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MPE/iX Shell and Utilities
Reference Manual

Volume 2

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Preface

MPE/iX, Multiprogramming Executive with Integrated POSIX, is the latest in a series of forward-compatible operating systems for the HP 3000 line of computers.

In HP documentation and in talking with HP 3000 users, you will encounter references to MPE XL, the direct predecessor of MPE/iX is a superset of MPE XL. All programs written for MPE XL will run without change under MPE/iX. You can continue to use MPE XL system documentation, although it may not refer to features added to the operating system to support POSIX (for example, hierarchical directories).

Finally, you may encounter references to MPE V, which is the operating system for HP 3000s, not based on PA-RISC architecture. MPE V software can be run on the PA-RISC (Series 900) HP 3000s in what is known as *compatibility mode*.

The first edition of the *MPE/iX Shell and Utilities Reference Manual Volumes 1 and 2* (customer order number 36431-60001) is a two volume manual set that provides reference descriptions of the commands and utilities available through the MPE/iX Shell.

- Volume 1 provides MPE/iX Shell command and utility descriptions alphabetically from A through M.
- Volume 2 provides command and utility descriptions alphabetically from N through Z.

The *MPE/iX Shell and Utilities Reference Manual Volumes 1 and 2* is organized into five chapters and one appendix. In addition, both volumes contain a common table of contents, permuted index, and index that provide cross references into both volumes.

Volume 1

Chapter 1 **Commands and Utilities** contains MPE/iX Shell command and utility descriptions alphabetically from A through M.

Volume 2

Chapter 1 **Commands and Utilities** provides MPE/iX Shell command and utility descriptions alphabetically from N through Z. (This chapter is a continuation of the Chapter 1 found in Volume 1.)

Chapter 2 **File Formats** provides more detailed information on the formats of files used by the various commands and utilities described in chapter 1.

Chapter 3

Miscellaneous Information provides details on miscellaneous topics not covered in other chapters.

Appendix A

MPE/iX Implementation Considerations provides an overview of implementation considerations you need to understand when using MPE/iX Shell and Utilities on a 900 Series HP 3000 computer system.

Conventions

Throughout this manual, the following conventions help you to distinguish between different elements of text and to learn about MPE/iX Shell and Utilities.

Convention	Description
<code>courier</code>	Literal user input, directory names, file names, and path names are expressed in normal Courier font (that is, typewriter font).
bold courier	Commands and command line options in a synopsis line or embedded in regular text are in bold Courier font.
[]	Optional command line items and optional parts of command names are enclosed in square brackets. For example, [-z] indicates that the -z option can be specified, but is not required.
	This manual uses the or-bar () to indicate a mutually exclusive choice of command line items. For example, -a -b indicates that you can specify either the -a option or the -b option, but not both.
...	In a command synopsis, the ellipsis indicates that a command line item can be repeated any number of times. In examples, it indicates where portions of an example have been omitted.
bold	Commands internal to interactive utilities are shown in bold Roman font (for example, ZZ in vi , and followup in mailx).
<i>ITALIC COURIER</i>	Environment variables are expressed in uppercase italic Courier font.
<i>italics</i>	Placeholders which are to be replaced when actually entering a command are shown in italics. For example, you would replace <i>filename</i> with an actual file name.
SMALL CAPS	Acronyms and combination key sequences are indicated with small caps. When you see the - sign between two key names, such as ALT or CTRL, hold down the first key while pressing the second. For example, to enter ALT-X, hold down the ALT key and press X.
ENTER	This manual uses ENTER to stand for the key that is sometimes labelled RETURN, or has an arrow pointing down and to the left.

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Appendix A. MPE/iX Implementation Considerations

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NAME

nice — run a command at a different priority

SYNOPSIS

nice [**-n** *number*] *command-line*

nice [**-number**] *command-line*

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

nice runs a command at a different priority than usual. Normally, **nice** lowers the current priority by 10.

The *command-line* must invoke a single utility command, without using compound commands, pipelines, command substitution, and other special structures.

Options

nice accepts the following options:

-n *number*

lowers the current priority by *number*. On systems supporting higher priorities, a user with appropriate privileges may use **nice** to increase priority by specifying a negative value for *number*. For example,

```
nice -n -3 command
```

runs the command with an increased priority of 3.

-number

is an obsolescent version of **-n** *number*.

ENVIRONMENT VARIABLES

nice uses the following environment variable:

PATH determines the search path that **nice** uses to locate the command specified in *command-line*.

DIAGNOSTICS

If **nice** invokes the *command-line*, it exits with the exit status returned by *command-line*; otherwise its exit status is one of the following.

1-125 An error occurred in the **nice** utility.

- 126 **nice** could not invoke *command-line*.
127 **nice** could not find the utility specified in *command-line*.

Message

Message: *command: not executable: system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Not able to read/write process information
Cause: For some reason, the underlying MPE/iX routines were unable to read or write
 process information.
Action: Contact your system manager.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

Normally, the priority of an MPE/iX process undergoes cyclical degradation. When the process begins running, it has a high priority. As the process continues to run, this priority is lowered until it hits the lowest point in the cycle. At this point, the priority begins to get higher and higher until it hits the original high priority. The cycle then begins again. The **nice** command turns this degradation off and locks the process at the given priority.

Due to different priority bounds on MPE/iX, the MPE/iX implementation of **nice** lowers the current priority by 1000 if neither **-n number** or **-number** are specified.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

nohup(1), **renice**(1)

NAME

nl — number lines

SYNOPSIS

```
nl [-btype] [-dxy] [-ftype] [-htype] [-in] [-ln] [-nfmt] [-p] [-ssep]
  [-v[n]] [-w[n]] [file]
```

DESCRIPTION

nl is a filter that numbers lines in a single *file*. If a *file* is not specified on the command line, the standard input is used.

