# M U N I X

## CURRENT COMMANDS

D930055-INFO

# Current MUNIX commands

*PCS*
*Pfälzer - Wald - Str. 36*
*8000 München 90*

September 1983

**Software facilities available on MUNIX**

This summary includes all commands, which are distributed with the MUNIX operating system or as additional packages.
The following optional packages are available. Commands belonging to the various packages are marked.

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|---|---|
| Berkeley Extensions V1.1 | (*E*) |
| MUNIX Editor V2.8 | (*M*) |
| Pascal Package V2.2 | (*P*) |
| SCCS Package V1.0 | (*S*) |
| Snobol Package V1.0 | (*SNO*) |
| Typeset Package V1.0 | (*T*) |

MUNIX consists of UNIX† V 7 with some commands of

| | |
|---|---|
| System III | (-III-) |
| Berkeley 4.1 bsd | (-B-) |
| Motorola fast floating point package | (-M-) |
| PCS made | (-0-) |

PCS appends some new utilities and extensions of existing UNIX commands, i.e. the *b* option for *dump* - useful for dumping on floppies.

†UNIX is a Trademark of Bell Laboratories.

## 1. Basic Software

This includes the time-sharing operating system with utilities, a machine language assembler and a compiler for the programming language C. Enough software to write and run new applications.

### 1.1. Operating System

MUNIX (-0-) The basic resident code on which everything else depends. Supports the system calls, and maintains the file system. A general description of UNIX design philosophy and system facilities were published in the Communications of the ACM, July, 1974. A more extensive survey is in the Bell System Technical Journal for July-August 1978. Capabilities include:

- Reentrant code for user processes.
- Separate instruction and data space.
- "Group" access permissions for cooperative projects, with overlapping memberships.
- Alarm-clock timeout.
- Timer-interrupt sampling and interprocess monitoring for debugging and measurement.
- Multiplexed I/O for machine-to-machine communication.

DRIVERS (-0-) All I/O is logically synchronous. I/O devices are simply files in the file system. Normally, invisible buffering makes all physical record structure and device characteristics transparent and exploits the hardware's ability to do overlapped I/O. Unbuffered physical record I/O is available for special applications. Drivers for the following devices and controllers are available:

- *Asynchronous interfaces:* DLV11, terminal multiplexer DZ11 or DZV11 and DH11. Support for most common ASCII terminals.
- *Printer:* LPV11, CANON Laser Beam Printer LBP10 and Versatec V80 printer plotter
- *Magnetic tape:* TU10
- *Streamer*
- *Floppy disk:* RX01/02
- *Disks:* RL01/02, RK06/07, RM02/03/05 drivers include bad block forwarding. RP04/05/06 and TANDON 5 1/4" disks with DILOG-520A or OMTI 20d controller.
- Ethernet with 3 COM hardware
- KE-BSC driver for RJE, an emulation of an IBM 360-20 multileaving workstation.
- Physical memory of QU68000
- Null device

TMCTRL (-0-) Force tape driver to swap bytes, for exchanging data with foreign systems.

TMSKIP (-0-) Skip a specified number of files on the tape.

MT (*E*) Give commands to the tape drive.

- Space forward i files or records.
- Space backward i files or records.
- Write i end-of-file marks.
- Rewind tape.
- Swap or do not swap bytes.

REWIND (*E*) Rewind the tape drive.

STCTRL (-0-) Force the streamer driver to erase the tape or to make a retension of the tape.

STSKIP (-0-) Skip a specified number of files on the streamer tape.

RXCTRL (-0-) Force the floppy driver to swap bytes, to initialize data fields etc.

LPCTRL (-0-) Force the line printer driver to change the layout or to go into transparent mode.

FORMAT (-0-) Procedures to format several disks:

- RX01 and RX02 floppies
- RL02 disks emulated by the ANDROMEDA WDC11 controller.
- RK06 and RK07 disks emulated by the EMULEX SC02 controller.
- RM02/03/05 disks emulated by the DATARAM SO4/A controller.
- TANDON disks TM603SE, TM503, TM703, TM 100-1 with DILOG-520A or OMTI 20d controller.

BOOT (-0-) Procedures to get MUNIX started.

NEWCONF (-0-) Make a new MUNIX kernel from an already existing or from an interactively created configuration file.

WHATCONF (-0-) Examine a MUNIX kernel, for which devices it is configured, where root and swap devices reside...

## 1.2. User Access Control

LOGIN Sign on as a new user.

- Verify password and establish user's individual and group (project) identity.
- Adapt to characteristics of terminal.
- Establish working directory.
- Announce presence of mail (from MAIL).
- Publish message of the day.
- Execute user-specified profile.
- Start command interpreter or other initial program.

PASSWD — Change a password.
- User can change his own password.
- Passwords are kept encrypted for security.

NEWGRP — (-III-) Change working group (project). Protects against unauthorized changes to projects.

CHFN — (*E*) Change full name of user. The gcos field of the passwd-file is used to give additional information about the user like phone number, office...

### 1.3. Terminal Handling

TABS — Set tab stops appropriately for specified terminal type.

STTY — Set up options for optimal control of the current output terminal. For setting options of other terminals redirect standard output. In so far as they are deducible from the input, these options are set automatically by LOGIN.
- Half vs. full duplex.
- Carriage return+line feed vs. newline.
- Interpretation of tabs.
- Parity.
- Mapping of upper case to lower.
- Raw vs. edited input.
- Delays for tabs, newlines and carriage returns.

