a _____	tmpnam(S)
characters conv(S) toupper(S)	toascii(S) tolower(S) translate _____	conv(S)
popen(S) pclose(S) initiate pipe	to/from a process _____	popen(S)
conv(S) toupper(S) toascii(S)	tolower(S) translate characters _____	conv(S)
chkshlib(CP)	tool for comparing shared libraries _____	chkshlib(CP)
tsort(C) sort a file	topologically _____	tsort(C)
times of a file	touch(C) update access and modification _____	touch(C)
translate characters conv(S)	toupper(S) toascii(S) tolower(S) _____	conv(S)
query terminfo database	tput(C) _____	tput(C)
	tra(C) copy out a file as it grows _____	tra(C)
strace(M) print STREAMS	trace messages _____	strace(M)
ptrace(S) process	trace _____	ptrace(S)
aftp(C)	transfer files between Altos machines _____	aftp(C)
conv(S) toupper(S) toascii(S) tolower(S)	translate characters _____	conv(S)
tr(C)	translate characters _____	tr(C)
xpd(M)	transparent printer daemon _____	xpd(M)
uucico(M) file	transport program for uucp system _____	uucico(M)
uusched(M) scheduler for the uucp file	transport program _____	uusched(M)
	tr(C) translate characters _____	tr(C)
ftw(S) walk a file	tree _____	ftw(S)
tdelete(S) twalk(S) manage binary search	trees tsearch(S) tfind(S) _____	tsearch(S)
trig(S) atan(S) atan2(S)	trigonometric functions _____	trig(S)
sin(S) cos(S) tan(S) asin(S) acos(S)	trigonometric functions trig(S) _____	trig(S)
functions	trig(S) atan(S) atan2(S) trigonometric _____	trig(S)
acos(S) trigonometric functions	trig(S) sin(S) cos(S) tan(S) asin(S) _____	trig(S)
	true(C) return with a zero exit value _____	true(C)
manage binary search trees	tsearch(S) tfind(S) tdelete(S) twalk(S) _____	tsearch(S)
	tset(C) set terminal modes _____	tset(C)
	tsort(C) sort a file topologically _____	tsort(C)
setmodem(C) set up	tty port for a modem _____	setmodem(C)
makettys(M) create	tty special files _____	makettys(M)
	tty(C) get the current port name _____	tty(C)
terminal	ttyname(S) isatty(S) find name of a _____	ttyname(S)
file of the current user	ttyslot(S) find the slot in the utmp _____	ttyslot(S)
	ttys(M) login terminals file _____	ttys(M)

tsearch(S) tfind(S) tdelete(S)	twalk(S) manage binary search trees	tsearch(S)
dtype(C) determine disk	type _____	dtype(C)
file(C) determine file	type _____	file(C)
sysfs(S) get file system	type information _____	sysfs(S)
uugetty(M) set terminal	type, modes, speed, line discipline	uugetty(M)
types(F) primitive system data	types _____	types(F)
	types(F) primitive system data types	types(F)
date and time to string ctime(S)	tzset(S) sactime(S) cftime(S) convert	ctime(S)
	ua(C) user administration program	ua(C)
	uadmin(S) administrative control	uadmin(S)
getpw(S) get name from	UID _____	getpw(S)
	ulimit(S) get and set user limits	ulimit(S)
	umask(C) set file-creation mode mask	umask(C)
	umask(S) set and get file creation mask	umask(S)
systems mountall(C)	umountall(C) mount/unmount multiple file	mountall(C)
mount(C)	umount(C) mount/unmount a file structure	mount(C)
information	uname(C) print the current UNIX	uname(C)
	uname(S) get name of current UNIX system	uname(S)
unget(CP)	undo a previous get of an SCCS file	unget(CP)
file	unget(CP) undo a previous get of an SCCS	unget(CP)
stream	ungetc(S) push character back into input	ungetc(S)
	uniq(C) report repeated lines in a file	uniq(C)
mktemp(S) make a	unique file name _____	mktemp(S)
constants	unistd(F) file header for symbolic	unistd(F)
units(C) convert	units _____	units(C)
	units(C) convert units _____	units(C)
uname(C) print the current	UNIX information _____	uname(C)
cu(C) call another	UNIX system _____	cu(C)
glossary(C) define common	UNIX terms and symbols _____	glossary(C)
uulog(C) unname(C) copy files from	UNIX to UNIX uucp(C) _____	uucp(C)
unname(C) copy files from UNIX to	UNIX uucp(C) uulog(C) _____	uucp(C)
uux(C) execute command on remote	UNIX _____	uux(C)
uto(C) unpick(C) public	UNIX-to-UNIX system file copy	uto(C)
link(M) unlink(M) link and	unlink files and directories	link(M)
directories link(M)	unlink(M) link and unlink files and	link(M)
	unlink(S) remove directory entry	unlink(S)
pack(C) pcatt(C)	unpack(C) compress and expand files	pack(C)
pause(S) suspend process	until signal _____	pause(S)
a file touch(C)	update access and modification times of	touch(C)
programs make(C) maintain.	update, and regenerate groups of	make(C)
lsearch(S) lfind(S) linear search and	update _____	lsearch(S)
sync(S)	update super block _____	sync(S)
sync(C)	update the super-block _____	sync(C)
upgrade.hd(C)	upgrade an additional hard disk	upgrade.hd(C)
disk	upgrade.hd(C) upgrade an additional hard	upgrade.hd(C)
shuttype(M)	UPS shutdown configuration utility	shuttype(M)
shuttype(S) get and set	UPS shutdown limits _____	shuttype(S)
lint(CP) check C language	usage and syntax _____	lint(CP)
du(C) summarize disk	usage _____	du(C)
su(C) make the	user a super-user or another user	su(C)
ua(C)	user administration program	ua(C)
id(C) print	user and group ID and names	id(C)
setuid(S) set	user and group IDs _____	setuid(S)
crontab(C) manage	user crontab files _____	crontab(C)
get character login name of the	user cuserid(S) _____	cuserid(S)
environ(M)	user environment _____	environ(M)
whoami(C) print effective current	user id _____	whoami(C)

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newgrp(C) log	user into a new group	newgrp(C)
ulimit(S) get and set	user limits	ulimit(S)
last(C) print last record of	user logins	last(C)
logname(S) return login name of	user	logname(S)
getuid(S) getegid(S) get real/effective	user or group IDs	getuid(S)
getuid(S) geteuid(S) get real/effective	user or group IDs	getuid(S)
getuid(S) getgid(S) get real/effective	user or group IDs	getuid(S)
make the user a super-user or another	user su(C)	su(C)
the slot in the utmp file of the current	user ttyslot(S) find	ttyslot(S)
write(C) write to another	user	write(C)
get and set maximum number of	users allowed to log in numusers(S)	numusers(S)
finger(C) find information about	users	finger(C)
wall(C) write to all	users	wall(C)
fuser(M) identify processes	using a file or file structure	fuser(M)
egrep(C) search file for pattern	using full regular expression	egrep(C)
	ustat(S) get file system statistics	ustat(S)
	utilities	cpset(C)
cpset(C) install	utility program for a streaming tape	tapeutil(C)
drive tapeutil(C)	utility	setmode(C)
setmode(C) printer modes	utility	shutype(M)
shutype(M) UPS shutdown configuration	utime(S) set file access and	utime(S)
modification times	utmp and wtmp entries	utmp(M)
utmp(M) wtmp(M) format of	utmp file entry getut(S) getutent(S)	getut(S)
utmpname(S) endutent(S) access	utmp file entry	getut(S)
getut(S) setutent(S) getutline(S) access	utmp file of the current user	ttyslot(S)
ttyslot(S) find the slot in the	utmp(M) wtmp(M) format of utmp and wtmp	utmp(M)
entries	utmpname(S) endutent(S) access utmp file	getut(S)
entry getut(S) getutent(S)	uuccheck(M) check the uucp directories	uuccheck(M)
and permissions file	uucico(M) file transport program for	uucico(M)
uucp system	uucleanup(M) uucp spool directory	uucleanup(M)
cleanup	uucp directories and permissions file	uuccheck(M)
uuccheck(M) check the	uucp file transport program	uucached(M)
uucached(M) scheduler for the	uucp link rmail(C) receives	rmail(C)
mail from	uucp spool directory cleanup	uucleanup(M)
uucleanup(M)	uucp status inquiry and job control	uustat(C)
uustat(C)	uucp system	uucico(M)
uucico(M) file transport program for	uucp(C) uulog(C) uname(C) copy files	uucp(C)
from UNIX to UNIX	uugetty(M) set terminal type, modes	uugetty(M)
speed, line discipline	uulog(C) uname(C) copy files from UNIX	uucp(C)
to UNIX uucp(C)	uname(C) copy files from UNIX to UNIX	uucp(C)
uucp(C) uulog(C)	uupick(C) public UNIX-to-UNIX system	uuto(C)
file copy uuto(C)	uusched(M) scheduler for the uucp file	uusched(M)
transport program	uustat(C) uucp status inquiry and job	uustat(C)
control	uuto(C) uupick(C) public UNIX-to-UNIX	uuto(C)
system file copy	uutry(M) contact remote system with	uutry(M)
debugging on	uux(C) execute command on remote UNIX	uux(C)
	uuxqt(M) execute remote command requests	uuxqt(M)
	val(CP) validate an SCCS file	val(CP)
	validate an SCCS file	val(CP)
val(CP)	value	abs(S)
abs(S) return integer absolute	value	false(C)
false(C) return with a nonzero exit	value for environment name	getenv(S)
getenv(S) return	value functions floor(S) ceil(S)	floor(S)
fabs(S) floor, ceiling, and absolute	value functions floor(S)	floor(S)
fmod(S) floor, ceiling, and absolute	value to environment	putenv(S)
putenv(S) change or add	value	true(C)
true(C) return with a zero exit	values	values(F)
values(F) machine-dependent		

vsprintf(S) print formatted output of list	values(F) machine-dependent values	values(F)
varargs(F) handles	varargs list vprintf(S) vfprintf(S)	vprintf(S)
variable argument list	varargs(F) handles variable argument	varargs(F)
vc(CP) version control	vc(CP) version control	vc(CP)
vector getopt(S)	vector getopt(S)	getopt(S)
verify program assertion	verify program assertion	assert(S)
version control	version control	vc(CP)
version of an SCCS file	version of an SCCS file	get(CP)
versions of an SCCS file	versions of an SCCS file	sccsdiff(CP)
vfprintf(S) vsprintf(S) print formatted	vfprintf(S) vsprintf(S) print formatted	vprintf(S)
vi(C) invoke a screen-oriented display	vi(C) invoke a screen-oriented display	vi(C)
view a file one full screen at a time	view a file one full screen at a time	more(C)
virtual terminal management	virtual terminal management	vt(M)
volcopy(M) labelit(M) copy file system	volcopy(M) labelit(M) copy file system	volcopy(M)
volume	volume	filesystem(M)
vprintf(S) vfprintf(S) vsprintf(S) print	vprintf(S) vfprintf(S) vsprintf(S) print	vprintf(S)
vsprintf(S) print formatted output of	vsprintf(S) print formatted output of	vprintf(S)
vt(M)	vt(M)	vt(M)
wait and check access to semaphore	wait and check access to semaphore	waitsem(S)
wait completion of background processes	wait completion of background processes	wait(C)
wait for child process to stop or	wait for child process to stop or	wait(S)
wait(C) wait completion of background	wait(C) wait completion of background	wait(C)
wait(S) wait for child process to stop	wait(S) wait for child process to stop	wait(S)
waitsem(S) nbwaitsem(S) wait and check	waitsem(S) nbwaitsem(S) wait and check	waitsem(S)
walk a file tree	walk a file tree	ftw(S)
wall(C) write to all users	wall(C) write to all users	wall(C)
wc(C) count lines, words, and characters	wc(C) count lines, words, and characters	wc(C)
what(C) identify files	what(C) identify files	what(C)
whereis(C) locate source, binary, or	whereis(C) locate source, binary, or	whereis(C)
whoami(C) print effective current user	whoami(C) print effective current user	whoami(C)
who(C) display who is on the system	who(C) display who is on the system	who(C)
whodo(M) determine who is doing what	whodo(M) determine who is doing what	whodo(M)
whom(C) display in columns logged in	whom(C) display in columns logged in	whom(C)
width output device	width output device	fold(C)
within a function	within a function	prof(F)
word from a stream getc(S) getw(S)	word from a stream getc(S) getw(S)	getc(S)
word on a stream putc(S) putchar(S)	word on a stream putc(S) putchar(S)	putc(S)
words, and characters	words, and characters	wc(C)
working directory	working directory	cd(C)
working directory	working directory	chdir(S)
working directory	working directory	getcwd(S)
working directory name	working directory name	pwd(C)
write on a file	write on a file	write(S)
write password file entry	write password file entry	putpwent(S)
write to all users	write to all users	wall(C)
write to another user	write to another user	write(C)
write(C) write to another user	write(C) write to another user	write(C)
write(S) write on a file	write(S) write on a file	write(S)
writing	writing	open(S)
written during manufacturing	written during manufacturing	drive(C)
wtmp entries	wtmp entries	utmp(M)
wtmp(M) format of utmp and wtmp entries	wtmp(M) format of utmp and wtmp entries	utmp(M)
xar(CP) maintain archives and libraries	xar(CP) maintain archives and libraries	xar(CP)
xar(F) archive file format	xar(F) archive file format	xar(F)
xargs(C) construct and execute commands	xargs(C) construct and execute commands	xargs(C)
xcc(CP) invoke the XENIX compiler	xcc(CP) invoke the XENIX compiler	xcc(CP)

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enroll(C)	xsend(C)	xget(C) secret mail _____	enroll(C)
		xld(CP) invoke the link editor _____	xld(CP)
from files		xlist(S) fxlist(S) get name list entries	xlist(S)
		xnm(CP) print name list _____	xnm(CP)
adb(C) invoke		x.out general purpose debugger _____	adb(C)
		xpd(M) transparent printer daemon _____	xpd(M)
		xref(CP) cross-reference C programs _____	xref(CP)
enroll(C)		xsend(C) xget(C) secret mail _____	enroll(C)
		xstr(CP) extract strings from C programs	xstr(CP)
		xtty(C) set the options for a port _____	xtty(C)
bessel(S) j0(S)		y0(S) Bessel functions _____	bessel(S)
		yacc(CP) invoke a compiler-compiler _____	yacc(CP)
		yes(C) print a string repeatedly _____	yes(C)
true(C) return with a		zero exit value _____	true(C)
timezone(M) set default system time		zone _____	timezone(M)

# About This Manual

## USING THIS MANUAL

This reference alphabetically describes the commands and programs that are on the Altos System V™ Run-time System. Altos System V is based on UNIX® System V Release 3 with enhancements from Altos and Microsoft.

## ORGANIZATION

This manual contains the miscellaneous utilities and files (M) of the Run-time system.

For commands, programs, and utilities (C), see the *Reference (C)*.

### NOTE

The last section of the manual, "Change Information," summarizes the changes that have been made to the manual since the previous version.

## MANUAL CONVENTIONS

The documentation conventions used in this manual are explained on the following page.

Symbol	Description
<b>boldface type</b>	What you type. For example:  Type <b>tar tv</b>
<b>boldface type</b>	Used for command or parameter names that must be typed as shown.  <b>mail user</b>
<i>italic type</i>	Variables (a value that can change), such as <i>user</i> . See the previous example. Also for manual titles, such as <i>Reference (C)</i> and <i>Reference (M)</i> .
<b>Ctrl-d</b>	Keys you press simultaneously (separated by a hyphen and shown in reverse type). For example:  <b>Ctrl-d</b> means you press and hold the <b>Ctrl</b> key and then press the <b>d</b> key.
<b>Esc c</b>	Keys you press sequentially.
[ ]	Optional items in a syntax statement. If you do not use the optional item, the program selects a default action to carry out.
	Use only one of the separated items.
...	Repeat preceding argument one or more times.
...	Repeat the preceding argument one or more times and separate arguments with a comma.
" "	Terms defined in the text. Quotation marks also indicate text from a source code example.

---

## ADDITIONAL REFERENCE MATERIALS

For more information on your operating system, see the following list of manuals. To order a manual, call (408) 434-6688, ext. 3004 and give the manual title and part number.

*Owner's Guide* (part number 690-21264-*nnn* or 690-20351-*nnn*) describes how to connect computer components and peripherals, turn on power, and use the diagnostic programs.

*Using the AOM Menu System* (part number 690-18055-*nnn*) describes how to use the Altos Office Manager (AOM) to install software and manage the operating system.

*Altos System V User's Guide* (part number 690-21178-*nnn*) (not shipped with the Run-time system) explains basic operating system concepts and programs (e.g., vi, ed, sh, csh, mail, sed, and awk).

*Altos System V Series 386 Operations Guide* (part number 690-21171-*nnn*) tells how to set up the system for users and peripherals, maintain and back up the system, optimize system performance, and use uucp communications programs. This manual also contains system and LP spooler error messages.

*Altos System V Series 386 Reference (C)* (part number 690-22869-*nnn*) describes the Altos Run-time system commands, programs, and utilities.

*Altos System V Series 386 Development System Set* (part number 690-21585-000) contains reference and tutorial material.

Manuals in this set include:

- Altos System V Series 386 C Compiler Library and User's Guide*
- Altos System V Series 386 C Compiler Language Reference*
- Altos System V Series 386 Programmer's Guide*
- Altos System V Series 386 Macro Assembler User's Guide and Reference*
- Altos System V Series 386 Reference (CP, S, F)*

*DOCUMENTER'S WORKBENCH* (part numbers 690-15843-*nnn* and 690-15844-*nnn*) describes mm, nroff, troff, and type-setting functions and commands.

# Contents

## Miscellaneous (M)

intro	Introduction to miscellaneous features and files.
acct	Format of per-process accounting file.
aliases	Alias file for mail.
aliohash	Rebuild data base for mail alias file.
ascii	Map of the ASCII character set.
boot	Secondary bootstrap program.
brc	System initialization procedure.
captainfo	Converts a termcap description into a terminfo description.
checklist	Lists file systems processed by fsck.
ckbupscd	Checks file system backup schedule.
clock	Provides access to the time-of-day chip.
clone	Opens any minor device on a STREAMS driver.
clri	Clears inode.
crash	Examines system images.
default	Default program information directory.
df	Reports number of free disk blocks and inodes.
dir	Format of a directory.
display	Series 500 system console display.
environ	The user environment.
errprint	Displays error log contents.
ff	Fast find.
filesystem	Format of a system volume.
finc	Fast incremental backup.
frec	Recovers files from a back-up tape.
fsdb	File system debugger.
fsinfo	Reports information about a file system.
fsstat	Reports file system status.
fstab	File system table.
fstyp	Determines the file system identifier.
fuser	Identifies processes using a file or file structure.

---

Contents(M)

getty	Sets terminal mode.
gettydefs	Speed and terminal settings used by getty.
group	Format of the group file.
infocmp	Compares or prints terminfo descriptions.
inir	Cleans the file system and executes init.
init	Process control initialization.
inittab	Script for the init processes.
inode	Format of an inode.
install	Installs commands.
keyboard	Series 500 system console keyboard.
layout	Manages hard disk partitions.
ldunix	Configurable kernel linker.
link, unlink	Links and unlinks files and directories.
log	Interface to STREAMS error logging and event tracing.
lpadmin	Configures the LP spooling system.
lpd	Line printer daemon.
lpinit	Adds new line printers to the system.
lpon, lpoﬀ	Turns on/off lp printer schedulers.
lpsched, lpshut, lpmove	Starts/stops the LP request scheduler and moves requests.
makedevs	Creates special device files.
makekey	Generates an encryption key.
maketty	Creates tty special files.
master	Master configuration database.
mem, kmem	Memory image file.
menus	Format of a Business Shell menu system.
mkboot	Converts an object file to a bootable object file.
mkfs	Constructs a file system.
mkunix	Makes a bootable system file with kernel and driver symbol tables.
mnttab	Mounted file system table.
ncheck	Generates path names from inode numbers.
null	The null file.
options	Floppy disk installation menu.
passwd	The password file.
printers	Print spooler configuration file.
profile	Sets up an environment at login time.
pwck, grpck	Checks password/group file.

rc0	Commands to stop the operating system.
rc2	Commands for multi-user environment.
sadcon, sadcoff	Turns on/off system activity data collector.
sar	System activity report package.
shutdown	Brings a system to single-user or shutdown.
shutype	UPS shutdown configuration utility.
strace	Prints STREAMS trace messages.
strclean	STREAMS error logger cleanup program.
strerr	STREAMS error logger daemon.
sulogin	Special login program invoked by init.
sysdef	Outputs system definition.
term	Conventional names for terminals.
termcap	Terminal capability database.
terminals	List of supported terminals.
terminfo	Terminal capability database.
termio	General terminal interface.
timezone	Sets default system time zone.
ttys	Login terminals file.
utmp, wtmp	Formats of utmp and wtmp entries.
uuccheck	Checks the uucp directories and permissions file.
uucico	File transport program for the uucp system.
uucleanup	Uucp spool directory cleanup.
uugetty	Sets terminal type, modes, speed, and line discipline.
uusched	Scheduler for the uucp file transport program.
uutry	Tries to contact remote system with debugging on.
uuxqt	Executes remote command requests.
volcopy, labelit	Copies file system with label checking.
vt	Virtual terminal management.
whodo	Determines who is doing what.
xpd	Transparent printer daemon.

(BLANK)

**Name**

**intro** - Introduction to miscellaneous features and files.

**Description**

This section contains miscellaneous information for maintaining the entire system, including descriptions of files, devices, tables, and programs.



## Name

**acct** - Format of per-process accounting file.

## Description

Files produced as a result of calling **acct(S)** have records in the form defined by `<sys/acct.h>`.

In *ac\_flag*, the AFORK flag is turned on by each **fork(S)** and turned off by an **exec(S)**. The *ac\_comm* field is inherited from the parent process and is reset by any **exec**. Each time the system charges the process with a clock tick, it also adds the current process size to *ac\_mem* computed as follows:

$$(\text{data size}) + (\text{text size}) / (\text{number of in-core processes using text})$$

The value of *ac\_mem/ac\_stime* can be viewed as an approximation to the mean process size, as modified by text-sharing.

## See Also

**acct(C)**, **acct(S)**

## Notes

The *ac\_mem* value for a short-lived command gives little information about the actual size of the command, because *ac\_mem* may be incremented while a different command (e.g., the shell) is being executed by the process.

## Name

**aliases** - Alias file for mail.

## Syntax

`/usr/lib/mail/aliases`

## Description

This file describes user ID aliases that are used by the `/usr/lib/sendmail` command. It is formatted as a series of lines of the form:

```
name: name_1, name_2, ... name_n
```

*Name* is the name to alias, and *name\_n* are the aliases for that name. For example,

```
terry: pubs!terry
```

Lines beginning with white space are continuation lines. Lines beginning with `#` are comments.

Aliasing occurs only on local names. Loops cannot occur, since no message will be sent to any person more than once.

**Aliases** is only the raw data file; the actual aliasing information is placed in binary format in the file `/usr/lib/mail/aliases.hash` by executing the program `aliashash(M)`. Each time you change the `aliases` file, run `aliashash` for the changes to take effect.

## See Also

`aliashash(M)`, `mail(C)`

**Name**

**aliashash** - Rebuild the data base for the mail alias file.

**Syntax**

**aliashash**

**Description**

**Aliashash** rebuilds the random access data base for the mail alias file **/usr/lib/mail/aliases**. For the change to take effect, run **aliashash** each time **/usr/lib/mail/aliases** is changed.

**See Also**

**aliases(M)**

## Name

ascii - Map of the ASCII character set.

## Description

Ascii is a map of the ASCII character set. It lists both octal and hexadecimal equivalents of each character. It contains:

000 nul	001 soh	002 stx	003 etx	004 eot	005 enq	006 ack	007 bel
010 bs	011 ht	012 nl	013 vt	014 np	015 cr	016 so	017 si
020 dle	021 dc1	022 dc2	023 dc3	024 dc4	025 nak	026 syn	027 etb
030 can	031 em	032 sub	033 esc	034 fs	035 gs	036 rs	037 us
040 sp	041 !	042 "	043 #	044 \$	045 %	046 &	047 '
050 (	051 )	052 *	053 +	054 ,	055 -	056 .	057 /
060 0	061 1	062 2	063 3	064 4	065 5	066 6	067 7
070 8	071 9	072 :	073 ;	074 <	075 =	076 >	077 ?
100 @	101 A	102 B	103 C	104 D	105 E	106 F	107 G
110 H	111 I	112 J	113 K	114 L	115 M	116 N	117 O
120 P	121 Q	122 R	123 S	124 T	125 U	126 V	127 W
130 X	131 Y	132 Z	133 [	134 \	135 ]	136 ^	137 _
140 `	141 a	142 b	143 c	144 d	145 e	146 f	147 g
150 h	151 i	152 j	153 k	154 l	155 m	156 n	157 o
160 p	161 q	162 r	163 s	164 t	165 u	166 v	167 w
170 x	171 y	172 z	173 {	174	175 }	176 ~	177 de.

00 nul	01 soh	02 stx	03 etx	04 eot	05 enq	06 ack	07 bel
08 bs	09 ht	0a nl	0b vt	0c np	0d cr	0e so	0f si
10 dle	11 dc1	12 dc2	13 dc3	14 dc4	15 nak	16 syn	17 etb
18 can	19 em	1a sub	1b esc	1c fs	1d gs	1e rs	1f us
20 sp	21 !	22 "	23 #	24 \$	25 %	26 &	27 '
28 (	29 )	2a *	2b +	2c ,	2d -	2e .	2f /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7
38 8	39 9	3a :	3b ;	3c <	3d =	3e >	3f ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G
48 H	49 I	4a J	4b K	4c L	4d M	4e N	4f O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W
58 X	59 Y	5a Z	5b [	5c \	5d ]	5e ^	5f _
60 `	61 a	62 b	63 c	64 d	65 e	66 f	67 g
68 h	69 i	6a j	6b k	6c l	6d m	6e n	6f o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w
78 x	79 y	7a z	7b {	7c	7d }	7e ~	7f del

**Name**

**boot** - Secondary bootstrap program.

**Syntax**

**/boot**

**Description**

The **boot** program brings up the operating system from a cold start. In addition to bringing an operating system file into memory from disk, **boot** also initializes all I/O subsystems and loads them with their operating software. The **boot** program keeps track of which I/O boards are present in a particular configuration and passes this information to the operating system.

The **boot** program is interactive and will prompt for the name of an operating system file you want to use. This permits the selection of one of several kernel files. Additionally, if the CPU Monitor sets the appropriate flag, **boot** will attempt to automatically boot the kernel file. If it cannot find this file, **boot** will go into interactive mode, and will display:

```
386 System Boot

hd(0.2)unix

Cannot open hd(0.2)unix

Enter bootable program or ? for help
```

For example, if you type ? **Retn**, you will see the following display:

```

Boot n.n.nnn of Jan 7, 1987

Type the full name of the program you wish to boot.
The default boot program is: hd(0,2)unix.
Press ESC to start with default name.
Press @ to erase line, or backspace to erase a character.
Press the DEL key to abort the boot once it has started.

Unix's on hd(0,2) are:
hd(0,2)unix
hd(0,2)unix.net

Enter bootable program or '?' for Help.

```

Enter the bootable program in the form:

*root\_device(disk,partition)kernel\_file*

where *root\_device* is:

fd - floppy disk  
hd - main hard disk

The *disk* field selects a disk number which contains a file system in which to find I/O subsystem download code and kernel files. On the floppy, this is always 0. On the hard disk, the disk is usually the root file system, 0 for the root disk. The *partition* field specifies which partition contains the root file system, and is always 0 for the floppy, and normally 2 for hard disk.

The *kernel\_file* field is the path name of a kernel file (relative to /).

Typical invocations are:

fd(0,0)unix.fd  
hd(0,2)unix

The **boot** program searches the file system in which it found the kernel for code files to load into the I/O subsystem boards. Those files are always kept in the `/etc` directory and are named:

<code>/etc/dlcode/ioc</code>	generic IOC code (Series 1000 only)
<code>/etc/dlcode/fp.type</code>	file processor specific (Series 2000 only)
<code>/etc/dlcode/sio</code>	generic SIO code (Series 2000 only)
<code>/etc/dlcode/sio[0123]</code>	board-specific SIO code (Series 2000 only)
<code>/etc/dlcode/mdc</code>	generic MDC code (Series 2000 only)
<code>/etc/dlcode/mdc[0123]</code>	board-specific MDC code (Series 2000 only)

If **boot** can find a file that corresponds to a particular SIO or MDC board, it will load that file; otherwise, it loads the generic code file.

## Files

<code>/boot</code>	Secondary boot
<code>/unix*</code>	Operating system kernel file
<code>/etc/dlcode/fp.esdi</code>	File processor download code for ESDI drive
<code>/etc/dlcode/fp</code>	File processor download code for ST506 drive
<code>/etc/dlcode/sio</code>	SIO generic code
<code>/etc/dlcode/sio?</code>	SIO specific code
<code>/etc/dlcode/mdc</code>	SIO generic code
<code>/etc/dlcode/mdc?</code>	SIO specific code

## See Also

`layout(M)`

## Diagnostics

For an error, **boot** displays an error message, then returns to its prompt. The following is a list of the most common messages.

bad drive specifier *x*

An invalid drive number was given, only 0-2 are valid.

bad superblock: *s\_magic x*

The partition given doesn't appear to have a filesystem on it.

device error, status [0123]

An error occurred while trying to read the program. The boot system retries up to 10 times on each error. If all 10 attempts fail, the following message appears: "Fatal disk error (10) retries."

*pathname* not found

The supplied pathname does not correspond to an existing file.

## Notes

**Boot** cannot be used to load programs that have not been linked for stand-alone execution.

## Name

**brc** - System initialization procedures.

## Syntax

**/etc/brc**

## Description

These shell procedures are executed via entries in **/etc/inittab** by **init(M)** whenever the system is booted (or rebooted).

The **brc** procedure clears the mounted file system table, **/etc/mnttab**, and puts the entry for the root file system into the mount table.

After these two procedures have executed, **init** checks for the *initdefault* value in **/etc/inittab**. This tells **init** in which run level to place the system. Since *initdefault* is initially set to **2**, the system will be placed in the multi-user state via the **/etc/rc2** procedure.

## See Also

**fsck(C)**, **init(M)**, **rc2(M)**, **shutdown(C)**

## Name

**captoinfo** - Converts a termcap description into a terminfo description.

## Syntax

**captoinfo** [-v...] [-V] [-l] [-w *width*] *file* ...

## Description

**Captoinfo** looks in *file* for **termcap**(M) descriptions. For each one found, an equivalent **terminfo**(M) description is written to standard output, along with any comments found. A description that is expressed as relative to another description (as specified in the **termcap** *tc=* field) will be reduced to the minimum superset before being output.

If no *file* is given, then the environment variable **TERMCAP** is used for the filename or entry. If **TERMCAP** is a full pathname to a file, only the terminal whose name is specified in the environment variable **TERM** is extracted from that file. If the environment variable **TERMCAP** is not set, then the file */etc/termcap* is read.

## Options

- v Print tracing information on standard error as the program runs. Specifying additional -v options will cause more detailed information to be printed.
- V Print the version of the program in use on standard error and exit.
- l Cause the fields to print one to a line. Otherwise, the fields will be printed several to a line to a maximum width of 60 characters.
- w Change the output to *width* characters.

## Files

`/usr/lib/terminfo/?/*`                      Compiled terminal description database

## Caveats

Certain **termcap** defaults are assumed to be true. For example, the bell character (**terminfo** `bel`) is assumed to be `^G`. The linefeed capability (**termcap** `nl`) is assumed to be the same for both cursor down and scroll forward (**terminfo** `cu` and `ind`, respectively). Padding information is assumed to belong at the end of the string.

The algorithm used to expand parameterized information for **termcap** fields such as cursor position (**termcap** `cm`, **terminfo** `cup`) will sometimes produce a string which, though technically correct, may not be optimal. In particular, the rarely used **termcap** operation `%n` will produce strings that are especially long. Most occurrences of these non-optimal strings will be flagged with a warning message and may need to be recoded by hand.

The short two-letter name at the beginning of the list of names in a **termcap** entry, a hold-over from an earlier version of the UNIX system, has been removed.

## Diagnostics

`tgetent` failed with return code *n* (*reason*).

The **termcap** entry is not valid. In particular, check for an invalid `'tc='` entry.

unknown type given for the **termcap** code *cc*.

The **termcap** description had an entry for *cc* whose type was not boolean, numeric, or string.

wrong type given for the boolean (numeric, string) **termcap** code *cc*. The boolean **termcap** entry *cc* was entered as a numeric or string capability.

the boolean (numeric, string) **termcap** code *cc* is not a valid name. An unknown **termcap** code was specified.

tgetent failed on TERM=*term*.

The terminal type specified could not be found in the **termcap** file.

TERM=*term*: cap *cc* (info *ii*) is NULL: REMOVED

The **termcap** code was specified as a null string. The correct way to cancel an entry is with an '@', as in ':bs@:'. Giving a null string could cause incorrect assumptions to be made by the software which uses **termcap** or **terminfo**.

a function key for *cc* was specified, but it already has the value *vv*.

When parsing the **ko** capability, the key *cc* was specified as having the same value as the capability *cc*, but the key *cc* already had a value assigned to it.

the unknown **termcap** name *cc* was specified in the **ko** **termcap** capability.

A key was specified in the **ko** capability which could not be handled.

the **vi** character *v* (info *ii*) has the value *xx*, but **ma** gives *n*.

The **ma** capability specified a function key with a value different from that specified in another setting of the same key.

the unknown **vi** key *v* was specified in the **ma** **termcap** capability.

A **vi(C)** key unknown to **captainfo** was specified in the **ma** capability.

Warning: **termcap** *sg* (*nn*) and **termcap** *ug* (*nn*) had different values.

**terminfo** assumes that the *sg* (now *xmc*) and *ug* values were the same.

Warning: the string produced for *ii* may be inefficient.

The parameterized string being created should be rewritten by hand.

Null **termname** given.

The terminal type was null. This is given if the environment variable **TERM** is not set or is null.

cannot open *file* for reading.  
The specified file could not be opened.

### See Also

tic(C), terminfo(M) and curses(S), in the *Reference*  
(CP, S, F)

### Notes

**Captoinfo** should be used to convert **termcap** entries to **terminfo(M)** entries because the **termcap** database (from earlier versions of UNIX System V) may not be supplied in future releases.

**Name**

**checklist** - Lists file systems processed by fsck.

**Description**

The **/etc/checklist** file contains a list of the file systems to be checked when **fsck(C)** is invoked without arguments. The list contains at most 15 special file names. Each special file name must be on a separate line and must correspond to a file system.

**See Also**

**fsck(C)**

**Name**

**ckbupscd** - Checks file system backup schedule.

**Syntax**

**/etc/ckbupscd [ -m ]**

**Description**

**Ckbupscd** consults the file **/etc/bupsched** and prints the file system lists from lines with date and time specifications matching the current time. If the **-m** flag is present an introductory message in the output is suppressed so that only the file system lists are printed. Entries in the **/etc/bupsched** file are printed under the control of **cron(C)**.

The file **/etc/bupsched** should contain lines of 4 or more fields, separated by spaces or tabs. The first 3 fields (the schedule fields) specify a range of dates and times. The rest of the fields constitute a list of names of file systems to be printed if **ckbupscd** is run at some time within the range given by the schedule fields. The general format is:

*time[,time] day[,day] month[,month] fsyslist*

where:

- |                 |  |
|-----------------|--|
| <i>time</i>     | Specifies an hour of the day (0 through 23), matching any time within that hour, or an exact time of day (0:00 through 23:59). |
| <i>day</i>      | Specifies a day of the week (sun through sat) or day of the month (1 through 31).  |
| <i>month</i>    | Specifies the month in which the time and day fields are valid. Legal values are the month numbers (1 through 12).             |
| <i>fsyslist</i> | The rest of the line is taken to be a file system list to print.   |

Multiple time, day, and month specifications may be separated by commas, in which case they are evaluated left to right.

An asterisk (\*) always matches the current value for that field.

A line beginning with a sharp sign (#) is interpreted as a comment and ignored.

The longest line allowed (including continuations) is 1024 characters.

### Examples

The following are examples of lines which could appear in the `/etc/bupsched` file.

```
06:00-09:00 fri 1,2,3,4,5,6,7,8,9,10,11 /applic
```

Prints the file system name `/applic` if `ckbupscd` is run between 6:00am and 9:00am any Friday during any month except December.

```
00:00-06:00,16:00-23:59 1,2,3,4,5,6,7 1,8 /
```

Prints a reminder to backup the root (`/`) file system if `ckbupscd` is run between the times of 4:00pm and 6:00am during the first week of August or January.

### Files

<code>/etc/bupsched</code>	Specification file containing times and file system to back up
----------------------------	--

### See Also

`cron(C)`, `echo(C)`, `sh(C)`, `sysadm(C)`

### Notes

`Ckbupscd` will report file systems due for backup if invoked any time in the window. It does not know that backups may have just been made.

**Name**

**clock** - Provides access to the time-of-day chip.

**staticram** - Provides 16 bytes of battery-backed-up memory.

**Description**

The file `/dev/clock` provides access to the time-of-day chip. The current time, date, and year can be read or written as ASCII data. (See for example, the `-s` option of `date`.) The date is stored in the form:

*MMDDhhmmYY*

Where *MM* is the month, *DD* is the day of the month, *hh* is the hour, *mm* is the minute, and *YY* is the last 2 digits of the year.

The clock is maintained by a battery, even when the power is off. The clock is normally used to set the system's idea of the date on every power-up.

The file `/dev/staticram` provides 16 bytes of battery-backed-up memory, which is actually part of the time-of-day chip. It may be used for anything the system administrator wishes, such as a system ID code, etc. This memory remains valid until the battery wears out, or until it is rewritten.

## Name

**clone** - Opens any minor device on a STREAMS driver.

## Description

**Clone** is a STREAMS software driver that finds and opens an unused minor device on another STREAMS driver. The minor device passed to **clone** during the open is interpreted as the major device number of another STREAMS driver for which an unused minor device is to be obtained. Each such open results in a separate *stream* to a previously unused minor device.

The **clone** driver consists solely of an open function. This open function performs all of the necessary work so that subsequent system calls (including **close(S)**) require no further involvement of **clone**.

## Notes

Multiple opens of the same minor device cannot be done through the **clone** interface. Executing **stat(S)** on the file system node for a cloned device yields a different result from executing **fstat(S)** using a file descriptor obtained from opening the node.

## See Also

**log(M)**, and the *STREAMS Programmer's Guide*

## Name

**clri** - Clears an inode.

## Syntax

*/etc/clri special i-number...*

## Description

**Clri** writes nulls on the 64 bytes at offset *i-number* from the start of the inode list. This effectively eliminates the inode at that address. *Special* is the device name on which a file system has been defined. After **clri** is executed, any blocks in the affected file will show up as "not accounted for" when **fsck(C)** is run against the file-system. The inode may be allocated to a new file.

Read and write permission is required on the specified *special* device.

This command is used to remove a file which appears in no directory; that is, to get rid of a file which cannot be removed with the **rm(C)** command.

## See Also

**fsck(C)**, **fsdb(M)**, **ncheck(M)**, **rm(C)**, and **fs(F)** in the *Reference (CP, S, F)*

## Notes

If the file is open for writing, **clri** will not work. The file system containing the file should NOT be mounted.

If **clri** is used on the inode number of a file that does appear in a directory, it is imperative to remove the entry in the directory at once, since the inode may be allocated to a new file. The old directory entry, if not removed, continues to point to the same file. This sounds like a link, but does not work like one. Removing the old entry destroys the new file.

## Name

**crash** - Examines system images.

## Syntax

```
/etc/crash [ -d dumpfile ] [ -n namelist ] [ -o offset ]  
           [ -w outputfile ]
```

## Description

The **crash** command is used to examine the system memory image of a live or a crashed system by formatting and printing control structures, tables, and other information. Command line arguments to **crash** are *dumpfile*, *namelist*, *offset*, and *outputfile*.

The *dumpfile* is the file containing the system memory image. The default *dumpfile* is */dev/kmem*. The system image can also be */dev/hd0.restart* if the system is in a panic state.