The input is viewed as a stream of text lines, possibly divided by separators into logical pages. In turn, each page may consist of a *header*, *body*, and/or *footer* in that order. Any missing part is assumed to be empty. Using the default page delimiter character of \ and :, lines consisting entirely of the combinations shown in Table 1-8 are logical page part delimiters (and are not numbered).

Input Line	Starts
\:\:	page header
\::	page body
\:	page footer

Table 1-8: **nl** Logical Page Delimiter Characters

There are numerous options to control the precise nature of the line numbering:

-btype Specifies the numbering type for each page body. The numbering type is one of:

a numbers all lines.

n does not number any lines.

pregexp

numbers only those lines which contain the basic regular expression *regexp*. See **regexp(3)** for details.

t numbers only those lines that are not empty lines. An empty line is a line consisting of only a newline character.

The default body numbering type is t.

-dxy Changes the default delimiter characters (\ and : mentioned earlier) to characters *x* and *y*. If only *x* is specified, only the first delimiter character is changed.

-ftype Specifies the page footer numbering *type* (see the **-b** option). The default *type* is n.

-
- h $type$** Specifies the page header numbering *type* (see the **-b** option). The default *type* is n (no lines numbered).
 - i n** Sets the line increment to n rather than the default value of 1.
 - l n** When the page numbering *type* is a (all), blank lines are treated specially. Every n th consecutive blank line is numbered. When this option is not specified, n defaults to 1 and, hence, every blank line is numbered.
 - n fmt** Specifies the line numbering format, which must be one of the following:
 - n right justified line number, padded to *width* (see **-w**) on the left with spaces (the default format).
 - rz right justified line number, padded on left with zeroes.
 - ln left justified line number, padded on right with spaces.
 - p** Specifies continuous page numbering across page boundaries. By default, **nl** restarts numbering (as in the next option) at each new page.
 - s sep** The string *sep* is printed to separate the line number from the text of the line being numbered. When this option is not specified, this separator is a single tab character.
 - v $[n]$** Starts numbering for each new page at n . If this option is not specified, page numbering starts at 1.
 - w $[n]$** Sets the width of the line number in the output to n . If this is not specified, the default is 6.

EXAMPLE

The following command numbers every second consecutive blank line, using page delimiters of ~!:

```
nl -l2 -ha -ba -fa -nrz -v10 -i10 -d~! file
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

- Message:** bad number format "*fmt*"
Cause: You specified an unrecognized number format with the **-n** option.
Action: Check the *DESCRIPTION* section for a list of valid number formats that you can use with the **-n** option.
- Message:** bad type specifier "*type*"
Cause: You specified an unrecognized type specifier with the **-b**, **-h**, or **-f** option.
Action: Check the *DESCRIPTION* section for a list of valid type specifiers.
- Message:** Badly formed number in "*string*"
Cause: You specified the **-i**, **-l**, **-v**, or **-w** option but the argument following it was not a valid number.
Action: When using these options, provide a valid number as an argument.
- Message:** file "*filename*": system error
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** must have 1 or 2 delimiters after **-d**
Cause: You specified the **-d** option, and either provided no arguments or more than two arguments.
Action: When using the **-d** option, specify exactly 1 or 2 arguments to act as delimiters.
- Message:** must specify separator after **-s**
Cause: You specified the **-s** option, but did not provide a string to act as the separator between the line number and the line.
Action: Provide the missing separator.
- Message:** nothing allowed after **-p** option
Cause: You specified an argument with the **-p** option which does not take one.
Action: Remove the argument following the **-p** option.
- Message:** Only one file name allowed
Cause: You specified more than one file name on the command line.
Action: Use **cat** to combine the files into one larger file and then run **nl** on the new file.
- Message:** regular expression error in "**-bregex**"
Cause: An error occurred while processing the regular expression *regex* which was specified as an argument to the **-b**, **-f**, or **-h** option.
Action: Check the syntax of the regular expression.

Message: Unknown option *"-option"*
Cause: You specified an option that is not valid for **nl**.
Action: Check the *DESCRIPTION* section for a list of valid **nl** options.

PORTABILITY

x/OPEN Portability Guide 4.0. UNIX System V.

SEE ALSO

awk(1), **pr**(1), **regexp**(3)

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

od — formatted file dump

SYNOPSIS