TT — (-O-) Reset the terminal bits to a sensible state. Useful after a program dies leaving a terminal in a funny state.

TSET — (*E*) Set terminal modes.

RESET — (*E*) Reset the terminal bits to the correct state.

CLEAR — (*E*) Clear terminal screen.

LOCK — (*E*) Reserve a terminal.

### 1.4. File Manipulation

CAT — Concatenate one or more files onto standard output. Particularly used for unadorned printing, for inserting data into a pipeline, and for buffering output that comes in dribs and drabs. Works on any file regardless of contents.

CAT — (*E*) Concatenate and print one or more files onto standard output. Additional options to the CAT command of the 7th edition:
- Numbering of output lines.
- Crushing out multiple adjacent empty lines.
- Printing non-printing characters in a visible way.

SEE — (*E*) Print a file which contains non-printing characters in a readable format.

MORE (*E*) Interactive display function for text files.
- Start at linenumber i or two lines before pattern.
- Display next page or i-more lines.
- Skip i lines.
- Search i-th occurence of pattern.
- Display current filename, current line number.
- Define window size.
- Squeeze multiple blank lines.
- Start up the editor VI at current line.
- Exit to Shell.
- Help function.

CP Copy one file to another, or a set of files to a directory. Works on any file regardless of contents.

CPIO (-IIIO-) Copy file archives in and out.

PR (-III-) Print files with title, date, and page number on every page.
- Output with line numbering.
- Multicolumn output.
- Parallel column merge of several files.

TAIL Print last n lines of input
- May print last n characters, or from n lines or characters to end.

NL (-III-) Print files with leading line numbers.

HEAD (*E*) Give first few lines of a stream.

STRINGS (*E*) Look for ASCII strings in a binary file.

FOLD (*E*) Fold long lines for finite width output device.

NUM (*E*) Number lines.

UL (*E*) Do underlining.

COLRM (*E*) Remove selected columns from a file.

LPR Off-line print. Spools arbitrary files to the line printer.

VPR (*E*) Raster printer/plotter spooler.

UPR (-O-) Spooler for the UD3 line printer.

LPQ (*T*) Line printer simulator for the laser beam printer. Print files in a format similar to the format on a normal line printer.

PRINT (-O-) Print files off-line with line numbers and every page headed by date, filename and page number.

CMP Compare two files and report if different.

SUM Sum the words of a file.

SPLIT Split a large file into more manageable pieces with a fixed number of lines. Occasionally necessary for editing (ED).

CSPLIT (-III-)Separate a file into sections not only defined by a number of lines like SPLIT but also by regular expressions.

PASTE (-III-) Merge corresponding lines of several files or subsequent lines of a single file.

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|---|---|
| REFORM | (-III-) Reformat text files.<br>• Rearrangment of tab characters.<br>• Trim trailing blanks.<br>• Truncate lines.<br>• Prepend blank lines. |
| EXPAND | (*E*) Expand tabs to spaces. |
| UNEXPAND | (*E*) Unexpand spaces to tabs. |
| COMPACT | (*E*) Store files in a compressed form. |
| UNCOMPACT | (*E*) Restore compressed files to original form. |
| CCAT | (*E*) Cat the original file from a file compressed by compact, without uncompressing the file. |
| TOUCH | Update access and modification times of a file. |
| DD | Physical file format translator, for exchanging data with foreign systems, especially IBM 370's. |

### 1.5. Manipulation of Directories and File Names

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|---|---|
| RM | Remove a file. Only the name goes away if any other names are linked to the file.<br>• Step through a directory deleting files interactively.<br>• Delete entire directory hierarchies. |
| LN | Link another name (alias) to an existing file. |
| MV | Move a file or files. Used for renaming files. |
| MOVE | (-O-) Copy a directory with all its subdirectories. |
| CREATE | (-O-) Create an empty file. |
| CHMOD | Change permissions on one or more files. Executable by files' owner. |
| CHOWN | Change owner of one or more files. |
| CHGRP | Change group (project) to which a file belongs. |
| MKDIR | Make a new directory. |
| RMDIR | Remove a directory. |
| CD | Change working directory. |

FIND (-III-) Prowl the directory hierarchy finding every file that meets specified criteria.

- Criteria include:
  name matches a given pattern,
  Creation date in given range,
  date of last use in given range,
  given permissions,
  given owner,
  given special file characteristics,
  boolean combinations of above.
- Any directory may be considered to be the root.
- Perform specified command on each file found.

WHEREIS (*E*) Locate source, binary, and or manual for specified files.

### 1.6. Running of Programs

SH (-III-) The Shell, or command language interpreter.

- Supply arguments to and run any executable program.
- Redirect standard input, standard output, and standard error files.
- Pipes: simultaneous execution with output of one process connected to the input of another.
- Compose compound commands using:
  if ... then ... else,
  case switches,
  while loops,
  for loops over lists,
  break, continue and exit,
  parentheses for grouping.
- Initiate background processes.
- Perform Shell programs, i.e., command scripts with substitutable arguments.
- Construct argument lists from all file names satisfying specified patterns.
- Take special action on traps and interrupts.
- User-settable search path for finding commands.
- Executes user-settable profile upon login.
- Optionally announces presence of mail as it arrives.
- Provides variables and parameters with default setting.