The text file *namelist* contains the symbol table information needed for symbolic access to the system memory image to be examined. The default *namelist* is */unix*. If a system image from another machine is to be examined, the corresponding text file must be copied from that machine.

The *offset* option offsets from the beginning of *dumpfile* at which data starts. This is useful with */dev/hd0.restart* where *offset* is 1024.

When the **crash** command is invoked, a session is initiated. The output from a **crash** session is directed to *outputfile*. The default *outputfile* is the standard output.

Input during a **crash** session is of the form:

```
function [argument ...]
```

where *function* is one of the **crash** functions described in the Functions section of this command description, and *arguments* are qualifying data that indicate which items of the system image are to be printed.

The default for process-related items is the current process for a running system and the process that was running at the time of the crash for a crashed system. If the contents of a table are being dumped, the default is all active table entries.

The following function options are available to **crash** functions wherever they are semantically valid.

- e                    Display every entry in a table.
- f                    Display the full structure.
- p                    Interpret all address arguments in the command line as *physical* addresses.
- s *process*         Specify a process slot other than the default.
- w *file*             Redirect the output of a function to *file*.

Note that if the **-p** option is used, all address and symbol arguments explicitly entered on the command line will be interpreted as physical addresses. If they are not physical addresses, results will be inconsistent.

The functions *mode*, *defproc*, and *redirect* correspond to the function options **-p**, **-s**, and **-w**. The *mode* function may be used to set the address translation mode to physical or virtual for all subsequently entered functions; *defproc* sets the value of the process slot argument for subsequent functions; and *redirect* redirects all subsequent output.

Output from **crash** functions may be piped to another program in the following way:

```
function [argument ...!]shell_command
```

For example,

```
mount ! grep rw
```

will write all mount table entries with an **rw** flag to the standard output. The redirection option (**-w**) cannot be used with this feature.

Depending on the context of the function, numeric arguments will be assumed to be in a specific radix. Counts are assumed to be decimal. Addresses are always hexadecimal. Table slot arguments are always decimal. Table slot arguments larger than the size of the function table will not be interpreted correctly. Use the `findslot` function to translate from an address to a table slot number. Default bases on all arguments may be overridden. The C conventions for designating the bases of numbers are recognized. A number that is usually interpreted as decimal will be interpreted as hexadecimal if it is preceded by 0x and as octal if it is preceded by 0. Decimal override is designated by 0d, and binary by 0b.

Aliases for functions may be any uniquely identifiable initial substring of the function name. Traditional aliases of one letter, such as `p` for `proc`, remain valid.

Many functions accept different forms of entry for the same argument. Requests for table information will accept a table entry number or a range. A range of slot numbers may be specified in the form:

$$a-b$$

where *a* and *b* are decimal numbers. An expression consists of two operands and an operator. An operand may be an address, a symbol, or a number; the operator may be `+`, `-`, `*`, `/`, `&`, or `|`. An operand that is a number should be preceded by a radix prefix if it is not a decimal number (0 for octal, 0x for hexadecimal, 0b for binary). The expression must be enclosed in parentheses (`()`). Other functions will accept any of these argument forms that are meaningful.

Two abbreviated arguments to `crash` functions are used throughout. Both accept data entered in several forms. They may be expanded into the following:

$$\text{table\_entry} = \text{table entry} | \text{range}$$

$$\text{start\_addr} = \text{address} | \text{symbol} | \text{expression}$$

## Functions

?[-w *file*]

List available functions.

!cmd

Escape to the shell to execute a command.

< *filename*

Take input from *filename* until end-of-file (EOF). Lines starting with a "#" are comments and are ignored.

adv [-e] [-w *file*] [[-p] *table\_entry...*]

Print the advertise table.

base [-w *file*] *number* ...

Print *number* in binary, octal, decimal, and hexadecimal. A number in a radix other than decimal should be preceded by a prefix that indicates its radix as follows: 0x, hexadecimal; 0, octal; and 0b, binary.

buffer [-w *file*] [-format] *bufferslot*

or

buffer [-w *file*] [-format] [-p]start\_addr

Alias: **b**.

Print the contents of a buffer in the designated format, where *format* can be:

- b byte
- c character
- d decimal
- x hexadecimal
- o octal
- r directory
- i inode

If no format is given, the previous format is used. The default format at the beginning of a **crash** session is hexadecimal.

**bufhdr** [-f] [-w *file*] [[-p]*table\_entry* ...]

Alias: **buf**.

Print system buffer headers.

**callout** [-w *file*]

Alias: **c**.

Print the callout table.

**dballoc** [-w *file*] [*class...* ]

Print the dballoc table. If a class is entered, only data block allocation information for that class will be printed.

**dbfree** [-w *file*] [*class...* ]

Print free streams data block headers. If a class is entered, only data block headers for the class specified will be printed.

**dblock** [-e] [-w *file*] [*class...* ]

or

**dblock** [-e] [-w *file*] [[-p] *table\_entry...* ]

Print allocated streams data block headers. If the class option (-c) is used, only data block headers for the class specified will be printed.

**defproc** [-w *file*] [-c]

or

**defproc** [-w *file*] [*slot*]

Set the value of the process slot argument. The process slot argument may be set to the current slot number (-c) or the slot number may be specified. If no argument is entered, the value of the previously set slot number is printed. At the start of a crash session, the process slot is set to the current process.

**dis** [-w *file*] [-a] *start\_address*[*count*]

Disassemble from the start address for *count* instructions. The default count is 1. The absolute option (-a) specifies a nonsymbolic disassembly.

- ds** [-w *file*] *virtual\_address* ...  
 Print the data symbol whose address is closest to, but not greater than, the address entered.
- file** [-e] [-w *file*] [[-p]*table\_entry* ...]  
 Alias: **f**.  
 Print the file table.
- findaddr** [-w *file*] *table slot*  
 Print the address of *slot* in *table*. Only tables available to the **size** function are available to **findaddr**.
- findslot** [-w *file*] *virtual\_address* ...  
 Print the table, entry slot number, and offset for the address entered. Only tables available to the **size** function are available to **findslot**.
- fs** [-w *file*] [[-p] *table\_entry...*]  
 Print the file system information table.
- gdp** [-e] [-f] [-w *file* ] [[-p] *table\_entry...*]  
 Print the gift descriptor protocol table.
- gdt** [-e] [-w *file*] [[-p] *table\_entry...*]  
 Print the global descriptor table.
- help** [-w *file*] -a *function* ...  
 Print a description of the named function, including syntax and aliases. The -a option lists all functions.
- idt** [-e] [-w *file*] [[-p] *table\_entry* ...]  
 Print the interrupt descriptor table.
- inode** [-e] [-f] [-w *file*] [[-p]*table\_entry* ...]  
 Alias: **i**.  
 Print the inode table, including file system switch information.
- kfp** [-w *file*] [*value*]  
 Print the frame pointer for the start of a kernel stack trace. If the *value* argument is entered, the **kfp** is set to that value.

- lck** [-e] [-w *file*] [[-p] *table\_entry* ...]  
 Alias: **l**.  
 Print record-locking information. If the **-e** option is used or *table* address arguments are given, the record lock list is printed. If no argument is entered, information on locks relative to inodes is printed.
- ldt** [-e] [-w *file*] [-s *process*] [[-p] *table\_entry* ...]  
 Print the local descriptor table for the given process, or for the current process if none is given.
- linkblk** [-e] [-w *file*] [[-p] *table\_entry* ...]  
 Print the linkblk table.
- map** [-w *file*] *mapname* ...  
 Print the map structure of the given *mapname*.
- mbfree** [-w *file*]  
 Print free streams message block headers.
- mblock** [-e] [-w *filename*] [[-p]*table\_entry* ...]  
 Print allocated streams message block headers.
- mode** [-w *file*] [*mode*]  
 Set address translation of arguments to virtual (**v**) or physical (**p**) mode. If no mode argument is given, the current mode is printed. At the start of a crash session, the mode is virtual.
- mount** [-e] [-w *file*] [[-p]*table\_entry* ...]  
 Alias: **m**.  
 Print the mount table.
- nm** [-w *file*] *symbol* ...  
 Print value and type for the given symbol.
- od** [-p] [-w *file*] [-format] [-mode] [-s *process*]  
*start\_addr*[*count*]  
 Alias: **rd**.  
 Print *count* values starting at the start address in one of the following formats: character (**-c**), decimal (**-d**), hexadecimal (**-x**), octal (**-o**), ascii (**-a**), or hexadecimal/character (**-h**), and one of the following modes: long (**-l**), short (**-t**), or byte (**-b**). The default mode for character and ascii formats is byte; the default mode for decimal, hexadecimal, and octal

formats is long. The format **-h** prints both hexadecimal and character representations of the addresses dumped; no mode needs to be specified. When *format* or *mode* is omitted, the previous value is used. At the start of a **crash** session, the format is hexadecimal and the mode is long. If no count is entered, 1 is assumed.

**pagemode** [-l *lines*] [-on|-off]

Toggle **pagemode**. If on, pause after every *lines* (24 by default). Similar to **more(C)**.

**panic**

Print the latest system notices, warnings and panic messages from the limited circular buffer kept in memory.

**pcb** [-w *file process*]

Print the process control block (TSS) for the given process. If no arguments are given, the active TSS for the current process is printed.

**pdt** [-e] [-w *file*] [-s *process*] *section segment*

or

**pdt** [-e] [-w *file*] [-s *process*] [-p] *start\_addr[count]*

The page descriptor table starting at the start address for *count* entries is printed. If no count is entered, 1 is assumed.

**pfdat** [-e] [-w *file*] [[-p]*table\_entry ...*]

Print the pfdata table.

**proc** [-f] [-w *file*] [[-p]*table\_entry ... #procid ...*]

or

**proc** [-f] [-w *file*] [-r]

Print the process table. Process table information may be specified in two ways. First, any mixture of table entries and process ids may be entered. Each process id must be preceded by a **#**. Alternatively, process table information for runnable processes may be specified with the runnable option (**-r**). The full option (**-f**) details most of the information in the process table as well as the pregon table for that process.

**qrun** [-w *file*]

Print the list of scheduled streams queues.

**queue** [-e] [-w *file*] [[-p]*table\_entry...* ]

Print streams queues.

**quit**

Alias: **q**.

Terminate the **crash** session.

**rcvd** [-e] [-f] [-w *file*] [[-p]*table\_entry...* ]

Print the receive descriptor table.

**redirect** [-w *file*] [-c]

or

**redirect** [-w *file*] [*file*]

Used with a file name, redirect output of a **crash** session to the named file. If no argument is given, the file name to which output is being redirected is printed. Alternatively, the close option (-c) closes the previously set file and redirects output to the standard output.

**region** [-e] [-f] [-w *file*] [[-p]*table\_entry ...*]

Print the region table.

**search** [-p] [-w *file*] [-m *mask*] [-s *process*] *pattern*  
*start\_addr count*

Print the long words in memory that match *pattern*, beginning at the start address for *count* long words. The *mask* is anded (&) with each memory word and the result compared against the pattern. The mask defaults to 0xffffffff.

**size** [-w *file*] [-x] [*structure\_name ...*]

Print the size of the designated structure. The -x option prints the size in hexadecimal. If no argument is given, a list of the structure names for which sizes are available is printed.

**sndd** [-e] [-w *file*] [[-p]*table\_entry...* ]

Print the send descriptor table.

**srmount** [-e] [-w *file*] [[-p]*table\_entry...* ]

Print the server mount table.

**stack** [-w *file*] [*process*]

Alias: **s**.

Dump stack. If no arguments are entered, the kernel stack for the current process is printed. Otherwise, the kernel stack for the given process is printed.

**stream** [-e] [-f] [-w *file*] [[-p]entry\_table... ]

Print the streams table.

**strstat** [-w *file*]

Print streams statistics.

**trace** [-w *file*] [-r] [*process*]

Alias: **t**.

Print stack trace. The **kfp** value is used with the **-r** option.

**ts** [-w *file*] *virtual\_address* ...

Print closest text symbol to the designated address.

**tty** [-e] [-f] [-w *file*] [-ttype[[-p]table\_entry ...]]

Valid types: mdc, sc, kd

Print the tty table. If no arguments are given, the tty table for mdc is printed. If the **-t** option is used, the table for the single tty type specified is printed. If no argument follows the **type** option, all entries in the table are printed. A single tty entry may be specified from the start address.

**user** [-f] [-w *file*] [*process slot*]

Alias: **u**.

Print the ublock for the designated process.

**var** [-w *file*]

Alias: **v**.

Print the tunable system parameters.

**vtop** [-w *file*] [-s *process*] *start\_addr* ...

Print the physical address translation of the virtual start address.

**Files**

/dev/kmem	System image of currently running system
/dev/hd0.restart	Used to access the saved system image on hard disk.

**See Also**

sh(C), test(C)

## Name

**default** - Default program information directory.

## Description

The files in the `/etc/default` directory contain the default information used by system commands such as `lpd(M)` and `remote(C)`. Default information is any information required by the command that is not explicitly given when the command is invoked.

The directory may contain zero or more files. Each file corresponds to one or more commands. A command searches for a file whenever it has been invoked without sufficient information. Each file contains zero or more entries which define the default information. Each entry has one of the following forms:

*keyword* or *keyword=value*

where *keyword* identifies the type of information available and *value* defines its value. Both *keyword* and *value* consist of letters, digits, and punctuation. The exact spelling of *keyword* and the appropriate *value* depends on the command and are described with the individual commands.

Any line in a file beginning with a number sign (#) is considered a comment and is ignored.

## Files

`/etc/default/lpd`  
`/etc/default/passwd`  
`/etc/default/quot`  
`/etc/default/su`

## See Also

`lpr(C)`, `quot(C)`, `su(C)`

## Name

**df** - Reports number of free disk blocks and inodes.

## Syntax

```
df [-lt] [-f] [file-system | directory | mounted-resource]
```

## Description

The **df** command prints out the number of free blocks and free inodes in mounted file systems, directories, or mounted resources by examining the counts kept in the super-blocks.

*File-system* may be specified either by device name (e.g., /dev/hd1b) or by mount point directory name (e.g., /usr).

*Directory* can be a directory name. The report presents information for the device that contains the directory.

*Mounted-resource* can be a remote resource name. The report presents information for the remote device that contains the resource.

If no arguments are used, the free space on all locally and remotely mounted file systems is printed.

The **df** command uses the following options:

- l Reports on local file systems only.
- t Causes the figures for total allocated blocks and inodes to be reported as well as the free blocks and inodes.
- f An actual count of the blocks in the free list is made, rather than taking the figure from the super-block (free inodes are not reported). This option will not print any information about mounted remote resources.

**Note**

If multiple remote resources are listed that reside on the same file system on a remote machine, each listing after the first one will be marked with an asterisk.

**Files**

/dev/\*  
/etc/mnttab

**See Also**

mount(M) mnttab(M), and fs(F) in the *Reference (CP, S, F)*

## Name

**dir** - Format of a directory.

## Syntax

```
#include <sys/dir.h>
```

## Description

A directory behaves exactly like an ordinary file, except that no user may write into a directory. The fact that a file is a directory is indicated by a bit in the flag word of its inode entry (see `filesystem(M)`). The structure of a directory is given in the include file `/usr/include/sys/dir.h`.

By convention, the first two entries in each directory are "dot" (.) and "dot dot" (..). The first is an entry for the directory itself. The second is for the parent directory. The meaning of "dot dot" is modified for the root directory of the master file system; there is no parent, so "dot dot" has the same meaning as "dot."

The first 2 bytes of each entry are the inode numbers, which will be zero if the entry has been removed. The next 14 bytes are the filename. If the name is exactly 14 bytes, there will be no terminating null byte.

## See Also

`dir(S)`, `filesystem(M)`

**Name**

**display** - Series 500 system console display.

**Description**

The system console (and user's terminal) is composed of two separate pieces: the keyboard (see **keyboard(M)**) and the display. Because of their complexity and because there are two possible display interfaces (the monochrome and color/graphics adapters), they are discussed in separate manual entries.

The display normally consists of 25 lines of 80 columns each; 40-column lines are also supported by the color/graphics adapter. Writing characters to the console (`/dev/console`) has an effect that depends on the characters. All characters written to `/dev/console` are first processed by the terminal interface (see **termio(M)**). For example, mapping new-line characters to carriage return plus new-line and expanding tabs to spaces will be done before the following processing:

- `x`           Where `x` is not one of the following, displays `x`.
- `BEL`       Generates a bell (audible tone, no modulation).
- `CR`       Places the cursor at column 1 of the current line.
- `LF,VT`   Places the cursor at the same column of the next line (scrolls if the current line is line 25).
- `FF`       Clears the screen and places the cursor at line 1, column 1.
- `BS`       Depends on the previous character: if a `_` (underscore), see below; otherwise, if the cursor is not at column 1, it is moved to the left one position on the same line. If the cursor is at column 1 but not line 1, it is moved to column 79 of the previous line. Finally, if the cursor is at column 1, line 1, it is not moved.

- `_BSx` Sets the underscore attribute for the character `x` to be displayed. The underscore attribute for the color/graphics adapter is a red background with a white foreground.
- `ESCx` Where `x` is any of the 256 possible codes (except for `c` and `[]`), displays that value interpreted. This is useful for using the full set of graphics available on the display. Note again that the characters are processed through the terminal interface prior to this escape sequence. Therefore, to get some of the possible 256 characters, it is necessary that the character not be post processed. The easiest way to accomplish this is to turn off `OPOST` in the `c_oflag` field (see `termio(M)`); however, this may have other side effects.

This display can be controlled by means of ANSI X3.64 escape sequences, which are specified sequences of characters, preceded by the ASCII character ESC. The escape sequences, which work on either the monochrome or color/graphics adapter, are the following:

- `ESCc` Clears the screen and places the cursor at line 1, column 1.
- `ESC[ n @` Insert character - inserts `n` blank places for `n` characters at the current cursor position.
- `ESC[ n A` Cursor up - moves the cursor up `n` lines (default: `n=1`).
- `ESC[ n B` Cursor down - moves the cursor down `n` lines (default: `n=1`).
- `ESC[ n C` Cursor right - moves the cursor right `n` columns (default: `n=1`).
- `ESC[ n D` Cursor left - moves the cursor left `n` columns (default: `n=1`).
- `ESC[ n E` Cursor next line - moves the cursor to column 1 of the next line, then down `n-1` lines (default: `n=1`).

ESC[ <i>n</i> F	Cursor previous line - moves the cursor to column 1 of the current line, then up <i>n</i> lines (default: <i>n</i> =1).
ESC[ <i>n</i> G	Cursor horizontal position - moves the cursor to column <i>n</i> of the current line (default: <i>n</i> =1).
ESC[ <i>n</i> ; <i>m</i> H	Position cursor - moves the cursor to column <i>m</i> of line <i>n</i> (default: <i>n</i> =1).
ESC[ <i>n</i> J	Erase window - erases from the current cursor position to the end of the window if <i>n</i> =0, from the beginning of the window to the current cursor position if <i>n</i> =1, and the entire window if <i>n</i> =2 (default: <i>n</i> =1).
ESC[ <i>n</i> K	Erase line - erases from the current cursor position to the end of the line if <i>n</i> =0, from the beginning of the line to the current cursor position if <i>n</i> =1, and the entire line if <i>n</i> =2 (default: <i>n</i> =1).
ESC[ <i>n</i> L	Inserts <i>n</i> lines at the current cursor position (default: <i>n</i> =1).
ESC[ <i>n</i> M	Deletes <i>n</i> lines at the current cursor position (default: <i>n</i> =1).
ESC[ <i>n</i> P	Deletes <i>n</i> characters from a line starting at the current cursor position (default: <i>n</i> =1).
ESC[ <i>n</i> S	Scroll up - scrolls the characters in the current window up <i>n</i> lines. The bottom <i>n</i> lines are cleared to blanks (default: <i>n</i> =1).
ESC[ <i>n</i> T	Scroll down - scrolls the characters in the current window down <i>n</i> lines. The top <i>n</i> lines are cleared to blanks (default: <i>n</i> =1).
ESC[ <i>n</i> X	Erase character - erases <i>n</i> character positions starting at the current cursor position (default: <i>n</i> =1).

ESC [ *Ps* ; *Ps*; ... *m*

Character attributes - each *Ps* is one of the following characters; multiple characters are separated by semicolons. These parameters apply to successive characters being displayed, in an additive manner (e.g., both bold and underscoring can be selected). Only the parameters through 7 apply to the monochrome adapter; all parameters apply to the color/graphics adapter. (Default: *Ps*=0.)

<i>Ps</i>	Meaning
0	all attributes off (normal display) (white foreground with black background)
1	bold intensity
4	underscore on (white foreground with red background on color)
5	blink on
7	reverse video
10	selects the primary font
11	selects the first alternate font; lets ASCII characters less than 32 be displayed as ROM characters
12	selects a second alternate font; toggles high bit of extended ASCII code before displaying as ROM characters
30	black (gray) foreground
31	red (light red) foreground
32	green (light green) foreground
33	brown (yellow) foreground
34	blue (light blue) foreground
35	magenta (light magenta) foreground
36	cyan (light cyan) foreground
37	white (bright white) foreground
40	black (gray) background
41	red (light red) background
42	green (light green) background
43	brown (yellow) background
44	blue (light blue) background
45	magenta (light magenta) background
46	cyan (light cyan) background
47	white (bright white) background

Note that for character attributes 30 through 37, the color selected for foreground will depend on whether the bold intensity attribute (1) is currently on. If not, the first color listed will result; otherwise the second color listed will result.

Similarly, for character attributes 40-47, the color selected for background will depend on whether the blink attribute (5) is currently on. The color selected for background also depends on whether blinking is enabled in color mode byte or no blinking is selected (see the `MODE_BLINK` and `MODE_BG16` bits in the color mode byte defined below). If the blink attribute is not on, then the first color listed will result. If the blink attribute is not on, and blinking is enabled, then the first color listed will result and it will blink. If the blink attribute is on, and no blinking is enabled, then the second color listed will result.

## ioctl calls

The display driver supports `ioctl(S)` calls of the form:

```
ioctl(filedes, command, arg)
```

*filedes* is a valid open file descriptor.

*command* is one of the commands listed below.

*arg* is the argument of *command*. The type of *arg* is specific to the command in use.

The following is a list of valid `ioctl` commands for display adapters. These commands and structures are defined in `sys/kd.h`.

### KDDISPTYPE

Returns information about the current display adapter. The argument is the address of a structure (defined in `sys/kd.h`) of the following type:

```
struct kd_disparam {
    long type;
    char *addr;
    ushort ioaddr[];
}
```

*type* describes the type of adapter installed, and is one of: `KD_MONO`, `KD_HERCULES`, `KD_CGA`, or `KD_EGA`.

*addr* is the physical address of the display memory for this adapter.

*ioaddr* is a list of I/O addresses valid for this adapter.

**KDGETMODE**

Returns the current display mode. *Arg* is an integer, whose values are one of the following:

<code>KD_TEXT</code>	Text mode
<code>KD_GRAPHICS</code>	Graphics Mode

**KDSETMODE**

Sets the current display mode. *Arg* is an integer, whose values are one of those defined above for `KDGETMODE`. Note, the user is responsible for programming the color/graphics adapter registers for the appropriate graphical state.

**KDADDIO**

Adds I/O port address to list of valid video adapter addresses. Argument is an unsigned short type which should contain a valid port address for the installed video adaptor.

**KDDELIO**

Deletes I/O port address from list video adaptor addresses. Argument is an unsigned short type which should contain a valid port address for the installed video adaptor.

**KDENABIO**

Enables ins and outs to video adaptor ports. No argument.

**KDDISABIO**

Disables ins and outs to video adaptor ports. No argument.

## KDMAPDISP

Maps the display memory for the current adapter in the user's data space. Argument is a pointer to structure type "kd\_memloc." Structure definition is:

```

struct kd_memloc {
    char *vaddr; /* virtual address to map to */
    char *physaddr; /* physical address to map from */
    long length; /* size in bytes to map */
    long ioflg; /* enable i/o addresses if set */
}

```

**vaddr** contains a paged-aligned virtual address in the user's data space. To map the display memory for a monographic adapter requires 4 Kbytes. In order to map the display memory, the user must first use **KDSETMODE** to place the adapter into graphics mode and also use the **VT\_SETMODE** option (see **vt(M)**) to set the virtual terminal mode to **VT\_PROCESS**. Included in this section is a sample code fragment showing how to correctly map the screen memory into user data space.

## KDUNMAPDISP

Unmaps the display adapter memory from user data space.

The following code fragment details how to map the display adapter memory into user data so the screen can be accessed via memory references in user code.

```

#include <sys/types.h>
#include <sys/immu.h>
#include <sys/at_ansi.h>
#include <sys/kd.h>
#include <sys/vt.h>

unsigned char d[0x2000]; /* allocate 2 pages of data */
unsigned char *c;
int fd;

```

```

struct vt_mode vt;
struct kd_memloc mp;
struct screen {
    char ch;
    char attr;
} *scr;
.
..
...

/* assign a page-aligned address.
 * Starting in the middle of a 2*pagesize array assures
 * it will contain 1 page-aligned address with 1 page of
 * data following.
 */
c = (unsigned char *)((long>(&d)/2) & (NBPP-1));
if (ioctl(fd,VT_GETMODE,&vt) == -1 )
    exit(1);
vt.mode = VT_PROCESS;

/* set virtual terminal process control mode */
if (ioctl(fd,VT_SETMODE,&vt) == -1 )
    exit(1);

/* set adapter in graphics mode */
if (ioctl(fd,KDSETMODE,KD_GRAPHICS) == -1 )
    exit(1);

/* virtual address to map to */
mp.vaddr = (char unsigned *)c;
/* start of monographic display memory */
mp.physaddr = (char *)MONO_BASE;
/* length of monograph display memory */
mp.length = (long)MONO_SIZE;
mp.ioflg = (long)0;

/* map the display memory into user data space */
if (ioctl(fd,KDMAPDISP,&mp))
    exit(1);

/* start of screen memory */
scr = (struct screen *)c;

```

```

/* The layout of screen memory is:
 *   For each character:
 *       1 data byte
 *       1 attribute byte
 */
scr->ch = ...
scr->attr = ....

/* Unmap display and reset modes */
ioctl(fd, KDUNMAPDISP);
ioctl(fd, KD_TEXT);
vt.mode = VT_AUTO;
ioctl(fd, VT_SETMODE, &vt);
...
..
.

```

VT\_OPENQRY  
VT\_GETMODE  
VT\_SETMODE  
VT\_RELDISP  
VT\_ACTIVATE

These `ioctl(S)` options are used for controlling virtual terminals. Refer to `vt(M)` for their definitions.

## Files

`/dev/console`

## See Also

`stty(C)`, `ioctl(S)`, `keyboard(M)`, `termio(M)`, `vt(M)`



## Name

**environ** - The user environment.

## Description

The user environment (**environ**) is a collection of information about a user, such as his login directory, mailbox, and terminal type. The environment is stored in special "environment variables," which can be assigned character values, such as names of files, directories, and terminals. These variables are automatically made available to programs and commands that you can invoke. The commands can then use the values to access your files and terminal.

## Options

- HOME** Names the user's login directory. Initially, **HOME** is set to the login directory given in the user's **passwd** file entry.
- PATH** Defines the search path for the directories containing commands. The system searches these directories whenever a user types a command without giving a full pathname. The search path is one or more directory names separated by colons (:). Initially, **PATH** is set to **:/bin:/usr/bin**.
- TERM** Defines the type of terminal being used. This information is used by commands such as **more** which rely on information about the capabilities of the user's terminal. The variable may be set to any valid terminal name (see **terminals(M)**) directly or by using the **tset(C)** command.
- TZ** Defines time zone information. This information used by **date(C)** to display the appropriate time. The variable may have any value of the form **xxxzzz** where **xxx** is standard local time zone abbreviation, **n** is the difference in hours from GMT, and **zzz** is the daylight-saving local time zone abbreviation (if any). For example, **EST5EDT**. The difference for a location east of England can be given as a negative number.

The environment can be changed by assigning a new value to a variable. An assignment has the form

*name=value*

For example, the assignment:

**TERM=altos3**

sets the TERM variable to an Altos III. When using the standard shell (**sh(C)**), the new value can be "exported" to each subsequent invocation of a shell by exporting the variable with the **export** command (see **sh(C)**) or by using the **env(C)** command. Users of the C-shell (**csh(C)**) can set and export a variable with the **setenv** command (see **csh(C)**).

A user may also add variables to the environment, but must be sure that the new names do not conflict with exported shell variables such as MAIL, PS1, PS2, and IFS. Placing assignments in the **.profile** file is a useful way to change the environment automatically before a session begins.

Note that the environment is made available to all programs as a string of arrays. Each string has the form:

*name=value*

where the *name* is the name of an exported variable and the *value* is the variable's current value. For programs started with a **exec(S)** call, the environment is available through the external pointer **environ**. For other programs, individual variables in environment are available through **getenv(S)** calls.

#### See Also

**login(C)**, **sh(C)**, **profile(M)**, and **getenv(S)** in the *Reference (CP, S, F)*

## Name

**errprint** - Displays error log contents.

## Syntax

*/etc/errprint* [*date*]

## Description

**Errprint** displays the error messages logged by the **strerr(M)** daemon for a particular date. The optional *date* argument may be specified on the command line in any of the following formats:

*mm dd*  
*mm-dd*  
*mm/dd*  
*monthname dd*

If no date is specified, the current date is used.

For ease of viewing, the only fields displayed for each error message are the time of day and the text of the message. The remaining fields found in the log file are not displayed. The output is automatically piped through **more(C)**.

## Files

*/usr/adm/streams/error.mm-dd*  
*/usr/lib/errstrip.awk*

## See Also

**strerr(M)**

## Name

**ff** - Fast find: lists file names and statistics for a file system.

## Syntax

*/etc/ff [options] special*

## Description

Ff reads the *i*-list and directories of the *special* file, assuming it is a file system. Inode data is saved for files which match the selection criteria. Output consists of the path name for each saved inode, plus other file information requested using the print options below. Output fields are positional. The output is produced in inode order; fields are separated by tabs. The default line produced by **ff** is:

*path-name i-number*

With all *options* enabled, output fields would be:

*path-name i-number size uid*

The argument *n* in the option descriptions that follow is used as a decimal integer (optionally signed), where *+n* means more than *n*, *-n* means less than *n*, and *n* means exactly *n*. A day is defined as a 24 hour period.

- I Do not print the inode number after each path name.
- l Generate a supplementary list of all path names for multiply-linked files.
- p *prefix* The specified *prefix* will be added to each generated path name. The default is . (dot).
- s Print the file size, in bytes, after each path name.

- u Print the owner's login name after each path name.
- a *n* Select if the inode has been accessed in *n* days.
- m *n* Select if the inode has been modified in *n* days.
- c *n* Select if the inode has been changed in *n* days.
- n *file* Select if the inode has been modified more recently than the argument *file*.
- i *inode-list* Generate names for only those inodes specified in *inode-list*.

#### See Also

find(C), ncheck(M)

#### Notes

If the **-l** option is not specified, only a single path name out of all possible ones is generated for a multiply-linked inode. If **-l** is specified, all possible names for every linked file on the file system are included in the output. However, no selection criteria apply to the names generated.

## Name

**filesystem** - Format of a system volume.

## Syntax

```
#include <sys/filsys.h>
#include <sys/types.h>
#include <sys/param.h>
#include <sys/inode.h>
#include <sys/ino.h>
```

## Description

Every file system storage volume (e.g., a hard disk) has a common format for certain vital information. Every such volume is divided into a certain number of 512 byte sectors. Sector 0 is unused and is available to contain a bootstrap program or other information.

Sector 1 is the super-block. The format of a super-block is described in `/usr/include/sys/filsys.h`. In that include file, `s_ysize` is the address of the first data block after the i-list. The i-list starts in logical block 2; thus the i-list is `s_ysize-2` blocks long. `S_fsize` is the first block not potentially available for allocation to a file. These numbers are used by the system to check for bad block numbers. If an "impossible" block number is allocated from the free list or is freed, a diagnostic is written on the console. Moreover, the free array is cleared so as to prevent further allocation from a presumably corrupted free list.

The free list for each volume is maintained as follows. The `s_free` array contains, in `s_free[1]`, ..., `s_free[s_nfree-1]`, up to `NICFREE-1` numbers of free blocks. `S_free[0]` is the block number of the head of a chain of blocks constituting the free list. The first long in each free-chain block is the number (up to `NICFREE`) of free-block numbers listed in the next `NICFREE` longs of this chain member. The first of these `NICFREE` blocks is the link to the next member of the chain. To allocate a block: decrement `s_nfree`, and the new block is `s_free[s_nfree]`. If the new block number is 0, there are no blocks left, so give an error. If `s_nfree` becomes 0,

read in the block named by the new block number, replace *s\_nfree* by its first word, and copy the block numbers in the next NICFREE longs into the *s\_free* array. To free a block, check if *s\_nfree* is 50; if so, copy *s\_nfree* and the *s\_free* array into it, write it out, and set *s\_nfree* to 0. In any event set *s\_free[s\_nfree]* to the freed block's number and increment *s\_nfree*.

*S\_tfree* is the total free blocks available in the file system.

*S\_ninode* is the number of free i-numbers in the *s\_inode* array. To allocate an inode: if *s\_ninode* is greater than 0, decrement it and return *s\_inode[s\_ninode]*. If it was 0, read the i-list and place the numbers of all free inodes (up to NICINOD) into the *s\_inode* array, then try again. To free an inode, provided *s\_ninode* is less than NICINOD, place its number into *s\_inode[s\_ninode]* and increment *s\_ninode*. If *s\_ninode* is already NICINOD, do not bother to enter the freed inode into any table. This list of inodes only speeds up the allocation process. The information about whether the inode is really free is maintained in the inode itself.

*S\_tinode* is the total number of free inodes available in the file system.

*S\_flock* and *s\_iloc* are flags maintained in the core copy of the file system while it is mounted and their values on disk are immaterial. The value of *s\_fmod* on disk is also immaterial, and is used as a flag to indicate that the superblock has changed and should be copied to the disk during the next periodic update of file system information.

*S\_ronly* is a read-only flag used to indicate write-protection.

*S\_time* is the last time the super-block of the file system was changed, and is a doubleprecision representation of the number of seconds that have elapsed since 00:00 Jan. 1, 1970 (GMT). During a reboot, the *s\_time* of the super-block for the root file system is used to set the system's idea of the time.

I-numbers begin at 1, and the storage for inodes begins in logical block 2. Inodes are 64 bytes long. Inode 1 is reserved for future use. Inode 2 is reserved for the root directory of the file system, but no other i-number has a built-in meaning. Each inode represents one file. For the format of an inode and its flags, see *ino.h*.

## Files

```
/usr/include/sys/filsys.h
/usr/include/sys/stat.h
/usr/include/sys/types.h
/usr/include/sys/param.h
/usr/include/sys/inode.h
/usr/include/sys/ino.h
```

## See Also

fsck(C), mkfs(M)

**Name**

**finc** - Fast incremental backup.

**Syntax**

*/etc/finc [selection-criteria] file-system raw-tape*

**Description**

**finc** selectively copies the input *file-system* to the output *raw-tape*. The cautious will want to mount the input *file-system* read-only to insure an accurate backup, although acceptable results can be obtained in read-write mode. The tape must be previously labelled by **labelit(C)**. The selection is controlled by the *selection-criteria*, accepting only those inodes/files for whom the conditions are true.

It is recommended that production of a **finc** tape be preceded by the **ff(M)** command, and the output of **ff** be saved as an index of the tape's contents. Files on a **finc** tape may be recovered with the **frec(M)** command.

The argument *n*, in the *selection-criteria* that follow, is used as a decimal integer (optionally signed), where *+n* means more than *n*, *-n* means less than *n*, and *n* means exactly *n*. A day is defined as 24 hours.

- a *n*        True if the file has been accessed in *n* days.
- m *n*        True if the file has been modified in *n* days.
- c *n*        True if the inode has been changed in *n* days.
- n *file*     True for any file which has been modified more recently than the argument *file*.

**Examples**

To write a tape consisting of all files from *file-system* / modified in the last 48 hours:

```
finc -m -2 /dev/root /dev/rct
```

**See Also**

**ff(M), frec(M), labelit(C) and epio(C)**

## Name

**frec** - Recovers files from a backup tape.

## Syntax

```
/etc/frec [-p path] [-f reqfile] raw_tape
inode_number:name...
```

## Description

**Frec** recovers files from the specified *raw\_tape* backup tape written by **volcopy(M)** or **finc(M)**, given their *inode\_numbers*. The data for each recovery request will be written into the file given by *name*.

## Options

- p path** Specifies a prefixing *path* (different from your current working directory). This will be prefixed to any *names* that are not fully qualified, i.e., that do not begin with / or ./ . If any directories are missing in the paths of recovery *names*, they will be created.
- f reqfile** Specifies a file that contains recovery requests. The format is *inode\_number:name*, one per line.

## Examples

To recover a file, *inode\_number* 1216 when backed-up, into a file named *junk* in your current working directory, type:

```
frec /dev/rct 1216:junk
```

To recover files with *inode\_numbers* 14156, 1232, and 3141 into files */usr/src/cmd/a*, */usr/src/cmd/b* and */usr/joe/a.c*, enter:

```
frec -p /usr/src/cmd /dev/rct 14156:a 1232:b
3141:/usr/joe/a.c
```

**See Also**

*ff(M)*, *finc(M)*, *labelit(M)*, and *cpio(C)*

**Notes**

While paving a path (i.e., creating the intermediate directories contained in a pathname), **frec** can only recover inode fields for those directories contained on the tape and requested for recovery.

## Name

**fsdb** - File system debugger.

## Syntax

*/etc/fsdb special* [ - ]

## Description

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

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

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

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

The symbols recognized by **fsdb** are:

<b>#</b>	absolute address
<b>i</b>	convert from inode number to inode address
<b>b</b>	convert to block address
<b>d</b>	directory slot offset
<b>+, -</b>	address arithmetic
<b>q</b>	quit

>,<	save, restore an address
=	numerical assignment
=+	incremental assignment
=-	decremental assignment
="	character string assignment
O	error checking toggle
p	general print facilities
f	file print facility
B	byte mode
W	word mode
D	double word mode
!	escape to shell

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

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

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

Dots, tabs, and spaces may be used as function delimiters but are not necessary. A line with just a new-line character will increment the current address by the size of the data type last printed. That is, the address is set to the next byte, word, double word, directory entry or inode, allowing the user to step through a region of a

file system. Information is printed in a format appropriate to the data type. Bytes, words and double words are displayed with the octal address followed by the value in octal and decimal. A .B or .D is appended to the address for byte and double word values, respectively. Directories are printed as a directory slot offset followed by the decimal inode number and the character representation of the entry name. Inodes are printed with labeled fields describing each element.

The following mnemonics are used for inode examination and refer to the current working inode:

md	mode
ln	link count
uid	user ID number
gid	group ID number
sz	file size
a#	data block numbers (0 - 12)
at	access time
ct	creation time
mt	modification time
maj	major device number
min	minor device number

### Examples

386i	Prints inode number 386 in an inode format. This now becomes the current working inode.
ln=4	Changes the link count for the working inode to 4.
ln+=1	Increments the link count by 1.
fc	Prints, in ASCII, block zero of the file associated with the working inode.
2i.fd	Prints the first 32 directory entries for the root inode of this file system.
d5i.fc	Changes the current inode to that associated with the 5th directory entry (numbered from zero) found from the above command. The first logical block of the file is then printed in ASCII.

- 512B.p0o Prints the superblock of this file system in octal.
- 2i.a0b.d7=3 Changes the inode number for the seventh directory slot in the root directory to 3. This example also shows how several operations can be combined on one command line.
- d7.nm="name" Changes the name field in the directory slot to the given string. Quotes are optional when used with nm if the first character is alphabetic.
- a2b.p0d Prints the third block of the current inode as directory entries.

### See Also

fsck(C), and dir(S), fs(S) in the *Reference (CP, S, F)*

## Name

**fsinfo** - Reports information about a file system.

## Syntax

**fsinfo** *options file-system*

## Description

The **fsinfo** command displays information about the given *filesystem*. All the values returned by **fsinfo** are expressed in 512 byte blocks.

## Options

- f Returns the free block count of the *file-system*.
- i Returns the total number of blocks of inodes in a *file-system*.
- l Returns the total number of free blocks in the *file-system*.
- s Performs a sanity check on the *file-system*. The return code will be 0 if the sanity check completes successfully. A positive number is returned on failure.