```
od [-bcDdhOoSsXx] [file] [[+]offset[.][b]]
od [-v] [-A addr_fmt] [-j num [bkm]] [-N num] [-t type_string] [file ...]
```

DESCRIPTION

od (octal dump) dumps a file to the standard output in a format specified by command line options. The default format is octal words. You can use combinations of options to generate multiple formats with the requested representation of each byte vertically aligned. The file seek address (in octal) precedes each line of new data.

od recognizes two syntaxes. The first one given in the *SYNOPSIS* is the historical (BSD) implementation of the command. With this form, you can specify only a single input *file*. If no *file* is specified, **od** reads the standard input. Specifying an offset (preceded by a plus sign (+) to distinguish it from a file name if no file is given) causes a seek to a position in the file where output begins. If the offset ends in a period (.), **od** considers it to be decimal; otherwise, it is considered octal. If you follow the offset with a b, **od** multiplies it by the block size of 512 bytes. The format of the offset determines the format of the address; that is, if the offset is decimal, addresses are displayed in decimal.

If you choose the second (POSIX-compliant) form, **od** displays the files listed on the command line one at a time. If no *file* appears on the command line, **od** reads the standard input.

Options

The first form of **od** accepts the following options:

- b bytes in octal
- c bytes in ASCII
- D unsigned decimal longs (4 bytes)
- d unsigned decimal words (2 bytes)
- h bytes in hex
- O unsigned octal longs
- o unsigned octal words
- S signed decimal longs
- s signed decimal words
- X unsigned hexadecimal longs
- x unsigned hexadecimal words

The second (POSIX-compliant) form accepts the following options:

-A *addr_fmt*
specifies the format for displaying the address field. *addr_fmt* can be **d** (decimal), **o** (octal), **x** (hexadecimal), or **n** (do not display address). The default is **-A o**.

-j num

skips *num* bytes from the beginning of the file. If you precede *num* with 0X or 0x, **od** interprets it as hexadecimal. If you precede it with 0, **od** interprets it as octal; otherwise, **od** assumes it is decimal. You can also append **b**, **k**, or **m** to *num* to indicate 512-byte blocks, kilobytes, or megabytes instead of bytes.

-N num

processes a maximum of *num* bytes.

-t type_string

specifies the output format. *type_string* may contain the following format characters.

- a** named characters from the ISO 646 character set.
- c** characters. **od** displays non-printable characters as backslash sequences and displays printable multi-byte characters properly.
- d** signed decimal. A one-digit number may follow **d** telling **od** how many bytes to use. This must correspond to the size of a *char*, *short*, *int*, or *long*. The default size is the size of an *int*. A symbolic size character may follow **d**, rather than the number of bytes. These have the following meaning:
 - C** corresponds to number of bytes in a *char*
 - S** corresponds to number of bytes in a *short int*
 - I** corresponds to the number of bytes in an *int*
 - L** corresponds to the number of bytes in a *long int*
- f** floating point. A one-digit number may follow **f** telling **od** how many bytes to use. This must correspond to the size of a *float*, *double*, or *long double*. The default size is the size of a *double*. A symbolic size character may follow **f**, rather than the number of bytes. These have the following meaning:
 - F** corresponds to size of *float*
 - D** corresponds to size of *double*
 - L** corresponds to size of *long double*
- o** octal. A one-digit number may follow **o** telling **od** how many bytes to use. This must correspond to the size of a *char*, *short*, *int*, or *long*. The default size is the size of an *int*. A symbolic size character may follow **o**, rather than the number of bytes. These have the following meaning:
 - C** corresponds to number of bytes in a *char*
 - S** corresponds to number of bytes in a *short int*
 - I** corresponds to the number of bytes in an *int*
 - L** corresponds to the number of bytes in a *long int*

u unsigned decimal. A one-digit number may follow **u** telling **od** how many bytes to use. This must correspond to the size of a *char*, *short*, *int*, or *long*. The default size is the size of an *int*. A symbolic size character may follow **u**, rather than the number of bytes. These have the following meaning:

C corresponds to number of bytes in a *char*
S corresponds to number of bytes in a *short int*
I corresponds to the number of bytes in an *int*
L corresponds to the number of bytes in a *long int*

x hexadecimal. A one-digit number may follow **x** telling **od** how many bytes to use. This must correspond to the size of a *char*, *short*, *int*, or *long*. The default size is the size of an *int*. A symbolic size character may follow **x**, rather than the number of bytes. These have the following meaning:

C corresponds to number of bytes in a *char*
S corresponds to number of bytes in a *short int*
I corresponds to the number of bytes in an *int*
L corresponds to the number of bytes in a *long int*

Multiple format characters can appear in one *type_string* and multiple **-t** options may appear on the command line. If there is no **-t** option, the default is **-t o2**.

-v displays all lines. Normally, **od** does not display multiple lines that differ only in the address. It displays the first line with a single * under it to show that any subsequent lines are the same.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: badly formed offset "*offset*"
Cause: You specified an *offset* that was not a decimal or octal value.
Action: Specify a valid *offset*.

Message: file "*filename*" : *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: Invalid size modifier for "*char*" format
Cause: You specified an invalid size modifier for the *char* format character.
Action: Check the *DESCRIPTION* section for the valid size modifiers for each format character.

Message: Missing argument for "*-opt*" option.
Cause: You specified the *-opt* option but did not follow it with the expected argument.
Action: Provide the expected argument. Check the *DESCRIPTION* section for a list of valid **od** options and their arguments.

Message: Option *-option* argument missing
Cause: You did not provide an argument for *-option*.
Action: Provide the missing argument.

Message: read error: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: seek error on input: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: seek past EOF on input
Cause: The seek offset specified on the command line was greater than the size of the input file.
Action: Check the offset and try again.

Message: Unknown format character "*char*"
Cause: You specified an unrecognized format character as an argument to the **-t** option.
Action: Check the *DESCRIPTION* section for a list of valid format characters.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **od**.
Action: Check the *DESCRIPTION* section for a list of valid **od** options.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

The options to operate on longs (**-OSXD**) and the hex byte (**-h**) are not normal options on traditional implementations of **od** on UNIX systems. System V and BSD versions have different semantics for certain options.

Only the second form of the command is part of the POSIX standard.

MPE/iX NOTES

On MPE/iX systems, a word is the same as a C language `int`, that is, it is 32 bits in length.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

`dd(1)`

NAME

pack — compress files by Huffman encoding

SYNOPSIS

pack [[-] [-f] [-o *file*] *file*] ...

DESCRIPTION

pack compresses argument *files* using a Huffman minimal redundancy code on a byte basis. By default, each file is compressed in place, and the resulting file has a *.z* extension appended to the file name, but keeps the same owner and permissions. For example, *abc* is compressed into *abc.z*. The times of last access and last modification are also preserved.

Packed files can be identified by **file**(1) and uncompressed by **unpack**(1) (which unpacks the file in place) or **pcat**(1) (which unpacks to the standard output).

Normally **pack** reports the degree of compression achieved in each file (the report is printed on the standard output). This number can be negative for small files with little redundancy if the **-f** option is used.

pack accepts the following options:

- displays more detail on size, overhead, and entropy (information rate). This option can be used several times on the command line, and acts as a toggle, inverting the detailed-report flag at each mention.
- f** forces compression when it normally does not occur. Without this option, **pack** does not compress a file if its size is not reduced by compression; the file is already compressed; or the file has more than one link.
- o *file*** specifies a different output file, so that compressed output is written to *file* rather than overwriting the original input file. Several input and output files may be specified. For example,