RSH (-III-) Restricted version of the Shell. Allows only limited command execution.

ENV (-III-) Set an environment for command execution.

TEST — Tests for use in Shell conditionals.
- String comparison.
- File nature and accessibility.
- Boolean combinations of the above.

EXPR — String computations for calculating command arguments.
- Integer arithmetic
- Pattern matching

WAIT — Wait for termination of asynchronously running processes.

GETOPT — (-III-) Break up options in command lines for easy parsing by shell procedures. Check for legal options.

LINE — (-III-) Read a line from terminal, for interactive Shell procedures.

READ — Read a line from terminal, for interactive Shell procedure.

ECHO — Print remainder of command line. Useful for diagnostics or prompts in Shell programs, or for inserting data into a pipeline.

SLEEP — Suspend execution for a specified time.

NOHUP — Run a command immune to hanging up the terminal.

NICE — Run a command in low (or high) priority.

KILL — Terminate named processes.

CRON — Schedule regular actions at specified times.
- Actions are arbitrary programs.
- Times are conjunctions of month, day of month, day of week, hour and minute. Ranges are specifiable for each.

AT — Schedule a one-shot action for an arbitrary time.

TEE — Pass data between processes and divert a copy into one or more files.

STKSIZ — (-O-) Change the stacksize of a program.

YES — (*E*) Be repetitively affirmative. Outputs 'y'.

PRINTENV — (*E*) Print out the values of the variables in the Shell environment.

### 1.7. Status Inquiries

LS — (-B-) List the names of one, several, or all files in one or more directories.
- Alphabetic or temporal sorting, up or down.
- Optional information: size, owner, group, date last modified, date last accessed, permissions, i-node number.

FILE — Try to determine what kind of information is in a file by consulting the file system index and by reading the file itself.

DATE — Print today's date and time. Has considerable knowledge of calendric and horological peculiarities.
- May set UNIX 's idea of date and time.

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| DF | Report amount of free space on file system devices. |
| DU | Print a summary of total space occupied by all files in a hierarchy. |
| DEVNM | (-III-) Give the device name where a specified subdirectory is resident. |
| QUOT | Print summary of file space usage by user id. |
| WHO | Tell who's on the system.<br>• List of presently logged in users, ports and times on.<br>• Optional history of all logins and logouts. |
| WHODO | (-III-) Tell who is doing what on the system. |
| FINGER | (*E*) List the current users including login name, terminal name, login time... |
| W | (*E*) Print a summary of the current activity on the system, including what each user is doing. |
| USERS | (*E*) Print a compact list of users who are on the system. |
| UPTIME | (*E*) Show how long system has been up. |
| ID | (-III-) Print user and group IDs and names. |
| LOGNAME | (-III-) Print login name. |
| UNAME | (-III-) Print the current system name of UNIX. |
| TTY | Print name of your terminal. |
| PS | Report on active processes.<br>• List your own or everybody's processes.<br>• Tell what commands are being executed.<br>• Optional status information: state and scheduling info, priority, attached terminal, what it's waiting for, size. |
| PWD | Print name of your working directory. |

### 1.8. Backup and Maintenance

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|---|---|
| MOUNT | Attach a device containing a file system to the tree of directories. Protects against nonsense arrangements. |
| UMOUNT | Remove the file system contained on a device from the tree of directories. Protects against removing a busy device. |
| MKFS | Make a new file system on a device. |
| MKNOD | Make an i-node (file system entry) for a special file. Special files are physical devices, virtual devices, physical memory, etc. |
| TP<br>TAR | Manage file archives on magnetic tape.<br>• Collect files into an archive.<br>• Update DECtape archive by date.<br>• Replace or delete DECtape files.<br>• Print table of contents.<br>• Retrieve from archive. |

| | |
|---|---|
| DUMP | (-O-) Dump the file system stored on a specified device, selectively by date, or indiscriminately. A multi-volume dump (i.e. on floppies) is possible. |
| RESTOR | Restore a dumped file system, or selectively retrieve parts thereof. |
| VOLCOPY | (-IIIO-) Copy a file system with label checking. |
| LABELIT | (-IIIO-) Create initial labels for disk or tape file systems. |
| SU | Temporarily become the super user with all the rights and privileges thereof. Requires a password. |
| FSCK | (-B-) File system consistency check and interactive repair. |
| FSDB | (-III-) File system debugger. Used to patch up a damaged filesystem after a crash. |
| DCHECK | Read the directories in a file system and compare the link-count in each i-node with the number of directory entries by which it is referenced. |
| ICHECK | Check the number of used and free blocks. List the number of regular files, of directories and special files. If specified, a new free list is constructed. |
| NCHECK | Generate a pathname vs. i-number list. |
| CLRI | Peremptorily expunge a file and its space from a file system. Used to repair damaged file systems. |
| INSTALL | (-III-) Install commands. |
| SYNC | Force all outstanding I/O on the system to completion. Used to shut down gracefully. |
| SHUTDOWN | (*E*) Close down the system at a given time. Used to notify users nicely when the system is shutting down. |
| BADSECT | (*E*) Create files to contain bad sectors. Less general than bad block forwarding, but better than nothing. |
| SCRIPT | (*E*) Make a typescript of everything printed on the terminal during a session. |
| DMESG | (*E*) Look in a system buffer for recently printed diagnostic messages and print them on the standard output. |

### 1.9. Accounting

The timing information on which the reports are based can be manually cleared or shut off completely.