## See Also

df(M)

**Name**

**fsstat** - Reports file system status.

**Syntax**

*/etc/fsstat special\_file*

**Description**

Fsstat reports on the status of the file system on *special\_file*. During startup, this command is used to determine if the file system needs checking before it is mounted. Fsstat succeeds if the file system is unmounted and appears okay. For the root file system, it succeeds if the file system is active and not marked bad.

**Diagnostics**

The command has the following exit codes:

- 0 - the file system is not mounted and appears okay,  
(except for root where 0 means mounted and okay).
- 1 - the file system is not mounted and needs to be  
checked.
- 2 - the file system is mounted.
- 3 - the command failed.

**Name**

**fstab** - File system table.

**Description**

The `etc/fstab` file contains information about file systems for use by `mount(C)` and `mountall(C)`. Each entry in `/etc/fstab` has the following format:

column 1	block special file name of file system
column 2	mount-point directory
column 3	"-r" if to be mounted read-only
column 4	(optional) file system type string
column 5+	ignored

White-space separates columns. Lines beginning with "#" are comments. Empty lines are ignored.

A file system table might read:

```
/dev/hd1b /usr2
```

**Files**

`/etc/fstab`

**See Also**

`mount(C)`, `mountall(C)`

## Name

**fstyp** - Determines file system identifier.

## Syntax

*/etc/fstyp special*

## Description

**Fstyp** allows the user to determine the file system identifier of mounted or unmounted file systems using heuristic programs. The file system type is required by **mount(S)** and sometimes by **mount(M)** to mount file systems of different types.

The directory */etc/fstyp.d* contains a program for each file system type to be checked; each of these programs applies some appropriate heuristic to determine whether the supplied *special* file is of the type for which it checks. If it is, the program prints on standard output the usual file-system identifier for that type and exits with a return code of 0; otherwise it prints error messages on standard error and exits with a non-zero return code. **Fstyp** runs the programs in */etc/fstyp.d* in alphabetical order, passing *special* as an argument; if any program succeeds, its file-system type identifier is printed and **fstyp** exits immediately. If no program succeeds, **fstyp** prints "Unknown\_fstyp" to indicate failure.

## Notes

The use of heuristics implies that the result of **fstyp** is not guaranteed to be accurate.

## See Also

**mount(M)**, and **mount(S)**, **sysfs(S)** in the *Reference (CP, S, F)*

## Name

**fuser** - Identifies processes using a file or file structure.

## Syntax

```
/etc/fuser [-ku ] file... | resource... [-] [[-ku]
file... | resource...]
```

## Description

Fuser outputs the process IDs of the processes that are using the *files* or remote *resources* specified as arguments. Each process ID is followed by a letter code, interpreted as follows if the process is using the file as:

- c** Current directory
- p** Parent of its current directory (only when the file is being used by the system)
- r** Root directory

For block special devices with mounted file systems, all processes using any file on that device are listed. For remote resource names, all processes using any file associated with that remote resource (Remote File Sharing) are reported. (Fuser cannot use the mount point of the remote resource; it must use the resource name.) For all other types of files (text files, executables, directories, devices, etc.) only the processes using that file are reported.

The following options may be used with **fuser**:

- u** The user login name, in parentheses, also follows the process ID.
- k** The SIGKILL signal is sent to each process. Since this option spawns kills for each process, the kill messages may not show up immediately (see **kill(S)**).

If more than one group of files are specified, the options may be respecified for each additional group of files. A lone dash cancels the options currently in force; then, the new set of options applies to the next group of files.

The process IDs are printed as a single line on the standard output, separated by spaces and terminated with a single new line. All other output is written on standard error.

You cannot list processes using a particular file from a remote resource mounted on your machine. You can only use the resource name as an argument.

Any user with permission to read /dev/kmem and /dev/mem can use **fuser**. Only the super-user can terminate another user's process.

## Files

/unix	For system namelist
/dev/kmem	For system image
/dev/mem	Also for system image

## See Also

mount(C), ps(C)  
kill(S), signal(S) in the *Reference (CP, S, F)*

## Name

**getty** - Sets terminal type, modes, speed, and line discipline.

## Syntax

```
/etc/getty [ -h ] [ -t timeout ] line [ speed [ type  
[ linedisc ] ] ]  
/etc/getty -c file
```

## Description

**Getty** is a program that is invoked by **init**(M). It is the second process in the series, (*init-getty-login-shell*) that ultimately connects a user with the operating system. It can only be executed by the super-user; that is, a process with the user-ID of **root**. Initially **getty** prints the login message field for the entry it is using from */etc/gettydefs*. **Getty** reads the user's login name and invokes the **login**(C) command with the user's name as argument. While reading the name, **getty** attempts to adapt the system to the speed and type of terminal being used. It does this by using the options and arguments specified.

*Line* is the name of a tty line in */dev* to which **getty** is to attach itself. **Getty** uses this string as the name of a file in the */dev* directory to open for reading and writing. Unless **getty** is invoked with the **-h** flag, **getty** will force a hangup on the line by setting the speed to zero before setting the speed to the default or specified speed. The **-t** flag plus *timeout* (in seconds), specifies that **getty** should exit if the open on the line succeeds and no one types anything in the specified number of seconds.

*Speed*, the optional second argument, is a label to a speed and tty definition in the file */etc/gettydefs*. This definition tells **getty** at what speed to initially run, what the login message should look like, what the initial tty settings are, and what speed to try next should the user indicate that the speed is inappropriate (by pressing **Break/Del**). The default *speed* is 300 baud.

*Type*, the optional third argument, is a character string describing to *getty* what type of terminal is connected to the line in question. *Getty* recognizes the following types:

<b>none</b>	default
<b>ds40-1</b>	Dataspeed40/1
<b>tektronix,tek</b>	Tektronix
<b>vt61</b>	DEC vt61
<b>vt100</b>	DEC vt100
<b>hp45</b>	Hewlett-Packard 45
<b>c100</b>	Concept 100

The default terminal is **none**; i.e., any crt or normal terminal unknown to the system. Also, for terminal type to have any meaning, the virtual terminal handlers must be compiled into the operating system. They are available, but not compiled in the default condition.

*Linedisc*, the optional fourth argument, is a character string describing which line discipline to use in communicating with the terminal. Again the hooks for line disciplines are available in the operating system but there is only one presently available, the default line discipline, LDISC0.

When given no optional arguments, *getty* sets the *speed* of the interface to 300 baud, specifies that raw mode is to be used (awaken on every character), that echo is to be suppressed, either parity allowed, new-line characters will be converted to carriage return-line feed, and tab expansion performed on the standard output. It types the login message before reading the user's name a character at a time. If a null character (or framing error) is received, it is assumed to be the result of the user pressing **Break/Del**. This will cause *getty* to attempt the next *speed* in the series. The series that *getty* tries is determined by what it finds in */etc/gettydefs*.

After the user's name has been typed in, it is terminated by a new-line or carriage-return character. The latter results in the system being set to treat carriage returns appropriately (see *ioctl(S)*).

The user's name is scanned to see if it contains any lower-case alphabetic characters; if not, and if the name is non-empty, the system is told to map any future upper-case characters into the corresponding lower-case characters.

Finally, **login** is executed with the user's name as an argument. Additional arguments may be typed after the login name. These are passed to **login**, which will place them in the environment (see **login(C)**).

A check option is provided. When **getty** is invoked with the **-c** option and *file*, it scans the file as if it were scanning `/etc/gettydefs` and prints out the results to the standard output. If there are any unrecognized modes or improperly constructed entries, it reports these. If the entries are correct, it prints out the values of the various flags. See **ioctl(S)** to interpret the values. Note that some values are added to the flags automatically.

## Files

`/etc/gettydefs`  
`/etc/issue`

## See Also

**ct(C)**, **gettydefs(M)**, **init(M)**, **inittab(M)**, **login(C)**, **tty(M)**, and **ioctl(S)** in the *Reference (CP, S, F)*

## Notes

While **getty** understands simple single character quoting conventions, it is not possible to quote certain special control characters used by **getty**. Thus, you cannot login via **getty** and type a `#`, `@`, `/`, `!`, `_`, backspace, `^U`, `^D`, or `&` as part of your login name or arguments. **Getty** uses them to determine when the end of the line has been reached, which protocol is being used, and what the erase character is. They will always be interpreted as having their special meaning.

## Name

**gettydefs** - Speed and terminal settings used by getty.

## Description

The `/etc/gettydefs` file contains information used by `getty(M)` to set up the speed and terminal settings for a line. It supplies information on what the login prompt should look like. It also supplies the speed to try next if the user types a **Break** character, which indicates the current speed is not correct.

Each entry in `/etc/gettydefs` has the following format:

*label#initial-flags#final-flags#login-prompt#next-label*

Each entry is followed by a blank line. The various fields can contain quoted characters of the form `\b`, `\n`, `\c`, etc., as well as `\nnn`, where *nnn* is the octal value of the desired character. The various fields are:

<i>label</i>	This is the string against which <code>getty(M)</code> tries to match its second argument. It is often the speed, such as <code>1200</code> , at which the terminal is supposed to run, but it need not be (see below).
<i>initial-flags</i>	These flags are the initial <code>ioctl(S)</code> settings to which the terminal is to be set if a terminal type is not specified to <code>getty</code> . The flags that <code>getty</code> understands are the same as the ones listed in <code>/usr/include/sys/termio.h</code> (see <code>termio(M)</code> ). Normally only the speed flag is required in the <i>initial-flags</i> . <code>Getty</code> automatically sets the terminal to raw input mode and takes care of most of the other flags. The <i>initial-flag</i> settings remain in effect until <code>getty</code> executes <code>login(C)</code> .

- final-flags* These flags take the same values as the *initial-flags* and are set just prior to **getty** executes login. The speed flag is again required. The composite flag SANE takes care of most of the other flags that need to be set so that the processor and terminal are communicating in a rational fashion. The other two commonly specified final-flags are TAB3, so that tabs are sent to the terminal as spaces, and HUPCL, so that the line is hung up on the final close.
- login-prompt* This entire field is printed as the *login-prompt*. Unlike the above fields where white space is ignored (a space, tab, or newline), they are included in the login-prompt field.
- next-label* If this entry does not specify the desired speed, indicated by the user typing a *break* character, then **getty** will search for the entry with *next-label* as its label field and set up the terminal for those settings. Usually, a series of speeds are linked together in this fashion, into a closed set. For instance, 2400 linked to 1200, which in turn is linked to 300, which finally is linked to 2400.

If **getty** is called without a second argument, then the first entry of `/etc/gettydefs` is used, and is the default entry. It is also used if **getty** cannot find the specified label. If `/etc/gettydefs` itself is missing, there is one entry built into the command which will bring up a terminal at 300 baud.

After making or modifying `/etc/gettydefs`, run it through **getty** with the check option to be sure there are no errors.

**Files**

`/etc/gettydefs`

**See Also**

`getty(M)`, `termio(M)`, `login(C)`, `uugetty(M)`

**Name**

**group** - Format of the group file.

**Description**

The `/etc/group` file contains the following information:

- Group name
- Encrypted password (optional)
- Numerical group ID
- Comma-separated list of all users allowed in the group

This is an ASCII file. The fields are separated by colons; each group is separated from the next by a new-line. If the password field is empty, then you are not prompted for a password, when using the `newgrp(C)` command.

This file resides in directory `/etc`. Because of the encrypted passwords, it can and does have general read permissions and can be used, for example, to map numerical group IDs to names.

**See Also**

`passwd(M)`

**Name**

**haltsys** - Closes out the file systems and halts the CPU.

**Syntax**

`/etc/haltsys`

**Description**

You must be the super-user to access this command.

The **haltsys** command immediately terminates the operating system and should only be used if a system problem prevents the running of **shutdown**. Do not run **haltsys** in multiuser mode and when other users are on the system. Since **haltsys** takes effect immediately, user processes should be killed beforehand (see **kill(C)**).

**Related Commands**

**kill(C)**, **ps(C)**, **shutdown(M)**

**Name**

**infocmp** - Compares or prints out terminfo descriptions.

**Syntax**

```
infocmp [-d] [-c] [-n] [-I] [-L] [-C] [-r] [-u]
          [-s d|i|l|c] [-v] [-V] [-1] [-w width]
          [-A directory] [-B directory] [termname ...]
```

**Description**

**Infocmp** can be used to compare a binary **terminfo**(M) entry with other terminfo entries, rewrite a **terminfo**(M) description to take advantage of the **use=** terminfo field, or print out a **terminfo**(M) description from the binary file (**term**(M)) in a variety of formats. In all cases, the boolean fields will be printed first, followed by the numeric fields, followed by the string fields.

**Default Options**

If no options are specified and zero or one *termnames* are specified, the **-I** option will be assumed. If more than one *termname* is specified, the **-d** option will be assumed.

**Comparison Options [-d] [-c] [-n]**

**Infocmp** compares the **terminfo**(M) description of the first terminal *termname* with each of the descriptions given by the entries for the other terminal's *termnames*. If a capability is defined for only one of the terminals, the value returned will depend on the type of the capability: **F** for boolean variables, **-1** for integer variables, and **NULL** for string variables.

- d Produce a list of each capability that is different. In this manner, if one has two entries for the same terminal or similar terminals, using **infocmp** will show what is different between the two entries. This is sometimes necessary when more than one person produces an entry for the same terminal and one wants to see what is different between the two.

- c Produce a list of each capability that is common between the two entries. Capabilities that are not set are ignored. This option can be used as a quick check to see if the **-u** option is worth using.
- n Produce a list of each capability that is in neither entry. If no *termnames* are given, the environment variable **TERM** will be used for both of the *termnames*. This can be used as a quick check to see if anything was left out of the description.

### Source Listing Options [-I] [-L] [-C] [-r]

The **-I**, **-L**, and **-C** options will produce a source listing for each terminal named.

- I Use the **terminfo(M)** names
- L Use the long C variable name listed in `<term.h>`
- C Use the **termcap** names
- r When using **-C**, put out all capabilities in **termcap** form

If no *termnames* are given, the environment variable **TERM** will be used for the terminal name.

The source produced by the **-C** option may be used directly as a **termcap** entry, but not all of the parameterized strings may be changed to the **termcap** format. **Infocmp** will attempt to convert most of the parameterized information, but that which it doesn't will be plainly marked in the output and commented out. These should be edited by hand.

All padding information for strings will be collected together and placed at the beginning of the string where **termcap** expects it. Mandatory padding (padding information with a trailing '/') will become optional.

All **termcap** variables no longer supported by **terminfo(M)**, but which are derivable from other **terminfo(M)** variables, will be output. Not all **terminfo(M)** capabilities will be translated; only those variables which were part of **termcap** will normally be output.

Specifying the **-r** option will take off this restriction, allowing all capabilities to be output in **termcap** form.

Note that because padding is collected to the beginning of the capability, not all capabilities are output, mandatory padding is not supported, and **termcap** strings were not as flexible, it is not always possible to convert a **terminfo(M)** string capability into an equivalent **termcap** format. Not all of these strings will be able to be converted. A subsequent conversion of the **termcap** file back into **terminfo(M)** format will not necessarily reproduce the original **terminfo(M)** source.

Some common **terminfo** parameter sequences, their **termcap** equivalents, and some terminal types which commonly have such sequences, are:

Terminfo	Termcap	Representative Terminals
%p1%c	%.	adm
%p1%d	%d	hp, ANSI standard, vt100
%p1%'x'%'%+%c	%+x	concept
%i	%i	ANSI standard, vt100
%p1%?'x'%'>%t%p1%'y'%'%+%;	%>xy	concept
%p2 is printed before %p1	%r	hp

### Use= Option [-u]

**-u** Produce a **terminfo(M)** source description of the first terminal *termname* which is relative to the sum of the descriptions given by the entries for the other terminals *termnames*. It does this by analyzing the differences between the first *termname* and the other *termnames* and producing a description with **use=** fields for the other terminals. In this manner, it is possible to retrofit generic **terminfo** entries into a terminal's description. Or, if two similar terminals exist, but were coded at different times or by different people so that each description is a full description, using **infocmp** will show what can be done to change one description to be relative to the other.

A capability will get printed with an at-sign (@) if it no longer exists in the first *termname*, but one of the other *termname* entries contains a value for it. A capability's value gets printed if the value in the first *termname* is not found in any of the other *termname* entries, or if the first of the other *termname* entries that has this capability gives a different value for the capability than that in the first *termname*.

The order of the other *termname* entries is significant. Since the terminfo compiler **tic(C)** does a left-to-right scan of the capabilities, specifying two **use=** entries that contain differing entries for the same capabilities will produce different results depending on the order in which the entries are given. **Infocmp** will flag any such inconsistencies between the other *termname* entries as they are found.

Alternatively, specifying a capability *after* a **use=** entry that contains that capability will cause the second specification to be ignored. Using **infocmp** to recreate a description can be a useful check to make sure that everything was specified correctly in the original source description.

Another error that does not cause incorrect compiled files, but will slow down the compilation time, is specifying extra **use=** fields that are superfluous. **Infocmp** will flag any other *termname* **use=** fields that were not needed.

#### Other Options [-s d|i|l|c] [-v] [-V] [-l] [-w *width*]

- s Sort the fields within each type according to the argument below:
  - d Leave fields in the order that they are stored in the **terminfo** database.
  - i Sort by **terminfo** name.
  - l Sort by the long C variable name.
  - c Sort by the **termcap** name.

If no `-s` option is given, the fields printed out will be sorted alphabetically by the `terminfo` name within each type, except in the case of the `-C` or the `-L` options, which cause the sorting to be done by the `termcap` name or the long C variable name, respectively.

- `-v` Print out tracing information on standard error as the program runs.
- `-V` Print out the version of the program in use on standard error and exit.
- `-l` Cause the fields to be printed out one to a line. Otherwise, the fields will be printed several to a line to a maximum width of 60 characters.
- `-w` Change the output to *width* characters.

### Changing Databases [`-A directory`] [`-B directory`]

The location of the compiled `terminfo(M)` database is taken from the environment variable `TERMINFO`. If the variable is not defined, or the terminal is not found in that location, the system `terminfo(M)` database, usually in `/usr/lib/terminfo`, will be used. The options `-A` and `-B` may be used to override this location. The `-A` option will set `TERMINFO` for the first *termname* and the `-B` option will set `TERMINFO` for the other *termnames*. With this, it is possible to compare descriptions for a terminal with the same name located in two different databases. This is useful for comparing descriptions for the same terminal created by different people. Otherwise the terminals would have to be named differently in the `terminfo(M)` database for a comparison to be made.

### Files

<code>/usr/lib/terminfo/?/*</code>	Compiled terminal description database
------------------------------------	--

## Diagnostics

malloc is out of space!

There was not enough memory available to process all the terminal descriptions requested. Run **infocmp** several times, each time including a subset of the desired *termnames*.

use= order dependency found:

A value specified in one relative terminal specification was different from that in another relative terminal specification.

'use=*term*' did not add anything to the description.

A relative terminal name did not contribute anything to the final description.

must have at least two terminal names for a comparison to be done.

The **-u**, **-d** and **-c** options require at least two terminal names.

## See Also

tic(C), curses(S), term(M), terminfo(M), captinfo(M)

## Note

The **termcap** database (from earlier releases of UNIX System V) may not be supplied in future releases.

## Name

**inir** - Cleans the file system and executes **init**.

## Syntax

**/etc/inir**

## Description

**Inir** first checks that the console devices (**/dev/console**, **/dev/syscon**, **/dev/systty**) are correct, and if not removes and creates them. **Inir** will then fork a child process that reports the number of users licensed for this system and that cleans the file system by running **fsck(C)**.

**Inir** is called as "c" or "d" to indicate whether the file system is clean or dirty. If **inir** is invoked as anything other than "c," it assumes the file system is dirty.

When the child process returns, **inir** will execute **init(M)**.

## Files

**/dev/console**  
**/dev/syscon**  
**/dev/systty**

## See Also

**init(M)**, **fsck(C)**

## Name

**init, telinit** - Process control initialization.

## Syntax

```
/etc/init [0123456SsQq]  
/etc/telinit [0123456sSQqabc]
```

## Description

**init** is a general process spawner. Its primary role is to create processes from a script stored in the file `/etc/inittab` (see **inittab(M)**). This file usually has **init** spawn **getty(M)** processes on each line that a user may log in on. It also controls autonomous processes required by any particular system.

**init** considers the system to be in a run-level at any given time. A run-level can be viewed as a software configuration of the system where each configuration allows only a selected group of processes to exist. The processes spawned by **init** for each of these run-levels are defined in the `inittab` file.

**init** can be in one of eight run-levels, **0-6**, and **S** or **s**. The run-level is changed by having a privileged user run `/etc/telinit` (which is linked to `/etc/init`). This user-spawned **init** sends appropriate signals to the original **init** spawned by the operating system when the system was booted, telling it which run-level to change to.

**init** is invoked as the last step in the **boot(M)** procedure. The first thing it does is to look for `/etc/inittab` and see if there is an entry of the type *initdefault* (see **inittab(M)**). If there is, **init** uses the run-level specified in that entry as the initial run-level to enter. If this entry is not in `inittab` or `inittab` is not found, **init** requests that the user enter a run-level from the virtual system console, `/dev/syscon`. If an **S** (**s**) is entered, **init** goes into the SINGLE USER level. This is the only run-level that doesn't require the existence of a properly formatted `inittab` file.

If `/etc/inittab` doesn't exist, then by default the only legal run-level that `init` can enter is the SINGLE USER level. In the SINGLE USER level, the virtual console terminal `/dev/syscon` is opened for reading and writing and the command `/bin/su` is invoked immediately. To exit from the SINGLE USER run-level one of two options can be elected. First, if the shell is terminated (via an end-of-file), `init` will reprompt for a new run-level. Second, the `init` or `telinit` command can signal `init` and force it to change the run-level of the system.

When attempting to boot the system, `init` may fail to prompt for a new run-level because the device `/dev/syscon` is linked to a device other than the physical system terminal (`/dev/systty`). If this occurs, `init` can be forced to relink `/dev/syscon` by typing a delete on the system console that is located with the processor.

When `init` prompts for the new run-level, you may enter only one of the digits `0` through `6` or the letters `S` or `s`. If `S` is entered, `init` operates as previously described in SINGLE USER mode with the additional result that `/dev/syscon` is linked to your terminal line, thus making it the virtual system console. A message is generated on the physical console, `/dev/systty`, saying where the virtual terminal has been relocated.

When `init` comes up initially and whenever it switches out of SINGLE USER state to normal run states, it sets the `ioctl(S)` states of the virtual console, `/dev/syscon`, to those modes saved in the file `/etc/ioctl.syscon`. This file is written by `init` whenever SINGLE USER mode is entered. If this file does not exist when `init` wants to read it, a warning is printed and default settings are assumed.

If a `0` through `6` is entered, `init` enters the corresponding run-level. Any other input will be rejected and the user will be reprompted. If this is the first time `init` has entered a run-level other than SINGLE USER, `init` first scans `inittab` for special entries of the type `boot` and `bootwait`. These entries are performed, providing the run-level entered matches that of the entry before any normal processing of `inittab`. In this way, any special initialization of the operating system, such as mounting file systems, can take place before users are allowed onto the system. The `inittab` file is scanned to find all entries that are to be processed for that run-level.

Run-level 2 is usually defined by the system administrator to contain all of the terminal processes and daemons that are spawned in the multiuser environment. Run-level 3 is defined to start up remote file sharing processes and daemons as well as mount and advertise remote resources. So, run-level 3 extends multiuser mode and is known as the Remote File Sharing state.

In a multiuser environment, the `inittab` file is usually set up so that `init` will create a process for each terminal on the system.

For terminal processes, the shell will ultimately terminate because of an end-of-file either typed explicitly or generated as the result of hanging up. When `init` receives a child death signal, telling it that a process it spawned has died, it records the fact and the reason it died in `/etc/utmp` and `/etc/wtmp` if it exists (see `who(C)`). A history of the processes spawned is kept in `/etc/wtmp` if such a file exists.

To spawn each process in the `inittab` file, `init` reads each entry and for each entry which should be respawned, it forks a child process. After it has spawned all of the processes specified by the `inittab` file, `init` waits for one of its descendant processes to die, a powerfail signal, or until it is signaled by `init` or `telinit` to change the system's run-level. When one of the above three conditions occurs, `init` re-examines the `inittab` file. New entries can be added to the `inittab` file at any time. To provide for an instantaneous response the `telinit Q` or `telinit q` command can wake `init` to reexamine the `inittab` file.

If `init` receives a powerfail signal (SIGWPR) and is not in SINGLE USER mode, it scans `inittab` for special powerfail entries. These entries are invoked (if the run-levels permit) before any further processing takes place. In this way `init` can perform various cleanup and recording functions whenever the operating system experiences a power failure. Note that in the single-user state, only powerfail and powerwait entries are executed.

When `init` is requested to change run-levels (via `telinit`), it sends the warning signal (SIGTERM) to all processes that are undefined in the target run-level. `init` waits 20 seconds before forcibly terminating these processes via the kill signal (SIGKILL).

## Telinit

**Telinit**, which is linked to `/etc/init`, is used to direct the actions of `init(S)`. It takes a one-character argument and signals `init` via the kill system call to perform the appropriate action. You must be the super-user to run `telinit`.

The following arguments serve as directives to `init`.

- 0-6** Tells `init` to place the system in one of the run-levels **0-6**. Run level 0 is used for shut-down; 1 is single user mode; and 2 is multiuser mode. To switch between single and multiuser modes, use the scripts `/etc/singleuser` and `/etc/multiuser`.
- a,b,c** Tells `init` to process only those `/etc/inittab` file entries having the **a**, **b**, or **c** run-level set (see `inittab(M)`).
- q,Q** Tells `init` to re-examine the `/etc/inittab` file.
- s,S** Tells `init` to enter the single user environment. The virtual system teletype, `/dev/syscon`, is changed to the terminal from which the command was executed.

## Init.d

The `/etc/init.d` directory contains initialization and termination scripts for changing `init` states. These scripts are linked with appropriate files in the `rc?.d` directories.

File names in `rc?.d` directories are of the form `[S|K]nn<init.d filename>` where **S** means start this job, **K** means kill this job, and *nn* is the relative sequence number for killing or starting the job. When entering a state (`init 0, 2, 3, etc.`), the `rc[0-6]` script executes those scripts in `/etc/rc[0-6].d` that are prefixed with **K** followed by those scripts prefixed with **S**.

For example, when changing to `init` state **2** (default multi-user mode), `/etc/rc2` is initiated by the `init` process. The following steps are performed by `/etc/rc2`:

- In the directory `/etc/rc2.d` are files used to stop processes that should not be running in state 2. The file names are prefixed with K. Each K file in the directory is executed (by `/etc/rc2`) in alpha-numeric order when the system enters `init` state 2 (see the following example).
- The `rc2.d` directory also contains files used to start processes that should be running in state 2. As in the step above, each S file is executed.

Example:

The file `/etc/netdaemon` contains a script that initiates networking daemons when given the argument `start` and terminates the daemons if given the argument `stop`. It is linked to `/etc/rc2.d/S68netdaemon`, and to `/etc/rc0.d/K67netdaemon`.

This script is executed by `/etc/rc2.d/S68netdaemon start` when `init` state 2 is entered and by `/etc/rc0.d/S67netdaemon stop` when shutting the system down.

## Files

```
/etc/inittab
/etc/init.d
/etc/rc0
/etc/rc0.d
/etc/rc2
/etc/rc2.d
/etc/utmp
/etc/wtmp
/etc/ioctl.syscon
/dev/syscon
```

## See Also

`brc(M)`, `getty(M)`, `inittab(M)`, `login(C)`, `rc0(M)`, `rc2(M)`, `sh(C)`, `utmp(M)`, `who(C)`

## Diagnostics

If `init` finds that it is continuously respawning an entry from `/etc/inittab` more than 10 times in 2 minutes, it assumes there is an error in the command string, generates an error message on the system console, and refuses to respawn this entry until either 1 minute has elapsed or it receives a signal from a user `init` (`telinit`). This prevents `init` from eating up system resources when someone makes a typographical error in the `inittab` file or a program is removed that is referenced in the `inittab`.

## Notes

`Telinit` can be run only by someone who is the super-user or a member of group `sys`. Attempting to relink `/dev/console` with `/dev/contty` by typing **Del** on the system console does not work.

## Name

**inittab** - Script for the init process.

## Description

The `/etc/inittab` file supplies the script to `init(M)`'s role as a general process dispatcher. The process that constitutes the majority of `init`'s process dispatching activities is the line process `getty(M)` that initiates individual terminal lines. Other processes typically dispatched by `init` are daemons and the shell.

The `inittab` file is composed of entries that are position dependent and have the following format:

*id:rstate:action:process*

Each entry is delimited by a newline; however, a backslash (\) preceding a newline indicates a continuation of the entry. Up to 512 characters per entry are permitted. Comments may be inserted in the process field using the `sh(C)` convention for comments. Comments for lines that spawn `getty(M)` are displayed by the `who(C)` command. They typically contain some information about the line such as the location. There are no limits (other than maximum entry size) imposed on the number of entries within the `inittab` file. The entry fields are:

- id* This is one or two characters used to uniquely identify an entry.
- rstate* This defines the run-level in which this entry is to be processed. Run-levels effectively correspond to a configuration of processes in the system. That is, each process spawned by `init` is assigned a run-level (or run-levels) in which it is allowed to exist. The run-levels are represented by a number ranging from 0 through 6. As an example, if the system is in run-level 1, only those entries having a 1 in the *rstate* field will be processed. When `init` is requested to change run-levels, all processes that do not have an entry in the *rstate* field for the target run-level will be sent the warning signal (SIGTERM) and allowed a 20-second grace period.

before being forcibly terminated by a kill signal (SIGKILL). The *rstate* field can define multiple run-levels for a process by selecting more than one run-level in any combination from 0-6. If no run-level is specified, then the process is assumed to be valid at all run-levels 0-6. There are three other values, **a**, **b**, or **c**, which can appear in the *rstate* field, even though they are not true run-levels. Entries that have these characters in the *rstate* field are processed only when the *telinit* (see *init(M)*) process requests them to be run (regardless of the current run-level of the system). They differ from run-levels in that *init* can never enter run-level **a**, **b**, or **c**. Also, a request for the execution of any of these processes does not change the current run-level. Furthermore, a process started by **a**, **b**, or **c** command is not killed when *init* changes levels. They are only killed if their line in */etc/inittab* is marked **off** in the action field, their line is deleted entirely from */etc/inittab*, or *init* goes into the SINGLE USER state.

*action* Key words in this field tell *init* how to treat the process specified in the process field. The actions recognized by *init* are as follows:

- respawn** If the process does not exist then start the process, do not wait for its termination (continue scanning the *inittab* file), and when it dies restart the process. If the process currently exists then do nothing and continue scanning the *inittab* file.
- wait** Upon *init*'s entering the run-level that matches the entry's *rstate*, start the process and wait for its termination. All subsequent reads of the *inittab* file while *init* is in the same run-level will cause *init* to ignore this entry.

- once** Upon `init`'s entering a run-level that matches the entry's `rstate`, start the process, do not wait for its termination. When it dies, do not restart the process. If upon entering a new run-level, where the process is still running from a previous run-level change, the program will not be restarted.
- boot** The entry is to be processed only at `init`'s boot-time read of the `inittab` file. `Init` is to start the process, not wait for its termination; and when it dies, not restart the process. In order for this instruction to be meaningful, the `rstate` should be the default or it must match `init`'s run-level at boot time. This action is useful for an initialization function following a hardware reboot of the system.
- bootwait** The entry is to be processed only at `init`'s boot-time read of the `inittab` file. `Init` is to start the process, wait for its termination, and, when it dies, not restart the process.
- powerfail** Execute the process associated with this entry only when `init` receives the power fail signal (SIGPWR, see `signal(S)`), which normally occurs when a UPS detects a power failure.
- powerwait** Execute the process associated with this entry only when `init` receives the power fail signal (SIGPWR) and wait until it terminates before continuing any processing of `inittab`.
- off** If the process associated with this entry is currently running, send the warning signal (SIGTERM) and wait 20 seconds before forcibly terminating the process via the kill signal (SIGKILL). If the process is nonexistent, ignore the entry.

**ondemand** This instruction is really a synonym for the **respawn** action. It is functionally identical to **respawn** but is given a different keyword in order to divorce its association with run-levels. This is used only with the **a**, **b**, or **c** values described in the *rstate* field.

**initdefault**

An entry with this action is only scanned when **init** initially invoked. **init** uses this entry, if it exists, to determine which run-level to enter initially. It does this by taking the highest run-level specified in the *rstate* field and using that as its initial state. If the *rstate* field is empty, this is interpreted as 0123456 and so **init** will enter run-level 6. Also, the **initdefault** entry cannot specify that **init** start in the SINGLE USER state. Additionally, if **init** does not find an **initdefault** entry in */etc/inittab*, then it will request an initial run-level from the user at reboot time.

**restart** Entries of this type are executed on a warm restart of the system after a power failure.

**sysinit** Entries of this type are executed before **init** tries to access the console. It is expected that this entry will be only used to initialize devices on which **init** might try to ask the run-level question. These entries are executed and waited for before continuing.

*process* This is a **sh(C)** command to be executed. The entire *process* field is prefixed with **exec** and passed to a forked **sh** as **sh -c exec** command. For this reason, any legal **sh** syntax can appear in the *process* field. Comments can be inserted with the **;** **#comment** syntax.

**Files**

`/etc/inittab`

**See Also**

`getty(M)`, `init(M)`, `sh(C)`, `who(C)`

## Name

**inode** - Format of an inode.

## Syntax

```
#include <sys/types.h>
#include <sys/ino.h>
```

## Description

An inode for a plain file or directory in a file system has the structure defined by <sys/ino.h>. For the meaning of the defined types *off\_t* and *time\_t*, see **types(F)**.

## Files

/usr/include/sys/ino.h

## See Also

**filesystem(M)** and **stat(S)**, **types(F)** in the *Reference (CP, S, F)*

## Name

**install** - Installs commands.

## Syntax

```
/etc/install [-c dira] [-f dirb] [-l] [-n dirc] [-m mode]  
[-u user] [-g group] [-o] [-s] file [dirx...]
```

## Description

The **install** command is most commonly used in "makefiles" (see **make(C)**) to **install** a *file* (updated target file) in a specific place within a file system). Each *file* is installed by copying it into the appropriate directory, thereby retaining the mode and owner of the original command. The program prints messages telling the user exactly what files it is replacing or creating and where they are going.

If no options or directories (*dirx ...*) are given, **install** will search a set of default directories (/bin, /usr/bin, /etc, /lib, and /usr/lib, in that order) for a file with the same name as *file*. When the first occurrence is found, **install** issues a message saying that it is overwriting that file with *file*, and proceeds to do so. If the file is not found, the program states this and exits without further action.

If one or more directories (*dirx ...*) are specified after *file*, those directories will be searched before the directories specified in the default list.

The meanings of the options are:

**-c *dira*** Installs a new command (*file*) in the directory specified by *dira*, only if it is not found. If it is found, **install** issues a message saying that the file already exists, and exits without overwriting it. May be used alone or with the **-s** option.

- f *dirb*** Forces *file* to be installed in given directory, whether or not one already exists. If the file being installed does not already exist, the mode and owner of the new file will be set to **755** and **bin**, respectively. If the file already exists, the mode and owner will be that of the already existing file. May be used alone or with the **-o** or **-s** options.
- i** Ignores default directory list, searching only through the given directories (*dirx ...*). May be used alone or with any other options except **-c** and **-f**.
- n *dirc*** If *file* is not found in any of the searched directories, it is put in the directory specified in *dirc*. The mode and owner of the new file will be set to **755** and **bin**, respectively. May be used alone or with any other options except **-c** and **-f**.
- m *mode*** The mode of the new file is set to *mode*. Only available to the super-user.
- u *user*** The owner of the new file is set to *user*. Only available to the super-user.
- g *group*** The group id of the new file is set to *group*. Only available to the super-user.
- o** If *file* is found, this option saves the "found" file by copying it to **OLDfile** in the directory in which it was found. This option is useful when installing a frequently used file such as **/bin/sh** or **/etc/getty**, where the existing file cannot be removed. May be used alone or with any other options except **-c**.
- s** Suppresses printing of messages other than error messages. May be used alone or with any other options.

See Also

make(C)

## Name

keyboard - Series 500 system console keyboard.

## Description

The system console (and user's terminal) is composed of two separate pieces: the keyboard and the display (see `display(M)`). Because of their complexity they are discussed in separate manual entries.

The actual code sequence delivered to the terminal input routine (see `termio(M)`) is defined by a set of internal tables in the driver. These tables can be modified by software (see `ioctl` calls below). In addition, the driver can be instructed not to do translations, delivering the keyboard up/down scan codes directly.

There are four translation tables: normal keys, shifted keys, alt keys, and shifted alt keys. Each table contains 128 16-bit entries, with an entry being made up of flags in the high-order 8 bits and the character code in the low-order 8 bits. The values that can be set in the flag byte, as defined in `<sys/kd.h>`, are as follows:

```

/* Flag bits */
#define NUMLCK      0x8000    /* key is affected by num lock */
#define CAPLCK      0x4000    /* key is affected by caps lock */
#define CTLKEY      0x2000    /* key is affected by control key */

/* Key types */
#define NORMKEY     0x0000    /* key is a normal key */
#define SHIFTKEY    0x0100    /* key is a shift key */
#define BREAKKEY    0x0200    /* key is a break key */
#define SS2PFX      0x0300    /* prefix key with <ESC> N */
#define SS3PFX      0x0400    /* prefix key with <ESC> O */
#define CS1PFX      0x0500    /* prefix key with <ESC> [ */
#define NOKEY       0x0f00    /* key sends nothing */

```

The tables are indexed by the keyboard scan code received. The table that is used is determined by the state of the following special keys:

- ALT This key essentially chooses an alternate keyboard. If it is not depressed, the normal and shifted tables are used; if it is depressed, the alt and shifted alt tables are used.
- SHIFT Depending on the ALT key, this key shifts into either the shifted table or the shifted alt table. The default shifted table is set up such that SHIFT will generate the ASCII uppercase characters.

The character code found in the table may be further modified by the following keys:

- CTRL Produces the appropriate ASCII control character if the CTLKEY bit is set in the flag byte. The control character is produced by masking off all but the low-order 5 bits of the character code in the table. If the CTLKEY bit is not set, the normal character (the code in the table) is generated. In the default tables, the CTRL key only modifies keys in the normal and shifted tables; it has no effect in the alt or shifted alt tables.

#### CAPS LOCK

This is a toggle; it controls whether keys that have the CAPLCK bit set in their flag byte go to the normal or shifted table. If the CAPLCK bit is not set, the normal character is generated regardless of the state of the CAPS LOCK. The SHIFT key inverts whatever state is indicated by the CAPS LOCK. Thus, if CAPS LOCK is off, SHIFT produces uppercase characters; if CAPS LOCK is on, SHIFT produces lowercase characters. In the default tables, the only keys affected by CAPS LOCK are the alphabetic keys.

#### NUM LOCK

This is a toggle; it controls whether keys that have the NUMLCK bit set in their flag byte go to the normal or shifted table. If the NUMLCK bit is not set, the normal character is generated regardless of the state of the NUM LOCK. The SHIFT key inverts whatever state is indicated by the NUM LOCK. In the default tables, the only keys affected by NUM LOCK are the

keypad keys. Note that CAPS LOCK and NUM LOCK do exactly the same thing; the only difference is the set of keys affected.

#### SCROLL LOCK

This key is marked as a BREAKKEY in its flag byte in both the shifted and shifted alt tables. This causes it to send BREAK to the terminal handler.

The remaining values for the key type are discussed below:

#### SHIFTKEY

This is used to mark the left and right SHIFT keys, the CTRL key, the ALT key, the CAPS LOCK, and the NUM LOCK in the translation tables. User programs will normally not be concerned with this flag.

#### SS2PFX, SS3PFX, CSIPFX

These are used to generate codes for the function keys and for the ALT keys. If one of these flags is specified in the translation table, the driver will prefix the character code in the table with <ESC>N, <ESC>O, or <ESC>I respectively, where <ESC> represents the ASCII escape character (1b hex).

**NOKEY** This is used to mark entries that should not generate any character code. Keystroke combinations that index table entries marked with this flag generate nothing.