```
pack -o out1 in1 -o out2 in2
```

packs file *in1* into *out1* and file *in2* into *out2*. The input files are not changed.

FILES

*pk\$** Temporary copy of input.

Note: This is stored under the current directory rather than the directory given by *TMPDIR*.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- n Indicates that n files could not be packed properly. For example, if three out of six files could not be packed properly, the exit status is 3.

Messages

- Message:** cannot create *filename*
Cause: When **pack** attempted to append the .z extension to the input file name, it resulted in a name that was longer than the maximum indicated by the configuration variable PATH_MAX.
- Message:** file "*filename*" : system error
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** *filename* already exists
Cause: **pack** attempted to write its output to the file *filename*, but the file already existed.
Action: Delete or rename *filename*.
- Message:** *filename* : already packed
Cause: You specified a *filename* that appeared to be a pack file.
Action: You can force *filename* to be packed with the **-f** option.
- Message:** *filename* : can't pack in place
Cause: You specified a file that was too large to pack in place.
Action: Specify an output file with the **-o** option.
- Message:** *filename* : directory
Cause: You specified a directory as the input file. **pack** will not touch directories.
Action: Specify an input file that is not a directory.
- Message:** *filename* : empty
Cause: You specified a file that was empty.
Action: Specify a file that has contents to pack.
- Message:** *filename* : has links
Cause: You specified a file that has more than one link.
Action: You can force *filename* to be packed with the **-f** option.

Message: *filename: no saving*
Cause: You specified a file that was too small or uniform to benefit from packing.
Action: You can force *filename* to be packed with the **-f** option.

Message: *filename: write error*
Cause: An error occurred while writing the output file.
Action: Check that *filename* exists, was named properly, and that you have appropriate permissions to write to the file.

Message: *output file "filename": system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: *seek on file "filename": system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: *setting time on file "filename": system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: *truncate file "filename" to length len failed*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

PORTABILITY

x/OPEN Portability Guide 4.0. UNIX System V.

MPE/iX NOTES

The current MPE/iX implementation of **pack** converts non-byte stream files to byte stream files before packing them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When you unpack the packed file, it is written as a byte stream file.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

file(1), **pcat(1)**, **unpack(1)**

NAME

paste — horizontally concatenate lines

SYNOPSIS

paste [-s] [-d *list*] *file* ...

DESCRIPTION

paste concatenates lines of all the specified input files onto the standard output. If you specify - (dash) instead of a file, **paste** uses the standard input. Normally, an output line consists of the corresponding lines from all the input files. **paste** replaces the newline character at the end of each input line (except the one from the last file on the command line) with a tab character, or characters specified by the -d option.

Options

paste accepts the following options:

- d *list* specifies a list of characters to be used one at a time instead of the tab character to replace the newline at the end of input lines. **paste** uses *list* circularly; when it exhausts the characters in *list*, it returns to the first character in the list. If you also specify the -s option, **paste** returns to the first character of *list* after processing each file. Otherwise, it returns to the first character after each line of output. *list* may contain any of the following standard C escapes such as \n, \t, \r, \b, \\, and \0, where \0 indicates that no separator is to be used.
- s concatenates all lines from each input file together on the single output line. If the -s option is not specified and an end-of-file is detected on any (but not all) of the input files, **paste** behaves as though empty lines have been read from those files.

EXAMPLES

The command

```
ls | paste -s -d'\t\t\n'
```

displays the output of **ls** in three tab separated columns.

If file A contains:

```
a
b
c
```

and file X contains:

```
x
y
z
```

then the command

```
paste A X
```

produces:

```
a      x
b      y
c      z
```

and the command

```
paste -s A X
```

produces:

```
a      b      c
x      y      z
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - missing input files
 - too many files specified
 - inability to open a file
- 2 Unknown command line option.

Messages

Message: file "*filename*" : *system error*

Cause: See **syserror(3)**.

Action: See **syserror(3)**.

Message: must specify input files

Cause: You did not specify any input files.

Action: Specify at least one input file.

Message: Option *-option* argument missing
Cause: You did not provide an argument for *-option*.
Action: Provide the missing argument.

Message: too many files at "*filename*"
Cause: You specified more files than **paste** can handle. The *filename* given in the error message is the name of the first file that **paste** was unable to open. The number of files that **paste** can open depends on the number of files that other processes have open.
Action: Close files that other processes have open to increase the number of files that **paste** can open.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **paste**.
Action: Check the *DESCRIPTION* section for a list of valid **paste** options.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. UNIX System V.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cut(1)

NAME

patch — change file using diff output

SYNOPSIS

```
patch [-bceflNnRsv] [-B prefix] [-D symbol] [-d dir] [-F n]
[-i patchfile] [-o outfile] [-p n] [-r rejectfile] [file]
```

DESCRIPTION

patch reads a *patchfile* which contains output from **diff** describing changes from an old text file to a new text file. **patch** then applies those changes to another text *file*. Typically, you use **patch** if you are keeping parallel versions of a file. When you make changes to one file, you can use **patch** to incorporate those changes into other versions of the file.

If you do not specify either the **-b** or **-B** options, **patch** tries to change the original *file* directly. If you do not specify **-c**, **-e**, or **-n**, **patch** looks at the format of the **diff** output and tries to determine which type of output the patchfile contains.

If you do not specify a file to be patched and the patchfile is not in context format, **patch** prompts you for the name of the file you want to patch. If the patchfile is in context format, **patch** tries to determine the file name on its own. The first two lines of a context patchfile give the names of the old and new files that **diff** compared. If only one of the files exists, **patch** patches that file; if neither exists or both do, **patch** checks for a line starting with the string `Index:` before prompting you for the name of the file to patch.