AC — Publish cumulative connect time report.

- Connect time by user or by day.
- For all users or for selected users.

SA — Publish Shell accounting report. Gives usage information on each command executed.
- Number of times used.
- Total system time, user time and elapsed time.
- Optional averages and percentages.
- Sorting on various fields.

SA — (*E*) Publish Shell accounting report. Gives usage information on each command executed. Additional options to the SA command of the 7th edition: Sorting by different criterions:
- disk I/O operation
- cpu-time average memory usage
- cpu-storage integral
- number of calls

LAST — (*E*) Indicate last logins of users, groups or on specified terminals.

LASTCOMM — (*E*) Show last commands executed in reverse order.

### 1.10. Communication

MAIL — (-III-) Mail a message to one or more users. Also used to read and dispose of incoming mail. The presence of mail is announced by LOGIN and optionally by SH.
- Each message can be disposed of individually.
- Messages can be saved in files or forwarded.

RMAIL — (-III-) Restricted version of MAIL for UUCP.

BIFF — (*E*) Be notified if mail arrives and who it is from.

FROM — (*E*) Show who is the sender of my mail.

PRMAIL — (*E*) Print the mail which waits for you, or a specified user, in the 'post office'.

LEAVE — (*E*) Remind you when you have to leave.

CALENDAR — Automatic reminder service for events of today and tomorrow.

WRITE — Establish direct terminal communication with another user.

WALL — Write to all users.

MESG — Inhibit receipt of messages from WRITE and WALL.

MSGS — (*E*) Read system messages. These messages are sent by mailing to the login 'msgs'.

CU — Call up another time-sharing system.
- Transparent interface to remote machine.
- File transmission.
- Take remote input from local file or put remote output into local file.
- Remote system need not be UNIX.

UUCP (-III-) File transfer between CPU's.
- Automatic queuing until line becomes available and remote machine is up.
- Copy between to remote machines.
- Differences, mail, etc., between two macines.

UUCLEAN (-III-) Clean up UUCP spool directory.

UULOG (-III-) Maintain a summary log of UUCP and UUX transactions.

UUNAME (-III-) List the UUCP names of known systems.

UUSTAT (-III-) UUCP status inquiry and job control. Display status of, or cancel, previously specified UUCP commands, or provide general status on UUCP connections to other systems.

UUSUB (-III-) Define and monitor a UUCP subnetwork.

UUTO (-III-) Public CPU to CPU command execution. Gather files from various CPUs, execute a command on a specified CPU, and send standard output to a file on a specified CPU.

UUPICK Accept or reject the files sent by UUTO. Looks somewhat like MAIL.

## 1.11. Basic Program Development Tools

Some of these utilities are used as integral parts of the higher level languages described in section 2.

AR Maintain archives and libraries. Combines several files into one for housekeeping efficiency.
- Create new archive.
- Update archive by date.
- Replace or delete files.
- Print table of contents.
- Retrieve from archive.

AS (-O-) M68000-Macro-Assembler,
implemented by CERN/SIEMENS.
- Most powerful instruction set of available assemblers.
- Creates object program consisting of
  code, possibly read-only
  initialized data
  uninitialized data.
- Relocatable object code is directly executable without further transformation.
- Object code normally includes a symbol table.
- Multiple source files.
- Conditional assembly.

LIBRARY — The basic run-time library. These routines are used freely by all software.

- Buffered character-by-character I/O.
- Formatted input and output conversion (SCANF and PRINTF) for standard input and output, files, in-memory conversion.
- Storage allocator.
- Time conversions.
- Number conversions.
- Password encryption.
- Quicksort.
- Random number generator.
- Mathematical function library, including trigonometric functions and inverses, exponential, logarithm, square root, bessel functions.

CURSES — (*E*) Library of screen functions which allows screen updating (with user input) and cursor motion optimization.

ADB — (-O-) Interactive debugger.

- Postmortem dumping.
- Examination of arbitrary files, with no limit on size.
- Interactive breakpoint debugging with the debugger as a separate process.
- Symbolic reference to local and global variables.
- Stack trace for C programs.
- Output formats:
  1-, 2-, or 4-byte integers in hex, octal or decimal
  single and double floating point
  character and string
  disassembled machine instructions
- Patching.
- Searching for integer, character, or floating patterns.
- Handles separated instruction and data space.

OD — Dump any file. Output options include any combination of octal or decimal by words, octal by bytes, ASCII, opcodes, hexadecimal.

- Range of dumping is controllable.

XD — (-O-) Hexadecimal file dump.

LD — (-O-) Link edit. Combine relocatable object files. Insert required routines from specified libraries.

- Resulting code may be sharable.
- Resulting code may have separate instruction and data spaces.

LORDER — Places object file names in proper order for loading, so that files depending on others come after them.

NM — Print the namelist (symbol table) of an object program. Provides control over the style and order of names that are printed.

SIZE — (-O-) Report the core requirements of one or more object files.

STRIP — (-O-) Remove the relocation and symbol table information from an object file to save space.

TIME — Run a command and report timing information on it.

PROF — Construct a profile of time spent per routine from statistics gathered by time-sampling the execution of a program.

- Subroutine call frequency and average times for C programs.

MAKE — (-III-) Controls creation of large programs. Uses a control file specifying source file dependencies to make new version; uses time last changed to deduce minimum amount of work necessary.