The following tables describe the codes generated by the default tables for all the keys. Keycodes are the values delivered at the keyboard interface when the corresponding key is struck (the down scan code). Note that when the key is released, the same code is delivered, but with the high-order bit set. Thus, codes 01-7f are down codes, and 81-ff are up codes. The generated codes are the codes delivered to the terminal driver after translation. All numbers are in hexadecimal.

### Shifting Keys

Key	Code	Function
Ctrl	1d	CTRL
Left Shift	2a	SHIFT
Right Shift	36	SHIFT
Alt	38	ALT
Caps Lock	3a	CAPS LOCK
Num Lock	45	NUM LOCK

### Special Keys

Keyboard Key	Code	Generated Codes				SHIFT
		Normal	SHIFT	CTRL	ALT	ALT
BACKSPACE	0e	08 bs	08 bs	08 bs	08 bs	08 bs
TAB	0f	09 ht	1d gs	09 ht	09 ht	1d gs
RETURN	1c	0d cr	0d cr	0d cr	0d cr	0d cr
SPACE	39	20 sp	20 sp	00 nul	20 sp	20 sp
ESC	01	1b esc	1b esc	1b esc	1b esc	1b esc

## Alphabetic Keys

Keyboard Key	Code	Generated Codes				SHIFT
		Normal	SHIFT	CTRL	ALT	ALT
a	1e	61 a	41 A	01 soh	1b4e61	1b4e41
b	30	62 b	42 B	02 stx	1b4e62	1b4e42
c	2e	63 c	43 C	03 etx	1b4e63	1b4e43
d	20	64 d	44 D	04 eot	1b4e64	1b4e44
e	12	65 e	45 E	05 enq	1b4e65	1b4e45
f	21	66 f	46 F	06 ack	1b4e66	1b4e46
g	22	67 g	47 G	07 bel	1b4e67	1b4e47
h	23	68 h	48 H	08 bs	1b4e68	1b4e48
i	17	69 i	49 I	09 ht	1b4e69	1b4e49
j	24	6a j	4a J	0a lf	1b4e6a	1b4e4a
k	25	6b k	4b K	0b vt	1b4e6b	1b4e4b
l	26	6c l	4c L	0c ff	1b4e6c	1b4e4c
m	32	6d m	4d M	0d cr	1b4e6d	1b4e4d
n	31	6e n	4e N	0e so	1b4e6e	1b4e4e
o	18	6f o	4f O	0f si	1b4e6f	1b4e4f
p	19	70 p	50 P	10 dle	1b4e70	1b4e50
q	10	71 q	51 Q	11 dc1	1b4e71	1b4e51
r	13	72 r	52 R	12 dc2	1b4e72	1b4e52
s	1f	73 s	53 S	13 dc3	1b4e73	1b4e53
t	14	74 t	54 T	14 dc4	1b4e74	1b4e54
u	16	75 u	55 U	15 nak	1b4e75	1b4e55
v	2f	76 v	56 V	16 syn	1b4e76	1b4e56
w	11	77 w	57 W	17 etb	1b4e77	1b4e57
x	2d	78 x	58 X	18 can	1b4e78	1b4e58
y	15	79 y	59 Y	19 em	1b4e79	1b4e59
z	2c	7a z	5a Z	1a sub	1b4e7a	1b4e5a

## Numeric and Punctuation Keys

Keyboard Key	Code	Generated Codes				SHIFT	
		Normal	SHIFT	CTRL	ALT	ALT	
1	02	31 1	21 !	31 1	1b4e31	1b4e21	
2	03	32 2	40 @	00 nul	1b4e32	1b4e40	
3	04	33 3	23 #	33 3	1b4e33	1b4e23	
4	05	34 4	24 \$	34 4	1b4e34	1b4e24	
5	06	35 5	25 %	35 5	1b4e35	1b4e25	
6	07	36 6	5e ^	1e rs	1b4e36	1b4e5e	
7	08	37 7	26 &	37 7	1b4e37	1b4e26	
8	09	38 8	2a *	38 8	1b4e38	1b4e2a	
9	0a	39 9	28 (	39 9	1b4e39	1b4e28	
0	0b	30 0	29 )	30 0	1b4e30	1b4e29	
-	0c	2d -	5f _	1f us	1b4e2d	1b4e5f	
=	0d	3d =	2b +	3d =	1b4e3d	1b4e2b	
[	1a	5b [	7b {	1b esc	1b4e5b	1b4e7b	
]	1b	5d ]	7d }	1d gs	1b4e5d	1b4e7d	
:	27	3b ;	3a :	3b ;	1b4e3b	1b4e3a	
'	28	27 '	22 "	27 '	1b4e27	1b4e22	
`	29	60 `	7e ~	1e rs	1b4e60	1b4e7e	
\	2b	5c \	7c	1c fs	1b4e5c	1b4e7c	
,	33	2c ,	3c <	2c ,	1b4e2c	1b4e3c	
.	34	2e .	3e >	2e .	1b4e2e	1b4e3e	
/	35	2f /	3f ?	1f us	1b4e2f	1b4e3f	

## Keypad Keys

Keyboard Key	Code	Generated Codes				SHIFT
		Normal	SHIFT	CTRL	ALT	ALT
*	37	2a *	2a *	2a *	1b4e2a	1b4e2a
scroll lock	46	1b5b4d	00 break	1b5b4d	1b5b4d	00 break
home	47	1b5b48	37 7	1b5b48	1b5b48	1b4e37
up arrow	48	1b5b41	38 8	1b5b41	1b5b41	1b4e38
page up	49	1b5b49	39 9	1b5b49	1b5b49	1b4e39
minus	4a	2d -	2d -	2d -	1b4e2d	1b4e2d
left arrow	4b	1b5b44	34 4	1b5b44	1b5b44	1b4e34
5	4c	1b5b45	35 5	1b5b45	1b5b45	1b4e35
right arrow	4d	1b5b43	36 6	1b5b43	1b5b43	1b4e36
plus	4e	2b +	2b +	2b +	1b4e2b	1b4e2b
end	4f	1b5b46	31 1	1b5b46	1b5b46	1b4e31
down arrow	50	1b5b42	32 2	1b5b42	1b5b42	1b4e32
page down	51	1b5b47	33 3	1b5b47	1b5b47	1b4e33
insert	52	1b5b4c	30 0	1b5b4c	1b5b4c	1b4e30
del	53	7f	2e .	7f	7f	1b4e2e
sys req	54	00	00	00	00	1b5b35

## Function Keys

Keyboard Key	Code	Generated Codes				SHIFT
		Normal	SHIFT	CTRL	ALT	ALT
F1	3b	1b5b4d	1b5b59	1b5b6b	1b4e4d	1b4e59
F2	3c	1b5b4e	1b5b5a	1b5b6c	1b4e4e	1b4e5a
F3	3d	1b5b4f	1b5b61	1b5b6d	1b4e4f	1b4e61
F4	3e	1b5b50	1b5b62	1b5b6e	1b4e50	1b4e62
F5	3f	1b5b51	1b5b63	1b5b6f	1b4e51	1b4e63
F6	40	1b5b52	1b5b64	1b5b70	1b4e52	1b4e64
F7	41	1b5b53	1b5b65	1b5b71	1b4e53	1b4e65
F8	42	1b5b54	1b5b66	1b5b72	1b4e54	1b4e66
F9	43	1b5b55	1b5b67	1b5b73	1b4e55	1b4e67
F10	44	1b5b56	1b5b68	1b5b74	1b4e56	1b4e68
F11	57	1b5b57	1b5b69	1b5b75	1b4e57	1b4e69
F12	58	1b5b58	1b5b6a	1b5b76	1b4e58	1b4e6a

## Foreign Character Set Support

The keyboard driver supports input and output mapping for 9 different foreign language keyboards and character sets. The foreign keyboards supported are:

---

Language	Language Type defined in <sys/kd.h>	Function key
English	US_ENGLISH	F1
U.K./British	UK_ENGLISH	F2
French	FRENCH	F3
German	GERMAN	F4
Spanish	SPANISH	F5
Swedish	SWEDISH	F6
Norwegian	NORWEGIAN	F7
Danish	DANISH	F8
Italian	ITALIAN	F9
7/8 Bit Mode Toggle		F10

---

The *Series 500 Owner's Guide* describes the keyboard layouts and ASCII character sets for each keyboard.

There are 3 ways to change from one language mapping to another. They are:

1. **Ctrl-Alt-Sysreq** key combination
2. `/etc/language` file
3. `KDSETLANG` and `KDGETLANG` `ioctl` commands

At any time when the operating system is running, the user can simultaneously type the keys **Ctrl**, **Alt** and **Sysreq** followed by a Function key, to change keyboard mapping. The function keys for each language are listed in the table above. To change to U.K. English, for example, the user would simultaneously press **Ctrl-Alt-Sysreq** then type the **F2** key. The current language will stay in effect until it is changed via a key sequence, an `ioctl` call, or until the system is rebooted. Note, on some keyboards, the `SYSREQ` key is labeled as `PRINT SCREEN`.

The **F10** key is used to toggle between 7-bit and 8-bit versions of the language type currently in use. When the system is first booted, 7-bit character sets are used by default. The **F10** key does not change the language type.

The system can be configured to boot with a particular language other than English as the default. This is done via the `/etc/language` file. If this file is present and contains a string matching one of the valid language types from the table above, then that language is mapped in immediately. If the file is not present or does not contain a valid language type, then the default language (`US_ENGLISH`) is used.

For an explanation of `KDSETLANG` and `KDGETLANG`, see the `ioctl` section that follows.

## ioctl Calls

### KDGKBTYP

This call is used to get the current keyboard type. It places one of the following numbers, as defined in `<sys/kd.h>`, at the unsigned char pointed to by the `ioctl` argument:

```
#define KB_84      1      /* 84-key keyboard */
#define KB_101    2      /* 101/102-key keyboard */
#define KB_OTHER  3      /* other type of keyboard */
```

### KDGKBMODE

This call is used to get the current keyboard mode. It returns one of the following numbers, as defined in `<sys/kd.h>`:

```
#define K_RAW      0x00   /* send up/down scan codes */
#define K_XLATE   0x01   /* translate to ascii */
```

### KDSKBMODE

This call is used to set the keyboard mode. The argument to the `ioctl` is either `K_RAW` or `K_XLATE`. By using raw mode, the program can see the raw up/down scan codes from the keyboard. In translate mode, the translation tables are used to generate the appropriate character code.

## KDGKBENT

This call is used to read one of entries in the translation tables. The argument to the `ioctl` is the address of one of the following structures, defined in `<sys/kd.h>`, with the first two fields filled in:

```

struct kentry {
    unchar kb_table;      /* which table to use */
    unchar kb_index;     /* which entry in table */
    ushort kb_value;     /* value to get/set */
}
/* Table selectors */
#define K_NORMTAB        0x00    /* normal table */
#define K_SHIFTTAB      0x01    /* shifted table */
#define K_ALTTAB        0x02    /* alt table */
#define K_ALTSHIFTTAB   0x03    /* shifted alt table */

```

The `ioctl` will get the indicated entry from the indicated table and return it in the third field.

## KDSKBENT

This call is used to set an entry in one of the translation tables. It uses the same structure as the `KDGKBENT` `ioctl`, but with the third field filled in with the value that should be placed in the translation table. This can be used to partially or completely remap the keyboard.

## KDGETLED

Used to return an unsigned character which may have any or none of the following flags (defined in `<sys/kd.h>`) set:

LED_CAP	The CAP LOCK key is set
LED_SCR	The SCROLL LOCK key is set
LED_NUM	The NUM LOCK key is set

## KDSETLED

Used to set the CAP LOCK, SCROLL LOCK, or NUM LOCK keys. The argument should contain one or all of the valid flags shown under `KDGETLED`.

**KDMKTONE**

Used to ring the bell at given frequency and for a given duration. The argument is a long integer having the following format:

lower 16 bits	Contains desired frequency
upper 16 bits	Time to ring in milliseconds

The frequency used for the normal system bell character is 1331 (decimal).

**KDGETLANG**

Used to return the current language in use on the console terminal. The argument returned is an integer which contains one of the valid language types (defined in `<sys/kd.h>`) listed previously under Foreign Character Set Support.

**KDSETLANG**

Used to change the language in use on the console terminal. Uses an integer argument which should be set to one of the valid language types (defined in `<sys/kd.h>`). The change takes effect immediately.

If the argument is 7-bit or 8-bit (defined in `<sys/kd.h>`), the terminal switches to a 7 or 8-bit version of the language currently in use.

**Files**

`/dev/console`

**See Also**

`ioctl(S)`, `display(M)`, `termio(M)`, `vt(M)`

**Name**

**killall** - Kills all active processes.

**Syntax**

*/etc/killall [signal]*

**Description**

**killall** terminates all active processes not directly related to the shutdown procedure. **killall** is used by */etc/shutdown*, and can only be run by the super-user.

**killall** terminates all processes with open files so that the mounted file systems will be unbusied and can be unmounted.

**killall** sends *signal* (see **kill(C)**). The default signal is 9.

**Files**

*/etc/shutdown*

**See Also**

**kill(C)**, **ps(C)**, **shutdown(M)**



**Name**

**layout** - Manages hard disk partitions.

**Syntax**

```
/etc/layout -c | -p driveid
/etc/layout -la|b|c|d|e|f|g|h|.spares|.restart driveid
/etc/layout [-f] [-r m|c] [-d] | [-e] | [-m] driveid
           ldevice
```

**Description**

The **layout** command is used to create, alter, and inspect the partition map on a hard disk unit. The hard disk partition map is a fixed-size table of 16 entries, each of which describes the position and size of a logical device on a hard disk. This information, along with the bad-sector map (/dev/hd?.secmap), is used by the file processor subsystem.

**CAUTION**

**Only an experienced system administrator should use this command. Running layout could make all of your files inaccessible.**

Several of these devices are informational and have fixed locations (track 0, cylinder 0). Other logical devices are made available for definition by the user.

The logical devices are:

Offset	Device	Use
0	hd0	unmapped drive
1	hd0a	user defined - default swap area on drive 0
2	hd0b	user defined - root file system on drive 0
3	hd0c	user defined
4	hd0d	user defined
5	hd0e	user defined
6	hd0f	user defined
7	hd0g	user defined
8	hd0h	user defined
9	hd0.spares	alternates for unmapped bad sectors
10	hd0.drinfo	drive configuration information (recorded during manufacturing)
11	hd0.badlist	list of bad sectors (recorded during manufacturing)
12	hd0.boot	boot program
13	hd0.restart	restart partition
14	hd0.layout	layout information
15	hd0.secmap	sector sparing map

The second hard disk (hd1) starts at 16 and the third hard disk (hd2) starts at 48.

### Layout for the Series 500 UNIX - hd0

For the Series 500, if you partition the disk with more than one partition, the *driveid* is a two-digit number. The first digit is the physical disk number (0 or 1). The second digit is the partition number (0, 1, 2, or 3). For example, if you partition your hard disk for both UNIX and DOS, the partitions are hd0 and hd01, respectively,

The following lists show the minor device number for the partitions and logical devices on the Series 500 hard disks. The major device number for all of these logical devices is 0. When UNIX is installed, minor devices 0 - 15 are automatically made. If a second hard disk is installed, only minor devices 16 - 31 are made for it.

If you want more than one UNIX partition, run `fdisk(C)` to split up the hard disk. Then run `mknod(C)` to create the logical devices for it. For example, run the following 16 commands to make the devices for the second partition (i.e., partition 1) on drive 0:

```
/etc/mknod /dev/hd01 c 0 32
/etc/mknod /dev/hd01a c 0 33
/etc/mknod /dev/hd01b c 0 34
/etc/mknod /dev/hd01c c 0 35
/etc/mknod /dev/hd01d c 0 36
/etc/mknod /dev/hd01e c 0 37
/etc/mknod /dev/hd01f c 0 38
/etc/mknod /dev/hd01.fsck c 0 39
/etc/mknod /dev/hd01h c 0 40
/etc/mknod /dev/hd01.spares c 0 41
/etc/mknod /dev/hd01.drinfo c 0 42
/etc/mknod /dev/hd01.badlist c 0 43
/etc/mknod /dev/hd01.boot c 0 44
/etc/mknod /dev/hd01.restart c 0 45
/etc/mknod /dev/hd01.layout c 0 46
/etc/mknod /dev/hd01.secmmap c 0 47
```

Minor device numbers (offset) for the partitions and logical devices are listed in the following pages.

---

**Drive 0, Partition 0**

---

<b>Offset</b>	<b>Device</b>
0	hd0 (or hd00)
1	hd0a (or hd00a)
2	hd0b (or hd00b)
3	hd0c (or hd00c)
4	hd0d (or hd00d)
5	hd0e (or hd00e)
6	hd0f (or hd00f)
7	hd0.fsck (or hd00.fsck)
8	hd0h (or hd00h)
9	hd0.spares (or hd00.spares)
10	hd0.drinfo (or hd00.drinfo)
11	hd0.badlist (or hd00.badlist)
12	hd0.boot (or hd00.boot)
13	hd0.restart (or hd00.restart)
14	hd0.layout (or hd00.layout)
15	hd0.secmap (or hd00.secmap)

---

---

**Drive 1, Partition 0**

---

<b>Offset</b>	<b>Device</b>
16	hd1 (or hd10)
17	hd1a (or hd10a)
18	hd1b (or hd10b)
19	hd1c (or hd10c)
20	hd1d (or hd10d)
21	hd1e (or hd10e)
22	hd1f (or hd10f)
23	hd1.fsck (or hd10.fsck)
24	hd1h (or hd10h)
25	hd1.spares (or hd10.spares)

---

**Drive 1, Partition 0 (Cont.)**

---

Offset	Device
26	hd1.drinfo (or hd10.drinfo)
27	hd1.badlist (or hd10.badlist)
28	hd1.boot (or hd10.boot)
29	hd1.restart (or hd10.restart)
30	hd1.layout (or hd10.layout)
31	hd1.secmap (or hd10.secmap)

---

---

**Drive 0, Partition 1**

---

Offset	Device
32	hd01
33	hd01a
34	hd01b
35	hd01c
36	hd01d
37	hd01e
38	hd01f
39	hd01.fsck
40	hd01h
41	hd01.spares
42	hd01.drinfo
43	hd01.badlist
44	hd01.boot
45	hd01.restart
46	hd01.layout
47	hd01.secmap

---

---

**Drive 1, Partition 1**

---

<b>Offset</b>	<b>Device</b>
48	hd11
49	hd11a
50	hd11b
51	hd11c
52	hd11d
53	hd11e
54	hd11f
55	hd11.fsck
56	hd11h
57	hd11.spares
58	hd11.drinfo
59	hd11.badlist
60	hd11.boot
61	hd11.restart
62	hd11.layout
63	hd11.secmmap

---

---

**Drive 0, Partition 2**

---

<b>Offset</b>	<b>Device</b>
64	hd02
	.
	.
	.
79	hd02.secmmap

---

---

**Drive 1, Partition 2**

---

<b>Offset</b>	<b>Device</b>
80	hd12
	.
	.
	.
95	hd12.secmap

---

---

**Drive 0, Partition 3**

---

<b>Offset</b>	<b>Device</b>
96	hd03
	.
	.
	.
111	hd03.secmap

---

---

**Drive 1, Partition 3**

---

<b>Offset</b>	<b>Device</b>
112	hd13
	.
	.
	.
127	hd13.secmap

---

There are two additional devices that allow access to the entire hard disk:

128 hd0.entire	All of Drive 0
144 hd1.entire	All of Drive 1

## Partition Map Creation

The **layout** command determines the size and positions of userdefinable areas from an ASCII format layout description file. Default layout descriptions are supplied, and may be altered by a knowledgeable user during the hard disk creation process. The install script and the **add.hd(C)** script are used to configure the main hard drive, and an additional drive, respectively.

On some machines, the optional Uninterruptible Power Supply (UPS) is available (for example, the Altos Series 2000). In this case, the install script asks you if a restart partition is desired, and if it is, whether it is to be made the current size of main memory, or the maximum possible memory size. This partition is used by the autorestart mechanism and may only be installed on the main drive. See **shutype(M)** for further details.

Next you are asked whether the default layout is acceptable for this disk. Select the default layout by determining the formatted size of the drive and consulting the `/etc/layouts/driveclass` file, which contains the names of default layout configuration files for different drive sizes. These files are found in the directory, `/etc/layouts/defaults`.

If the default layout is not acceptable, as in the case of a system that requires a larger-than-normal swap area, a dialogue is entered with the user (see the "Example" section that follows). As a result of this dialogue, a new layout file is created in the directory, `/etc/layouts`. The format of a layout description file is a collection of newline-terminated lines of the form:

*name\_of\_partition size\_of\_partition*

The first field is the name of the partition, the second field is the size of the partition in 512-byte blocks. The partition name must be a lowercase character in the

range **a** through **h**, or the reserved words **.restart** and **.spares**. The size field is a decimal number. The partition description lines are not required to be in any specific order. The `/etc/layouts/config` file contains a mapping between the names of various user-configurable partitions and the minor device to which they apply. A sample layout file follows.

```

a          12320
b          6720
c          10080
d          1222280
.spares    152
.restart   4096

```

Any lines in the layout file with **#** in column 1 are considered comments and are ignored.

The **layout** command uses the following rules for map creation.

Each partition is allocated in the order it is specified in the layout description file. Space is allocated starting from track 2 of cylinder 0. Unlike previous versions of *layout*, partitions are made exactly the size cited in the description file. Likewise, the size of the last partition will not be automatically adjusted to make room for the space required for the maximum number of bad sectors on a drive. This number is calculated at a track per megabyte of unformatted disk. An advisory message will NOT be produced if the last partition spills over in the bad sector reserved area. The command line options for the partition creation invocation of **layout** are:

```

/etc/layout [-f] [-r m | c] [-d] | [-e] | [-m]
           driveid ldevice

```

The value for *driveid* is a single character that selects the drive in question. The main drive's *driveid* is 0. The value for *ldevice* is usually the raw layout device for the specified drive. In the case of the main drive, this value is `/dev/rhd0.layout`.

- f This flag indicates that you want to alter a layout. A dialogue will begin and a new layout description file will be created with the values you specify.
- r This flag indicates that a restart partition is needed. You may choose between a restart partition sized the same as the maximum size of memory (m), or the current size of memory (c).
- d This flag indicates that the default layout description file for this size of disk should be used for all further operations.
- e This flag indicates that an altered layout description file for this size of disk should be used for all further operations.
- m This flag indicates that the partition map already installed on the disk should be used for all further operations.

### Layout Viewing

The **-p** option prints (on standard output) a representation of the layout information for a particular drive. This representation consists of the name of the logical device, starting block number, and starting block size in 1/2K blocks. The numbers are in decimal. The following is an example taken from an 80 Mbyte hard disk:

```
/etc/layout -p 0
```

produces:

```

/dev/hd0 0 131072
/dev/hd0a 128 12416
/dev/hd0b 12544 6784
/dev/hd0c 19328 10112
/dev/hd0d 29440 100352
/dev/hd0e 0 0
/dev/hd0f 0 0
/dev/hd0g 0 0
/dev/hd0h 129792 416
/dev/hd0.spares 16 112
/dev/hd0.restart 0 0

```

The `-l` option with partition selector is used to supply `mkfs(C)` with the size to make the corresponding file system. For example,

```
/etc/layout -ld 0
```

produces:

```
100352
```

and is best used in the following context:

```

DSIZE = `/etc/layout -ld 0`
/etc/mkfs /dev/hd0d `expr $DSIZE /2` 4 128

```

Besides `a` through `h`, the `-l` option also takes `.restart` and `.spares` as acceptable arguments.

The `-c` option reads the `/dev/hd?.drinfo` file and prints the decimal values for size of drive in megabytes, number of cylinders, number of heads, number of sectors per track, numbers of sectors per cylinder, type of drive, and recommended interleave if the drive is a SCSI. The following is the result from an 80 Mbyte ST506-type hard disk:

```

80
1024
8
16
128
ST506
0

```

Other types of drives are SCSI and ESDI. The `-c` option is intended primarily for the benefit of shell scripts used to configure hard disk drives.

### Example

For example, to add swap space to an additional drive, type `layout -f 2 /dev/rhd2.layout`. The following menu will be displayed:

```

1:a          # (extra swap area)
2:b          # (file system)
3:c          0 (not used)
4:d          0 (not used)
5:e          0 (not used)
6:f          0 (not used)
7:G          0 (not used)
8:h          0 (not used)
9: spares   # (spares for grown bad sectors)
10:
11:
12:
13: .restart # (restart memory image)
14: .extras # (currently unassigned)

command quit move display

```

To increase the swap area size (move blocks to the main swap area), type **m** (for move) and press **Retn**. A message on the screen prompts:

```
move blocks from partition #:
```

Type **14** (the partition number of currently unassigned blocks). You are asked:

```
move blocks to partition #:
```

Type **1** (for the main swap area). When prompted for the number of blocks, type the number you want to move from partition 14 to 1. Then type **d** to display the new block assignments. Finally, type **q** to quit.

## Files

<code>/etc/layouts/config</code>	Device map for configurable partitions
<code>/etc/layouts/defaults/*</code>	Default layout descriptions
<code>/etc/layouts/driveclass</code>	Drive classes file
<code>/dev/hd?.secmap</code>	Bad-sector map

## See Also

`mknod(C)`, `mkfs(M)`, `shutype(M)`

## Name

**ldunix** - Altos configurable kernel linker.

## Syntax

```
ldunix [ -d boot_directory ] -k kernel_file ]  
        [ -s system_file ]
```

## Description

**ldunix** will link special object file modules produced by **mkboot**(M) creating kernel and symbol table image files. These image files can then be processed by **mkunix**(M) to yield a bootable kernel file.

**ldunix** is a utility based on the auto-configuration boot procedure. It allows users to reconfigure a unix kernel file to reflect changes in tuneable parameters, or the addition of special purpose kernel drivers.

To create the image files, **ldunix** uses the KERNEL and system files from the current directory and the special object files from the boot.d directory. The **-d**, **-k**, and **-s** options can be used to explicitly specify the pathnames for **ldunix** to use for boot.d, KERNEL, and system, respectively.

When **ldunix** links in the modules specified by the master files and by the system file, it checks for functions with specific names in modules that are drivers. The names checked for are formed by concatenating the prefix specified in the master file and the desired suffix. For example, in a driver with the prefix "hd," if **ldunix** is checking for the suffix "intr," it will look for the function "hdintr." In most cases, if the routine is not found, the appropriate table entry gets the entry for the "nodev" routine. In the case of the "rstrt," "shut," and "init" suffixes, if there is no matching routine, no entry is made in the table.

The following suffixes are checked by `ldunix` for each load module of the given type:

**block device drivers:**

<code>intr</code>	interrupt handler
<code>open</code>	open routine
<code>close</code>	close routine
<code>strategy</code>	strategy routine
<code>print</code>	routine to call to report device errors

**character device drivers (including streams drivers):**

<code>intr</code>	interrupt handler
<code>open</code>	open routine
<code>close</code>	close routine
<code>read</code>	read routine
<code>write</code>	write routine

**all drivers:**

<code>rstrt</code>	restart routine to be called when power is restored after a power failure (if UPS is installed)
<code>shut</code>	shutdown routine to be called when power fails (if UPS is installed)
<code>init</code>	routine to be called to initialize the driver (called after all other kernel initialization is completed)

**Files**

<code>kimage</code>	Kernel image file
<code>ksymbols</code>	Kernel symbol table file

**See Also**

`mkboot(M)`, `mkunix(M)`

**Name**

**link, unlink** - Links and unlinks files and directories.

**Syntax**

```
/etc/link file1 file2
/etc/unlink file
```

**Description**

The **link** command is used to create a file name that points to another file. Linked files and directories can be removed by the **unlink** command; however, it is strongly recommended that the **rm(C)** and **rmdir(C)** commands be used instead of the **unlink** command.

The only difference between **ln(C)** and **link/unlink** is that the latter do exactly what they are told to do, abandoning all error checking. This is because they directly invoke the **link(S)** and **unlink(S)** system calls.

**See Also**

**rm(C)** and **link(S)**, **unlink(S)** in the *Reference (CP, S, F)*

**Notes**

These commands can be run only by the super-user.

## Name

**log** - Interface to STREAMS error logging and event tracing.

## Description

**Log** is a STREAMS software device driver that provides an interface for the STREAMS error logging and event tracing processes (**strerr(M)**, **strace(M)**). **Log** presents two separate interfaces: a function call interface in the kernel through which STREAMS drivers and modules submit **log** messages; and a subset of **ioctl(S)** system calls and STREAMS messages for interaction with a user level error logger, a trace logger, or processes that need to submit their own **log** messages.

## Kernel Interface

**Log** messages are generated within the kernel by calls to the function **strlog**:

```
strlog(mid, sid, level, flags, fmt, arg1, ...)
short mid, sid;
char level;
ushort flags;
char *fmt;
```

Required definitions are contained in `<sys/strlog.h>` and `<sys/log.h>`. *Mid* is the STREAMS module id number for the module or driver submitting the **log** message. *Sid* is an internal sub-id number usually used to identify a particular minor device of a driver. *Level* is a tracing level that allows for selective screening out of low priority messages from the tracer. *Flags* are any combination of `SL_ERROR` (the message is for the error logger), `SL_TRACE` (the message is for the tracer), `SL_FATAL` (advisory notification of a fatal error), and `SL_NOTIFY` (request that a copy of the message be mailed to the system administrator). *Fmt* is a `printf(S)` style format string, except that `%s`, `%e`, `%E`, `%g`, and `%G` conversion specifications are not handled. Up to `NLOGARGS` (currently 3) numeric or character arguments can be provided.

## User Interface

**Log** is opened via the **clone** interface, `/dev/log`. Each open of `/dev/log` obtains a separate *stream* to **log**. In order to receive **log** messages, a process must first notify **log** whether it is an error logger or trace logger via a `STREAMS I_STR ioctl` call (see below). For the error logger, the `I_STR ioctl` has an `ic_cmd` field of `I_ERRLOG`, with no accompanying data. For the trace logger, the `ioctl` has an `ic_cmd` field of `I_TRCLOG`, and must be accompanied by a data buffer containing an array of one or more struct `trace_ids` elements. Each `trace_ids` structure specifies an *mid*, *sid*, and *level* from which messages will be accepted. **Strlog** will accept messages whose *mid* and *sid* exactly match those in the `trace_ids` structure, and whose *level* is less than or equal to the *level* given in the `trace_ids` structure. A value of `-1` in any of the fields of the `trace_ids` structure indicates that any value is accepted for that field.

At most one trace logger and one error logger can be active at a time. Once the logger process has identified itself via the `ioctl` call, **log** will begin sending up messages subject to the restrictions noted above. These messages are obtained via the `getmsg(S)` system call. The control part of this message contains a `log_ctl` structure which specifies the *mid*, *sid*, *level*, *flags*, time in ticks since boot that the message was submitted, the corresponding time in seconds since Jan. 1, 1970, and a sequence number. The time in seconds since 1970 is provided so that the date and time of the message can be easily computed, and the time in ticks since boot is provided so that the relative timing of **log** messages can be determined.

Different sequence numbers are maintained for the error and trace logging *streams*, and are provided so that gaps in the sequence of messages can be determined (during times of high message traffic some messages may not be delivered by the logger to avoid hogging system resources). The data part of the message contains the unexpanded text of the format string (null terminated), followed by `NLOGARGS` words for the arguments to the format string, aligned on the first word boundary following the format string.

A process may also send a message of the same structure to **log**, even if it is not an error or trace logger. The only fields of the `log_ctl` structure in the control part of the message that are accepted are the level and flags fields; all other fields are filled in by **log** before being forwarded to the appropriate logger. The data portion must be packed one word each, on the next word boundary following the end of the format string.

Attempting to issue an `I_TRCLOG` or `I_ERRLOG` when a logging process of the given type already exists will result in the error `ENXIO` being returned. Similarly, `ENXIO` is returned for `I_TRCLOG` `ioctl`s without any `trace_ids` structures, or for any unrecognized `I_STR` `ioctl` calls. Incorrectly formatted **log** messages sent to the driver by a user process are silently ignored (no error results).

## Examples

Example of `I_ERRLOG` notification.

```
struct strioctl ioc;

ioc.ic_cmd = I_ERRLOG;
ioc.ic_timeout = 0; /* default timeout (15 secs.) */
ioc.ic_len = 0;
ioc.ic_dp = NULL;

ioctl(log, I_STR, &ioc);
```

Example of `I-TRCLOG` notification.

```
struct trace_ids tid[2];

tid[0].ti_mid = 2;
tid[0].ti_sid = 0;
tid[0].ti_level = 1;

tid[1].ti_mid = 1002;
tid[1].ti_sid = -1; /* any sub-id will be allowed */
tid[1].ti_level = -1; /* any level will be allowed */
```

```
ioc.ic_cmd = I_TRCLOG;
ioc.ic_timeout = 0;
ioc.ic_len = 2 * sizeof(struct trace_ids);
ioc.ic_dp = char *)tid;

ioctl(log, I_STR, &ioc);
```

Example of submitting a log message (no arguments).

```
struct strbuf ctl, dat;
struct log_ctl lc;
char *message = "Don't forget to pick up some milk \
                on the way home";

ctl.len = ctl.maxlen = sizeof(lc);
ctl.buf = (char *)&lc;

dat.len = dat.maxlen = strlen(message);
dat.buf = message;

lc.level = 0;
lc.flags = SL_ERRORSL_NOTIFY;

putmsg(log, &ctl, &dat, 0);
```

## Files

```
/dev/log
<sys/log.h>
<sys/strlog.h>
```

## See Also

`strace(M)`, `strerr(M)`, `clone(M)`, and `intro(S)`, `getmsg(S)`, `putmsg(S)` in *Reference (CP, S, F) STREAMS Programmer's Guide*

## Name

**lpadmin** - Configures the LP spooling system.

## Syntax

```
/usr/lib/lpadmin -pprinter [options]  
/usr/lib/lpadmin -xdest  
/usr/lib/lpadmin -d[dest]
```

## Description

**lpadmin** configures LP spooling systems to describe printers, classes, and devices. It is used to add and remove destinations, change membership in classes, change devices for printers, change printer interface programs and change the system default destination. **lpadmin** may not be used when the LP scheduler, **lpsched(M)**, is running, except where noted below.

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

- |                  |  |
|------------------|--|
| <b>-d[dest]</b>  | Makes <i>dest</i> , an existing destination, the new system default destination. If <i>dest</i> is not supplied, then there is no system default destination. This option may be used when <b>lpsched(M)</b> is running. No other options are allowed with <b>-d</b> . |
| <b>-pprinter</b> | Names a <i>printer</i> to which all of the options below refer. If <i>printer</i> does not exist then it will be created.  |
| <b>-xdest</b>    | Removes destination <i>dest</i> from the LP system. If <i>dest</i> is a printer and is the only member of a class, then the class will be deleted, too. No other options are allowed with <b>-x</b> .  |

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

- cclass**            Inserts printer *P* into the specified *class*. *Class* will be created if it does not already exist.
- eprinter**        Names a *printer* to which all of the options below refer. If *printer* does not exist then it will be created.
- h**                Indicates that the device associated with *P* is hardwired. This option is assumed when creating a new printer unless the **-l** option is supplied.
- iinterface**      Establishes a new interface program for *P*. *Interface* is the path name of the new program.
- mmodel**         Selects a *model* interface program for *P*. *Model* is one of the model interface names supplied with the LP software (see Models below).
- rclass**         Removes printer *P* from the specified *class*. If *P* is the last member of the *class*, then the *class* will be removed.
- vdevice**        Associates a new *device* with printer *P*. *Device* is the path name of a file that is writable by the LP administrator, **lp**. Note that there is nothing to stop an administrator from associating the same device with more than one printer. If only the **-p** and **-v** options are supplied, then **lpadmin** may be used while the scheduler is running.

## Restrictions

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

## Models

Model printer interface programs are supplied with the LP software. They are shell procedures that interface between **lpsched**(M) and devices. All models reside in the directory `/usr/spool/lp/model` and may be used as is with **lpadmin -m**. Models should have 644 permission if owned by `lp` and `bin`, or 664 permission if owned by `bin` and `bin`. Alternatively, LP administrators may modify copies of models and then use **lpadmin -i** to associate them with printers. The following list describes the models and lists the options which they may be given on the `lp` command line using the `-o` keyletter:

**dumb**           Interface for a line printer without special functions and protocol. Form feeds are assumed. Use this model to copy and modify (for printers that do not have models).

## Examples

1. To create a printer named `hp2` on port `02`, use the commands:

```
cd /usr/lib
lpshut
xTTY disable tty02
lpadmin -php2 -v/dev/tty02 -mdumb
accept hp2
lpenable hp2
lpsched
```

2. To print on `hp2`, use the command:

```
lp -dhp2 files
```

## Files

```
/usr/spool/lp/*
```

## See Also

`accept`(C), `lpenable`(C), `lp`(C), `lpsched`(M), `lpstat`(C)

## Name

**lpd** - Line printer daemon.

## Syntax

**lpd** *n*

## Description

The **lpd** command is the line printer daemon which supports multiple printer spooling. The **lpd** command is executed automatically by the **lpr(C)** command. A single daemon is used per printer device, and daemons are invoked only if there is currently no daemon active. The **lpd** command does not engage in any filtering of the data to the printer, hence printer control codes, escape sequences and other binaries will be reproduced. For serial printers, **lpr(C)** supplies **lpd** with a tty modes setting which is non-destructively used to print individual requests. The **lpd** command restores tty modes between each request, and at exit time.

The **lpr** command decides whether to invoke the **lpd** daemon based on the presence (or absence) of a "lock" file in each spool directory. A daemon will run until there is no more output for its printer. It also removes its lock file so that a new daemon may be started up. If the daemon were to terminate before removing its lock file, the lock file must be removed from its spool directory before printing can be resumed. The **lpd** command prints an optional header (specified in **lpr**), followed by a sequence of files (each followed by a formfeed).

## Options

- n*    *N* is a number that selects a spool directory and printer device. If *n* were specified as "2", /usr/spool/lpd2 and /dev/lp2 would be selected. If no number is supplied, then **lpd** assumes /dev/lp and /usr/spool/lpd. The **lpr** command invokes **lpd** with an appropriate printer selector digit.

**Related Commands**

lpr(C), printers(M)

**Files**

/usr/spool/lpd?	spool directories
/dev/lp*	printer devices
/usr/spool/lpd?/lock	lock file

## Name

**lpinit** - Adds new lineprinters to the system.

## Syntax

**/usr/lib/lpinit**

## Description

**lpinit** is a shell script for configuring and adding new lineprinters to a system. It should only be executed by the super user.

**lpinit** asks a series of questions for which the default answers are displayed. You can type a response or press **Retn** for the default answer. If you type a response to the first question, a Help message is displayed. **lpinit** prompts for the following information:

- The print device pathname (default is /dev/lp).
- The name of the printer (default is linepr).
- The pathname of the printer interface program (default is /usr/spool/lp/model/dumb).

The printer name can be any combination of up to 14 alpha numeric characters or underscores. A printer interface program can be a shell script, C program, or any executable program; or the model interface program, /usr/spool/lp/model/dumb, can be copied and modified.

After you have responded to these questions, **lpinit** stops the print scheduler, **lpsched**, changes the acceptance status of the new lineprinter to accept, and enables it to print files. **lpinit** then asks if the new printer will be the default printing destination (default is Yes). All nonspecific print requests are routed to the default destinations (see **lp(C)**).

The steps to configure a new printer can be taken separately (see **lpadmin(M)**, **accept(C)**, **lpenable(C)**, **lpsched(M)** for details).

**Files**

`/usr/lib/lpinit`

**See Also**

`accept(C)`, `lpenable(C)`, `lp(C)`, `lpadmin(M)`, `lpsched(M)`

## Name

**lpon**, **lpoff** - Turns on/off line printer scheduling.

## Syntax

**lpon**  
**lpoff**

## Description

By default, line printer scheduling is activated in Altos System V, version 5.3d. If there is no line printer attached to the system, this scheduling is superfluous; printer scheduling may be stopped, and boot-time startup of scheduling permanently disabled by using the **lpoff** command. If a printer is added to a system that has printer scheduling disabled, the **lpon** command will start scheduling and enable boot-time scheduling startup.