With a context format patchfile, **patch** can recognize when line numbers given in the patchfile do not match line numbers in the file being patched. Thus it can patch a file with line counts that do not match the old file that was used by **diff**. To do this, it takes these steps:

- For each section to be changed, **patch** starts with the line number found in the patchfile, plus or minus any adjustment that must be made for the previous section.
- If the line at this location does not match the line in the patchfile, **patch** scans forward and backward for a line that does match. If it finds a matching line, **patch** makes the appropriate changes. **patch** also remembers the adjustment it had to make to find the matching line, and uses this adjustment in the next section to be changed.
- If **patch** cannot find a line matching the one in the patchfile, it tries to find the line using the lines given as context. It ignores the first and last lines of the context and searches again. If it finds a match this time, it makes the change and remembers the adjustment.
- If a search ignoring the first and last lines of the context fails, **patch** searches one more time, ignoring the first two and last two lines of the context. If it finds a match, it makes the changes and remembers the adjustment.

- If **patch** still cannot find a match, it writes the unmatching portion to the *reject file*. It then tries to process the next section of changes. Thus the reject file contains the sections that **patch** is not able to change. Line numbers on sections in the reject file may be different than those in the patchfile, since **patch** adjusts them using the adjustment that **patch** calculated for preceding sections.

To some extent, **patch** tries the same process if the patchfile is in normal rather than context format. Because the patchfile does not contain the context information, **patch** has less to work with and probably creates more rejects. **patch** always writes the reject file in context format, regardless of the format of the patchfile.

By default, the reject file has the same name as the original *file*, plus the suffix *.rej*. You can use **-r** to specify a different reject file on the command line. If the reject file already exists, **patch** does not try to overwrite it; it simply terminates with a status greater than 1.

If you do not specify **-R**, **patch** starts out with the assumption that the patchfile could be normal or reversed. Therefore if the first change is rejected, **patch** tries the reverse change to see if that one works. If the reverse change is also rejected, **patch** continues on with other changes in the file, trying both forward changes and reverses until one of them works. If the one that works is a forward change, **patch** only attempts forward changes for the rest of the file. If the one that works is a reverse change, **patch** issues a message to this effect and asks if it should treat all changes as reverse ones.

The patchfile can contain output from several **diff** comparisons. **patch** treats each collection of changes as a separate patchfile, and with each, **patch** may prompt you for the name of the file to be patched.

Options

patch accepts the following options:

-B prefix

saves a copy of the original *file* in a file with the same name preceded by the string *prefix*. If there is already a file with this name, **patch** does not touch it and terminates with a status greater than 1.

-b

saves a copy of the original *file* in a file with the same name plus the suffix *.orig*. If there is already a file with this name, **patch** overwrites it. When applying more than one patch to the same file, **patch** only creates *file.orig* for the first patch. When you also specify **-o outfile**, **patch** does not create *file.orig*, but if *outfile* already exists, it creates *outfile.orig*.

-c

interprets the patchfile as a *context* diff file (the output of **diff** when **-c** or **-C** is specified). You cannot use this option with **-e** or **-n**.

-D *symbol*

marks changes with the C preprocessor construct

```
#ifdef symbol
    ...
#endif
```

When you compile the resulting (patched) file, you get the original file if *symbol* is not defined, and the changed file if *symbol* is defined.

-d *dir* changes the current directory to *dir* before processing the patch.

-e interprets the patchfile as an **ed** script (the output of **diff** when **-e** is specified). You cannot use this option with **-c** or **-n**.

-F *n* specifies the number of lines of a context diff to ignore when searching for a place to install a patch.

-f forces processing without requesting additional information from the user.

-i *patchfile*

reads the patchfile information from *patchfile*. If you do not specify *patchfile*, **patch** reads the information from the standard input.

-l matches any sequences of blanks in the patchfile to any sequence of blanks in the input *file*. In other words, **patch** considers two lines equivalent if the only difference between them is their spacing.

-N ignores any patches which have already been applied. By default, **patch** rejects already-applied patches.

-n interprets the patchfile as normal **diff** output. You cannot use this option with **-c** or **-e**.

-o *outfile*

writes patched output to *outfile* instead of to the original file. When you specify more than one patch to a single file, **patch** applies the patches to intermediate versions of the file created by previous patches, resulting in multiple, concatenated versions of the file being written to *outfile*.

-p *n* deletes *n* components from the beginning of all path names in the patch file. If a path name is an absolute path name (that is, starts with a slash), **patch** treats the leading slash as the first component of the path, and **patch -p 1** deletes the leading slash. Specifying **-p 0** tells **patch** to use the full path names given in the patch file. If you do not specify this option, **patch** only uses the basename (the final path name component).

-R reverses the sense of the patch script. In other words, **patch** behaves as if the patch script shows the changes that make the new version into the old version. You cannot use **-R** if the patchfile is in **ed** script format.

With **-R**, **patch** attempts to reverse each change recorded in the script before applying the change. **patch** saves rejected differences in reversed format (which means that you can check the rejections to see if **patch** made the reversals correctly).

-r rejectfile

records rejects in the file *rejectfile*, instead of the default reject file name. By default, the reject file has the same name as the original *file*, plus the suffix *.rej*.

-s tells **patch** to remain silent until an error occurs. Normally, **patch** writes information on the results of the patching process to standard error (stderr).

-v displays the version number of **patch**, then exits.

DIAGNOSTICS

patch may return the following status values:

0 successful completion.
1 there were one or more rejects.
>1 an error occurred.

Messages

Message: Argument to **-D** not an identifier

Cause: You specified an argument to the **-D** option that was not a valid C preprocessor identifier.

Action: Make sure that the symbol provided is a valid C identifier, and try again.