- Knows about CC, PASCAL, YACC, LEX etc.

WHAT — (*E*) Show what versions of object modules were used to construct a file.

ERROR — (*E*) Analyze and disperse compiler error messages.

- Knows about error messages produced by MAKE, CC, CPP, AS, LD, LINT, PC, F77.
- Attempts to determine which language processor produced each error message.
- Determines source file and line number to which the error message refers.
- Determines if the error message is to be ignored, or not.
- Inserts the error message into the source file as comment

## 1.12. UNIX Programmer's Manual

MANUAL — Machine-readable version of the UNIX Programmer's Manual.

- System overview.
- All commands.
- All system calls.
- All subroutines in C and assembler libraries.
- All devices and other special files.
- Formats of file system and kinds of files known to system software.
- Boot and maintenance procedures.

MAN — Print specified manual section on your terminal.

MAN — (*E*) Give information from the on line programmers' manual.

- Gives all commands whose description contains any of a specified set of keywords.
- Attempts to locate manual sections related to a specified list of files.
- Formats a specified set of manual pages.

CATMAN — (*E*) Create the preformatted versions of the on-line manuals.

APROPOS — (*E*) Show which manual sections contain instances of any of the given keywords in their title.

WHATIS — (*E*) Look up a given command and give the header line from the manual section.

## 1.13. Computer-Aided Instruction

LEARN — A program for interpreting CAI scripts, plus scripts for learning about UNIX by using it.

- Scripts for basic files and commands, editor, advanced files and commands, EQN, MS macros, C programming language.

# 2. Languages

## 2.1. The C Language

CC

(-O-) Compile and/or link edit programs in the C language. The UNIX operating system, most of the subsystems and C itself are written in C. For a full description of C, read "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1978.

- General purpose language designed for structured programming.
- Data types include character, integer, float, double, pointers to all types, functions returning above types, arrays of all types, structures and unions of all types.
- Operations intended to give machine-independent control of full machine facility, including to-memory operations and pointer arithmetic.
- Macro preprocessor for parameterized code and inclusion of standard files.
- All procedures recursive, with parameters by value.
- Machine-independent pointer manipulation.
- Object code uses full addressing capability of the M68000.
- Runtime library gives access to all system facilities.
- Floating point arithmetic realized by software.
- Definable data types.
- Block structure

LINT

Verifier for C programs. Reports questionable or nonportable usage such as:

Mismatched data declarations and procedure interfaces.
Nonportable type conversions.
Unused variables, unreachable code, no-effCect operations.
Mistyped pointers.
Obsolete syntax.

- Full cross-module checking of separately compiled programs.

CB

A beautifier for C programs. Does proper indentation and placement of braces.

## 2.2. Fortran

F77 — A full compiler for ANSI Standard Fortran 77.

- Compatible with C and supporting tools at object level.
- Optional source compatibility with Fortran 66.
- Free format source.
- Optional subscript-range checking, detection of uninitialized variables.
- all widths of arithmetic: 2- and 4-byte integer; 4- and 8-byte real; 8- and 16-byte complex.

RATFOR — (-III-) Ratfor adds rational control structure like C to Fortran.

- Compound statements.
- If-else, do, for, while, repeat-until, break, next statements.
- Symbolic constants.
- File insertion.
- Free format source
- Translation of relationals like >, >=.
- Produces genuine Fortran to carry away.
- May be used with F77.

STRUCT — Converts ordinary ugly Fortran into structured Fortran (i.e., Ratfor), using statement grouping, if-else, while, for, repeat-until.

## 2.3. Pascal

PC — (*P*) Compile and/or link programs in the PASCAL 68000 language.
PASCAL 68000 is an extended implementation of the PASCAL language. Specifically PASCAL 68000 complies almost completely with the requirements of the ISO standard proposal for PASCAL. Some of the features of PASCAL 68000 are

- General purpose language
- Block oriented language
- Strong type checking
- Variety of data structures:
  simple types, arrays, records,
  sets, files, pointers, strings
- Conformant arrays
- Various control statements
- Predefined procedures and functions
- Seperate compilation of modules
- Import and export of variables,procedures and functions
- Linking C, FORTRAN or assembler modules to PASCAL 68000 modules

## 2.4. Snobol

SNO

(*SNO*) Is an implementation of the SNOBOL language (especially the SPITBOL version). Its unusual support for string, list and table manipulation makes SNO a powerful tool for several applications.

- SNO has some of the best features of Basic and Lisp: It is interactive, has 'rubber memory' for strings, lists and associative tables, and finally it is easy to learn.
- SNO is qualified for the following applications:
  text editing jobs
  small interactive data bases
  small translators: mini-languages, macros...
- Preprocessor snif

## 2.5. Other Algorithmic Languages

BS

(-III-) A compiler/interpreter for modest-sized programs. A descendant of Basic and SNOBOL 4 with a little C language thrown in.

- Statements from console execute immediately.
- Statements from a file compile for later execution (by default).
- Line-at-a-time debugging.
- Many builtin functions.

DC

Interactive programmable desk calculator. Has named storage locations as well as conventional stack for holding integers or programs.

- Unlimited precision decimal arithmetic.
- Appropriate treatment of decimal fractions.
- Arbitrary input and output radices, in particular binary, octal, decimal and hexadecimal.
- Reverse Polish operators:
  + − * /
  remainder, power, square root,
  load, store, duplicate, clear,
  print, enter program text, execute.