## Files

/etc/init.d/lpsched  
/etc/rc0.d/K36lpsched  
/etc/rc2.d/S38lpsched  
/etc/rc2.d/S02.printers  
/etc/rc2.d/s02.printers

## See Also

lp(C), lpenable(C), lpdisable(C)

## Name

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

## Syntax

```
/usr/lib/lpsched  
/usr/lib/lpshut  
/usr/lib/lpmove request... dest  
/usr/lib/lpmove dest1 dest2
```

## Description

**Lpsched** schedules requests taken by **lp(C)** for printing on line printers.

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

**Lpmove** moves requests that were queued by **lp(C)** between LP destinations. You can use this command only when **lpsched** is not running.

The first form of the command moves the named requests to the LP destination, *dest*. Requests are request ids as returned by **lp(C)**. The second form moves all requests for destination *dest1* to destination *dest2*. As a side effect, **lp(C)** will reject requests for *dest1*.

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

## Files

```
/usr/spool/lp/*
```

## See Also

**accept(C)**, **lp(C)**, **lpstat(C)**



**Name**

**makedevs** - Creates special device files.

**Syntax**

*/etc/makedevs directory*

**Description**

**Makedevs** creates all the special device files in the specified *directory* supported by the operating system.

- **Makedevs** is normally run to create the device files for the hard disk at installation time, and to repair the device directory (/dev).

**See Also**

mknod(C)

**Name**

**makekey** - Generates an encryption key.

**Syntax**

**/usr/lib/makekey**

**Description**

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

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

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

**Makekey** is intended for use with programs that perform encryption (e.g., **passwd(M)**). Usually its input and output will be pipes.

**See Also**

**ed(C)**, **vi(C)**, **passwd(M)**

## Name

**makettys** - Creates tty special files.

## Syntax

**/etc/makettys** [*directory*]

## Description

The **makettys** command creates all the special files in the specified *directory* (/dev by default) for all the serial ports (tty special files) supported by the operating system and installed hardware.

Execute this command in single-user mode.

This is done by executing the IOCHOWMANY ioctl to determine how many ports are supported for each type of communications board that is installed. If necessary, it will first remove incorrect entries. It will NOT remove special files that are not supported by the current hardware. (This could happen after a board has been removed.)

All files created have the prefix "tty," and up to three decimal digits appended. (For compatibility, ports 1-9 become tty01 - tty09.)

Currently, **makettys** supports only the SIO and Multidrop boards; other devices may be supported in the future.

**Makettys** is normally run from /etc/brc on every system boot to ensure that all tty devices are correct.

## Files

/dev default directory

## See Also

mknod(C)

**Diagnostics**

Messages appear if **makettys** can't change to the correct directory, if it is unable to execute the **IOCHOWMANY** **ioctl**, or can't create the special files.

**Makettys** will not make the pseudo file **/dev/tty**.

## Name

**master** - Master configuration database.

## Description

The **master** configuration database is a collection of files. Each file contains configuration information for a device or module that may be included in the system. A file is named with the module name to which it applies. This collection of files is maintained in a directory called `/usr/sys/master.d`. Each individual file has an identical format. For convenience, this collection of files will be referred to as the **master** file, as though it was a single file. This will allow a reference to the **master** file to be understood to mean the *individual file* in the `master.d` directory that corresponds to the name of a device or module.

The file is used by the **mkboot(M)** program to obtain device information to generate the device driver and configurable module files. It is also used by the **sysdef(M)** program to obtain the names of supported devices. **Master** consists of two parts; they are separated by a line with a dollar sign (\$) in column 1.

- Part 1 contains device information for both hardware and software devices, and loadable modules.
- Part 2 contains parameter declarations used in part 1. Any line with an asterisk (\*) in column 1 is treated as a comment.

### Part 1, Description

Hardware devices, software drivers, and loadable modules are defined with a line containing the following information. Field 1 must begin in the left-most position on the line. Fields are separated by white space (tab or blank).

Field 1: Element characteristics:

<b>o</b>	Specify only once
<b>r</b>	Required device
<b>b</b>	Block device
<b>c</b>	Character device
<b>a</b>	Generate segment descriptor array
<b>t</b>	Initialize cdevsw[.d_ttys
<b>s</b>	Software driver
<b>f</b>	STREAMS driver
<b>m</b>	STREAMS module
<b>x</b>	Not a driver; a loadable module
<i>number</i>	The first interrupt vector for a device

Field 2: Number of interrupt vectors required by a hardware device; "-" if none

Field 3: Handler prefix (4 chars. maximum)

Field 4: Software driver external major number; "-" if not a software driver, or to be assigned during execution of `ldunix(M)`

Field 5: Number of sub-devices per device; "-" if none

Field 6: Mask of which CPU's driver can run on; "-" if driver doesn't have multiprocessor knowledge

Field 7: Dependency list (optional); this is a comma separated list of other driver or modules that must be present in the configuration if this module is to be included.

For each module, two classes of information are required by `mkboot(M)`:

- External routine references
- Variable definitions

Routine and variable definition lines begin with white space and immediately follow the initial module specification line. These lines are free form; thus they may be continued arbitrarily between non-blank tokens as long as the first character of a line is white space.

## Part 1, Routine Reference Lines

If the system kernel or other dependent module contains external references to a module, but the module is not configured, then these external references would be undefined. Therefore, the routine reference lines are used to provide the information necessary to generate appropriate dummy functions at boot time when the driver is not loaded. Routine references are defined as follows:

Field 1: Routine name ()

Field 2: The routine type: one of

```
{}          routine_name(){}
{nosys}    routine_name(){return nosys();}
{nodev}    routine_name(){return nodev();}
{false}    routine_name(){return 0;}
{true}     routine_name(){return 1;}
{pass}     routine_name(){return
            first_argument;}
```

## Part 1, Variable Definition Lines

Variable definition lines are used to generate all variables required by the module. The variable generated may be an arbitrary size, initialized or not, or arrays containing an arbitrary number of elements. These variables are defined as follows:

Field 1: *Variable\_name*

Field 2: [ *expr* ] - optional field used to indicate array size

Field 3: (*length*) - required field indicating the size of the variable (see below)

Field 4: = { *expr*, ... } - optional field used to initialize individual elements of a variable

The *length* field is mandatory. It is an arbitrary sequence of length specifiers, each of which may be one of the following:

%i	Integer
%l	Long integer
os	Short integer
%c	Single character
% <i>number</i>	Field which is <i>number</i> bytes long
% <i>number</i> c	Character string which is <i>number</i> bytes long
% <i>vname</i>	<i>Length</i> is the value that variable <i>name</i> was initialized with in the corresponding <b>boot.d</b> module

For example, the length field

```
(%8c%l%0x58%l%c%c)
```

could be used to identify a variable consisting of a character string 8-bytes long, a long integer, a 0x58 byte structure of any type, another long integer, and two characters. Appropriate alignment of each % specification is performed (%*number* is word aligned) and the variable length is rounded up to the next word boundary during processing.

The expressions for the optional array size and initialization are infix expressions consisting of the usual operators for addition, subtraction, multiplication, and division: +, -, \*, and /. Multiplication and division have the higher precedence, but parentheses may be used to override the default order. The built-in functions **min** and **max** accept a pair of expressions, and return the appropriate value. The operands of the expression may be any mixture of the following:

& <i>name</i>	Address of <i>name</i> where <i>name</i> is any symbol defined by the kernel, any module loaded or any variable definition line of any module loaded
# <i>name</i>	Size of <i>name</i> where <i>name</i> is any variable name defined by a variable definition for any module loaded; the size is that of the individual variable, not of an entire array

- #C** Number of controllers present; this number is determined by the EDT for hardware devices, or by the number provided in the system file for non-hardware driver or modules
- #C(name)** Number of controllers present for the module *name*; this number is determined by the EDT for hardware devices, or by the number provided in the system file for nonhardware driver or modules
- #D** Number of devices per controllers taken directly from the current master file entry
- #D(name)** Number of devices per controller taken directly from the master file entry for the module *name*
- #M** Internal major number assigned to the current module if it is a device driver; zero if this module is not a device driver
- #M(name)** Internal major number assigned to the module *name* if it is a device driver: zero if that module is not a device driver
- name* Value of a parameter as defined in the second part of **master**
- number* Arbitrary number (octal, decimal, or hex allowed)
- string* Character string enclosed within double quotes (all of the character string conventions supported by the C language are allowed); this operand has a value which is the address of a character array containing the specified *string*

When initializing a variable, provide one initialization expression for each %i, %l, %s, or %c of the length field. The only initializers allowed for a '%number c' are either a character string (the string may not be longer than *number*), or an explicit zero. Initialization expressions must be separated by commas, and variable initialization will proceed element by element. Note that %number specifications cannot be initialized -- they are set to zero.

Only the first element of an array can be initialized, the other elements are set to zero. If there are more initializers than size specifications, it is an error and execution of the `mkboot(M)` program will be aborted. If there are fewer initializations than size specifications, zeros will be used to pad the variable. For example:

```
={"V2.L1", #C*#D, max(10,#D), #C(OTHER), #M(OTHER)}
```

would be a possible initialization of the variable whose length field was given in the preceding example.

## Part 2, Description

Parameter declarations may be used to define a value symbolically. Values can be associated with identifiers and these identifiers may be used in the variable definition lines.

Parameters are defined as follows:

Field 1: *Identifier* (8 characters maximum)

Field 2: =

Field 3: *Value* - the value may be a number (decimal, octal, or hex allowed), or a string

## Example

A sample `master` file for a tty device driver would be named `atty` if the device appeared in the EDT as `ATTY`. The driver is a character device, the driver prefix is `at`, two interrupt vectors are used, and the interrupt priority is 6. In addition, another driver named `ATLOG` is necessary for the correct operation of the software associated with this device.

```
* FLAG #VEC PREFIX SOFT #DEV CPU DEPENDENCIES/ VARIABLES
```

```
tca 2 at - 2 ATLOG
                                atpoint()(false)
                                at_tty[#C*#D] (%0x58)
                                at_cnt(%i) = { #C*#D}
                                at_logmaj (%i) = {#M(ATLOG)}
                                at_id(%8c) = { ATID}
                                at_table(%i%1%31%8s)
                                = { max(#C ATMAX).
                                &at_tty.
                                #C }

$
ATID="fred"
ATMAX=6
```

This master file will cause a routine named **atpoint** to be generated by the **mkboot(M)** program if the **ATTY** driver is not loaded, and there is a reference to this routine from any other module loaded. When the driver is loaded, the variables **at\_tty**, **at\_cnt**, **at\_logmaj**, **at\_id**, and **at\_table** will be allocated and initialized as specified. Due to the **t** flag, the **d ttys** field in the character device switch table will be initialized to point to **at\_tty** (the first variable definition line contains the variable whose address will be stored in **d ttys**). The **ATTY** driver would reference these variables by coding:

```
extern struct tty at_tty[];
extern int at_cnt;
extern int at_logmaj;
extern char at_id[8];
extern struct

{
    int member1;
    struct tty *member2;
    char junk[31];
    short member3;
} at_table;
```

**Files**

`/usr/sys/master.d/*`

**See Also**

`ldunix(M)`, `mkboot(M)`, `sysdef(M)`

**Name**

**mem, kmem** - Memory image file.

**Description**

The **mem** file provides access to the computer's physical memory. All byte addresses in the file are interpreted as memory addresses. Thus, memory locations can be examined in the same way as individual bytes in a file. Note that accessing a nonexistent location causes an error.

The **kmem** file is the same as **mem**, except that it corresponds to kernel virtual memory rather than physical memory.

In rare cases, the **mem** and **kmem** files may be used to write to memory and memory-mapped devices. Such patching is not intended for the naive user and may lead to a system crash if not conducted properly. Patching device registers is likely to lead to unexpected results if the device has read-only or write-only bits.

**Files**

/dev/mem  
/dev/kmem

**Notes**

Some of /dev/kmem cannot be read because of write-only addresses or unequipped memory addresses.

## Name

**menus** - Format of a Business Shell menu system.

## Description

A menu system is defined as a collection of menus, each of which is an ASCII text file. It is relatively easy to create a new customized Business Shell (**bsh(C)**) menu system or to modify the default menu system. The procedure to create a menu system follows.

To create a text file containing the source menu, use the following format:

```
&Menuidentifier
    . . . the substance of the menu . . .
    . . . not over 24 lines length

&Actions
    . . . zero or more sequences of . . .

~ prompt size
    . . . sequences of actions . . .
    for this prompt . . .
```

This sequence may be repeated as often as desired. The ampersand (&) and tilde (~) must appear in the first column. &Actions must appear, even if there are no actions.

The substances of each menu is composed of text which will be reproduced exactly as it appears in the location where it appears. There are five exceptions where characters have special meanings:

```
"~string"    denotes a valid "prompt" string (the text
              of the actual prompt).

"!date"      inserts the current date and time.

"!user"      inserts the current user id.

"!pwd"       inserts the current directory.

"!@"         indicates where to leave the cursor.
```

The "!" may appear as a suffix, in which case the string will be right-justified instead of left-justified.

The prompts must be reproduced as they are expected to be typed in the Actions chapter. The actions may be composed of `bsh` commands or commands which are executed by the standard shell (`/bin/sh`). The actions should all be indented one tab stop.

*Size* rows will be reserved at the bottom of the screen for output. If *size* is omitted, a value of 5 will be used. If *size* is 0, the entire screen will be used. After executing the actions, the message

```
[Type return to continue]
```

will appear at the bottom of the screen. If *size* is -1 the entire screen is used, but no message is issued; and `bsh` resumes without pause after all the actions have been executed.

Transfer to another menu is specified by writing the name of the destination menu in the semantics field.

Commands to be executed by the `bsh` interpreter must be typed one-per-line.

Commands to be executed by the operating system follow the usual conventions.

For example, the menu for Electronic Mail can be created as follows:

```
&Mail
```

```
!date      \ELECTRONIC~MAIL~SERVICES
```

```
~a - Receive~mail
```

```
~b - Send~mail
```

```
~c - Return~to~starting~menu
```

```
&Actions
```

```
~a      0
```

```
mail
```

```
~b      -1
```

```
echo -n "To whom do you wish to send mail?"
```

```
read x
```

```
echo "Now type the message."
```

```
echo "Terminate it by typing a control -d."
```

```
mail $x
```

```
~c
```

```
Start
```

## See Also

bsh(C), termcap(M)

## Name

**mkboot** - Converts an object file to a bootable object file.

## Syntax

```
/etc/mkboot [ -m master ] [ -d directory ] [ -k kernel.o ]  
driver.o ...
```

## Description

The **mkboot** command is used to create a bootable object file in a format compatible with the self-configuration program. It can only be used by the super-user. The object file specified as an argument must have a corresponding **master(M)** file in the `/usr/sys/etc/master.d` directory. The master file name for the UNIX system kernel object file is always `kernel`. The other master file names derive from their associated object file names in lowercase letters minus any optional path prefix or `".o"` suffix.

To create the new bootable object file, the applicable master file is read and the configuration information is extracted. Then, the new bootable file is created containing this configuration information and written to the `/usr/sys/boot.d` directory. It is given the same name, in uppercase letters and without the `".o"` suffix, as the object file. Note that if the current working directory is `/usr/sys/boot.d` when **mkboot** is executed, then the object file used is the previous bootable object file residing in this directory. This means that you do not have to keep separate `".o"` files.

The options are:

- |                            |   |
|----------------------------|---|
| <b>-m</b> <i>master</i>    | This option specifies the directory containing the master files to be used for the object file. The default <i>master</i> directory is <code>/usr/sys/master.d</code> . |
| <b>-d</b> <i>directory</i> | This option specifies the directory to be used for storing the new bootable object file. The default output <i>directory</i> is <code>/usr/sys/boot.d</code> .          |

**-k *kernel.o*** This option specifies the name of the object file for the operating system. The master file name used for this object file is always named *kernel*.

The name of the object file for a module or driver is specified by the *driver.o* argument.

### Example

```
mkboot -m newmaster genty.o
```

This will read the file name *genty* from the directory *newmaster* for the *genty* device configuration data, take the file *genty.o* from the current directory and create the formatted file */usr/sys/boot.d/GENTTY* containing the configuration information for the *genty*.

### See Also

*mkunix(M)*, *master(M)*

### Diagnostics

Most messages are self-explanatory.

***name.o*: not processed; cannot open */etc/master.d/name***

The file *name.o* was specified on the command line but there was no master file in the *master.d* directory for *name.o*.

***name.o*: not processed**

An error has aborted processing for the named object file.

## Name

**mkfs** - Constructs a file system.

## Syntax

```
/etc/mkfs special blocks[:inodes] [gap blocks/cyl]
/etc/mkfs special proto [gap blocks/cyl]
```

## Description

Mkfs constructs a file system by writing on the *special* file using the values found in the remaining arguments of the command line. The command waits 10 seconds before starting to construct the file system. During this 10-second pause the command can be aborted by entering a delete (**Break/Del**).

If the second argument is a string of digits, the size of the file system is the value of *blocks* interpreted as a decimal number. This is the number of *physical* (512 byte) disk blocks the file system will occupy. If the number of inodes is not given, the default is the number of *logical* (1024 byte) blocks divided by 4. Mkfs builds a file system with a single empty directory on it. The boot program block (block zero) is left uninitialized.

If the second argument is the name of a file that can be opened, **mkfs** assumes it to be a prototype file *proto*, and will take its directions from that file. The prototype file contains tokens separated by spaces or new-lines. A sample prototype specification follows (line numbers have been added to aid in the explanation):

```
1. /stand/diskboot
2. 4872 110
3. d--777 3 1
4. usr      d--777 3 1
5.          sh      ---755 3 1 /bin/sh
6.          ken     d--755 6 1
7.          $
8.          b0      b--644 3 1 0 0
9.          c0      c--644 3 1 0 0
10.         $
11. $
```

Line 1 in the example is the name of a file to be copied onto block zero as the bootstrap program.

Line 2 specifies the number of *physical* (512 byte) blocks the file system is to occupy and the number of inodes in the file system. Lines 3-9 tell mkfs about files and directories to be included in this file system.

Line 3 specifies the root directory.

Lines 4-6 and 8-9 specifies other directories and files.

The \$ on line 7 tells mkfs to end the branch of the file system it is on, and continue from the next higher directory. The \$ on lines 10 and 11 end the process, since no additional specifications follow.

File specifications give the mode, the user ID, the group ID, and the initial contents of the file. Valid syntax for the contents field depends on the first character of the mode.

The mode for a file is specified by a 6-character string. The first character specifies the type of the file. The character range is `-bcd` to specify regular, block special, character special and directory files respectively. The second character of the mode is either `u` or `-` to specify set-user-id mode or not. The third is `g` or `-` for the set-group-id mode. The rest of the mode is a 3 digit octal number giving the owner, group, and other read, write, execute permissions (see `chmod(C)`).

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

If the file is a regular file, the next token of the specification may be a path name whence the contents and size are copied. If the file is a block or character special file, two decimal numbers follow which give the major and minor device numbers. If the file is a directory, mkfs makes the entries `.` and `..` and then reads a list of names and (recursively) file specifications for the entries in the directory. As noted above, the scan is terminated with the token `$`.

The final argument in both forms of the command specifies the rotational *gap* and the number of *blocks/cyl*. The following values are recommended:

Device	Gap Size	Blks/Cyl
30M Hard Disk	8	90
72M Hard Disk	8	162 (CDC Wren II)
72aM Hard Disk	8	144 (Micropolis)
72bM Hard Disk	8	198 (Priam)
72cM Hard Disk	8	198 (Fujitsu)
Floppy Disk	4	18

Mkfs uses a gap size in multiples of 4. If the *gap* and *blocks/cyl* are not specified or are considered illegal values a default value of gap size 4 and 400 blocks/cyl is used.

### See Also

chmod(C), dir(F), and fs(F) in the *Reference (CP, S, F)*

### Notes

With a prototype file, it is not possible to copy in a file larger than 64K bytes, nor is there a way to specify links. The maximum number of inodes configurable is 65500.

## Name

**mkunix** - Makes a bootable system file with kernel and driver symbol tables.

## Syntax

```
/etc/mkunix [ -i kernel_file ] [ -o unix_file ]
```

## Description

The **mkunix** command will create an absolute, bootable system file (*new\_namelist*) from the UNIX system kernel file and the object files created by **mkboot(M)**. This procedure completes the generation of a new */unix*. It can only be used by the super-user.

The resulting *unix\_file* can be used as the *kernel\_file* for **ps(C)**, etc. In addition, this file may be booted directly, bypassing the self-configuration phase of the boot process. This will save on the order of 30 to 60 seconds at boot time.

*Kernel\_file* (defaults to the path name specified as the **BOOT** program in the */usr/sys/system* file) is read to obtain the object, data, and symbol table for the basic kernel. This name, if specified, must be the same as that used in */usr/sys/system* for the boot line; if not, a warning diagnostic is issued since the resulting *namelist* file will not be accurate.

The argument **-o *unix\_file*** (defaults to **a.out**) is the new file - a bootable image of the current operating system with the composite symbol table.

## See Also

**mkboot(M)**, **ps(C)**, and **nm(CP)** in the *Reference (CP, S, F)*

## Name

**mnttab** - Mounted file system table.

## Syntax

```
#include <mnttab.h>
```

## Description

The `/etc/mnttab` file contains a table of devices mounted by the `mount(C)` command.

Each table entry contains the pathname of the directory on which the device is mounted, the name of the device special file, the read/write permissions of the special file, and the date on which the device was mounted.

The maximum number of entries in `mnttab` is based on the system parameter `NMOUNT` located in `/usr/include/mnttab.n`, which defines the number of allowable mounted special files.

## See Also

`mount(C)`

**Name**

**multiuser, singleuser** - Causes the system to enter multi-user or single-user mode.

**Syntax**

```
/etc/multiuser  
/etc/singleuser
```

**Description**

This command can only be used by the super-user.

**Multiuser** changes the system mode of operation from single-user to multi-user. **Multiuser** performs system startup functions such as mounting file systems and starting various daemons and spoolers. The **/etc/telinit 2** command is executed to tell **init(M)** to enter multi-user mode (run level 2).

**Singleuser** causes the system to kill all currently running processes and enter system maintenance mode (run level 1).

**See Also**

**init(M), shutdown(M), who(C)**

## Name

**ncheck** - Generates path names from inode numbers.

## Syntax

```
/etc/ncheck [ -i inode... ] [ -a ] [ -s ] [ file-system ]
```

## Description

Ncheck with no arguments generates a path-name vs. inode list of all files on a set of default file systems (see */etc/checklist*). Names of directory files are followed by *./.*

The options are as follows:

- i Limits the report to only those files whose inode numbers follow.
- a Allows printing of the names *.* and *./.*, which are ordinarily suppressed.
- s Limits the report to special files and files with set-user-ID mode. This option may be used to detect violations of security policy.

*File-system* must be specified by the file system's special file. The report should be sorted so that it is more useful.

## See Also

*fsck*(C), *sort*(C)

## Diagnostics

If the file system structure is not consistent, *??* denotes the "parent" of a parentless file and a path-name beginning with *...* denotes a loop.

**Name**

**null** - The null file.

**Description**

Data written on a null special file is discarded. Reads from a null special file always return 0 bytes.

**Files**

/dev/null

**Name**

**options** - Floppy disk installation menu.

**Syntax**

**options**

**Description**

The **options** command displays the installation menu on the operating system Root diskette.

To display this menu, first go to system maintenance mode. Then boot the system from the Root File System floppy disk. Type **options** to display the menu.

Use this menu to initially install or upgrade the operating system, restore data from a cartridge tape, shut down the system, or exit to the shell.

## Name

**passwd** - The password file.

## Description

The `/etc/passwd` file contains the following information for each user:

- Login name
- Encrypted password
- Numerical user ID
- Numerical group ID
- Comment
- Initial working directory
- Program to use as shell

This is an ASCII file. Each field within each user's entry is separated from the next by a colon (:). The comment can contain any desired information; it typically contains the user's real name. Each user is separated from the next by a newline. If the password field is null, no password is demanded; if the shell field is null, the `sh(C)` command is used.

This file resides in the directory `/etc`. Because the passwords are encrypted, the file has general read permission and can be used, for example, to map numerical user IDs to names.

The encrypted password consists of 13 characters chosen from a 64-character alphabet (`.`, `/`, `0-9`, `A-Z`, `a-z`), except when the password is null, in which case the encrypted password is also null. Password aging is in effect for a particular user if his encrypted password in the password file is followed by a comma and a nonnull string of characters from the above alphabet. (Such a string must be introduced by the super-user.) The first character of the age denotes the maximum number of weeks for which a password is valid.

A user who attempts to log in after his password has expired will be forced to supply a new one. The next character denotes the minimum period in weeks which must expire before the password may be changed. The remaining characters define the week (counted from the beginning of 1970) when the password was last changed. (A null string is equivalent to zero.) The first and second characters must have numerical value in the range 0-63, where the dot (.) is equal to 0 and lowercase z is equal to 63. If the numerical value of both characters is 0, the user will be forced to change his password the next time he logs in. If the second character is greater than the first, only the super-user will be able to change the password.

### Files

/etc/passwd

### See Also

group(M), login(C), passwd(C)

## Name

**printers** - Printer spooler configuration file.

## Description

Using the printer spooler facility `lpr(C)`, you can print a specified list of files on one or several line printers. Additionally, a printer on a machine connected to WorkNet can be shared by other machines on the same net. Such printers may need to have an arbitrary set of terminal modes set for tab expansion, baud rate, etc.

The system printer configuration file (`/etc/printers`) consists of lines of printer configuration information. These include WorkNet machine names, tty types, device names, and tty modes. Each line in the `/etc/printers` file is of the form:

```
lp[p]:name:ttytype:[netname]:[ttymodes]
```

Fields are separated by colons (`:`) and may not contain spaces between the colon separators and field values. The length of each line may not exceed 128 characters. Comments are permitted in the configuration file. A comment line begins with `"#"` in the first column. Any fields surrounded by `"[]"` are optional, although their colon separators are not. That is, if a field position is to be empty, its place must be marked by two colons (`::`).

The fields are:

- |                |   |
|----------------|---|
| <b>lp[p]</b>   | The printer device selected. Allowable values for <i>p</i> are null or 0 - 255. This value is used to specify one of several printers.  |
| <b>name</b>    | A tag by which a particular configuration line can be selected. Allowable values are alphanumeric strings, which do not contain the <code>"."</code> character.                       |
| <b>ttytype</b> | Exists for the convenience of word processing programs that derive printer control sequences from <code>/etc/termcap</code> (or similar database). (Not used by the printer spooler.) |

- netname* May be null, which indicates that spooling is to take place on the requestor's machine. Other values are network machine names. The print spooler uses this name to do remote printing.
- ttymodes* A list of whitespace-delimited tty mode specifications, such as would be supplied to stty.

### Example

The following example shows the contents of a printer configuration file (the contents of /etc/printers):

```
# a printer configuration file
lp:calcite:NEC3510:gateway:
lp:galena:Oki93::-tabs 1200 nl
lp0:obsidian:I9:Marketing:tabs 9600 nl
lp1:feldspar:epson::nl tabs 9600
lp2:mica:TI810:Finance:9600 -tabs
```

In this example:

The first line uses the /dev/lp printer on the machine named "gateway." The printer type is "NEC3510" and no tty modes are set on that printer. This line may be selected by specifying "calcite" to lpr.

The next line specifies the /dev/lp printer on the user's local machine (note the null *netname* field), is type Oki93 and sets tab expansion (-tabs), 1200 baud operation, and no linefeed to cr-lf expansion. This line is selected with the name "galena."

The third line requests /dev/lp0, is on the Marketing machine, runs the printer at 9600 baud, etc., is type I9, and is selected by the name "obsidian."

The last two lines use /dev/lp1 on the local machine, and /dev/lp2 on the Finance machine.

**Files**

/etc/printers

Printer mode control file

**Related Commands**

lpr(C), lpd(M), tty(M), lp(C)

## Name

**profile** - Sets up an environment at login time.

## Description

The optional file `.profile` permits automatic execution of commands when a user logs into `/bin/sh` and other shells (except `/bin/csh`). Use this file to personalize a user's work environment by setting exported environment variables and terminal mode (see `environ(M)`).

When a user logs in, the user's login shell looks for `.profile` in the login directory. If found, the shell executes the commands in the file before beginning the session. The commands in the file must match the command as if typed at the keyboard. Any line beginning with the number sign (`#`) is considered a comment and is ignored. The following is an example of a typical file:

```
# Tell me when new mail comes in
MAIL=/usr/mail/myname
# Add my /bin directory to the shell search sequence
PATH=$PATH:$HOME/bin
# Make some environment variables global
export MAIL PATH TERM
# Set file creation mask
umask 22
```

The file `/etc/profile` is a system-wide profile that, if it exists, is executed for every user before the user's `.profile` is executed.

## Files

```
$HOME/.profile
/etc/profile
```

## See Also

`env(C)`, `mail(C)`, `sh(C)`, `stty(C)`, `su(C)`, `login(M)`, `environ(M)`

## Name

**pwck, grpck** - Checks password/group file.

## Syntax

```
/etc/pwck [file]
/etc/grpck [file]
```

## Description

**Pwck** scans the password file and notes any inconsistencies. The checks include validation of the number of fields, login name, user ID, group ID, and whether the login directory and the program-to-use-as-shell exist. The default password file is `/etc/passwd`.

**Grpck** verifies all entries in the group file. This verification includes a check of the number of fields, group name, group ID, and whether all login names appear in the password file. The default group file is `/etc/group`.

## Files

```
/etc/group
/etc/passwd
```

## See Also

`group(M)`, `passwd(M)`

## Diagnostics

Group entries in `/etc/group` with no login names are flagged.

## Name

**rc0** - Runs commands performed to stop the operating system.

## Syntax

**/etc/rc0**

## Description

This file is executed at each system state change that needs to have the system in an inactive state. It is responsible for those actions that bring the system to a quiescent state, traditionally called "shutdown." This command can be used only by the superuser.

The system state that requires this procedure is:

state 0 - system halt state

Whenever a change to one of these states occurs, the **/etc/rc0** procedure is run. The entry in **/etc/inittab** might read:

```
hlt0:0:once:/etc/rc0 </dev/console >/dev/console 2>&l
```

Some of the actions performed by **/etc/rc0** are carried out by files beginning with K in **/etc/rc0.d**. These files are executed in ASCII order (see files below for more information), terminating some system service. The combination of commands in **/etc/rc0** and files in **/etc/rc0.d** determines how the system is shut down.

The recommended sequence for **/etc/rc0** is:

1. Stop System Services and Daemons.

Various system services (such as a local area network or LP spooler) are gracefully terminated.

When new services are added that should be terminated when the system is shut down, the appropriate files are installed in **/etc/rc0.d**.

## 2. Terminate Processes

SIGTERM signals are sent to all running processes by `killall(C)`. Processes stop themselves cleanly if sent SIGTERM.

## 3. Kill Processes

SIGKILL signals are sent to all remaining processes; no process can resist SIGKILL.

At this point the only processes left are those associated with `/etc/rc0` and processes 5 and 1, which are special to the operating system.

## 4. Unmount All File Systems

Only the root file system (/) remains mounted.

Depending on which system state the system ends up in (0 or 6), the entries in `/etc/inittab` will direct what happens next. If the `/etc/inittab` has not defined any other actions to be performed as in the case of system state 0, then the operating system will have nothing to do. It should not be possible to get the system's attention. The only thing that can be done is to turn off the power or possibly get the attention of a firmware monitor.

## Files

The execution by `/bin/sh` of any files in `/etc/rc0.d` occurs in ASCII sort-sequence order. See `rc2(M)` for more information.

## See Also

`killall(C)`, `rc2(M)`, `shutdown(M)`

**Name**

**rc2** - Runs commands performed for multi-user environment.

**Syntax**

**/etc/rc2**

**Description**

This file is executed via an entry in **/etc/inittab** and is responsible for those initializations that bring the system to a ready-to-use state, traditionally state 2, called the "multi-user" state. This command can be used only by the super-user.

The actions performed by **/etc/rc2** are found in files in the directory **/etc/rc.d** and files beginning with S in **/etc/rc2.d**. These files are executed by **/bin/sh** in ASCII sort-sequence order (see "Files" for more information). When functions are added that need to be initialized when the system goes multi-user, an appropriate file should be added in **/etc/rc2.d**.

The functions done by **/etc/rc2** command and associated **/etc/rc2.d** files include:

- Setting and exporting the TZ variable.
- Setting-up and mounting the user (**/usr**) file system.
- Cleaning up (remaking) the **/tmp** and **/usr/tmp** directories.
- Loading the network interface and ports cards with program data and starting the associated processes.
- Starting the cron daemon by executing **/etc/cron**.
- Cleaning up (deleting) uucp lock, status, and temporary files in the **/usr/spool/uucp** directory.

Other functions can be added, as required, to support the addition of hardware and software features.

## Examples

The following are prototypical files found in `/etc/rc2.d`. These files are prefixed by an S and a number indicating the execution order of the files.

```
MOUNTFILESYS
#   Set up and mount file systems

cd /
/etc/mountall /etc/fstab
RMTMPFILES
# clean up /tmp
rm -rf /tmp
mkdir /tmp
chmod 777 /tmp
chgrp sys /tmp
chown sys /tmp
uucp
#   clean-up uucp locks, status, and temporary files

rm -rf /usr/spool/locks/*
```

The file `/etc/TIMEZONE` is included early in `/etc/rc2`, thus establishing the default time zone for all commands that follow.

## Files

Here are some hints about files in `/etc/rc.d`:

The order in which files are executed is important. Since they are executed in ASCII sort-sequence order, using the first character of the file name as a sequence indicator will help keep the proper order. Thus, files starting with the following characters would be:

```
[0-9] very early
[A-Z] early
[a-n] later
[o-z] last
```

Files in `/etc/rc.d` that begin with a dot (`.`) will not be executed. This feature can be used to hide files that are not to be executed for the time being without removing them.

Files in `/etc/rc2.d` must begin with an **S** or a **K** followed by a number and the rest of the file name. Upon entering run level 2, files beginning with **S** are executed with the **start** option; files beginning with **K**, are executed with the **stop** option. Files beginning with other characters are ignored.

### See Also

`rc0(M)`, `shutdown(M)`

**Name**

**sadcon, sadcoff** - Turns on/off system activity data collector.

**Syntax**

**sadcon**  
**sadcoff**

**Description**

By default, the system activity data collector is deactivated in Altos System V, version 5.3d. The data collector may be started, and boot-time startup of the collector enabled by using the **sadcon** command. A subsequent **sadcoff** command will disable boot-time data collector startup.

**Files**

**/etc/init.d/sadc**  
**/etc/rc2.d/S34sadc**  
**/usr/spool/cron/crontabs/sys**  
**/usr/spool/cron/crontabs/adm**

**See Also**

**sar(C), cron(C)**

## Name

**sar:** **sa1**, **sa2**, **sadc** - System activity report package.

## Syntax

```
/usr/lib/sa/sadc [t n] [ofile]
/usr/lib/sa/sa1 [t n]
/usr/lib/sa/sa2 [-ubdycwaqvmpRSDA] [-s time] [-e time]
[-i sec]
```

## Description

System activity data can be accessed at the special request of a user (see **sar(C)**) and automatically on a routine basis as described here. The operating system contains a number of counters that are incremented as various system actions occur. These include counters for CPU utilization, buffer usage, disk and tape I/O activity, TTY device activity, switching and system-call activity, file-access, queue activity, inter-process communications, paging, and Remote File Sharing.

**Sadc** and shell procedures, **sa1** and **sa2**, are used to sample, save, and process this data.

**Sadc**, the data collector, samples system data *n* times every *t* seconds and writes in binary format to *ofile* or to standard output. If *t* and *n* are omitted, a special record is written. This facility is used at system boot time, when booting to a multiuser state, to mark the time at which the counters restart from zero. For example, the `/etc/init.d/perf` file writes the restart mark to the daily data by the command entry:

```
su sys -c "/usr/lib/sa/sadc /usr/adm/sa/sa`date +%d`"
```

The shell script **sa1**, a variant of **sadc**, is used to collect and store data in binary file `/usr/adm/sa/sardd` where *dd* is the current day. The arguments *t* and *n* cause

records to be written  $n$  times at an interval of  $t$  seconds, or once if omitted. The `/usr/spool/cron/crontabs/sys` (see `cron(C)`) entries:

```
0 * * * 0-6 /usr/lib/sa/sal
20.40 8-17 * * 1-5 /usr/lib/sa/sal
```

will produce records every 20 minutes during working hours and hourly otherwise.

The shell script `sa2` writes a daily report in file `/usr/adm/sa/sardd`. The `/usr/spool/cron/crontabs/sys` entry:

```
5 18 * * 1-5 /usr/lib/sa/sa2 -s 8:00 -e 18:01 -i 1200 -A
```

will report important activities hourly during the working day. The structure of the binary daily data file is:

```
struct sa
(
    struct sysinfo si;          /* see/usr/include/sys/sysinfo.h */
    struct minfo mi;          /* defined in sys/sysinfo.h */
    struct dinfo di;          /* RFS info defined in sys/sysinfo.h */
    int minserve, maxserve;    /* RFS server low and high water
    * marks */

    int szinode;              /* current size of inode table */
    int szfile;              /* current size of file table */
    int szproc;              /* current size of proc table */
    int szlckf;              /* current size of file record header table */
    int szlckr;              /* current size of file record lock table */
    int mszinode;            /* size of inode table */
    int mszfile;            /* size of file table */
    int mszproc;            /* size of proc table */
    int mszlckf;            /* maximum size of file record header table */
    int mszlckr;            /* maximum size of file record lock table */
    long inodeovf;          /* cumulative overflows of inode table */
    long fileovf;          /* cumulative overflows of file table */
    long procovf;          /* cumulative overflows of proc table */
    time_t ts;              /* time stamp, seconds */
    long devio[NDEVS][4];    /* device unit information */
    #define IO_OPS 0          /* cumulative I/O requests */
    #define IO_BCNT 1        /* cumulative blocks transferred */
    #define IO_ACT 2         /* cumulative drive busy time in ticks */
    #define IO_RESP 3        /* cumulative I/O resp time in ticks */
);
```

**Files**

<i>/usr/adm/sa/sadd</i>	Daily data file
<i>/usr/adm/sa/sarddl</i>	Daily report file
<i>/tmp/sa.adrfl</i>	Address file

**See Also**

*cron(C)*, *sar(C)*

## Name

**shutdown** - Brings a system to single-user mode or to shutdown.

## Syntax

```
/etc/shutdown [ -y ] [ -ggrace_period ] [ -iinit_state ]
```

## Description

This command is executed by the super-user to change the state of the machine. By default, it brings the system to a state where only the console has access to the system. This state is traditionally called "single-user."

The command sends a warning message (via `wall(C)`) and a final message before it starts actual shutdown activities. By default, the command asks for confirmation before it starts shutting down daemons and killing processes. The options are as follows:

- y** Pre-answers the confirmation question so the command can be run without user intervention. A default of 60 seconds is allowed between the warning message and the final message. Another 60 seconds is allowed between the final message and the confirmation.
- g*grace\_period*** Allows the super-user to change the number of seconds from the 60-second default. You can specify a number from 0 to 999 to delay shutdown for that amount of time following notification to the users. If 0 is entered, shutdown will be immediate, and if no parameter is given, 60 seconds is assumed.
- i*init\_state*** Specifies the state that `init(M)` is to be put in following the warnings, if any. By default, system state "s" is used (the same as states "1" and "S").

Other recommended system state definitions are:

state 0 Shut the machine down so it is safe to remove the power. Have the machine remove power if it can. The `/etc/rc0` procedure is called to so this work.

state 1, s, S Bring the machine to the state traditionally called single-user. The `/etc/rc0` procedure is called to do this work. (Though `s` and `1` are both used to go to single-user state, `s` only kills processes spawned by `init` and does not unmount file systems. State `1` unmounts everything except root and kills all user processes, except those that relate to the console.

state5 Stop the system and go to the firmware monitor.

state 6 Stop the system and reboot to the state defined by the `initdefault` entry in `/etc/inittab`.