Message: Can't cd to *dir*.

Cause: **patch** was unable to change the current directory to the directory specified with the **-d** option.

Action: Make sure that the specified directory name exists, was named properly, and that you have appropriate permissions.

Message: Can't open file *filename*

Cause: **patch** was unable to open the file that you wanted to patch.

Action: Make sure that *filename* exists, was named properly, and that you have appropriate permissions.

Message:	Can't seem to get enough memory.
Cause:	There were not enough free system resources for patch to allocate the buffers it needed to do its job.
Action:	Free up some system resources and try again.
Message:	can't write temp file: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	creating temporary file <i>filename</i> : <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	<i>filename</i> is not a normal file -- can't patch.
Cause:	You specified a <i>filename</i> as the file to be patched that was not a regular file, but a device or a pipe.
Action:	Make sure that <i>filename</i> exists, was named properly, and that you have appropriate permissions.
Message:	input file "name": <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	Lost hunk on alloc error!
Cause:	patch was unable to allocate enough system resources to do its job.
Action:	Free up some system resources and try again.
Message:	tempnam() error: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	missing argument after " <i>-option</i> " option
Cause:	You specified <i>-option</i> without providing the required argument.
Action:	Check the <i>DESCRIPTION</i> section for a list of patch options and their arguments.
Message:	Too many file arguments.
Cause:	You specified more than one file to be patched on the command line.
Action:	Do not specify more than one file to be patched on the command line.
Message:	Unknown option " <i>-option</i> "
Cause:	You specified an option that is not valid for patch .
Action:	Check the <i>DESCRIPTION</i> section for a list of valid patch options.

Message: You may not change to a different patch file.
Cause: You specified more than one patch file with the **-i** option.
Action: You can specify only one file with the **-i** option.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

The **-B**, **-F**, **-f**, **-s**, and **-v** options are not part of the POSIX standard.

ACKNOWLEDGEMENT

patch was written by Larry Wall.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

diff(1), **ed(1)**

NAME

pathchk — check path names

SYNOPSIS

pathchk [-p] *pathname*...

DESCRIPTION

pathchk checks one or more *pathnames* for validity and portability (based on the underlying file system). A *pathname* is valid if you can use it to create or access a file without causing a syntax error. A *pathname* is portable if the file system does not truncate the name when it tries to use it. **pathchk** writes an error message indicating the error detected and the erroneous path name if any *pathname*

- is longer than PATH_MAX bytes;
- contains a component longer than NAME_MAX bytes;
- contains any component in a directory that is not searchable;
- contains any character in any component that is not valid.

Options

pathchk accepts the following option:

- p** instead of using the previous criteria, writes an error message if *pathname*
- is longer than _POSIX_PATH_MAX bytes;
 - contains any component longer than _POSIX_NAME_MAX bytes;
 - contains any character in any component that is not in the portable file name character set.

DIAGNOSTICS

Possible exit status values are:

- 0 All *pathnames* passed the check.
- 1 An error occurred.
- 2 Unknown command line option.

Messages

Message: *component*: component too long.
Cause: One of the components of the path name provided is longer than is allowed by the filesystem (or by POSIX, if **-p** was specified).
Action: Try to shorten the offending component or components of the path name.

Message: *pathname*: Nonportable character '*char*' found.
Cause: You were using the **-p** option and you specified a *pathname* containing the character *char* which is not in the portable character set.
Action: Specify a *pathname* that contains only characters found in the portable character set.

Message: *pathname*: Not searchable.
Cause: You specified a *pathname* that could not be searched.
Action: Specify a new *pathname*.

Message: *pathname*: Pathname too long.
Cause: The length of the path name provided is longer than that allowed by the filesystem (or by POSIX, if **-p** was specified).
Action: Try to shorten some of the components of the path name, in order to reduce the overall length of the path name.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **pathchk**.
Action: Check the *DESCRIPTION* section for a list of valid **pathchk** options.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

NAME

pax — archiver for data interchange and file backup

SYNOPSIS

pax [-cdnqvz] [-f *archive*] [-s *substitute*] ... [*pattern* ...]

pax -r [-cdiknuvz] [-f *archive*] [-o *options*] ... [-p *string*] ...
[-s *substitute*] ... [-V *volpat*] [*pattern* ...]

pax -w [-diLqtuvXz] [-b *block*] [[-a] [-f *archive*]] [-o *options*] ...
[-s *substitute*] ... [-V *volpat*] [-x *format*] [*pathname* ...]

pax -r -w [-diklLnquvX] [-p *string*] ... [-s *substitute*] ...
[*pathname* ...] *directory*

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

pax reads and writes *archive files*. An archive file records the contents of files and directories, and can also record such information as file modification dates, owner names (on POSIX-compliant systems), and so on. You can therefore use a single archive file to transfer a directory structure from one machine to another, or to backup/restore groups of files and directories.

A file stored inside an archive is called a *component file*; similarly, a directory stored inside an archive is called a *component directory*. Together, component files and directories make up the *components* of the archive file.

You can specify the name of the archive file with the **-f** *archive* option. If you do not specify **-f** or neither of **-r** or **-w**, the **-r** option assumes the archive file is the standard input while the **-w** options assumes it is the standard output.

As noted in the *SYNOPSIS*, there are four possible formats for the **pax** command line.

- If you do not specify **-r** or **-w**, you are in *list* mode. In this mode, **pax** uses the standard output to display the table of contents of an existing archive file. **pax** only displays information on component files the names of which match one of the *patterns* given on the command line. Patterns are described in a later section of this man page.
- If you specify **-r** but not **-w**, you are in *read* mode. In this mode, **pax** reads an archive file as input and *extracts* selected components from the archive. By default, **pax** selects the components using *patterns* given on the command line. If the archive contains several components with the same name, **pax** extracts each of them with later components overwriting files created by earlier components with the same name.

pax stores extracted components under the current directory. Extracted directories become subdirectories of the current directory. Ownership and permissions of the extracted files are discussed under the **-p** option.