BC — A C-like interactive interface to the desk calculator DC.

- All the capabilities of DC with a high-level syntax.
- Arrays and recursive functions.
- Immediate evaluation of expressions and evaluation of functions upon call.
- Arbitrary precision elementary functions: exp, sin, cos, atan.
- Go-to-less programming.

FFPCALC — (-M-) Interactive programmable fast floating point desk calculator.

- Fortran expression syntax
- Optional assignement statement
- Two variables X and Y
- Functions: sqrt, power, log, exp, sin, cos, tan, atan, sinh, cosh, tanh, abs, neg, conversion to integer, rounding.

## 2.6. Macroprocessing

M4 — (-III-) A general purpose macroprocessor.

- Stream-oriented, recognizes macros anywhere in text.
- Syntax fits with functional syntax of most higher-level languages.
- Can evaluate integer arithmetic expressions.

## 2.7. Compiler-compilers

YACC — An LR(1)-based compiler writing system. During execution of resulting parsers, arbitrary C functions may be called to do code generation or semantic actions.

- BNF syntax specifications.
- Precedence relations.
- Accepts formally ambiguous grammars with non-BNF resolution rules.

LEX — Generator of lexical analyzers. Arbitrary C functions may be called upon isolation of each lexical token.

- Full regular expression, plus left and right context dependence.
- Resulting lexical analysers interface cleanly with YACC parsers.

## 3. Text Processing

### 3.1. Document Preparation

ED — (-III-) Interactive context editor. Random access to all lines of a file.

- Find lines by number or pattern. patterns may include: specified characters, don't care characters, choices among characters, repetitions of these constructs, beginning of line, end of line.
- Add, delete, change, copy, move or join lines.
- Permute or split contents of a line.
- Replace one or all instances of a pattern within a line.
- Combine or split files.
- Escape to Shell (command language) during editing.
- Do any of above operations on every pattern-selected line in a given range.
- Optional encryption for extra security.

MED — (*M*) This editor allows you to edit a file using the screen and the cursor keys somewhat like paper, pencil and eraser.

- Add, delete, change, copy lines.
- Split, concatenate lines.
- Find lines by number or pattern.
- Manage previous defined rectangles.
- Switch to another file.
- Macro facility.
- Install windows for working simultaneously with different files.
- Escape to Shell during editing.

EX — (*E*) The line oriented text editor EX is a superset of the ED editor from UNIX V7 and the root of the interactive display function VIEW and the family of editors: EX, EDIT, VI.

- Find lines by number or pattern.
- Add, delete, change, copy, move or join lines.
- Permute or split contents of a line.
- Replace one or all instances of a pattern within a line.
- Combine or split files.
- Switch to the location of a 'tag'.
- Enter intraline editing.
- Reverse the effects of the last command.
- Escape to Shell during editing.
- Indent automatically.
- Define abbreviations.
- Attempt to recover the buffer in case of hangups or crashes.

- Read and execute commands from a specified file.
- Simulate an intelligent terminal on a dumb terminal.

EDIT (*E*) A small version of EX. Avoids some of the complexities of EX to provide an environment for new and casual users.

- Find lines by number or pattern.
- Add, delete, change, copy or move lines.
- Replace a pattern in a line.
- Add the contents of a file.
- Reverse the effects of the last command.
- Escape to Shell.
- Attempt to recover the buffer in case of hangups or crashes.

VI (*E*) The screen oriented editor VI is based on EX (see above). Additional attributes:

- Numerous commands for file manipulation.
  i.e. edit file containing the tag 'tag'
  at the first line of 'tag'
- Extensive command set for scrolling, paging and cursor motion.
  i.e. move to the end of line
  move to the begin of the next word
- Various units of text can be handled: words, sentences, sections.
  i.e. duplicate sentence
  delete word
- Searching for strings by a set of different conditions.
  i.e. matches any character between 'x' and 'y'
  matches the end of a word
- Definition of macros for saving time by typing commands.
- Escape to the line oriented editor EX.

VIEW (*E*) Interactive display function. Works like the VI - but with read-only files.

CTAGS (*E*) Make a tags file for EX from the specified C, PASCAL and FORTRAN sources. A tags file gives the locations of specified objects (in this case functions) in a group of files.

PTX Make a permuted (key word in context) index.

SPELL Look for spelling errors by comparing each word in a document against a word list.

- 25,000-word list includes proper names.
- Handles common prefixes and suffixes.
- Collects words to help tailor local spelling lists.

CRYPT Encrypt and decrypt files for security.

HYPHEN (-III-) Find hyphenated words.

MKSTR (*E*) Used to create a file of error messages by massaging C source code.

- Places all error messages from a C source file in a specified file.
- Keys on the string 'error(''' to process the error messages to the message file.
- The copy of the C source file contains pointer into the message file to retrieve the error message.

XSTR (*E*) Extract strings from C programs to implement shared constant strings.

- Maintains a file into which strings of component parts of a large program are hashed.
- The strings are replaced with references to the common area.

DICTION (*E*) Find wordy sentences in a document.

- Finds all sentences that contain phrases from a data base of bad or wordy diction.
- The user may supply his own pattern file.

EXPLAIN (*E*) Interactive thesaurus for the phrases found by diction.

STYLE (*E*) Analyze surface characteristics of a document.

- Reports on
  - readability
  - sentence length and structure
  - word length and usage
  - verb type
  - sentence openers
- Options to locate sentences with certain characteristics.