### See Also

`wall(C)`, `init(M)`, `rc0(M)`, `rc2(M)`

## Name

**shutype** - UPS shutdown configuration utility.

## Syntax

```
shutype [-p] [-ttype] [-ffailtime] [-cpwrent] [-uuptime]
          [wpwvertime] [-etermtime]
```

## Description

The **shutype** command allows the alteration of the current configurable settings for a UPS power failure condition. The six configuration settings that can be changed are:

- |                    |   |
|--------------------|---|
| <b>-ttype</b>      | The type of shutdown that is to be initiated for a power failure condition. This option causes the following to occur: the <b>shutkill</b> command issues a SIGPWR signal to all processes, and then posts SIGTERM and SIGKILL signals to the processes; a <b>sync(S)</b> command is then executed to maintain the integrity of the file system; a <b>shutsave</b> command delivers the SIGPWR signal to all processes, but saves memory to disk so a later restart can be attempted. |
| <b>-ffailtime</b>  | The time in ticks to wait to check for a power failure condition after the first power failure condition was detected. This is used to check if a power glitch only has occurred.   |
| <b>-cpwrent</b>    | The maximum number of power failure interrupts that can occur within the above FAILTIME time interval before the power source is considered to be unreliable.   |
| <b>-uuptime</b>    | The time in seconds that the UPS battery backup unit can operate reliably after power has been turned off.  |
| <b>-wpwvertime</b> | The time in seconds for the system to wait after posting the SIGPWR signal to all processes before initiating shutdown procedures.  |

**-etermtime** The time in seconds for the system to wait after posting the SIGTERM signal to all processes before posting the SIGKILL signal to all processes. This is only used when the **shutkill** option is in effect.

If no options are given, **shutype** will prompt you for each of the above parameters. A null response followed by a carriage return will leave the current configuration value the same.

The **-p** option will print out the current settings of the above mentioned configurable parameters. No other options are allowed to be given with the **-p** option.

A sanity check will be done on any and all of the values entered. If the shutdown type is **shutkill**, the total times of *termtime*, *pwrtime*, and *failtime* cannot exceed the value of *uptime*.

If the shutdown type is **shutsave**, the total times of *pwrtime* and *failtime* plus the estimated disk output time cannot exceed *uptime*. The estimated disk output time will be printed if no options are given, or the **-p** option is given. If there are any inconsistencies, appropriate error message will be output.

Only the super-user is allowed to change any of the above mentioned configurable parameters.

See Also

**shuttype(S)**

## Name

**strace** - Prints STREAMS trace messages.

## Syntax

**strace** [ *mid sid level* ]...

## Description

**Strace** without arguments writes all STREAMS event trace messages from all drivers and modules to its standard output. These messages are obtained from the STREAMS log driver (**log(M)**). If arguments are provided they must be in triplets of the form *mid, sid, level*, where *mid* is a STREAMS module id number, *sid* is a sub-id number, and *level* is a tracing priority level. Each triplet indicates that tracing messages are to be received from the given module/ driver, sub-id (usually indicating minor device), and priority level equal to or less than the given level. The token *all* may be used for any member to indicate no restriction for that attribute.

The format of each trace message output is:

*<seq>* *<time>* *<ticks>* *<level>* *<flags>* *<mid>* *<sid>* *<text>*

where:

<i>&lt;seq&gt;</i>	trace sequence number
<i>&lt;time&gt;</i>	time of message in hh:mm:ss
<i>&lt;ticks&gt;</i>	time of message in machine ticks since boot
<i>&lt;level&gt;</i>	tracing priority level
<i>&lt;flags&gt;</i>	E: message is also in the error log
	F: indicates a fatal error
	N: mail was sent to the system administrator
<i>&lt;mid&gt;</i>	module id number of source
<i>&lt;sid&gt;</i>	sub-id number of source
<i>&lt;text&gt;</i>	formatted text of the trace message

Once initiated, **strace** will continue to execute until terminated by the user.

## Examples

Output all trace messages from the module or driver whose module id is 41:

```
strace 41 all all
```

Output those trace messages from driver/module id 41 with sub-ids 0, 1, or 2:

```
strace 41 0 1 41 1 1 41 2 0
```

Messages from sub-ids 0 and 1 must have a tracing level less than or equal to 1. Those from sub-id 2 must have a tracing level of 0.

## Notes

Due to performance considerations, only one **strace** process is permitted to open the STREAMS log driver at a time. The log driver has a list of the triplets specified in the command invocation, and compares each potential trace message against this list to decide if it should be formatted and sent up to the **strace** process. Hence, long lists of triplets will have a greater impact on overall STREAMS performance. Running **strace** will have the most impact on the timing of the modules and drivers generating the trace messages that are sent to the **strace** process. If trace messages are generated faster than the **strace** process can handle them, then some of the messages will be lost. This last case can be determined by examining the sequence numbers on the trace messages output.

## See Also

log(M), and *STREAMS Programmer's Guide*

## Name

**strclean** - STREAMS error logger cleanup program.

## Syntax

```
strclean [ -d logdir ] [-a age ]
```

## Description

**Strclean** is used to clean up the STREAMS error logger directory on a regular basis (for example, by using **cron(M)**). By default, all files with names matching **error.\*** in **/usr/adm/streams** that have not been modified in the last 3 days are removed. A directory other than **/usr/adm/streams** can be specified using the **-d** option. The maximum age in days for a log file can be changed using the **-a** option.

## Example

```
strclean -d/usr/adm/streams -a 3
```

has the same result as running **strclean** with no arguments.

## Notes

**strclean** is typically run from **cron(M)** on a daily or weekly basis.

## Files

```
/usr/adm/streams/error.*
```

## See Also

**cron(C)**, **strerr(M)**, and *STREAMS Programmer's Guide*

**Name**

**strerr** - STREAMS error logger daemon.

**Syntax**

**strerr**

**Description**

**Strerr** receives error log messages from the STREAMS log driver (**log(M)**) and appends them to a log file. The error log files produced reside in the directory `/usr/adm/streams`, and are named `error.mm-dd`, where *mm* is the month and *dd* is the day of the messages contained in each log file.

The format of an error log message is:

`<seq> <time> <ticks> <flags> <mid> <sid> <text>`

where:

<code>&lt;seq&gt;</code>	error sequence number
<code>&lt;time&gt;</code>	time of message in hh:mm:ss
<code>&lt;ticks&gt;</code>	time of message in machine ticks since boot
<code>&lt;flags&gt;</code>	T: message was also sent to a tracing process F: indicates a fatal error N: send mail to the system administrator
<code>&lt;mid&gt;</code>	module id number of source
<code>&lt;sid&gt;</code>	sub-id number of source
<code>&lt;text&gt;</code>	formatted text of the error message

Messages that appear in the error log are intended to report exceptional conditions that require the attention of the system administrator. Those messages which indicate the total failure of a STREAMS driver or module should have the F flag set. Those messages requiring the immediate attention of the administrator will have the N flag set, which causes the error logger to send the message to the system administrator via `mail(C)`. Messages with a module id of 0 are generated by the kernel.

## Notes

Only one `strerr` process at a time is permitted to open the STREAMS log driver. If a module or driver is generating a large number of error messages, running the error logger will cause a degradation in STREAMS performance. If a large burst of messages are generated in a short time, the log driver may not be able to deliver some of the messages. This situation is indicated by gaps in the sequence numbering of the messages in the log files.

## Files

`~/usr/adm/streams/error.mm-dd`

## See Also

`log(M)`, and *STREAMS Programmer's Guide*

## Name

**sulogin** - Special login program invoked by init (via /etc/inittab) to bring the machine up in single-user or multi-user mode.

## Syntax

**sulogin**

## Description

**Sulogin** prompts you for system maintenance (single-user) mode or multi-user mode.

If you select single-user mode by typing a valid root password, the system is brought up in system maintenance (single-user) mode by executing the shell script /etc/singleuser. If you select multiuser mode by typing **Ctrl-d**, or there is no response for 5 seconds, **sulogin** will execute the shell script file /etc/multiuser, which will bring the system up in multi-user mode.

## Files

/etc/multiuser  
/etc/singleuser  
/etc/inittab

## See Also

init(M)

## Name

**sysdef** - Outputs system definition.

## Syntax

```
/etc/sysdef [ system_namelist [ master.d ] ]
```

## Description

**Sysdef** outputs the current system definition in tabular form. It lists all hardware devices, their local bus addresses, and unit count, as well as pseudo devices, system devices, loadable modules and the values of all tunable parameters. It generates the output by analyzing the named operating system file (*system\_namelist*) and extracting the configuration information from the name list itself. The operating system file must be an "absolute" boot file (see **mkunix(M)**).

## Files

/unix	Default operating system file (where the system namelist is)
/usr/sys/master.d/*	Default directory containing master files

## See Also

**mkunix(M)**, **master(M)**, and **nlist(S)** in the *Reference (CP, S, F)*

## Diagnostics

*internal name list overflow*  
if the master table contains more than an internally specified number of entries for use by **nlist(S)**.

## Name

**term** - Compiled term file.

## Description

Compiled terminfo descriptions are placed under the directory `/usr/lib/terminfo`. To avoid a linear search of a huge system directory, a two-level scheme is used: `/usr/lib/terminfo/c/name` where *name* is the name of the terminal, and *c* is the first character of name. Thus, `act4` can be found in the file `/usr/lib/terminfo/a/act4`. Synonyms for the same terminal are implemented by multiple links to the same compiled file.

The format has been chosen so that it will be the same on all hardware. An eight (or more) bit byte is assumed, but no assumptions about byte ordering or sign extension are made.

The compiled file is created with the terminfo compiler (`tic(C)`) program, and read by the routine `setupterm(S)`. Both of these pieces of software are part of `curses(S)`. The file is divided into six parts: the header, terminal names, boolean flags, numbers, strings, and string table.

The headers section begins the file. This section contains six short integers in the following format.

- The magic number (octal 0432).
- The size, in bytes, of the names section.
- The number of bytes in the boolean section.
- The number of short integers in the numbers section.
- The number of offsets (short integers) in strings section.
- The size, in bytes, of the string table.

Short integers are stored in two 8-bit bytes. The first byte contains the least significant 8 bits of the value, and the second byte contains the most significant 8 bits. (Thus, the value represented is  $256 * \text{second} + \text{first}$ .) The

value -1 is represented by 0377,0377; other negative values are illegal. The -1 generally means that a capability is missing from this terminal. Machines where this does not correspond to the hardware read the integers as two bytes and compute the result.

The terminal names section comes next. It contains the first line of the terminfo description, listing the various names for the terminal, separated by the '|' character. The section is terminated with an ASCII NUL character.

The boolean flags have one byte for each flag. This byte is either 0 or 1 as the flag is present or absent. The capabilities are in the same order as the file <term.h>.

Between the boolean section and the number section, a null byte will be inserted, if necessary, to ensure that the number section begins on an even byte. All short integers are aligned on a short word boundary.

The numbers section is similar to the flags section. Each capability takes up two bytes, and is stored as a short integer. If the value represented is -1, the capability is taken to be missing.

The strings section is also similar. Each capability is stored as short integer, in the format above. A value of -1 means the capability is missing. Otherwise, the value is taken as an offset from the beginning of the string table. Special characters in ^X or /c notation are stored in their interpreted form, not the printing representation. Padding information \$<nn> and parameter information =%x are stored intact in uninterpreted form.

The final section is the string table. It contains all the values of string capabilities referenced in the string section. Each string is null terminated.

Note that it is possible for **setupterm** to expect a different set of capabilities than are actually present in the file. Either the database may have been updated since **setupterm** has been recompiled (resulting in extra unrecognized entries in the file) or the program may have been recompiled more recently than the database was updated (resulting in missing entries). The routine **setupterm** must be prepared for both possibilities -- this is why the



**Name**

**termcap** - Terminal capability database.

**Description**

The file `/etc/termcap` is a data base describing terminals. Terminals are described in **termcap** by a set of capabilities and how operations are performed. Padding requirements and initialization sequences are included in **termcap**. Note that the use of **term(M)** is preferred.

Entries in **termcap** consist of a number of ':' separated fields. The first entry for each terminal gives the names known for the terminal, separated by vertical bar (|) characters. The first name is always 2 characters long for compatibility with older systems. The second name given is the most common abbreviation for the terminal, and the last name given should be a long name fully identifying the terminal. The second name should contain no blanks; the last name may well contain blanks for readability.

**Capabilities**

The following is a list of the capabilities that can be defined for a given terminal. In this list (P) indicates padding may be specified, and (P\*) indicates that padding may be based on the number of lines affected.

Name	Type	Pad?	Description
ae	str	(P)	End alternate character set
al	str	(P*)	Add new blank line
am	bool		Terminal has automatic margins
as	str	(P)	Start alternate character set
bc	str		Backspace if not ^H
BE	str		Bell character
bs	bool		Terminal can backspace with ^H
BS	str		Sent by BACKSPACE key (if not bc)
bt	str	(P)	Back tab
bw	bool		Backspace wraps from column 0 to last column

Name	Type	Pad?	Description
CC	str		Command character in prototype if terminal settable
cd	str	(P*)	Clear to end of display
ce	str	(P)	Clear to end of line
CF	str		Cursor off
ch	str	(P)	Like cm but horizontal motion only, line stays same
CL	str		Sent by CHAR LEFT key
cl	str	(P*)	Clear screen
cm	str	(P)	Cursor motion
CN	str		Sent by CANCEL key
co	num		Number of columns in a line
CO	str		Sent by CHAR RIGHT key
cr	str	(P*)	Carriage return, (default ^M)
cs	str	(P)	Change scrolling region (vt100), like cm
cv	str	(P)	Like ch but vertical only
CW	str		Sent by CHANGE WINDOW key
da	bool		Display may be retained above
db	bool		Display may be retained below
dB	num		Number of millisecc of bs delay
dC	num		Number of millisecc of cr delay
dc	str	(P*)	Delete character
dF	num		Number of millisecc of ff delay
DK	str		Sent by down arrow key (if not kd)
DL	str		Sent by DELETE key
DL	str		Sent by destructive character delete key
dl	str	(P*)	Delete line
dm	str		Delete mode (enter)
dN	number		Number of millisecc of nl delay needed
do	str		Down one line
ed	str		End delete mode
EE	str		Edit mode end
EG	num		Number of chars taken by ES and EE
ei	str		End insert mode; give ':ei-:'
EN	str		Sent by END key
eo	str		Erase overstrikes with a blank
ES	str		Edit mode start
ff	str	(P*)	Hardcopy terminal page eject (default ^L)
G1	str		Upper-right (1st quadrant) corner character

Name	Type	Pad?	Description
G2	str		Upper-left (2nd quadrant) corner character
G3	str		Lower-left (3rd quadrant) corner character
G4	str		Lower-right (4th quadrant) corner character
GD	str		Down-tick character
GE	str		Graphics mode end
GG	num		Number of chars taken by GS and G
GH	str		Horizontal bar character
GS	str		Graphics mode start
GU	str		Up-tick character
GV	str		Vertical bar character
hc	bool		Hardcopy terminal
hd	str		Half-line down (forward 1/2 linefeed)
hz	str		Hazeltine; can't print 's
ic	str	(P)	Insert character
if	str		Name of file containing is
im	bool		Insert mode (enter); give ':im=:q' if ic
in	bool		Insert mode distinguishes nulls on display
ip	str	(P*)	Insert pad after character inserted
is	str		Terminal initialization string
k0-k9	str		Sent by 'other' function keys 0-9
kb	str		Sent by backspace key
kd	str		Sent by terminal down arrow key
ke	str		Out of 'keypad transmit' mode
KF	str		Key-clock off
kh	str		Sent by home key
kl	str		Sent by terminal left arrow key
kn	num		Number of 'other' keys
KO	str		Key-clock on
ko	str		Termcap entries for other non-function keys
kr	str		Sent by terminal right arrow key
ks	str		Put terminal in 'keypad transmit' mode
dT	num		Number of millisec of tab delay needed
ku	str		Sent by terminal up arrow key
l0-19	str		Labels on 'other' function keys
LD	str		Sent by line delete key

Name	Type	Pad?	Description
LF	str		Sent by line feed key
li	num		Number of lines on screen or page
LK	str		Sent by left arrow key (if not kl)
ll	str		Last line, first column (if no cm)
ma	str		Arrow key map, used by vi version 2 only
mi	bool		Safe to move while in insert mode
ml	str		Memory lock on above cursor
MN	str		Sent by minus sign key
MP	str		Multiplan initialization string
MR	str		Multiplan reset string
mu	str		Memory unlock (turn off memory lock)
nc	bool		No correctly working carriage return (DM25000,H2000)
nd	str		Non-destructive space (cursor right)
nl	str	(P*)	Newline character (default /n)
ns	bool		Terminal is a CRT but doesn't scroll
NU	str		Sent by NEXT UNLOCKED CELL key
os	bool		Terminal overstrikes
pc	str		Pad character (rather than null)
PD	str		Sent by PAGE DOWN key
PL	str		Sent by PAGE LEFT key
PR	str		Sent by PAGE RIGHT key
PS	str		Sent by plus sign key
pt	bool		Has hardware tabs (may need to be set with is)
PU	str		Sent by PAGE UP key
RC	str		Sent by RECALC key
RF	str		Sent by TOGGLE REFERENCE key
RK	str		Sent by right arrow key (if not kr)
RT	str		Sent by RETURN key
RT	str		Sent by return key
se	str		End stand out mode
sf	str	(P)	Scroll forward
sg	num		Number of blank chars left by so or se
so	str		Begin stand out mode
sr	str	(P)	Scroll reverse (backwards)
ta	str	(P)	Tab (other than ^I or with padding)
TB	str		Sent by TAB key
tc	str		Entry of similar terminal - must be last
te	str		String to end programs that use cm

Name	Type	Pad?	Description
ti	str		String to begin programs that use cm
uc	str		Underscore one char and move past it
ue	str		End underscore mode
ug	num		Number of blank chars left by use or ue
UK	str		Sent by up arrow key (if not ku)
ul	bool		Terminal underlines even though it doesn't overstrike
up	str		Upline (cursor up)
us	str		Start underscore mode
vb	str		Visible bell (may not move cursor)
ve	str		Sequence to end open/visual mode
vs	str		Sequence to start open/visual mode
WR	str		Sent by WORD RIGHT key
xb	bool		Beehive (f1=escape, f2=ctrl C)
xn	bool		A newline is ignored after a wrap (Concept)
xr	bool		Return acts like ce /r /n (Delta Data)
xs	bool		Standard out not erased by writing over it (HP 264?)
xt	bool		Tabs are destructive, magic so char (Telaray 1061)

### A Sample Entry

Entries may continue onto multiple lines by giving a \ as the last character of a line, and empty fields may be included for readability (here between the last field on a line and the first field on the next). Capabilities in `termcap` are of three types:

- Boolean capabilities which indicate that the terminal has some particular feature.
- Numeric capabilities giving the size of the terminal or the size of particular delays
- String capabilities, which give a sequence which can be used to perform particular terminal operations.

The following entry describes the Altos II terminal.

```
a2|altos2|alt2|altos 2|Altos II:\
:cd=\E[J:ce=\E[K:cl=\E:cl=\E[:H\E[2J:\
:up=\E[1A:do=\E[1B:nd=\E[1C:bc=\E[1D:cm=\E[%i%d;%dH:ho=\E[H:\
:al=\E[L:dl=\E[M:ic=\E[@:dc=\E[P:im=:ei=: \
:co#80:li#24:ug#0:sg#0:bs:pt:sr:\
:so=\E[7m:se=\E[m:us=\E[4m:ue=\E[m:\
:is=\E>\E[?31\E[?41\E[?51\E[?7h\E[?8H:if=/usr/lib/tabset/vt100:\
:ku=\E[A:kd=\E[B:kr=\E[C:kl=\E[D:kh=\E[f:kb=`H:cr=`M:\
:XU=`Aq\r:XD=`Ar\r:XR=`As\r:XL=`At\r:\
:YU=`AQ\r:YD=`AR\r:YR=`AS\r:YL=`AT\r:\
:HL=`AP\r:\
:IS=\E[@:DE=\E[P:IL=\E[L:DL=\E[M:NS=\E[S:PS=\E[T:\
:LO=\E[0q:LC=\E[5q:LL=\E[6q:\
:k0=`A@r:k1=`AA\r:k2=`AB\r:k3=`AC\r:\
:k4=`AD\r:k5=`AE\r:k6=`AF\r:k7=`AG\r:\
:k8=`AH\r:k9=`AI\r:kA=`AJ\r:kB=`AK\r:\
:kC=`AL\r:kD=`AM\r:kE=`AN\r:kF=`AO\r:\
:c0=`A`r:c1=`Aa\r:c2=`Ab\r:c3=`Ac\r:\
:c4=`Ad\r:c5=`Ae\r:c6=`Af\r:c7=`Ag\r:\
:c8=`Ah\r:c9=`Ai\r:cA=`Aj\r:cB=`Ak\r:\
:cC=`Al\r:cD=`Am\r:cE=`An\r:cF=`Ao\r:
```

## Type of Capabilities

All capabilities have two letter codes. For instance, the fact that the Concept has 'automatic margins' (i.e., an automatic return and linefeed when the end of a line is reached) is indicated by the capability **am**. Hence the description of the Concept includes **am**. Numeric capabilities are followed by the character '#' and then value. Thus **co**, which indicates the number of columns the terminal has, gives the value '80' for the Concept.

Finally, string valued capabilities, such as **ce** (clear to end of line sequence) are given by the two character code, an '=', and then a string ending at the next following ':'. A delay in milliseconds may appear after the '=' in such a capability, and padding characters are supplied by the editor after the remainder of the string is sent to provide this delay. The delay can be either an integer, e.g., '20', or an integer followed by an '\*', i.e., '3\*'. A '\*' indicates that the padding required is proportional to the number of lines affected by the operation, and the amount given is the per-affected-unit padding required.

When a '\*' is specified, it is sometimes useful to give a delay of the form '3.5' to specify a delay per unit to tenths of milliseconds.

A number of escape sequences are provided in the string-valued capabilities for easy encoding of characters there. A \E maps to an ESCAPE character, ^x maps to a control-x for any appropriate x, and the sequence \n \r \t \b \f give a newline, return, tab, backspace and formfeed. Finally, characters may be given as three octal digits after a \, and the characters ^ and \ may be given as \^ and \\. If it is necessary to place a : in a capability it must be escaped in octal as \072. If it is necessary to place a null character in a string capability it must be encoded as \200. The routines that deal with **termcap** use C strings, and strip the high bits of the output very late so that a \200 comes out as \000 would.

## Preparing Descriptions

We now outline how to prepare descriptions of terminals. The most effective way to prepare a terminal description is by imitating the description of a similar terminal in **termcap** and to build up a description gradually, using partial descriptions. Be aware that a very unusual terminal may expose deficiencies in the ability of the **termcap** file to describe it.

## Basic Capabilities

The number of columns on each line for the terminal is given by the **co** numeric capability. If the terminal is a CRT, then the number of lines on the screen is given by the **li** capability. If the terminal wraps around to the beginning of the next line when it reaches the right margin, then it should have an **am** capability. If the terminal can clear its screen, then this is given by the **cl** string capability. If the terminal can backspace, then it should have the **bs** capability, unless a backspace is accomplished by a character other than ^H in which case you should give this character as the **bc** string capability. If it overstrikes (rather than clearing a position when a character is struck over) then it should have the **os** capability.

A very important point here is that the local cursor motions encoded in `termcap` are undefined at the left and top edges of a CRT terminal. The editor will never attempt to backspace around the left edge, nor will it attempt to go up locally off the top. The editor assumes that feeding off the bottom of the screen will cause the screen to scroll up, and the `am` capability tells whether the cursor sticks at the right edge of the screen. If the terminal has switch selectable automatic margins, the `termcap` file usually assumes that this is on, i.e., `am`.

These capabilities suffice to describe hardcopy and 'glass-tty' terminals. Thus the model 33 teletype is described as:

```
t3|33|tty33:co#72:os
```

while the Lear Siegler ADM-3 is described as:

```
c1|adm3|3|lsi adm3:am:bs:c1=``:li#24:co#80
```

### Cursor Addressing

Cursor addressing in the terminal is described by a `cm` string capability, with `printf(S)`-like escapes (`%x`) in it. These substitute to encodings of the current line or column position, while other characters are passed through unchanged. If the `cm` string is thought of as being a function, then its arguments are the line and then the column to which motion is desired, and the `%` encodings have the following meanings:

<code>%d</code>	as in <code>printf</code> , 0 origin
<code>%2</code>	like <code>%2d</code>
<code>%3</code>	like <code>%3d</code>
<code>%</code>	like <code>%c</code>
<code>%+x</code>	adds <code>x</code> to value, then <code>%</code>
<code>%&gt;xy</code>	if value <code>&gt; x</code> adds <code>y</code> , no output
<code>%r</code>	reverses order of line and column, no output
<code>%i</code>	increments lines/column (for 1 origin)
<code>%%</code>	gives a single <code>%</code>
<code>%n</code>	exclusive-or (xor) row and column with 0140 (DM2500)
<code>%B</code>	BCD ( $16*(x/10) + (x \bmod 10)$ ), no output
<code>%d</code>	Reverse coding ( $x-2*(x \bmod 16)$ ), no output (Delta Data)

Consider the HP2645, which, to get to row 3 and column 12, needs to be sent `\E&a12c03Y` padded for 6 milliseconds. Note that the order of the rows and columns is inverted here, and that the row and column are printed as two digits. Thus its `cm` capability is `'cm=6\E&r%2c%2Y'`. The Microterm ACT-IV needs the current row and column sent preceded by a `^T`, with the row and column simply encoded in binary, `'cm=^T%%'`. Terminals which use `'%` need to be able to backspace the cursor (`bs` or `bc`), and to move the cursor up one line on the screen (`up` introduced below). This is necessary because it is not always safe to transmit `\t`, `\n ^D` and `\r`, as the system may change or discard them.

A final example is the LSI ADM-3a, which uses row and column offset by a blank character, thus `'cm=\E=%+ %+ '`.

### Cursor Motions

If the terminal can move the cursor one position to the right, leaving the character at the current position unchanged, then this sequence should be given as `nd` (non-destructive space). If it can move the cursor up a line on the screen in the same column, this should be given as `up`. If the terminal has no cursor addressing capability, but can home the cursor (to very upper left corner of screen) then this can be given as `ho`; similarly, a fast way of getting to the lower left hand corner can be given as `ll`; this may involve going up with `up` from the home position, but the editor will never do this itself (unless `ll` does) because it makes no assumption about the effect of moving up from the home position.

### Area Clears

If the terminal can clear from the current position to the end of the line, leaving the cursor where it is, this should be given as `ce`. If the terminal can clear from the current position to the end of the display, then this should be given as `cd`. The editor only uses `cd` from the first column of a line.

### Insert/Delete Line

If the terminal can open a new blank line before the line where the cursor is, this should be given as **al**; this is done only from the first position of a line. The cursor must then appear on the newly blank line. If the terminal can delete the line which the cursor is on, then this should be given as **dl**; this is done only from the first position on the line to be deleted. If the terminal can scroll the screen backwards, then this can be given as **sb**, but just **al** suffices. If the terminal can retain display memory above, then the **da** capability should be given; if display memory can be retained below then **db** should be given. These let the editor understand that deleting a line on the screen may bring non-blank lines up from below, or that scrolling back with **sb** may bring down non-blank lines.

### Insert/Delete Character

There are two basic kinds of intelligent terminals with respect to insert/delete character which can be described using **termcap**. The most common insert/delete character options affect only the characters on the current line and shift characters off the end of the line. Other terminals, such as the Concept 100 and the Perkin Elmer Owl, make a distinction between typed and untyped blanks on the screen, shifting upon an insert or delete only to an untyped blank on the screen which is either eliminated, or expanded to two untyped blanks.

You can find out which kind of terminal you have by clearing the screen and then typing text separated by cursor motions. Type **abc def** using local cursor motions (not spaces) between the **abc** and the **def**. Then position the cursor before the 'abc' and put the terminal in insert mode. If typing characters causes the rest of the line to shift rigidly and characters to fall off the end, then your terminal does not distinguish between blanks and untyped positions. If the 'abc' shifts over to the 'def,' which then move together around the end of the current line and onto the next as you insert, you have the second type of terminal, and should give the capability **in**, which stands for 'insert null'. If your terminal does something different and unusual then you may have to modify the edi-

tor to get it to use the insert mode your terminal defines. No known terminals have an insert mode not falling into one of these two classes.

The editor can handle both terminals that have an insert mode and terminals which send a simple sequence to open a blank position on the current line. Give as `im` the sequence to get into insert mode, or give it an empty value if your terminal uses a sequence to insert a blank position. Give as `ei` the sequence to leave insert mode (give an empty value also if you gave `im` an empty value). Now give as `ic` any sequence needed to be sent just before sending the character to be inserted. Most terminals with a true insert mode will not give `ic`; terminals that send a sequence to open a screen position should give it here. (Insert mode is preferable if a terminal has both.) If post insert padding is needed, give this as a number of milliseconds in `ip` (a string option). Any other sequence which may need to be sent after an insert of a single character may also be given in `ip`.

It is occasionally necessary to move around while in insert mode to delete characters on the same line (e.g., if there is a tab after the insertion position). If your terminal allows motion while in insert mode you can give the capability `mi` because of the way its insert mode works.

Finally, you can specify delete mode by entering `dm` and `ed` to enter and exit delete mode, and `dc` to delete a single character while in delete mode.

### Highlighting, underlining, and visible bells

If your terminal has sequences to enter and exit standout mode, these can be given as `so` and `se` respectively. If there are several types of standout mode, (such as inverse video, blinking, or underlining), the preferred mode is inverse video by itself. If the code to change into or out of standout mode leaves one or even two blank spaces on the screen, as the TVI 912 and Teleray 1061 do, this is acceptable, and although it may confuse some programs slightly, it can't be helped.

Codes to begin underlining and end underlining can be given as **us** and **ue** respectively. If the terminal has a code to underline the current character and move the cursor one space to the right, such as the Microterm Mime, this can be given as **uc**. (If the underline code does not move the cursor to the right, give the code followed by a nondestructive space.)

If the terminal has a way of flashing the screen to indicate an error quietly (a bell replacement) then this can be given as **vb**; it must not move the cursor. If the terminal should be placed in a different mode during open and visual modes of **ex**, this can be given as **vs** and **ve**, sent at the start and end of visual mode respectively. These can be used to change from a underline to a block cursor and back.

If the terminal needs to be in a special mode when running a program that addresses the cursor, the codes to enter and exit this mode can be given as **ti** and **te**. This arises, for example, from terminals like the Concept with more than one page of memory. If the terminal has only memory-relative cursor addressing and not screen relative cursor addressing, a one screen-sized window must be fixed into the terminal for cursor addressing to work properly.

If your terminal correctly generates underlined characters (with no special codes needed), even though it does not overstrike, then you should give the capability **ul**. If overstrikes are erasable with a blank, then this should be indicated by giving **eo**.

## Keypad

If the terminal has a keypad that transmits codes when the keys are pressed, this information can be given. Note that it is not possible to handle terminals where the keypad only works in local mode (this applies for example, to the unshifted HP 2621 keys). If the keypad can be set to transmit or not transmit, give these codes as **ks** and **ke**. Otherwise the keypad is assumed to always transmit. The codes sent by the left arrow, right arrow, up arrow, down arrow, and home keys can be given as **kl**, **kr**, **ku**, **kd**, and **kh** respectively. If there are function keys such as **f0**, **f1**, ..., **f9**, the codes they send can be given as **k0**, **k1**, ..., **k9**. If these keys have labels other than the default

f0 through f9, the labels can be given as **10**, **11**, ..., **19**. If there are other keys that transmit the same code as the terminal expects for the corresponding function, such as clear screen, the **termcap** 2 letter codes can be given in the **ko** capability, for example, **':ko=cl,ll,sf,sb:'**, which says that the terminal has clear, home down, scroll down, and scroll up keys that transmit the same thing as the **cl**, **ll**, **sf**, and **sb** entries.

The **ma** entry is also used to indicate arrow keys on terminals which have single character arrow keys. It is obsolete but still in use in version 2.0 of **vi**, which must be run on some minicomputers due to memory limitations. This field is redundant with **kl**, **kr**, **ku**, **kd**, and **kh**. It consists of groups of two characters. In each group, the first character is what an arrow key sends, the second character is the corresponding **vi** command. These commands are **h** for **kl**, **j** for **kd**, **k** for **ku**, **l** for **kr**, and **H** for **kh**. For example, the mime would be **:ma=^Kj^k^Xl:** indicating arrow keys left (**^H**), down (**^K**), up (**^**), and right (**^X**). (There is no home key on the mime.)

### Miscellaneous

If the terminal requires other than a null (zero) character as a pad, then this can be given as **pc**.

If tabs on the terminal require padding, or if the terminal uses a character other than **^I** to tab, then this can be given as **ta**.

Hazeltine terminals, which don't allow **'^^'** characters to be printed should indicate **hz**. Datamedia terminals, which echo carriage-return linefeed for carriage return and then ignore a following linefeed should indicate **nc**. Early Concept terminals, which ignore a linefeed immediately after an **am** wrap, should indicate **xn**. If an erase-eol is required to get rid of standout (instead of merely writing on top of it), **xs** should be given. Teleray terminals, where tabs turn all characters moved over to blanks, should indicate **xt**. Other specific terminal problems may be corrected by adding more capabilities of the form **xz**. Other capabilities include **is**, an initialization string for the terminal, and **if**, the name of a file containing long initialization strings. These strings are expected to properly clear and then set the tabs on the terminal,

if the terminal has settable tabs. If both are given, is will be printed before if. This is useful where if is /usr/lib/tabset/atd, but is clears the tabs first.

### Similar Terminals

If there are two very similar terminals, one can be defined as being just like the other with certain exceptions. The string capability `tc` can be given with the name of the similar terminal. This capability must be **last** and the combined length of the two entries must not exceed 1024. Since `termlib` routines search the entry from left to right, and since the `tc` capability is replaced by the corresponding entry, the capabilities given at the left override the ones in the similar terminal. A capability can be cancelled with `xx@`, where `xx` is the capability. For example:

```
hh|2621nl:ks@:ke@:tc=2621:
```

This defines a 2621nl that does not have the `ks` or `ke` capabilities, and hence does not turn on the function key labels when in visual mode. This is useful for different modes for a terminal, or for different user preferences.

### Files

/etc/termcap            File containing terminal descriptions.

### Related Commands

`ex(C)`, `tset(C)`, `more(C)`

### Credit

This utility was developed at the University of California at Berkeley and is used with permission.

## Notes

Use of `term(M)` is preferred.

`Ex(C)` allows only 256 characters for string capabilities, and the routines in `termcap` do not check for overflow of this buffer. The total length of a single entry (excluding only escaped newlines) may not exceed 1024.

The `ma`, `vs`, and `ve` entries are specific to the `vi(C)` program.

Not all programs support all entries. There are entries that are not supported by any program.

**Name**

**terminals** - Supported terminals.

**Description**

The **/etc/termcap** file and the **/usr/lib/terminfo** directory contain two types of descriptions: terminals that have been tested and are supported by Altos, and terminals that are supplied for information only. The corresponding names can be used to assign the terminal type to TERM (see **environ(M)**).

If you wish to add a terminal from the "information only" section of one of the terminfo files, choose a description that closely resembles the terminal you are adding. Put the terminal description in a file, and edit it to suit your needs. Use **tic(C)** to compile the file by typing the following:

**tic filename**

**Files**

**/etc/termcap**  
**/usr/lib/terminfo/\*/\***

## Name

**terminfo** - Terminal capability database.

## Syntax

`/usr/lib/terminfo/*/*`

## Description

**Terminfo** is a database describing terminals, used, for example, by **curses(S)**. Terminals are described in **terminfo** by giving a set of capabilities that they have, and by describing how operations are performed. Padding requirements and initialization sequences are included.

Entries in **terminfo** consist of a number of comma-separated fields. White space after each comma (,) is ignored. The first entry for each terminal gives the names which are known for the terminal, separated by vertical bar (|) characters. The first name given is the most common abbreviation for the terminal, the last name given should be a long name fully identifying the terminal, and all others are understood as synonyms for the terminal name. All names but the last should be in lower case and contain no blanks, the last name may well contain upper case and blanks for readability.

Terminal names (except for the last, verbose entry) should be chosen using the following conventions. The particular piece of hardware making up the terminal should have a root name chosen, thus **alt3** for the Altos III terminal. This name should not contain hyphens, except that synonyms may be chosen that do not conflict with other names. Modes that the hardware can be in, or user preferences, should be indicated by appending a hyphen and an indicator of the mode. Thus, a **vt100** in 132 column mode would be **vt100-w**. The following suffixes should be used where possible:

Suffix	Meaning	Example
-w	Wide mode (more than 80 columns)	vt100-w
-am	With auto. margins (usually default)	vt100-am
-nam	Without automatic margins	vt100-nam
-n	Number of lines on the screen	aaa-60
-na	No arrow keys (leave them in local)	c100-na
-np	Number of pages of memory	c100-4p
-rv	Reverse video	c100-rv

## Capabilities

The variable is the name by which the programmer (at the terminfo level) accesses the capability. The capname is the short name used in the text of the database, and is used by a person updating the database. The i.code is the two letter internal code used in the compiled database, and always corresponds to the old `termcap(M)` capability name.

Capability names have no hard length limit, but an informal limit of five characters has been adopted to keep them short and to allow the tabs in the source file caps to line up nicely. Whenever possible, names are chosen to be the same as or similar to the ANSI X3.64-1979 standard. Semantics are also intended to match those of the specification.