- If you specify **-w** but not **-r**, you are in *write* mode. In this mode, **pax** writes out an archive file that contains the specified *pathnames* as components. If a *pathname* is a directory, the archive file contains all the files and subdirectories under that directory. If you do not specify any *pathnames*, **pax** reads the standard input to get a list of path names to select; the input should give one path name per line.
- If you specify both **-r** and **-w**, you are in *copy* mode. In this mode, **pax** reads the specified *pathnames* and copies them to the specified *directory*. In this case, the given *directory* must already exist and you must be able to write to that directory. If a *pathname* is a directory, **pax** copies all the files and subdirectories under that directory as well as the directory itself. If you do not specify any *pathnames*, **pax** reads the standard input to get a list of path names to copy; the input should give one path name per line.

pax can read input archives in **cpio** and **tar** format. It can also write these formats; see the **-x** option.

On POSIX-compliant systems, you need appropriate privileges to create block or character special files.

Patterns

Command line patterns behave similarly to the wild card constructs explained in **sh**(1) including the fact that wild card characters do not match the slash character (/). For example, the pattern ***** stands for any string of characters excluding slash characters. A pattern like ***.c** therefore selects all files with the suffix **.c** under the current directory.

If you do not specify any *patterns* on a command line that accepts *patterns*, **pax** assumes that all files and directories match. As a result **pax** will act on the entire contents of the current directory, plus the entire contents of all its subdirectories.

Options

pax accepts the following options. Some of them are only appropriate to some forms of the command, as shown in the *SYNOPSIS*.

-a appends specified files/directories to the end of the contents of an existing archive. If the archive doesn't already exist, **pax** creates it.

-b *block*

specifies the output *blocksize*. Each output operation writes *block* bytes, where *block* is an integer appropriate to the output device. If **b** follows the *block* number, blocksize is measured in 512-byte blocks. If **k** follows the *block* number, the blocksize is measured in 1024-byte blocks. The default *block* is 10k for **tar** archives, 5k for **cpio** archives. The blocksize must be at least 512 bytes for reading.

- c** selects all those files which do *not* match any of the *patterns* given on the command line; this is the opposite of the usual behavior.
- d** does not traverse directories. A pattern matching a directory only extracts the directory itself. When creating an archive, a directory name only stores the directory itself.
- f** *archive*
lets you specify the name of the archive file instead of using the standard input for list and read modes and the standard output for write mode. *archive* can also be a device name.
- i** lets you rename files as **pax** works. When extracting, **pax** displays the name of the component it is about to extract and gives you the chance to specify a name for the extracted file. When archiving, **pax** displays the name of the file or directory it is about to record in the archive, and lets you specify a different name to be assigned to the component. If you enter **.** as the name, **pax** processes the file or directory with no modification to the name. If you just press ENTER, **pax** skips the file (doesn't extract or archive it). **pax** terminates if you enter end-of-file.

If you also specify **-s**, **pax** makes the given substitution before displaying the name of the component.
- k** prevents the overwriting of existing files.
- L** follows symbolic links. When you specify this option, **pax** copies the file to which a symbolic link points to the archive. Normally, only the symbolic link is copied. This option is only valid on systems which support symbolic links.
- l** in copy mode, creates links to the original files whenever possible, rather than copying them.
- n** treats the *pattern* arguments as ordinary path names. **pax** only selects the first component with a given path name, even if the archive contains several components with the same name. **pax** checks the given path names against the archive before applying any renaming from the **-i** or **-s** options. **pax** writes an error message for each specified file that cannot be found in the archive.

-o *options*

provides information for modifying the algorithm for writing and extracting files that the file format specified with **-x** uses.

Presently, **pax** supports one *option* to **-o**. It converts data from one code set to another while reading or writing an archive. This option has the format:

-o *keyword=value* [, *keyword=value*] . . .

where *keyword* is either `to` or `from` and *value* is the name of a code set. Sample code sets include:

IS8859	ISO/IEC 8859-1 (8-bit ASCII)
IS646	ISO 646 (7-bit ASCII)
CP1047	Codepage 1047

For a complete list of code sets, see **iconv**(3).

Note: It is possible that the `-o` may be expanded in future releases to accept other *keywords* and *values*. Currently, specifying an unknown *keyword* results in a warning message from **pax**.

You can omit either the `to` or `from` keyword. If you omit `to`, **pax** assumes that you want to write (or read) a portable archive tape and will convert the data to ISO/IEC 8859-1. If you omit `from`, **pax** assumes that you are converting from the system-specific local code set.

If your input contains a character which is not valid in the source code set, **pax** displays a warning and continues, leaving the character untranslated. In the inverse situation, where the source code set contains a character that is not in the destination code set, **pax** converts the character to an underscore (`_`).

Note: If you do not specify `-o`, no code set conversion is done. When doing code set conversions, **pax** assumes that all files are text files, since only text files are portable.

-p *string*

specifies file characteristic options. *string* can consist of any combination of the following specification characters:

- a** does not preserve file access times.
- e** preserves the user ID, group ID, file mode, access time, and modification time.
- m** does not preserve file modification times.
- o** preserves the user ID and group ID.
- p** preserves the file mode.

If a character in *string* duplicates or conflicts with another character in *string*, the one given last takes precedences. By default, **pax** restores modification time only.

-q

for input mode only, **pax** assumes that all created files are text files and extracts them to the local text file format. On systems with fixed length records, this might mean padding with blanks to the record length.

On systems with fixed length records, this might mean padding with blanks to the record length. On UNIX and POSIX-compliant systems, **pax** removes all carriage return characters (`\r`) and retains only the newline (`\n`) characters.