### 3.2. Document Formatting

TROFF
NROFF

(-III-) Advanced typesetting. TROFF drives a Graphic Systems phototypesetter; NROFF drives ascii terminals of all types. TROFF and NROFF style is similar to ROFF (not available on MUNIX), but they are capable of much more elaborate feats of formatting, when appropriately programmed. TROFF and NROFF accept the same input language.

- All ROFF capabilities available or definable.
- Completely definable page format keyed to dynamically planted "interrupts" at specified lines.
- Maintains several separately definable typesetting environments (e.g., one for body text, one for footnotes, and one for unusually elaborate headings).
- Arbitrary number of output pools can be combined at will.
- Macros with substitutable arguments, and macros invocable in mid-line.
- Computation and printing of numerical quantities.
- Conditional execution of macros.
- Tabular layout facility.
- Positions expressible in inches, centimeters, ems, points, machine units or arithmetic combinations thereof.
- Access to character-width computation for unusually difficult layout problems.
- Overstrikes, built-up brackets, horizontal and vertical line drawing.
- Dynamic relative or absolute positioning and size selection, globally or at the character level.
- Can exploit the characteristics of the terminal being used, for approximating special characters, reverse motions, proportional spacing, etc.

The Graphic Systems typesetter has a vocabulary of several 102-character fonts (4 simultaneously) in 15 sizes. TROFF provides terminal output for rough sampling of the product.

NROFF will produce multicolumn output on terminals capable of reverse line feed, or through the postprocessor COL.

High programming skill is required to exploit the formatting capabilities of TROFF and NROFF, although unskilled personnel can easily be trained to enter documents according to canned formats such as those provided by MS, below. TROFF and EQN are essentially identical to NROFF and NEQN so it is usually possible to define interchangeable formats to produce approximate proof copy on terminals before actual typesetting. The preprocessors MS and TBL are fully compatible with TROFFand NROFF.

MS — The standardized manuscript layout package of V7 for use with NROFF or TROFF. This document was formatted with MS.

- Page numbers and draft dates.
- Automatically numbered subheads.
- Footnotes.
- Single or double column.
- Paragraphing, display and indentation.
- Numbered equations.

MM — (-III-) The standardized manuscript layout package of System III for use with NROFF or TROFF. Some features different from the MS macro package:

- Table of contents.
- Static and Floating displays.
- Special formatting macros for preparing memoranda and released papers..

ME — (*E*) Package from Berkeley 4.1 bsd for formatting technical papers with NROFF or TROFF. Easy to learn.

VTROFF — (*E*) Troff for raster printer/plotter.

LTROFF — (*T*) Troff for CANON laser beam printer. Ltroff accepts the same input language as troff.

EQN — (-III-) A mathematical typesetting preprocessor for TROFF. Translates easily readable formulas, either in-line or displayed, into detailed typesetting instructions.

- Automatic calculation of size changes for subscripts, sub-subscripts, etc.
- Full vocabulary of Greek letters and special symbols, such as 'gamma', 'GAMMA', 'integral'.
- Automatic calculation of large bracket sizes.
- Vertical "piling" of formulae for matrices, conditional alternatives, etc.
- Integrals, sums, etc., with arbitrarily complex limits.
- Diacriticals: dots, double dots, hats, bars, etc.
- Easily learned by nonprogrammers and mathematical typists.

NEQN — (-III-) A version of EQN for NROFF; accepts the same input language. Prepares formulas for display on any terminal that NROFF knows about, for example, those based on Diablo printing mechanism.

- Same facilities as EQN within graphical capability of terminal.

TBL (-III-) A preprocessor for NROFF/TROFF that translates simple descriptions of table layouts and contents into detailed typesetting instructions.

- Computes column widths.
- Handles left- and right-justified columns, centered columns and decimal-point alignment.
- Places column titles.
- Table entries can be text, which is adjusted to fit.
- Can box all or parts of table.

GREEK Fancy printing on Diablo-mechanism terminals like DASI-300 and DASI-450, and on Tektronix 4014.

- Gives half-line forward and reverse motions.
- Approximates Greek letters and other special characters by overstriking.

COL Canonicalize files with reverse line feeds for one-pass printing.

DEROFF Remove all TROFF commands from input.

CHECKEQ Check document for possible errors in EQN usage.

VFONTINFO (*E*) Inspect and print out information about unix fonts.

SOELIM (*E*) Eliminate .so's from nroff input.

CHECKNR (*E*) Check NROFF/TROFF files.

- Knows about MS and ME macro packages.
- Checks unknown commands.
- Checks mismatched opening and closing delimiters in case of
  macros which always come in pairs
  font changes
  size changes

PTI (*E*) Interpret a stream from the standard output of TROFF as it would act on the typesetter.

FMT (*E*) Simple text formatter.

- Produces an output with lines as close to 72 characters as possible.
- Spacing at the beginning of input lines and blank lines are preserved.

LASO (*T*) Write to CANON laser printer.

- Write files to the laser printer.
- Write files in a type font from the Berkeley Font Catalog.
- Together with the MED works laso as a simple text formatter.

## 4. Information Handling

SORT — Sort or merge ASCII files line-by-line. No limit on input size.
- Sort up or down.
- Sort lexicographically or on numeric key.
- Multiple keys located by delimiters or by character position.
- May sort upper case together with lower into dictionary order.
- Optionally suppress duplicate data.