(P) indicates that padding may be specified

(G) indicates that the string is passed through `tparm` with parms as given (*#i*)

(\*) indicates that padding may be based on the number of lines affected

(*#i*) indicates the *i*th parameter

Variable	Cap- name	Termcap Code	Description
<u>Booleans:</u>			
auto_left_margin,	bw	bw	cubl wraps from column 0 to last column
auto_right_margin,	am	am	Terminal has automatic margins
beehive_glitch,	xs	xb	Beehive (f1=escape, f2=ctrl C)
ceol_standout_glitch,	xhp	xs	Standout (not erased by overwriting (hp)
eat_newline_glitch,	xenl	xn	newline ignored after 80 cols (Concept)
erase_overstrike,	eo	eo	Can erase overstrikes with a blank
generic_type,	gn	gn	Generic line type (e.g., dialup, switch)
hard_copy,	hc	hc	Hardcopy terminal
has_meta_key,	km	km	Has a meta key (shift, sets parity bit)
has_status_line,	hs	hs	Has extra "status line"
insert_null_glitch,	in	in	Insert mode distinguishes nulls
memory_above,	da	da	Display may be retained above the screen
memory_below,	db	db	Display may be retained below the screen
move_insert_mode,	mir	mi	Safe to move while in insert modes
move_standout_mode,	msgr	ms	Safe to move in standout modes
over_strike,	os	os	Terminal overstrikes
status_line_esc_ok,	eslok	es	Escape can be used on the status line
teleray_glitch,	xt	xt	Tabs ruin. magic so char (Teleray 1061)
tilde_glitch,	hz	hz	Hazeltine: cannot print '~'s
transparent_underline,	ul	ul	Underline character overstrikes
xon_xoff,	xon	xo	Terminal uses xon/xoff handshaking

Numbers:

column,	cols	co	Number of columns in a line
init_tabs,	it	it	Tabs initially every # spaces
lines,	lines	li	Number of lines on screen or page
lines_of_memory,	lm	lm	Lines of memory if > lines. 0 means varies
magic_cookie_glitch,	xmc	sg	Number of blank chars left by smso or rmso
padding_baud_rate,	pb	pb	Lowest baud where cr/nl padding is needed
virtual_terminal,	vt	vt	Virtual terminal number (UNIX system)
width_status_line,	ws1	ws	No. columns in status line

Variable	Cap- name	Termcap Code	Description
<u>Strings:</u>			
acs_chars	acsc	ac	Graphic char set pairs aAbBcC - def = vt100+
back_tab,	cbt	bt	Back tab (P)
bell,	bel	bl	Audible signal (bell) (P)
carriage_return,	cr	cr	Carriage return (P*)
change_scroll_region,	csr	cs	Change to lines #1 through #2 (vt100) (PG)
clear_all_tabs,	tbc	ct	Clear all tab stops (P)
clear_screen,	clear	cl	Clear screen and home cursor (P*)
clr_eol,	el	ce	Clear to end of line (P)
clr_eos,	ed	cd	Clear to end of display (P*)
column_address,	hpa	ch	Set cursor column (PG)
command_character,	cmdch	CC	Term.settable cmd char in prototype
cursor_address,	cup	cm	Screen rel. cursor motion row #1 col #2 (PG)
cursor_down,	cudl	do	Down one line
cursor_home	home	ho	Home cursor (if no cup)
cursor_invisible,	civis	vi	Make cursor invisible
cursor_left,	cubl	le	Move cursor left one space
cursor_mem_address,	mrcup	CM	Memory relative cursor addressing
cursor_normal,	cnorm	ve	Make cursor appear normal (undo vs/vi)
cursor_right,	cuf1	nd	Non-destructive space (cursor right)
cursor_to_11,	11	11	Last line, first column (if no cup)
cursor_up,	cuul	up	Upline (cursor up)
cursor_visible,	cvvis	vs	Make cursor very visible
delete_character,	dch1	dc	Delete character (P*)
delete_line,	d11	dl	Delete line (P*)
dis_status_line,	dsl	ds	Disable status line
down_half_line,	hd	hd	Half-line down (forward 1/2 linefeed)
enter_alt_charset_mode,	smacs	as	Start alternate character set (P)
enter_blink_mode,	blink	mb	Turn on blinking
enter_bold_mode,	bold	md	Turn on bold (extra bright) mode
enter_ca_mode,	smcup	ti	String to begin programs that use cup
enter_delete_mode,	smdc	dm	Delete mode (enter)
enter_dim_mode,	dim	mh	Turn on half-bright mode
enter_insert_mode,	smir	im	Insert mode (enter)
enter_protected_mode,	prot	mp	Turn on protected mode
enter_reverse_mode,	rev	mr	Turn on reverse video mode
enter_secure_mode,	invis	mk	Turn on blank mode (chars invisible)
enter_standout_mode,	sms0	so	Begin stand out mode
enter_underline_mode,	smul	us	Start underscore mode

Variable	Cap- name	Termcap Code	Description
erase_chars	ech	ec	Erase #1 characters (PG)
exit_alt_charset_mode.	rmacs	ae	End alternate character set (P)
exit_attribute_mode.	sgr0	me	Turn off all attributes
exit_ca_mode.	rmcup	te	String to end programs that use cup
exit_delete_mode.	rmdc	ed	End delete mode
exit_insert_mode.	rmir	ei	End insert mode
exit_standout_mode.	rmso	se	End stand out mode
exit_underline_mode.	rmul	ue	End underscore mode
flash_screen.	flash	vb	Visible bell (may not move cursor)
form_feed.	ff	ff	Hardcopy terminal page eject (P*)
from_status_line.	fs1	fs	Return from status line
init_lstring.	is1	i1	Terminal initialization string
init_2string.	is2	i2	Terminal initialization string
init_3string.	is3	i3	Terminal initialization string
init_file.	if	if	Name of file containing is
insert_character.	ichl	ic	Insert character (P)
insert_line.	ill	al	Add new blank line (P*)
insert_padding.	ip	ip	Insert pad after character inserted (P*)
key_backspace.	kbm	kb	Sent by backspace key
key_catab.	ktbc	ka	Sent by clear-all-tabs key
key_clear.	kclr	kC	Sent by clear screen or erase key
key_ctab.	kctab	kt	Sent by clear-tab key
key_dc.	kdchl	kD	Sent by delete character key
key_dl.	kdll	kL	Sent by delete line key
key_down.	kcudl	kd	Sent by terminal down arrow key
key_eic.	krmir	kM	Sent by rmir or smir in insert mode
key_eol.	kel	kE	Sent by clear-to-end-of-line key
key_eos.	ked	kS	Sent by clear-to-end-of-screen key
key_f0	kf0	k0	Sent by function key f0
key_f1.	kf1	k1	Sent by function key f1
key_f10.	kf10	ka	Sent by function key f10
key_f2.	kf2	k2	Sent by function key f2
key_f3.	kf3	k3	Sent by function key f3
key_f4.	kf4	k4	Sent by function key f4
key_f5.	kf5	k5	Sent by function key f5
key_f6.	kf6	k6	Sent by function key f6
key_f7.	kf7	k7	Sent by function key f7
key_f8.	kf8	k8	Sent by function key f8
key_f9.	kf9	k9	Sent by function key f9

Variable	Cap- name	Termcap Code	Description
key_home.	khome	kh	Sent by home key
key_ic.	kichl	kI	Sent by ins char/enter ins mode key
key_il.	kill	kA	Sent by insert line
key_left.	kcubl	kl	Sent by terminal left arrow key
key_ll.	kll	kH	Sent by home-down key
key_npage.	knp	kN	Sent by next-page key
key_ppage.	kpp	kP	Sent by previous-page key
key_right.	kcuf1	kr	Sent by terminal right arrow key
key_sf.	kind	kF	Sent by scroll-forward/down key
key_sr.	kri	kR	Sent by scroll-backward/up key
key_stab.	khts	kT	Sent by set-tab key
key_up.	kcuul	ku	Sent by terminal up arrow key
keypad_local.	rmkx	ke	Out of "keypad transmit" mode
keypad_xmit.	smkx	ks	Put terminal in "keypad transmit" mode
lab_f0.	lf0	10	Labels on function key f0 if not f0
lab_f1.	lf1	11	Labels on function key f1 if not f1
lab_f10.	lf10	1a	Labels on function key f10 if not f10
lab_f2.	lf2	12	Labels on function key f2 if not f2
lab_f3.	lf3	13	Labels on function key f3 if not f3
lab_f4.	lf4	14	Labels on function key f4 if not f4
lab_f5.	lf5	15	Labels on function key f5 if not f5
lab_f6.	lf6	16	Labels on function key f6 if not f6
lab_f7.	lf7	17	Labels on function key f7 if not f7
lab_f8.	lf8	18	Labels on function key f8 if not f8
lab_f9.	lf9	19	Labels on function key f9 if not f9
meta_on.	smm	mm	Turn on "meta mode" (8th bit)
meta_off.	rmm	mo	Turn off "meta mode"
newline.	nel	nw	Newline (behaves like cr followed by lf)
pad_char.	pad	pc	Pad character (rather than null)
parm_dch.	dch	DC	Delete #1 chars (PG*)
parm_delete_line.	dl	DL	Delete #1 lines (PG*)
parm_down_cursor.	cud	DO	Move cursor down #1 lines (PG*)
parm_ich.	ich	IC	Insert #1 blank chars (PG*)
parm_index.	indn	SF	Scroll forward #1 lines (PG)
parm_insert_line	il	AL	Add #1 new blank lines (PG*)
parm_left_cursor.	cub	LE	Move cursor left #1 spaces (PG)
parm_right_cursor.	cuf	RI	Move cursor right #1 spaces (PG*)
parm_rindex.	rin	SR	Scroll backward #1 lines (PG)
parm_up_cursor.	cuu	UP	Move cursor up #1 lines (PG*)

Variable	Cap- name	Termcap Code	Description
pkey_key.	pfkey	pk	Prog funct key #1 to type string #2
pkey_local.	pfloc	pl	Prog funct key #1 to execute string #2
pkey_xmit.	pfx	px	Prog funct key #1 to xmit string #2
print_screen.	mc0	ps	Print contents of the screen
prtr_off.	mc4	pf	Turn off the printer
prtr_on.	mc5	po	turn on the printer
repeat_char.	rep	rp	Repeat char #1 #2 times (PG*)
reset_1string.	rs1	r1	Reset terminal completely to sane modes
reset_2string.	rs2	r2	Reset terminal completely to sane modes
reset_3string.	rs3	r3	Reset terminal completely to sane modes
reset_file.	rf	rf	Name of file containing reset string
restor_cursor.	rc	rc	Restore cursor to position of last sc
row_address.	vpa	cv	Vertical position absolute (set row) (PG)
save_cursor.	sc	sc	Save cursor position (P)
scroll_forward.	ind	sf	Scroll text up (P)
scroll_reverse.	ri	sr	Scroll text down (P)
set_attributes.	sgr	sa	Define the video attributes (PG9)
set_tab.	hts	st	Set a tab in all rows, current column
set_window.	wind	wi	Current window is lines #1-#2 cols #3-#4
tab.	ht	ta	Tab to next 8 space hardware tab stop
to_status_line.	tsl	ts	Go to status line, column #1
underline_char.	uc	uc	Underscore one char and move past it
up_half_line.	hu	hu	Half-line up (reverse 1/2 linefeed)
init_prog.	ipro	iP	Path name of program for init
key_a1.	ka1	K1	Upper left of keypad
key_a3.	ka3	K3	Upper right of keypad
key_b2.	kb2	K2	Center of keypad
key_c1.	kc1	K4	Lower left of keypad
key_c3.	kc3	K5	Lower right of keypad
prtr_non	mc5p	p0	Turn on the printer for #1 bytes

## A Sample Entry

The following is a complex example that describes a Concept-100.

```
concept100|c100|c104|c100-4p|concept 100.
  am, bel=`G, blank=`EH, blink=`EC, clear=`L$<2*>, cnorm=`EW,
  cols#80, cr=`M$<9>, cubl=`H, cudl=`J, cufl=`E=,
  cup=`Ea%pl%' '%+%c%p2%' '%+%c,
  cuul=`E;:, cvvis=`EW, db, dchl=`E^A$<16*>, dim=`EE:, dll=`E^B$<3*>,
  ed=`E^C$<16*>, el=`E^U$<16>, eo, flash=`EK$<20>\EK, ht=`t$<8>,
  ill=`E^R$<3*>, in, ind=`J, .ind=`J$<9>, ip=`$<16*>,
  is2=`EU\Ef\E7\E5\E8\E1\ENH\EK\E200\Eo&\200\Eo\47\E,
  kbs=`h, kcubl=`E>, kcudl=`E<, kcufl=`E=, kcuul=`E;:,
  kfl=`E5, kf2=`E6, kf3=`E7, khome=`E?,
  lines#24, mir, pb#9600, prot=`EI, rep=`Er%pl%c%p2%' '%+%c$<.2*>,
  rev=`ED, rmcup=`EV $<6>\Ep\r\n, rmir=`E\200, rmxk=`EX,
  rmso=`Ed\Ee, rmul=`Eg, rmul=`Eg, sgr0=`EN\200,
  smcup=`EU\Ev 8p\Ep\r, smir=`E^P, smkx=`EX, smso=`EE\ED,
  smul=`EG, tabs, ul, vt#8, xenl.
```

Entries may continue onto multiple lines by placing white space at the beginning of each line except the first. Comments may be included on lines beginning with a #.

Capabilities in **terminfo** are of three types: Boolean capabilities which indicate that the terminal has some particular feature, numeric capabilities giving the size of the terminal or the size of particular delays, and string capabilities, which give a sequence that can be used to perform particular terminal operations.

## Types of Capabilities

All capabilities have names. For instance, the Concept-100 has automatic margins (i.e., an automatic return and linefeed when the end of a line is reached) which is indicated by the capability **am**. Numeric capabilities are followed by the character # and then the value. Thus, **cols**, which indicates the number of columns the terminal has, gives the value 80 for the Concept.

Finally, string valued capabilities, such as **el** (clear to end of line sequence) are given by the two-character code, an =, and then a string ending at the next following ,. A delay in milliseconds may appear anywhere in such a capa-

bility, enclosed in  $\langle \dots \rangle$  brackets, as in `el=\EK$3`, and padding characters are supplied by `tputs` to provide this delay. The delay can be either a number, e.g., `20`, or a number followed by an `*`, i.e., `3*`. A `*` indicates that the padding required is proportional to the number of lines affected by the operation, and the amount given is the peraffected-unit padding required. (In the case of insert character, the factor is still the number of lines affected. This is always one unless the terminal has `xenl` and the software uses it.) When a `*` is specified, it is sometimes useful to give a delay of the form `3.5` to specify a delay per unit to tenths of milliseconds. (Only one decimal place is allowed.)

A number of escape sequences are provided in the string valued capabilities for each encoding of characters there. Both `\E` and `\e` map to an ESCAPE character, `^x` maps to a control-`x` for any appropriate `x`, and the sequences `\n` `\l` `\r` `\t` `\b` `\f` `\s` give a newline, linefeed, return, tab, backspace, formfeed, and space. Other escapes include `\^` for `^`, `\\` for `\`, `\,` for comma, `\:` for `:`, and `\0` for null. (`\0` will produce `\200`, which does not terminate a string but behaves as a null character on most terminals.)

Sometimes individual capabilities must be commented out. To do this, put a period before the capability name.

## Preparing Terminal Descriptions

The most effective way to prepare a terminal description is by imitating the description of a similar terminal in `terminfo` and to build up a description gradually, using partial descriptions with `vi(C)` to check that they are correct. Be aware that a very unusual terminal may expose deficiencies in the ability of the `terminfo` file to describe it or bugs in `vi`. To easily test a new terminal description you can set the environment variable `TERMINFO` to a pathname of a directory containing the compiled description you are working on and programs will look there rather than in `/usr/lib/terminfo`. To get the padding for insert line right (if the terminal manufacturer did not document it) a severe test is to edit a test file at 9600 baud, delete 16 or so lines (i.e., `d16d`) from the middle of the screen, then press the `u` key several times quickly. If the terminal messes up, more padding is usually needed. A similar test can be used for insert character.

## Basic Capabilities

The number of columns on each line for the terminal is given by the **cols** numeric capability. If the terminal is a CRT, then the number of lines on the screen is given by the **lines** capability. If the terminal wraps around to the beginning of the next line when it reaches the right margin, then it should have the **am** capability. If the terminal can clear its screen, leaving the cursor in the home position, then this is given by the **clear** string capability. If the terminal overstrikes (rather than clearing a position when a character is struck over) then it should have the **os** capability. If the terminal is a printing terminal, with no soft copy unit, give it both **hc** and **os**. (**os** applies to storage scope terminals, such as TEKTRONIX 4010 series, as well as hardcopy and APL terminals.) If there is a code to move the cursor to the left edge of the current row, give this as **cr**. (Normally this will be carriage return, control M.) If there is a code to produce an audible signal (bell, beep, etc.) give this as **bel**.

If there is a code to move the cursor one position to the left (such as backspace) that capability should be given as **cu1**. Similarly, codes to move to the right, up, and down should be given as **cuf1**, **cuu1**, and **cud1**. These local cursor motions should not alter the text they pass over, for example, you would not normally use '**cuf1=**' because the space would erase the character moved over.

A very important point here is that the local cursor motions encoded in **terminfo** are undefined at the left and top edges of a CRT terminal. Programs should never attempt to backspace around the left edge, unless **bw** is given, and never attempt to go up locally off the top. In order to scroll text up, a program will go to the bottom left corner of the screen and send the **ind** (index) string.

To scroll text down, a program goes to the top left corner of the screen and sends the **ri** (reverse index) string. The strings **ind** and **ri** are undefined when not on their respective corners of the screen.

Parameterized versions of the scrolling sequences are **indn** and **rin** except that they take one parameter, and scroll that many lines. They are also undefined except at the appropriate edge of the screen.

The **am** capability tells whether the cursor sticks at the right edge of the screen when text is output, but this does not necessarily apply to a **cuf1** from the last column. The only local motion which is defined from the left edge is if **bw** is given, then a **cub1** from the left edge will move to the right edge of the previous row. If **bw** is not given, the effect is undefined. This is useful for drawing a box around the edge of the screen, for example.

If the terminal has switch selectable automatic margins, the **terminfo** file usually assumes that this is on; i.e., **am**. If the terminal has a command which moves to the first column of the next line, that command can be given as **nel** (newline). It does not matter if the command clears the remainder of the current line, so if the terminal has no **cr** and if it may still be possible to craft a working **nel** out of one or both of them.

These capabilities suffice to describe hardcopy and glass-tty terminals. Thus the model 33 teletype is described as:

```
33|tty33|model 33 teletype.
bel=^G, cols#72, cr=^M, cudl=^J, hc, ind=^J, os,
```

while the Lear Siegler ADM-3 is described as:

```
adm3|3|lsi adm3.
am, bel=^G, clear=^, cols#80, cr=^M, cubl=^H, cudl=^J,
ind=^J, lines#24.
```

## Parameterized Strings

Cursor addressing and other strings requiring parameters in the terminal are described by a parameterized string capability, with **printf(S)** like escapes **%x** in it. For example, to address the cursor, the **cup** capability is given, using two parameters: the row and column to address to. (Rows and columns are numbered from zero and refer to the physical screen visible to the user, not to any unseen memory.) If the terminal has memory relative cursor addressing, that can be indicated by **mrcup**.

The parameter mechanism uses a stack and special **%** codes to manipulate it. Typically a sequence will push one of the parameters onto the stack and then print it in some format. Often more complex operations are necessary.

The % encodings have the following meanings:

%	outputs '%'
%d	print pop() as in printf
%2d	print pop() like %2d
%3d	print pop() like %3d
%02d	
%03d	as in printf
%c	print pop() as %c
%s	print pop() as %s
%p[1-9]	push ith parm
%P[a-z]	set variable [a-z] to pop()
%g[a-z]	get variable [a-z] and push it
%'c'	char constant c
%{nn}	integer constant nn
%+%-*%/%m	arithmetic (%m is mod): push(pop() op pop())
%&% ^	bit operations: push(pop() op pop())
%=>%<	logical operations: push(pop() op pop())
%!%~	unary operations push(op pop())
%i	add 1 to first two parms (for ANSI terminals)
%? expr %t thenpart %e elsepart %;	if-then-else, %e elsepart is optional.
	else-if's are possible ala Algol 68:
%? c1 %tb1 %ec2 %tb2 %ec3 %tb3 %ec4 %tb4 %e%;	
	ci are conditions, bi are bodies.

Binary operations are in postfix form with the operands in the usual order. That is, to get x-5 one would use %gx%{5}%-.

Consider the HP2645, which, to get to row 3 and column 12, needs to be sent \E%&a12c03Y padded for six milliseconds. Note that the order of the rows and columns is inverted here, and that the row and column are printed as two digits. Thus its **cup** capability is cup=6\E&%p2dc%p1%2dY.

The Microterm ACT-IV needs the current row and column sent preceded by a ^T, with the row and column simply encoded in binary, cup=^T%p1%c%p2%c. Terminals which use %c need to be able to backspace the cursor (**cup1**), and to

move the cursor up one line on the screen (**cuul**). This is necessary because it is not always safe to transmit  $\backslash n$   $\backslash D$  and  $\backslash r$ , as the system may change or discard them. (The library routines dealing with terminfo set tty modes so that tabs are never expanded, so  $\backslash t$  is safe to send. This turns out to be essential for the Ann Arbor 4080.)

A final example is the LSI ADM-3a, which uses row and column offset by a blank character, thus `cup=\E=%p1%'%+%c%p2%'%+%c`. After sending  $\backslash E=$ , this pushes the first parameter, pushes the ASCII value for a space (32), adds them (pushing the sum on the stack in place of the two previous values) and outputs that value as a character. Then the same is done for the second parameter. More complex arithmetic is possible using the stack.

If the terminal has row or column absolute cursor addressing, these can be given as single parameter capabilities **hpa** (horizontal position absolute) and **vpa** (vertical position absolute). Sometimes these are shorter than the more general two parameter sequence (as with the hp2645) and can be used in preference to **cup**. If there are parameterized local motions (e.g., move n spaces to the right) these can be given as **cud**, **cub**, **cuf**, and **cuu** with a single parameter indicating how many spaces to move. These are primarily useful if the terminal does not have **cup**, such as the TEKTRONIX 4025.

## Cursor Motions

If the terminal has a fast way to home the cursor (to the very upper left corner of screen) then this can be given as **home**; similarly a fast way of getting to the lower left-hand corner can be given as **ll**; this may involve going up with **cuul** from the home position, but a program should never do this itself (unless **ll** does) because it can make no assumption about the effect of moving up from the home position. Note that the home position is the same as addressing to (0,0): to the top left corner of the screen, not of memory. (Thus, the  $\backslash EH$  sequence on HF terminals cannot be used for **home**.)

## Area Clears

If the terminal can clear from the current position to the end of the line, leaving the cursor where it is, this should be given as **el**. If the terminal can clear from the current position to the end of the display, then this should be given as **ed**. **Ed** is only defined from the first column of a line. (Thus, it can be simulated by a request to delete a large number of lines, if a true **ed(C)** is not available.)

## Insert/Delete Line

If the terminal can open a new blank line before the line where the cursor is, this should be given as **ill**; this is done only from the first position of a line. The cursor must then appear on the newly blank line. If the terminal can delete the line which the cursor is on, then this should be given as **dll**; this is done only from the first position on the line to be deleted. Versions of **ill** and **dll** which take a single parameter and insert or delete that many lines can be given as **il** and **dl**. If the terminal has a settable scrolling region (like the vt100) the command to set this can be described with the **csr** capability, which takes two parameters: the top and bottom lines of the scrolling region. The cursor position is, alas, undefined after using this command. It is possible to get the effect of insert or delete line using this command -- the **sc** and **rc** (save and restore cursor) commands are also useful. Inserting lines at the top or bottom of the screen can also be done using **ri** or **ind** on many terminals without a true insert/delete line, and is often faster even on terminals with those features.

If the terminal has the ability to define a window as part of memory, which all commands affect, it should be given as the parameterized string **wind**. The four parameters are the starting and ending lines in memory and the starting and ending columns in memory, in that order.

If the terminal can retain display memory above, then the **da** capability should be given; if display memory can be retained below, then **db** should be given. These indicate that deleting a line or scrolling may bring non-blank lines up from below or that scrolling back with **ri** may bring down non-blank lines.

## Insert/Delete Character

There are two basic kinds of intelligent terminals with respect to insert/delete character which can be described using **terminfo**. The most common insert/delete character operations affect only the characters on the current line and shift characters off the end of the line rigidly. Other terminals, such as the Concept 100 and the Perkin Elmer Owl, make a distinction between typed and untyped blanks on the screen, shifting upon an insert or delete only to an untyped blank on the screen which is either eliminated, or expanded to two untyped blanks.

You can determine the kind of terminal you have by clearing the screen and then typing text separated by cursor motions. Type **abc def** using local cursor motions (not spaces) between the **abc** and the **def**. Then position the cursor before the **abc** and put the terminal in insert mode. If typing characters causes the rest of the line to shift rigidly and characters to fall off the end, then your terminal does not distinguish between blanks and untyped positions. If the **abc** shifts over to the **def** which then move together around the end of the current line and onto the next as you insert, you have the second type of terminal, and should give the capability **in**, which stands for insert null. While these are two logically separate attributes (one line vs. multiline insert mode, and special treatment of untyped spaces), no known terminals have an insert mode that cannot be described with the single attribute.

**Terminfo** can describe both terminals which have an insert mode, and terminals which send a simple sequence to open blank position on the current line. Give as **smir** the sequence to get into insert mode. Give as **rmir** the sequence to leave insert mode. Now give as **ich1** any sequence needed to be sent just before sending the character to be inserted. Most terminals with a true insert mode will not give **ich1**; terminals which send a sequence to open a screen position should give it here. (If your terminal has both, insert mode is usually preferable to **ich1**. Do not give both unless the terminal actually requires both to be used in combination.) If post insert padding is needed, give this as a number of milliseconds in **ip** (a string option).

Any other sequence which may need to be sent after an insert of a single character may also be given in `ip`. If your terminal needs both to be placed into an insert mode and a special code to precede each inserted character, then both `smir/rmir` and `ich1` can be given, and both will be used. The `ich` capability, with one parameter, `n`, will repeat the effects of `ich1` `n` times.

It is occasionally necessary to move around while in insert mode to delete characters on the same line (e.g., if there is a tab after the insertion position). If your terminal allows motion while in insert mode you can give the capability `mir` to speed up inserting in this case. Omitting `mir` will affect only speed. Some terminals (notably Datamedia's) must not have `mir` because of the way their insert mode works.

Finally, you can specify `dch1` to delete a single character, `dch` with one parameter, `n`, to delete `n` characters, and delete mode by giving `smdc` and `rmdc` to enter and exit delete mode (any mode the terminal needs to be placed in for `dch1` to work).

A command to erase `n` characters (equivalent to outputting `n` blanks without moving the cursor) can be given as `ech` with one parameter.

## Highlighting, Underlining, and Visible Bells

If your terminal has one or more kinds of display attributes, these can be represented in a number of different ways. You should choose one display form as standout mode, representing a good, high contrast, easy-on-the-eyes, format for highlighting error messages and other attention getters. (If you have a choice, reverse video plus half-bright is good, or reverse video alone.) The sequences to enter and exit standout mode are given as `sms0` and `rmso`, respectively. If the code to change into or out of standout mode leaves one or even two blank spaces on the screen, as the TVI 912 and Teleray 1061 do, then `xmc` should be given to tell how many spaces are left.

Codes to begin underlining and end underlining can be given as `smul` and `armul` respectively. If the terminal has a code to underline the current character and move the cursor one space to the right, such as the Microterm Mime, this can be given as `uc`.

Other capabilities to enter various highlighting modes include:

<b>blink</b>	blinking
<b>bold</b>	bold or extra bright
<b>dim</b>	dim or half-bright
<b>invis</b>	blanking or invisible text
<b>prot</b>	protected
<b>rev</b>	reverse video
<b>sgr0</b>	turn off <u>all</u> attribute modes
<b>smacs</b>	enter alternate character set mode
<b>rmacs</b>	exit alternate character set mode

Turning on any of these modes singly may or may not turn off other modes.

If there is a sequence to set arbitrary combinations of modes, this should be given as **sgr** (set attributes), taking 9 parameters. Each parameter is either 0 or 1, as the corresponding attribute is on or off. The 9 parameters are, in order: standout, underline, reverse, blink, dim, bold, blank, protect, alternate character set. Not all modes need be supported by **sgr**, only those for which corresponding separate attribute commands exist.

Terminals with the "magic cookie" glitch (**xmc**) deposit special "cookies" when they receive mode-setting sequences, which affect the display algorithm rather than having extra bits for each character. Some terminals, such as the HP2621, automatically leave standout mode when they move to a new line or the cursor is addressed. Programs using standout mode should exit standout mode before moving the cursor or sending a newline, unless the **msg** capability, asserting that it is safe to move in standout mode, is present.

If the terminal has a way of flashing the screen to indicate an error quietly (a bell replacement) then this can be given as **flash**; it must not move the cursor.

If the cursor needs to be made more visible than normal when it is not on the bottom line (to make, for example, a non-blinking underline into an easier to find block or blinking underline) give this sequence as **cvvis**. If there is a way to make the cursor completely invisible, give that as **cvis**. The capability **cnorm** should be given, which undoes the effects of both of these models.

If the terminal needs to be in a special mode when running a program that uses these capabilities, the codes to enter and exit this mode can be given as **smcup** and **rmcup**. This arises, for example, from terminals like the Concept with more than one page of memory. If the terminal has only memory relative cursor addressing and not screen relative cursor addressing, a one screen-sized window must be fixed into the terminal for cursor addressing to work properly. This is also used for the TEKTRONIX 4025, where **smcup** sets the command character to the one used by **terminfo**.

If your terminal correctly generates underlined characters (with no special codes needed) even though it does not overstrike, then you should give the capability **ul**. If overstrikes are erasable with a blank, then indicate this by giving **eo**.

## Keypad

If the terminal has a keypad that transmits codes when the keys are pressed, this information can be given. Note that it is not possible to handle terminals where the keypad only works in local (this applies, for example, to the unshifed HP2621 keys). If the keypad can be set to transmit or not to transmit, give these codes as **smkx** and **rmkx**. Otherwise, the keypad is assumed to always transmit. The codes sent by the left arrow, right arrow, up arrow, down arrow, and home keys can be given as **kcubl**, **kcuf1**, **kcuul**, **kcucl**, and **khome** respectively. If there are function keys such as **f0**, **f1**, ..., **f10**, the codes they send can be given as **kf0**, **kf1**, ..., **kf10**. If these keys have labels other than the default **f0** through **f10**, the labels can be given as **lf0**, **lf1**, ..., **lf10**. The codes transmitted by certain other special keys can be given: **kll** (home down), **kbs** (backspace), **ktbc** (clear all tabs), **kctab** (clear the tab stop in this column), **kclr** (clear screen or erase key), **kdch1** (delete character), **kdll** (delete line), **krmir** (exit insert mode), **kel** (clear to end of line), **kill** (insert

line), **kn**p (next page), **kpp** (previous page), **kind** (scroll forward/down), **kri** (scroll backward/up), **khts** (set a tab stop in this column). In addition, if the keypad has a 3 by 3 array of keys including the four arrow keys, the other five keys can be given as **ka1**, **ka3**, **kb2**, **kc1**, and **kc3**. These keys are useful when the effects of a 3 by 3 directional pad are needed.

## Tabs and Initialization

If the terminal has hardware tabs, the command to advance to the next tab stop can be given as **ht** (usually control-I). A "backtab" command (move left to the next tab stop) can be given as **cbt**. By convention, if the teletype modes indicate that tabs are being expanded by the computer rather than being sent to the terminal, programs should not use **ht** or **cbt** even if they are present, since the user may not have the tab stops properly set. If the terminal has hardware tabs which are initially set every *n* spaces when the terminal is powered up, the numeric parameter it is given, showing the number as spaces the tabs are set to. This is normally used by the **tset(C)** command to determine whether to set the mode for hardware tab expansion, and whether to set the tab stops. If the terminal has tab stops that can be saved in nonvolatile memory, the **terminfo** description can assume that they are properly set.

Other capabilities include **is1**, **is2**, and **is3**, initialization strings for the terminal, **iprog**, the path name of a program to be run to initialize the terminal, and **if**, the name of a file containing long initialization strings. These strings are expected to set the terminal into modes consistent with the rest of the **terminfo** description. They are normally sent to the terminal by the **tset(C)** program each time the user logs in. They will be printed in the following order: **is1**; **is2**; setting tabs using **tbc** and **hts**; **if**; running the program **iprog**; and finally **is3**. Most initialization is done with **is2**.

Special terminal modes can be set up without duplicating strings by putting the common sequences in **is2** and special cases in **is1** and **is3**. A pair of sequences that does a harder reset from a totally unknown state can be analogously given as **rs1**, **rs2**, and **rs3**, analogous to **is2** and **if**. These strings are output by the **reset** program, which is

used when the terminal gets into a wedged state. Commands are normally placed in **rs2** and **rf** only if they produced annoying effects on the screen and are not necessary when logging in. For example, the command to set the vt100 into 80-column mode would normally be part of **is2**, but it causes an annoying glitch of the screen and is not normally needed since the terminal is usually already in 80 column mode.

If there are commands to set and clear tab stops, they can be given as **tbc** (clear all tab stops) and **hts** (set a tab stop in the current column of every row). If a more complex sequence is needed to set the tabs than can be described by this, the sequence can be placed in **is2** or **if**.

## Delays

Certain capabilities control padding in the teletype driver. These are primarily needed by hardcopy terminals, and are used by the **tset** program to set teletype modes appropriately. Delays embedded in the capabilities **cr**, **ind**, **cub1**, **ff**, and **tab** will cause the appropriate delay bits to be set in the teletype driver. If **pb** (padding baud rate) is given, these values can be ignored at baud rates below the value of **pb**.

## Line Graphics

If the terminal has a line drawing alternate character set, the mapping of glyph to character would be given in **acsc**. The definition of this string is based on the alternate character set used in the DEC VT100 terminal, extended slightly with some modifications from the AT&T 4410v1 terminal. These characters and their corresponding glyphs are shown in the following table:

Glyph Name	VT100+ Character
arrow pointing right	+
arrow pointing left	,
arrow pointing down	.
solid square block	0
lantern symbol	I
arrow pointing up	-
diamond	'
checker board (stipple)	a
degree symbol	f
plus/minus	g
board of squares	h
lower right corner	j
upper right corner	k
upper left corner	l
lower left corner	m
plus	n
scan line 1	o
horizontal line	q
scan line 9	s
left tee	t
right tee	u
bottom tee	v
top tee	w
vertical line	x
bullet	~

The best way to describe a terminal's line graphics set is to add a third column to the above table with the characters for the new terminal that produce the appropriate glyph when the terminal is in the alternate character set mode. An example is on the following page:

Glyph Name	VT100+ Char.	New tty Char.
upper left corner	l	R
lower left corner	m	F
upper right corner	k	T
lower right corner	j	G
horizontal line	q	,
vertical line	x	.

Specify the characters defining the new tty character set in a left-to-right order, as shown in the following example (taken from the example above):

```
acsc=1RmFkTjGq\ .x.
```

## Miscellaneous

If the terminal requires other than a null (zero) character as a pad, then this can be given as **pad**. Only the first character of the **pad** string is used.

If the terminal has an extra "status line" that is not normally used by software, this fact can be indicated. If the status line is viewed as an extra line below the bottom line, into which one can cursor address normally (such as the Heathkit h19's 25th line, or the 24th line of a vt100 which is set to a 23-line scrolling region), the capability **hs** should be given. Special strings to go to the beginning of the status line and to return from the status line can be given as **tsl** and **fsl**. (**fsl** must leave the cursor position in the same place it was before **tsl**. If necessary, the **sc** and **rc** strings can be included in **tsl** and **fsl** to get this effect.) The capability **tsl** takes one parameter, which is the column number of the status line the cursor is to be moved to.

If escape sequences and other special commands, such as **tab**, work while in the status line, the flag **eslok** can be given. A string which turns off the status line (or otherwise erases its contents) should be given as **dsl**. If the terminal has commands to save and restore the position

of the cursor, give them as **sc** and **rc**. The status line is normally assumed to be the same width as the rest of the screen, e.g., **cols**. If the status line is a different width (possibly because the terminal does not allow an entire line to be loaded) the width, in columns, can be indicated with the numeric parameter **wsl**.

If the terminal can move up or down half a line, this can be indicated with **hu** (half-line up) and **hd** (half-line down). This is primarily useful for superscripts and subscripts on hardcopy terminals. If a hardcopy terminal can eject to the next page (form feed), give this as **ff** (usually control L).

If there is a command to repeat a given character a given number of times (to save time transmitting a large number of identical characters) this can be indicated with the parameterized string **rep**. The first parameter is the character to be repeated and the second is the number of times to repeat it. Thus, **tparm(repeat\_char, 'x', 10)** is the same as **'xxxxxxxxxx'**.

If the terminal has a settable command character, such as the TEKTRONIX 4025, this can be indicated with **cmdch**. A prototype command character is chosen which is used in all capabilities. This character is given in the **cmdch** capability to identify it. The following convention is supported on some UNIX systems: The environment is to be searched for a **CC** variable, and if found, all occurrences of the prototype character are replaced with the character in the environment variable.

Terminal descriptions that do not represent a specific kind of known terminal, such as **switch**, **dialup**, **patch**, and **network**, should include the **gn** (generic) capability so that programs can complain that they do not know how to talk to the terminal. (This capability does not apply to virtual terminal descriptions for which the escape sequences are known.)

If the terminal uses **xon/xoff** handshaking for flow control, give **xon**. Padding information should still be included so that routines can make better decisions about costs, but actual pad characters will not be transmitted.

If the terminal has a "meta key" that acts as a shift key, setting the eighth bit of any character transmitted, this fact can be indicated with **km**. Otherwise, software will assume that the eighth bit is parity and it will usually be cleared. If strings exist to turn this "meta mode" on and off, they can be given as **smm** and **rmm**.

If the terminal has more lines of memory than will fit on the screen at once, the number of lines of memory can be indicated with **lm**. A value of **lm#0** indicates that the number of lines is not fixed, but that there is still more memory than fits on the screen.

If the terminal is one of those supported by the UNIX virtual terminal protocol, the terminal number can be given as **vt**. Media copy strings which control an auxiliary printer connected to the terminal can be given as **mc0**: print the contents of the screen, **mc4**: turn off the printer, and **mc5**: turn on the printer. When the printer is on, all text sent to the terminal will be sent to the printer. It is undefined whether the text is also displayed on the terminal screen when the printer is on. A variation **mc5p** takes one parameter, and leaves the printer on for as many characters as the value of the parameter, then turns the printer off.

The parameter should not exceed 255. All text, including **mc4**, is transparently passed to the printer while an **mc5p** is in effect.

Strings to program function keys can be given as **pfkey**, **pfloc**, and **pfx**. Each of these strings takes two parameters: the function key number to program (from 0 to 10) and the string to program it with. Function key numbers out of this range may program undefined keys in a terminal dependent manner. The difference between the capabilities is that **pfkey** causes pressing the given key to be the same as the user typing the given string; **floc** causes the string to be executed by the terminal in local; and **pfx** causes the string to be transmitted to the computer.

## Glitches and Braindamage

Hazeltine terminals, which do not allow `^^` characters to be displayed should indicate **hz**.

Terminals that ignore a linefeed immediately after an am wrap, such as the Concept and vt100, should indicate `xenl`.

If `el` is required to get rid of standout (instead of merely writing normal text on top of it), `xhp` should be given.

Telera terminals, where tabs turn all characters moved over to blanks, should indicate `xt` (destructive tabs). This glitch is also taken to mean that it is not possible to position the cursor on top of a "magic cookie", that to erase standout mode it is instead necessary to use delete and insert line.

The Beehive Superbee, which is unable to correctly transmit the escape or Control-C characters, has `xsb`, indicating that the `f1` key is used for escape and `f2` for control-C. (Only certain Superbees have this problem, depending on the ROM.) Other specific terminal problems may be corrected by adding more capabilities of the form `xx`.

## Similar Terminals

If there are two very similar terminals, one can be defined as being just like the other with certain exceptions. The string capability `use` can be given with the name of the similar terminal. The capabilities given before `use` override those in the terminal type invoked by `use`. A capability can be cancelled by placing `xx@` to the left of the capability definition, where `xx` is the capability. For example, the entry

```
2621-nl, smkx@, rmkx@, use=2621.
```

defines a `2621-nl` that does not have the `smkx` or `rmkx` capabilities, and hence does not turn on the function key labels when in visual mode. This is useful for different modes for a terminal, or for different user preferences.

**Files**

<code>/usr/lib/terminfo/?/*</code>	Files containing terminal descriptions
<code>/usr/lib/terminfo/altos.src</code>	File containing descriptions of terminals supported by Altos
<code>/usr/lib/terminfo/terminfo.src</code>	File containing descriptions of other terminals not supported by Altos

**See Also**

`term(M)`

## Name

**termio** - General terminal interface.

## Description

All of the asynchronous communications ports use the same general interface, no matter what hardware is involved. The remainder of this section discusses the common features of this interface.

When a terminal file is opened, it normally causes the process to wait until a connection is established. In practice, users' programs seldom open these files; they are opened by `getty(M)` and become a user's standard input, output, and error files. The very first terminal file opened by the process group leader of a terminal file not already associated with a process group becomes the control terminal for that process group. The control terminal plays a special role in handling quit and interrupt signals, as discussed below. The control terminal is inherited by a child process during a `fork(S)`. A process can break this association by changing its process group using `setpgrp(S)`.

A terminal associated with one of these files ordinarily operates in full duplex mode. You can type characters at any time, even while output is occurring, and are only lost when the system's character input buffers become completely full, which is rare, or when the user has accumulated the maximum allowed number of input characters that have not yet been read by some program. Currently, this limit is 256 characters. When the input limit is reached, all the saved characters are thrown away without notice.

Normally, terminal input is processed in units of lines. A line is delimited by a newline (ASCII LF) character, an end-of-file (ASCII EOT) character, or an end-of-line character. This means that a program attempting to read will be suspended until an entire line has been typed. Also, no matter how many characters are requested in the read call, at most one line will be returned. It is not, however, necessary to read a whole line at once; any number of characters may be requested in a read, even one, without losing information.

During input, erase and kill processing is normally done. By default, the character # erases the last character typed, except that it will not erase beyond the beginning of the line. By default, the character @ kills (deletes) the entire input line, and optionally outputs a new-line character. Both these characters operate on a keystroke basis, independently of any backspacing or tabbing that may have been done. Both the erase and kill characters may be entered literally by preceding them with the escape character (\). In this case, the escape character is not read. The erase and kill characters may be changed.

Certain characters have special functions on input. These functions and their default character values are summarized as follows:

- INTR (Rubout or ASCII DEL) generates an interrupt signal which is sent to all processes with the associated control terminal. Normally, each such process is forced to terminate, but arrangements may be made either to ignore the signal or to receive a trap to an agreed-upon location; see `signal(S)`.
- QUIT (Control-\ or ASCII FS) generates a quit signal. Its treatment is identical to the interrupt signal except that, unless a receiving process has made other arrangements, it will not only be terminated but a core image file (called core) will be created in the current working directory.
- ERASE (#) erases the preceding character. It will not erase beyond the start of a line, as delimited by a NL, EOF, or EOL character.
- KILL (@) deletes the entire line, as delimited by a NL, EOF, or EOL character.
- EOF (Control-d or ASCII EOT) may be used to generate an end-of-file from a terminal. When received, all the characters waiting to be read are immediately passed to the program, without waiting for a newline, and the EOF is discarded. Thus, if there are no characters waiting, which is to say the EOF occurred at the beginning of a line, zero characters will be passed back, which

is the standard end-of-file indication. NL (ASCII LF) is the normal line delimiter. It cannot be changed or escaped.

- EOL (ASCII NUL) is an additional line delimiter, like NL. It is not normally used.
- STOP (Control-s or ASCII DC3) can be used to temporarily suspend output. It is useful with CRT terminals to prevent output from disappearing before it can be read. While output is suspended, STOP characters are ignored and not read.
- START (Control-q or ASCII DC1) is used to resume output which has been suspended by a STOP character. While output is not suspended, START characters are ignored and not read. The start/stop characters cannot be changed or escaped.

The character values for INTR, QUIT, SWITCH, ERASE, KILL, EOF, and EOL may be changed to suit individual tastes. The ERASE, KILL, and EOF characters may be escaped by a preceding \ character, in which case no special function is done.

When the carrier signal from the data-set drops, a hang-up signal is sent to all processes that have this terminal as the control terminal. Unless other arrangements have been made, this signal causes the processes to terminate. If the hang-up signal is ignored, any subsequent read returns with an end-of-file indication. Thus, programs that read a terminal and test for end-of-file can terminate appropriately when hung up on.

When one or more characters are written, they are transmitted to the terminal as soon as previously-written characters have finished typing. Input characters are echoed by putting them in the output queue as they arrive. If a process produces characters more rapidly than they can be typed, it will be suspended when its output queue exceeds some limit. When the queue has drained down to some threshold, the program is resumed.

Several `ioctl(S)` system calls apply to terminal files. The primary calls use the following structure, defined in `<termio.h>`:

```
#define NCC      8
struct termio {
    unsigned short  c_iflag; /*input modes*/
    unsigned short  c_oflag; /*output modes*/
    unsigned short  c_cflag; /*control modes*/
    unsigned short  c_lflag; /*local modes*/
    char            c_line; /*line discipline*/
    unsigned char   c_cc[NCC]; /*control chars*/
};
```

The special control characters are defined by the array `c_cc`. The relative positions and initial values for each function are as follows:

0	VINTR	DEL
1	VQUIT	FS
2	VERASE	#
3	VKILL	@
4	VEOF	EOT
5	VEOL	NUL
6	reserved	
7	SWTCH	

The `c_iflag` field describes the basic terminal input control:

IGNBRK	0000001	Ignore break condition
BRKINT	0000002	Signal interrupt on break
IGNPAR	0000004	Ignore characters with parity errors
PARMRK	0000010	Mark parity errors
INPCK	0000020	Enable input parity check
ISTRIP	0000040	Strip character
INLCR	0000100	Map NL to CR on input
IGNCR	0000200	Ignore CR
ICRNL	0000400	Map CR to NL on input
IUCLC	0001000	Map uppercase to lowercase on input
IXON	0002000	Enable start/stop output control
IXANY	0004000	Enable any character to restart output
IXOFF	0010000	Enable start/stop input control

If IGNBRK is set, the break condition (a character framing error with data all zeros) is ignored, that is, not put on the input queue and therefore not read by any process. Otherwise, if BRKINT is set, the break condition will generate an interrupt signal and flush both the input and output queues. If IGNPAR is set, characters with other framing and parity errors are ignored.

If PARMRK is set, a character with a framing or parity error which is not ignored is read as the three-character sequence: 0377, 0, X, where X is the data of the character received in error. To avoid ambiguity in this case, if ISTRIP is not set, a valid character of 0377 is read as 0377,0377. If PARMRK is not set, a framing or parity error which is not ignored is read as the character NUL(0).

If INPCK is set, input parity checking is enabled. If INPCK is not set, input parity checking is disabled. This allows output parity generation without input parity errors.

If ISTRIP is set, valid input characters are first stripped to 7-bits, otherwise all 8-bits are processed.

If INLCR is set, a received NL character is translated into a CR character. If IGNCR is set, a received CR character is ignored (not read). Otherwise, if ICRNL is set, a received CR character is translated into a NL character.

If IUCLC is set, a received uppercase alphabetic character is translated into the corresponding lowercase character.

If IXON is set, start/stop output control is enabled. A received STOP character will suspend output and a received START character will restart output. All start/stop characters are ignored and not read. If IXANY is set, any input character will restart output which has been suspended.

If IXOFF is set, the system will transmit START/STOP characters when the input queue is nearly empty/full.

The initial input control value is all-bits-clear.

The `c_oflag` field specifies the system treatment of output:

OPOST	0000001	Postprocess output
OLCUC	0000002	Map lowercase to upper on output
ONLCR	0000004	Map NL to CR-NL on output
OCRNL	0000010	Map CR to NL on output
ONOCR	0000020	No CR output at column 0
ONLRET	0000040	NL performs CR function
OFILL	0000100	Use fill characters for delay
OFDEL	0000200	Fill is DEL, else NUL
NLDLY	0000400	Select new-line delays:
NL0	0	
NL1	0000400	
CRDLY	0003000	Selector carriage-return delays:
CR0	0	
CR1	0001000	
CR2	0002000	
CR3	0003000	
TABDLY	0014000	Select horizontal-tab delays:
TAB0	0	
TAB1	0004000	
TAB2	0010000	
TAB3	0014000	Expand tabs to spaces
BSDLY	0020000	Select backspace delays:
BS0	0	
BS1	0020000	
VTDLY	0040000	Select vertical-tab delays:
VT0	0	
VT1	0040000	
FFDLY	0100000	Select form-feed delays:
FF0	0	
FF1	0100000	

If OPOST is set, output characters are post-processed as indicated by the remaining flags, otherwise characters are transmitted without change.

If OLCUC is set, a lowercase alphabetic character is transmitted as the corresponding uppercase character. This function is often used in conjunction with IUCLC.

IF ONLCR is set, the NL character is transmitted as the CR-NL character pair. If OCRNL is set, the CR character is transmitted as the NL character. If ONOCR is set, no CR character is transmitted when at column 0 (first position). If ONLRET is set, the NL character is assumed to do the carriage-return function; the column pointer will be set to 0 and the delays specified for CR will be used. Otherwise the NL character is assumed to do just the line-feed function; the column pointer will remain unchanged. The column pointer is also set to 0 if the CR character is actually transmitted.

The delay bits specify how long transmission stops to allow for mechanical or other movement when certain characters are sent to the terminal. In all cases a value of 0 indicates no delay. If OFILL is set, fill characters will be transmitted for delay instead of a timed delay. This is useful for high baud rate terminals which need only a minimal delay. If OFDEL is set, the fill character is DEL, otherwise NUL.

If a form-feed or vertical-tab delay is specified, it lasts for about two seconds.

New-line delay lasts about 0.10 seconds. If ONLRET is set, the carriage-return delays are used instead of the new-line delays. If OFILL is set, two fill characters will be transmitted.

Carriage-return delay type 1 is dependent on the current column position, type 2 is about 0.10 seconds, and type 3 is about 0.15 seconds. If OFILL is set, delay type 1 transmits two fill characters, and type 2, four fill characters.

Horizontal-tab delay type 1 is dependent on the current column position. Type 2 is about 0.10 seconds. Type 3 specifies that tabs are to be expanded into spaces. If OFILL is set, two fill characters will be transmitted for any delay.

Backspace delay lasts about 0.05 seconds. If OFILL is set, one fill character will be transmitted.

The actual delays depend on line speed and system load.

The initial output control value is all bits clear.

The `c_cflag` field describes the hardware control of the terminal:

CBAUD	0000017	Baud rate:
B0	0	Hang up
B50	0000001	50 baud
B75	0000002	75 baud
B110	0000003	110 baud
B134	0000004	134.5 baud
B150	0000005	150 baud
B200	0000006	200 baud
B300	0000007	300 baud
B600	0000010	600 baud
B1200	0000011	1200 baud
B1800	0000012	1800 baud
B2400	0000013	2400 baud
B4800	0000014	4800 baud
B9600	0000015	9600 baud
B19200	0000016	19200 baud
B38400	0000017	38400 baud (not supported)
CSIZE	0000060	Character size:
CS5	0	5 bits
CS6	0000020	6 bits
CS7	0000040	7 bits
CS8	0000060	8 bits
CSTOPB	0000100	Send two stop bits, else one
CREAD	0000200	Enable receiver
PARENB	0000400	Parity enable
PARODD	0001000	Odd parity, else even
HUPCL	0002000	Hang up on last close
CLOCAL	0004000	Local line, else dial-up
RCV1EN	0010000	
XMT1EN	0020000	
LOBLK		Block layer output 0040000

The CBAUD bits specify the baud rate. The zero baud rate, B0, is used to hang up the connection. If B0 is specified, the dataterminal-ready signal will not be asserted. Normally, this will disconnect the line. For any particular hardware, impossible speed changes are ignored.

The CSIZE bits specify the character size in bits for both transmission and reception. This size does not include the parity bit, if any. If CSTOPB is set, two stop bits are used, otherwise one stop bit. For example, at 110 baud, two stop bits are required.

If PARENB is set, parity generation and detection is enabled and a parity bit is added to each character. If parity is enabled, the PARODD flag specifies odd parity if set, otherwise even parity is used.

If CREAD is set, the receiver is enabled. Otherwise no characters will be received.

If HUPCL is set, the operating system disconnects ("hangs up") the line when the last process (or file) for that port closes. That is, the dataterminal-ready signal becomes false (is not asserted). If HUPCL is false, the data-terminal-ready signal remains true even after the last close on the port.

If CLOCAL is set when a port is opened, the operating system assumes the line is a local, directly connected port (i.e., there is no modem control) and the open completes without waiting for carrier. The dataterminal-ready and request-to-send signals are asserted, and incoming modem signals are ignored. If CLOCAL is false for a port when opening it, the operating system assumes there is modem control, and the open waits for the carrier-detect to be true (if the O\_NDELAY flag is not set on the file (see fcntl.h)). The data-terminal-ready and request-to-send signals are asserted.

The operating system also checks CLOCAL when a modem interrupt occurs, usually when the data-terminal-ready signal changes. The operating system assumes that the data-terminal-ready signal reflects the carrier sense of the modem and will kill the process group for the port if data-terminal-ready goes from true to false. If data-terminal-ready goes from false to true, the operating system wakes up any open requests waiting for carrier-detect to go true. If CLOCAL is true, the operating system disables modem interrupts.

Finally, CLOCAL also affects hardware flow control. If CLOCAL is false, the operating system does not enable any hardware flow control, regardless of the setting of hardware flow control (see SETFLOW below) flags.

The initial hardware control value after open is B9600, CS8, CREAD, HUPCL for modem ports, and B9600, CS8, CREAD, CLOCAL for local ports.

If LOBLK is set, the output of a job control layer will be blocked when it is not the current layer. Otherwise the output generated by that layer will be multiplexed onto the current layer.

The initial hardware control value after open is B300, CS8, CREAD, HUPCL.

The `c_lflag` field of the argument structure is used by the line discipline to control terminal functions. The basic line discipline (0) provides the following:

ISIG	0000001	Enable signals
ICANON	0000002	Canonical input (erase and kill processing)
XCASE	0000004	Canonical upper/lower presentation
ECHO	0000010	Enable echo
ECHOE	0000020	Echo erase character as BS-SP-BS
ECHOK	0000040	Echo NL after kill character
ECHONL	0000100	Echo NL
NOFLSH	0000200	Disable flush after interrupt or quit

If ISIG is set, each input character is checked against the special control characters INTR, SWTCH, and QUIT. If an input character matches one of these control characters, the function associated with that character is performed. If ISIG is not set, no checking is done. Thus these special input functions are possible only if ISIG is set. These functions may be disabled individually by changing the value of the control character to an unlikely or impossible value (e.g., 0377).

If ICANON is set, canonical processing is enabled. This enables the erase and kill edit functions, and the assembly of input characters into lines delimited by NL, EOF, and EOL. If ICANON is not set, read requests are satisfied directly from the input queue. A read will not be satisfied until at least MIN characters have been received or the timeout value TIME has expired between characters. This allows fast bursts of input to be read efficiently while still allowing single character input. The MIN and TIME values are stored in the position for the EOF and EOL characters, respectively. The time value represents tenths of seconds.

If XCASE is set, and if ICANON is set, an uppercase letter is accepted on input by preceding it with a \ character, and is output preceded by a \ character. In this mode, the following escape sequences are generated on output and accepted on input:

for:	use:
'	\'
	\!
~	\~
{	\{
}	\}
\	\\

For example, A is input as \a, \n as \\n, and \N as \\N.

If ECHO is set, characters are echoed as received.

When ICANON is set, the following echo functions are possible. If ECHO and ECHOE are set, the erase character is echoed as ASCII BS SP BS, which will clear the last character from a CRT screen. If ECHOE is set, the NL character will be echoed after the kill character to emphasize that the line will be deleted.

Note that an escape character preceding the erase or kill character removes any special function. If ECHONL is set, the NL character will be echoed even if ECHO is not set. This is useful for terminals set to local echo (so-called half duplex). Unless escaped, the EOF character is not echoed. Because EOT is the default EOF character, this prevents terminals that respond to EOT from hanging up.

If NOFLSH is set, the normal flush of the input and output queues associated with the quit, switch, and interrupt characters will not be done.

The initial line-discipline control value is all bits clear.

The primary ioctl(S) system calls have the form:

```
ioctl (filedes, command, arg)
struct termio *arg;
```

The commands using this form are:

**TCGETA**

Get the parameters associated with the terminal and store in the **termio** structure referenced by *arg*.

**TCSETA**

Set the parameters associated with the terminal from the structure referenced by *arg*. The change is immediate.

**TCSETAW**

Wait for the output to drain before setting the new parameters. This form should be used when changing parameters that will affect output.

**TCSETAF**

Wait for the output to drain, then flush the input queue and set the new parameters.

Another group of **ioctl** system calls have the form:

```
ioctl (filedes, command, arg)  
char *arg;
```

The commands using this form are:

**SETFLOW**

Sets the hardware flow control bits, defined as **TXHARD** and **RXHARD** for the terminal. If the **TXHARD** bit is set, hardware output flow control is enabled. If the **RXHARD** bit is set, hardware input flow control is enabled. The argument is a pointer to a byte with these bits set (or not). The software flow control bits (**TXSOFT** and **RXSOFT**) are ignored.

**GETFLOW**

Returns the hardware flow control bits. The argument is a pointer to a byte with these bits set (or not).

Additional **ioctl** calls have the form:

```
ioctl (filedes, command, arg)  
int arg;
```

The commands using this form are:

**TCSBRK**

Wait for the output to drain. If *arg* is 0, then send a break (zero bits for 0.25 seconds).

**TCXONC**

Start/stop control. If *arg* is 0, suspend output; if 1, restart suspended output.

**TCFLSH**

If *arg* is 0, flush the input queue; if 1, flush the output queue; if 2, flush both the input and output queues.

**SETMODEM**

Sets the modem mode to USER, ON, or OFF for the terminal. *Arg* should be either MDM\_ON, MDM\_OFF, or MDM\_USER.

**GETMODEM**

Returns the current modem setting, either MDM\_ON, MDM\_OFF, MDM\_USER. *Arg* is ignored.

See `ioctl(S)` for details on how to use this system call.

**Files**

`/dev/tty`  
`/dev/tty*`  
`/dev/console`

**See Also**

`ioctl(S)`, `stty(C)`, `xtty(C)`

**Name**

**timezone** - Sets default system time zone.

**Syntax**

**/etc/TIMEZONE**

**Description**

This file sets and exports the time zone environmental variable TZ. This file is included into other files that must know the time zone.

**Examples**

**/etc/TIMEZONE** for the East coast:

```
#      Time Zone
TZ=EST5EDT
export TZ
```

**See Also**

rc2(M), profile(M), and ctime(S) in the *Reference (CP, S, F)*

## Name

**ttys** - Login terminals file.

## Syntax

**/etc/ttys**

## Description

The **/etc/ttys** file contains a list of the device special files associated with possible login terminals.

The file contains one or more entries of the form:

*state mode name*

The *name* must be the filename of a device special file. Only the filename may be supplied, the path is assumed to be **/dev**. If *state* is "1", the device is enabled for logins; if "0", the device is disabled. The *mode* is used as an argument to the **getty** program. It defines the line speed and type of device associated with the terminal. A list of arguments is provided in **getty**.

For example, the entry "16tty02" means the serial line **tty02** is to be enabled for logging in at 9600 baud.

## Files

**/etc/ttys**

## See Also

**getty(M)**, **pconfig(C)**

## Notes

Edit the **/etc/ttys** file only when in system maintenance mode. This file is obsolete, and is maintained only for the convenience of old programs. **Init(M)** no longer examines this file.

## Name

utmp, wtmp - Utmp and wtmp entry formats.

## Syntax

```
#include <sys/types.h>
#include <utmp.h>
```

## Description

These files, which hold user and accounting information for such commands as `who(C)`, `write(C)`, and `login(M)`, have the following structure as defined by `<utmp.h>`:

```
#define      UTMP_FILE      "/etc/utmp"
#define      WTMP_FILE      "/etc/wtmp"
#define      ut_name        ut_user

struct utmp {
    char      ut_user[8];    /* User login name */
    char      ut_id[4];     /* /etc/inittab id (usually line #) */
    char      ut_line[12];  /* device name (console, lnx) */
    short     ut_pid;       /* process id */
    short     ut_type;      /* type of entry */
    struct    exit_status {
        short  e_termination; /* Process termination status */
        short  e_exit;        /* Process exit status */
    } ut_exit;             /* The exit status of a process
                           * marked as DEAD_PROCESS. */
    time_t    ut_time;      /* time entry was made */
};

/* Definitioins for ut_type */
#define EMPTY          0
#define RUN/LVL        1
#define BOOT_TIME      2
#define OLD_TIME       3
#define NEW_TIME       4
#define INIT_PROCESS   5 /* Process spawned by "init" */
#define LOGIN_PROCESS  6 /* A "getty" process waiting for login */
#define USER_PROCESS   7 /* A user process */
#define DEAD_PROCESS   8
#define ACCOUNTING     9
#define UTMAXTYPE      ACCOUNTING /* Largest legal value of */
                           /* ut_type */
```

```
/* Special strings or formats used in the "ut_line" field accounting */
/* accounting for something other than a process */
/* No string for the ut_line field can be more than 11 chars + */
/* a NULL in length */
#define RUNLVL_MSG "run-level %c"
#define BOOT_MSG  "system boot"
#define OTIME_MSG "old time"
#define NTIME_MSG "new time"
```

## Files

```
/etc/utmp
/etc/wtmp
```

## See Also

getut(S), login(C), who(C), write(C)

## Name

**uuccheck** - Checks the uucp directories and permissions file.

## Syntax

```
/usr/lib/uucp/uuccheck [ -v ] [ -x debug_level ]
```

## Description

**Uuccheck** checks for the presence of the uucp system required files and directories. Within the **uucp** makefile, it is executed before the installation takes place. It also checks for some obvious errors in the permissions file (**/usr/lib/uucp/Permissions**). When executed with the **-v** option, it gives a detailed explanation of how the **uucp** programs will interpret the permissions file. The **-x** option is used for debugging. *Debug\_level* is a single digit in the range 1-9; the higher the value, the greater the detail. Note that **uuccheck** can only be used by the super-user or **uucp**.

## Files

```
/usr/lib/uucp/Systems  
/usr/lib/uucp/Permissions  
/usr/lib/uucp/Devices  
/usr/lib/uucp/Maxuuscheds  
/usr/lib/uucp/Maxuuxqts  
/usr/spool/uucp/*  
/usr/spool/locks/LCK*  
/usr/spool/uucppublic/*
```

## See Also

**uucico(M)**, **uusched(M)**, **uucp(C)**, **uustat(C)**, **uux(C)**

## Notes

The program does not check file/directory modes or some errors in the permissions file such as duplicate login or machine names.

## Name

**uucico** - File transport program for the uucp system.

## Syntax

```
/usr/lib/uucp/uucico [ -r role_number ] [ -x debug_level ]  
[ -i interface ] [ -d spool_directory ] -s system_name
```

## Description

**Uucico** is the file transport program for **uucp** work file transfers. *Role numbers* for the **-r** option are the digit 1 for master mode or 0 for slave mode (default). The **-r** option should be specified as the digit 1 for master mode when **uucico** is started by a program or **cron(C)**. **Uux** and **uucp** both queue jobs that will be transferred by **uucico**. It is normally started by the scheduler, **uusched**, but can be started manually for debugging. For example, the script **uutry** starts **uucico** with debugging turned on. A single digit must be used for the **-x** option with higher numbers for more debugging. The **-i** option defines the interface used with **uucico**. This interface only affects slave mode. Known interfaces are UNIX (default), TLI (basic Transport Layer Interface), and TLIS (Transport Layer Interface with Streams modules, read/write).

## Files

```
/usr/lib/uucp/Systems  
/usr/lib/uucp/Permissions  
/usr/lib/uucp/Devices  
/usr/lib/uucp/Devconfig  
/usr/lib/uucp/Sysfiles  
/usr/lib/uucp/Maxuuxqts  
/usr/lib/uucp/Maxuuscheds  
/usr/spool/uucp/*  
/usr/spool/locks/LCK*  
/usr/spool/uucppublic/*
```

## See Also

**cron(C)**, **uusched(M)**, **uutry(M)**, **uucp(C)**, **uustat(C)**, **uux(C)**

## Name

**uucleanup** - Uucp spool directory cleanup.

## Syntax

```
/usr/lib/uucp/uucleanup [ -Ctime ] [ -Wtime ] [ -Dtime ]  
  [ -Xtime ] [ -mstring ] [ -otime ] [ -ssystem ]  
  [ -xdebug_level ]
```

## Description

**Uucleanup** will scan the spool directories for old files and take appropriate action to remove them in a useful way:

- Inform the requestor of send/receive requests for systems that cannot be reached.
- Return mail, which cannot be delivered, to the sender.
- Delete or execute rnews for rnews type files (depending on where the news originated--locally or remotely).
- Remove all other files.

In addition, there is provision to warn users of requests that have been waiting for a given number of days (default 1). Note that **uucleanup** will process as if all option *times* were specified to the default values, unless *time* is specifically set.

The following options are available.

- |               |  |
|---------------|--|
| <b>-Ctime</b> | Any C. files greater or equal to <i>time</i> days old will be removed with appropriate information to the requestor (default 7 days).  |
| <b>-Dtime</b> | Any D. files greater or equal to <i>time</i> days old will be removed. An attempt will be made to deliver mail messages and execute rnews when appropriate (default 7 days). |

- Wtime** Any C. files equal to *time* days old will cause a mail message to be sent to the requester warning about the delay in contacting the remote (default 1 day). The message includes the *JOBID*, and in the case of mail, telling whom to call to check the problem (-m option).
- Xtime** Any X. files greater or equal to *time* days old will be removed (default 2 days). The D. files are probably not present (if they were, the X. could get executed). But if there are D. files, they will be taken care of by D. processing.
- mstring** This line will be included in the warning message generated by the -W option.
- otime** Other files whose age is more than *time* days will be deleted (default 2 days). The default line is "See your local administrator to locate the problem."
- ssystem** Execute for *system* spool directory only.
- xdebug\_level** The -x *debug\_level* is a single digit between 0 and 9; higher numbers give more detailed debugging information. (If *uucleanup* was compiled with -DSMALL, no debugging output will be available.)

This program is typically started by the shell *uudemon.cleanup*, which should be started by **cron(C)**.

## Files

- |                        |   |
|------------------------|---|
| <i>/usr/lib/uucp</i>   | Directory with commands used by <b>uucleanup</b> internally |
| <i>/usr/spool/uucp</i> | Spool directory   |

## See Also

**cron(C)**, **uucp(C)**, **uux(C)**

## Name

**uugetty** - Sets terminal type, modes, speed, and line discipline.

## Syntax

```
/usr/lib/uucp/uugetty [-h] [-t timeout] [-r] line [speed
    [type [linedisc]]]
/usr/lib/uucp/uugetty -c file
```

## Description

**Uugetty** is identical to **getty(M)** but changes have been made to support using the line for **uucico**, **cu**, and **ct**; that is, the line can be used in both directions. **Uugetty** will allow users to log in, but if the line is free, **uucico**, **cu**, or **ct** can use it for dialing out. The implementation depends on the fact that **uucico**, **cu**, and **ct** create lock files when devices are used. When the **open(S)** returns (or the first character is read when **-r** option is used), the status of the lock file indicates whether the line is being used by **uucico**, **cu**, **ct**, or someone trying to log in. Note that in the **-r** case, several carriage-return characters may be required before the login message is output. The users will be able to handle this slight inconvenience. **Uucico** trying to log in will have to be told by using the following login script:

```
"" \r\d\r\d\r\d\r in:--in:...
```

where the ... is whatever would normally be used for the login sequence.

An entry for an intelligent modem or direct line that has a **uugetty** on each end must use the **-r** option. (This causes **uugetty** to wait to read a character before it puts out the login message, thus preventing two **uugettys** from looping.) If there is a **uugetty** on one end of a direct line, there must be a **uugetty** on the other end as well. Here is an **/etc/inittab** entry using **uugetty** on an intelligent modem or direct line:

```
tt12:2:respawn:env - TERM=altos5
/usr/lib/uucp/uugetty -r -t 60 tty12 1200
```

For an explanation of `uugetty` options, see `getty(M)`.

## Files

```
/etc/gettydefs
/etc/issue
```

## See Also

`uucico(M)`, `getty(M)`, `init(M)`, `tty(M)`, `cu(C)`, `login(M)`  
`gettydefs(M)`, `inittab(M)`, and `ioctl(S)` in the *Reference*  
(*CP*, *S*, *F*)

## Notes

`Uugetty` does not support linking of device files.

## Name

**uusched** - Scheduler for the uucp file transport program.

## Syntax

```
/usr/lib/uucp/uusched [ -x debug_level ] [ -u debug_level ]
```

## Description

**Uusched** is the **uucp** file transport scheduler. It is usually started by the daemon **uudemond.hour** that is started by **cron(C)** from an entry in **/usr/spool/cron/crontab**:

```
39 * * * * /bin/su uucp -c "/usr/lib/uucp/uudemond.hour > /dev/null"
```

The two options are for debugging purposes only; **-x *debug\_level*** will output debugging messages from **uusched** and **-u *debug\_level*** will be passed as **-x *debug\_level*** to **uucico**. The *debug\_level* is a number between 0 and 9; higher numbers give more detailed information.

## Files

```
/usr/lib/uucp/Systems  
/usr/lib/uucp/Permissions  
/usr/lib/uucp/Devices  
/usr/spool/uucp/*  
/usr/spool/locks/LCK*  
/usr/spool/uucppublic/*
```

## See Also

**cron(C)**, **uucico(M)**, **uucp(C)**, **uustat(C)**, **uux(C)**

## Name

**Uutry** - Tries to contact remote system with debugging on.

## Syntax

```
/usr/lib/uucp/Uutry [ -x debug_level ] [ -r ] system_name
```

## Description

**Uutry** is a shell that is used to invoke **uucico** to call a remote site. Debugging is turned on (default is level 5); **-x** will override that value. The **-r** overrides the retry time in `/usr/spool/uucp/.status`. The debugging output is put in file `/tmp/system_name`. A **tail -f** of the output is executed. A `<DELETE>` or `<BREAK>` will give control back to the terminal while the **uucico** continues to run, putting its output in `/tmp/system_name`.

## Files

```
/usr/lib/uucp/Systems  
/usr/lib/uucp/Permissions  
/usr/lib/uucp/Devices  
/usr/lib/uucp/Maxuuxqts  
/usr/lib/uucp/Maxuuscheds  
/usr/spool/uucp/*  
/usr/spool/locks/LCK*  
/usr/spool/uucppublic/*  
/tmp/system_name
```

## See Also

**uucico(M)**, **uucp(C)**, **uux(C)**

## Name

**uuxqt** - Executes remote command requests.

## Syntax

```
/usr/lib/uucp/uuxqt [ -s system ] [ -x debug_level ]
```

## Description

**Uuxqt** is the program that executes remote job requests from remote systems generated by the use of the **uux** command. (Mail uses **uux** for remote mail requests.) **Uuxqt** searches the spool directories looking for *X.* files. For each *X.* file, **uuxqt** checks to see if all the required data files are available and accessible, and file commands are permitted for the requesting system. The Permissions file is used to validate file accessibility and command execution permission.

There are two environment variables that are set before the **uuxqt** command is executed:

**UU\_MACHINE** is the machine that sent the job (the previous one).

**UU\_USER** is the user that sent the job.

These can be used in writing commands that remote systems can execute to provide information, auditing, or restrictions. The **-x debug\_level** is a single digit between 0 and 9. Higher numbers give more detailed debugging information.

## Files

```
/usr/lib/uucp/Permissions  
/usr/lib/uucp/Maxuuxqts  
/usr/spool/uucp/*  
/usr/spool/locks/LCK*
```

## See Also

uucico(M), uucp(C), uustat(C), uux(C), mail(C)

## Name

**volcopy**, **labelit** - Copies file systems with label checking.

## Syntax

```
/etc/volcopy [options] fsname special1 volname1 special2
volname2
/etc/labelit special [fsname volume [-n]]
```

## Description

The **volcopy** command makes a literal copy of the file system using a blocksize matched to the device.

The **labelit** command creates a label for an unmounted disk file system or a **volcopy** archive device. The **-n** option provides for initial labeling on tapes only (this destroys previous contents). Otherwise, a label must already exist and only the *fsname* and *volume* arguments are modified. If all optional arguments are omitted, **labelit** prints the current label values of the special device.

## Options

- a** Invokes a verification sequence requiring a positive operator response instead of the standard 10-second delay before the copy is made.
- s** Prompts the user before the copy is made. The copy is aborted if the user presses **Break/Del** within 10 seconds (default).
- y** Assumes a "yes" response to all questions.

The following additional options are used only with tapes:

- reelnum** Specifies the beginning reel number for a restarted copy.
- buf** Uses double-buffered I/O.

- feetnum** Specifies the tape length, only valid when using reel tape.
- bpinum** Specifies the tape density (bits/inch), only valid when using reel tape.
- tr** Specifies reel tape.
- tc** Specifies cartridge tape.
- scsi** Assumes tape drive is of scsi type, only valid when using cartridge tape.
- nonscsi** Assumes tape drive is not scsi type, only valid when using cartridge tape.
- typeLABEL** Specifies the type of cartridge tape being used, only valid when using cartridge tape.

The program requests length and density information if it is not given on the command line or is not recorded on an input tape label. Reel or cartridge tapes may be used. If the file system is too large to fit on one reel, **volcopy** will prompt for additional reels. Labels of all reels are checked.

If **volcopy** is interrupted, it will ask if the user wants to quit or wants a shell. In the latter case, the user can perform other operations, such as **labelit**, and return to **volcopy** by exiting the new shell.

The *fsname* argument represents the mounted name (for example, root or usr) of the file system being copied. The *special* argument should be the physical disk section or tape, for example, /dev/rhd0b or /dev/rct.

The *volname* argument is the physical volume name (for example, rhd0b), and should match the external label sticker. Such label names are limited to six or fewer characters. To use the existing volume name, specify -- for the *volname* argument.

The arguments *special1* and *volname1* are the device and volume from which the copy of the file system is being extracted. The arguments *special2* and *volname2* are the target device and volume.

Neither the source or target device should have a file system mounted while running **volcopy**, or while creating a label with **labelit**. The exception is for the / file system, where you should be in single-user mode. (You can read the label of a mounted file system with **labelit**.)

The values for *fname* and *volname* are recorded in the last 12 characters of the superblock (char *fname*[6], *volname*[6];).

## Examples

To label a tape for the / file system, with volume label v001, go to single-user mode and enter:

```
/etc/labelit /dev/rct / v001
```

To archive the / file system on a tape, labeled as in the above example, enter:

```
/etc/volcopy / /dev/rhd0b hd0b /dev/rct v001
```

To restore a tape (archived as above) of the / file system to disk, enter:

```
/etc/volcopy / /dev/rct v001 /dev/rhd0b hd0b
```

Note that when using **volcopy** for the / file system, go to single-user mode.

## Files

/etc/log/filesave.log

Record of file systems/volume copied

## See Also

sh(C)

## Notes

Only device names beginning with /dev/rct are treated as tapes.

## Name

vt - Virtual terminal management (Series 500 only).

## Description

The virtual terminal (VT) device driver is a layer of management functions that provides the facilities to support and switch between up to eight screen faces on each physical device. Terminal or display device drivers that have been written to take advantage of this facility can therefore present multiple VTs on a single physical device. The correspondence between physical and virtual terminals is determined using the minor device number of the physical device, with the bottom five bits selecting the physical device and the top three bits selecting the virtual terminal.

Virtual terminals are accessed in exactly the same way as any other device. The `open(S)` system call is used to open the virtual terminal, and `read(S)`, `write(S)`, and `ioctl(S)` are used in the normal way and support all the functionality of the underlying device. In addition, some VT-specific `ioctl` calls are provided as described below.

Virtual terminals provide the link between different screen faces and the device. The virtual terminal that corresponds to the currently visible screen face is called the active virtual terminal. The active VT is the one that input from the device will be directed to, and any device-specific modes that can change on a per-VT basis will be set to the characteristics associated with the active VT.

Open virtual terminals on a device are placed on a "ring," with the active VT always being the VT on the top of the ring. The ring can be cycled through via a "hot key" that is specific to the underlying device driver. The first open of a VT causes it to be placed at the top of the ring and become the active VT. The last close on a VT causes it to be removed from the ring, and if this was the active VT, the previous VT on the ring becomes the active one.

Virtual terminal switching can be done in two different modes: automatically on receipt of a hot key, or under control of the process owning the VT. In the first case,

the process associated with the VT knows nothing about the switch and it is handled entirely by the underlying device driver and the virtual terminal manager. In process-controlled switch mode, when a switch hot key is sent, the process owning the VT is sent a signal (see `sigset(S)`) that it has specified to the VT manager. This signal requests the process to release the physical device. The VT manager then awaits an `ioctl` from the process indicating that the VT either has released the physical device (in which case a switch occurs), or refuses to release the device (in which case the switch does not occur). If a predefined time limit expires before the `ioctl` is received from the process owning the VT, the VT manager behaves as if an `ioctl` indicating refusal was received. The ring of active VTs can contain intermixed auto mode and process control mode VTs. Process control mode VTs will be sent a signal that they have specified when they become the active VT. Some device drivers may support a forced switch mode, in which case an alternate hotkey sequence will cause the driver to force a switch to the next VT even if a normal switch is refused. The driver does the forced switch and the VT manager signals the VT that it has been forced out.

## Ioctl Calls

The following `ioctl` calls apply to any device that supports VTs.

### VT\_OPENQRY

This call is used to find an available VT. The argument to the `ioctl` is a pointer to a long. The long will be filled in with the number of the first available VT that no other process has open (this may be the one currently opened). If there are no available VTs then -1 will be filled in.

### VT\_GETMODE

This call is used to determine what mode the VT is currently in, either `VT_AUTO` or `VT_PROCESS`. The argument to the `ioctl` is the address of the following structure, as defined in `<sys/vt.h>`.

```

struct vt_mode {
    char    mode;      /* VT mode */
    char    waitv;     /* if non-zero, hang on writes when
                        not active */
    short   relsig;    /* signal to use for release request */
    short   acqsig;    /* signal to use for display acquired */
    short   frsig;     /* signal to use for forced release */
}
/* Virtual Terminal Modes */
#define    VT_AUTO      0 /* automatic VT switching */
#define    VT_PROCESS   1 /* process controls switching */

```

The structure will be filled in with the current value for each field.

### VT\_SETMODE

This call is used to set the VT mode. The argument to the `ioctl` is a pointer to a `vt_mode` structure, as defined above. The structure should be filled in with the desired VT mode and whether or not to block on writes when not active. If process-control mode is specified then the signals that should be used to communicate with the process should be specified. If any of the signals are not specified (value is zero), then the default for that signal will be used (SIGUSR1 for *relsig* and *acqsig* and SIGUSR2 for *frsig*).

### VT\_RELDISP

This call is used to tell the VT manager if the display has been released or if the process has refused to release the display. A non-zero argument signals release and zero indicates refusal to release.

### VT\_ACTIVATE

This call has the effect of making the VT specified in the argument the active VT. The VT manager will cause a switch to occur in the same manner as if a hotkey had initiated the switch. If the specified VT is not open or does not exist, the call will fail and *errno* will be set to ENXIO.

## Files

`/dev/vtxxn`

**See Also**

ioctl(S), sighold(S), signal(S), sigrelse(S), sigset(S)

**Warnings**

There is a potential for a race condition on a heavily loaded system. When a process-control mode VT is sent the release requested signal, it is possible that it may not reply with a release `ioctl` before the internal timer expires and refusal to switch is assumed. The switch request will then be canceled and the VT will not switch screen faces. This can be detected by the process attempting to release the display. If the release `ioctl` fails and `errno` is `EINVAL`, then the releasing process can assume that the switch request was canceled.

## Name

**whodo** - Shows who is doing what.

## Syntax

**/etc/whodo**

## Description

**Whodo** produces formatted and dated output from information in the `/etc/utmp` and `/etc/ps_data` files.

The display is headed by the date, time, and machine name. For each user logged in, device name, user-id and login time is shown, followed by a list of active processes associated with the user-id. The list includes the device name, process-id, cpu minutes and seconds used, and process name.

## Example

The command:

**whodo**

produces a display like this:

```
Tue Mar 12 15:48:03 1985
bailey

tty09  mcn      8:51
      tty09 28158 0:29 sh

tty52  bdr      15:23
      tty52 21688 0:05 sh
      tty52 22788 0:01 whodo
      tty52 22017 0:03 vi
      tty52 22549 0:01 sh

xt162  lee      10:20
      tty08 6748 0:01 layers
      xt162 6751 0:01 sh
      xt163 6761 0:05 sh
      tty08 6536 0:05 sh
```

**Files**

/etc/passwd  
/etc/ps\_data  
/etc/utmp

**See Also**

ps(C), who(C)

**Name**

**xpd** - Transparent printer daemon.

**Syntax**

**xpd** *tty lp type*

**Description**

The **xpd** daemon directs any output sent to the *lp* device to the printer attached to the *tty* device printer port.

*tty* is the name of the terminal device to which the printer is attached. It must be invoked as */dev/tty*.

*lp* is the name of a FIFO special device to be used by the printer. It must be invoked as */dev/lp*.

*type* is the name of the terminal type. The *altos2*, *altos3*, *altos4*, *altos5*, and *Wyse 30* terminals are supported.

**Files**

*/dev/tty??*  
*/dev/lp?*

**Also See**

**mknod**(C)



# Change Information

This is a summary of the changes that have been made to the previous version of this manual. The chapters, page numbers, and/or paragraphs mentioned in this summary reference the previous manual.

**Title:** Altos System V Series 386 Reference (M)

**Revised Part Number:** 690-22870-002

**Previous Part Number:** 690-22870-001

**Date:** June 1989

## Changes:

Updated the Permuted Index and Table of Contents.

Added `aliases(M)` and `aliashash(M)`.

Changed `rc5(M)` to `rc0(M)`.

Changed the following pages:

Page	Command	Description
8	<code>crash(M)</code>	Corrected <code>pagemode</code> on/off toggle option to read <code>-on</code> or <code>-off</code> .
4	<code>init(M)</code>	Run level 0 is now used for shutdowns (formerly run level 5).
7	<code>keyboard(M)</code>	Modified Keyboard Keys table and added Other Keys table.
4, 20	<code>terminfo(M)</code>	Added information about line graphics character set mapping with <code>acsc</code> .

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*Change Information*

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<b>Page</b>	<b>Command</b>	<b>Description</b>
26	<b>terminfo(M)</b>	Added two more files containing terminal descriptions: <b>altos.src</b> and <b>terminfo.src</b> .
3	<b>volcopy(M)</b>	Removed references to backing up root file system with <b>volcopy(M)</b> .

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## READER'S COMMENTS

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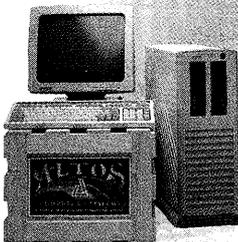
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