TSORT — Topological sort — converts a partial order into a total order.

UNIQ — Collapse successive duplicate lines in a file into one line.
- Publish lines that were originally unique, duplicated, or both.
- May give redundancy count for each line.

TR — Do one-to-one character translation according to an arbitrary code.
- May coalesce selected repeated characters.
- May delete selected characters.

DIFF — Report line changes, additions and deletions necessary to bring two files into agreement.
- May produce an editor script to convert one file into another.
- A variant compares two new versions against one old one.

SDIFF — (-III-) Produce a side-by-side listing of two files indicating those lines that are different.

COMM — Identify common lines in two sorted files. Output in up to 3 columns shows lines present in first file only, present in both, and/or present in second only.

JOIN — Combine two files by joining records that have identical keys.

GREP — Print all lines in a file that satisfy a pattern.
- May print all lines that fail to match.
- May print count of hits.
- May print first hit in each file.

LOOK — Binary search in sorted file for lines with specified prefix.

WC — Count the lines, "words" (blank-separated strings) and characters in a file.

SED — Stream-oriented version of ED. Can perform a sequence of editing operations on each line of an input stream of unbounded length.
- Lines may be selected by address or range of addresses.
- Control flow and conditional testing.
- Multiple output streams.
- Multi-line capability.

AWK — Pattern scanning and processing language. Searches input for patterns, and performs actions on each line of input that satisfies the pattern.

- Patterns include regular expressions, arithmetic and lexicographic conditions, boolean combinations and ranges of these.
- Data treated as string or numeric as appropriate.
- Can break input into fields; fields are variables.
- Variables and arrays (with non-numeric subscripts).
- Full set of arithmetic operators and control flow.
- Multiple output streams to files and pipes.
- Output can be formatted as desired.
- Multi-line capabilities.

BFS — (-III-) Big file scanner. Similar to ED, except it is read-only and processes larger files. Useful for identifying sections of a large file where CSPLIT can be used to divide it.

- Maximum file size is 1024-K bytes.
- Scans actual file, not a copy.
- All ED address expressions are supported.
- Regular expression processing.
- Most ED commands operate.
- Many additional commands.
-

PWCK — (-III-) Scan the password file and note inconsistencies..

GRPCK — (-III-) Verify entries in the group file.

CREF — (-III-) Make a cross-reference listing of an assembler or C program.

XREF — (*P*) Create a cross reference listing from a C or Pascal program.

**5. Graphics**

The programs in this section are predominantly intended for use with Tektronix 4014 storage scopes.

GRAPH — Prepares a graph of a set of input numbers.

- Input scaled to fit standard plotting area.
- Abscissae may be supplied automatically.
- Graph may be labeled.
- Control over grid style, line style, graph orientation, etc.

SPLINE — Provides a smooth curve through a set of points intended for GRAPH.

TPLOT — (-III-) A set of filters for printing graphs produced by GRAPH and other programs on various terminals. Filters provided for Tektronix 4014, DASI terminals, Versatec printer/plotter.

## 6. Source Code Control System SCCS

SCCS is a collection of commands for controlling changes to files of text (typically, the source code of programs or text of documents).

| | |
|---|---|
| ADMIN | (*S*) Create new SCCS files and change parameters of existing ones. |
| CDC | (*S*) Change the delta commentary of an SCCS delta. |
| COMB | (*S*) Combine SCCS deltas. |
| DELTA | (*S*) Make a delta (change) to an SCCS file. |
| GET | (*S*) Create an ASCII text file |
| PRS | (*S*) Print an SCCS file. |
| RMDEL | (*S*) Remove a delta from an SCCS file. |
| SACT | (*S*) Inform the user of any impending deltas to a named SCCS file. |
| SCCSDIFF | (*S*) Compare two versions of an SCCS file and generate a list of differences. |
| UNGET | (*S*) Undo a previous GET of an SCCS file. |
| VAL | (*S*) Determine if a specified file is an SCS file meeting characteristics specified by the argument list. |
| WHAT | (*S*) Identify SCCS files. |

## 7. Novelties, Games, and Things That Didn't Fit Any Where Else

| | |
|---|---|
| ARITHMETIC | Speed and accuracy test for number facts. |
| BACKGAMMON | A player of modest accomplishment. |
| BANNER | Print output in huge letters. |
| BCD | Converts ascii to card-image form. |
| CAL | Print a calendar of specified month and year. |
| FORTUNE | Presents a random fortune cookie on each invocation. Limited jar of cookies included. |
| QUIZ | Test your knowledge of Shakespeare, Presidents, capitals, etc. |
| STARTREK | Strategy game. Destroy the klingons. |
| UNITS | Convert amounts between different scales of measurement. Knows about hundreds of units. For example, how many km/sec is a parsec/megayear? |
| WUMP | Hunt the wumpus, thrilling search in a dangerous cave. |
| FISH | (*E*) Childrens' card guessing game. |
| HANGMAN | |
| HANG | (*E*) Word guessing games. Uses the dictionary supplied with SPELL. |
| TWINKLE1 | |
| TWINKLE2 | (*E*) Milky way on the screen. |
| WORM | (*E*) Lead the worm to random points. |

| | |
|---|---|
| WORMS | (*E*) Several worms running around on screen. |
| HUP | (-O-) Ring the terminal bell. |
| TRUE | |
| FALSE | Provide truth values. |