It might be desirable to have this option work when creating output to convert text to a system-independent format; however, due to the format of an archive file, this would (unacceptably) require all files to be read twice.

-r reads an archive file from standard input.

-s *substitute*

modifies path names using a substitution command *substitute*. This is similar to the substitution command of the **ed**(1) text editor. The full option has the form

`-s /bregex/string/[gp]`

where *bregex* is a basic regular expression (see **regex**(3)) and *string* is a string that **pax** is to insert in place of matches for the regular expression. *string* can contain an ampersand & (standing for the string matching *bregex*), or `\1`, `\2`, and so on (with the meanings defined in **regex**(3)), for subexpression matching.

Normally, **-s** only replaces the first match for *bregex*. A `g` following the *string* replaces all matches in the line.

A `p` following the *string* prints all successful substitutions on the standard error stream. **pax** displays a substitution in the format

`oldname >> newname`

In this form of the command, the slash (/) is used as the character separating parts of *substitute*; you can use any non-null character instead.

There may be more than one **-s** option on the command line. In this case, **pax** tries the substitutions in the order given. **pax** stops trying to make these substitutions as soon as it makes its first successful substitution. If the null string replaces a file name, **pax** ignores that file name on both input and output.

-t after reading files being archived, **pax** resets the access time to that prior to **pax**'s access.

-u compares component dates to dates of existing files with the same name. In read mode, **pax** only extracts a file if its modification date is more recent than the modification date on an existing file of the same name. In other words, it doesn't overwrite an existing file if the existing file is newer than the one in the archive.

Similarly, in copy mode, **pax** does not overwrite an existing file if the existing file is newer than the one being copied.

In write mode, **-u** checks to see if the file being added has the same name as a file already in the archive. If so, and if the file being added is newer than the one in the archive, **pax** leaves the old file in the archive and appends the new one at the end. In this case, **-u** automatically implies **-a**, which means that **pax** adds new files to the end of the archive.

-V *volpat*

provides automatic multi-volume support. **pax** writes output to files the names of which are formatted using *volpat*. It replaces any occurrence of # in *volpat* with the current volume number. When you invoke **pax** with this option, it asks for the first number in the archive set, and waits for you to type the number and a carriage return before proceeding with the operation. **pax** issues the same sort of message when a write error or read error occurs on the archive; the reasoning is that this kind of error means that **pax** has reached the end of the volume and is to go on to a new one. An interrupt at this point terminates **pax**.

-v in list mode, displays a *verbose* table of contents; this verbose format shows information about the components in the same format used by the **ls(1)** command with the **-l** option. In other modes, this option lists path names on the standard error stream just before beginning to process the files/directories, but after any **-i** or **-s** options have had their effect.

-w writes files to the standard output in the specified archive format.

-X only writes out those files which are on the same device as their parent directory.

-x *format*

specifies a format for an output archive. The *format* argument may be:

cpio standing for the ASCII format used by the **cpio** command, described in **cpio(1)** and **cpio(2)**.

cpioB standing for the binary format used by **cpio**.

tar standing for the old format of **tar** files; see **tar(1)** and **tar(2)**.

ustar standing for the (new) USTAR format used by the **tar** command.

The default *format* is **ustar**.

-z performs Lempel-Ziv compression. The number of bits of compression used for input and output is system defined.

Output

In the output, the notation

pathname == *linkname*

indicates that *linkname* is a hard link for *pathname*. The next nine characters are in three groups of three; they describe the permissions on the file. The first group of three describes owner permissions; the second describes group permissions; the third describes other (or *world*) permissions. Characters that may appear are:

- r Permission to read file
- w Permission to write on file
- x Permission to execute file
- a Archive bit is on (file has not been backed up)
- s System file
- h Hidden file

After the permissions comes the number of links to the file.

Next comes the name of the owner of the file or directory.

Then comes the name of the group that owns the file or directory.

Following this is the size of the file, expressed in bytes.

After this comes a date and time. For a file, this is the time that the file was last changed; for a directory, it is the time that the directory was created.

The last item on the line is the name of the file or directory.

EXAMPLES

The following creates an archive file from all the files under the current directory.

```
pax -w . >/dir/archive
```

The following extracts all the components of an archive file and puts them into the current directory.

```
pax -r * </dir/archive
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

If **pax** cannot extract a particular file when reading, or find a particular file when writing, it generates an error message and continues to process other files but returns a status of 1. If any other sort of error occurs, **pax** terminates immediately without attempting further processing.

Messages

- Message:** allocating compress buffer: *system error*
Cause: See **syserror**(3).
Action: Run the archive through the **uncompress** program, and pipe the output into this program.
- Message:** allocating I/O buffer: *system error*
Cause: See **syserror**(3).
Action: Try using a smaller archive blocking factor.
- Message:** archive file name >*number* characters
Cause: The archive contained a path name that was longer than that permitted on the local system.
Action: Re-create the archive using a shorter relative path.
- Message:** bad format in header
Cause: Either the wrong file was passed, or the file has been corrupted.
Action: Check your archive file.
- Message:** bad magic number in archive
Cause: Either the wrong file was passed, or the file has been corrupted.
Action: Check your archive file.
- Message:** bad replacement string: "*sub_pattern*", *regular expression error*
Cause: You specified an invalid regular expression as a substitution pattern with the **-s** option; see **regerror**(3) for detailed errors.
Action: See **regerror**(3).
- Message:** bad substitution expression: "*sub_pattern*"
Cause: You invoked with a **-s** option, but the *sub_pattern* argument was empty, or did not contain a leading delimiter.
Action: Specify a valid *sub_pattern* argument, such as **-s old/new**.
- Message:** badly formed number: "*number*"
Cause: You specified an invalid number as the argument of a **-b** option.
Action: Specify a valid number.
- Message:** blocking factor must be at least 512 for read operations
Cause: You specified a blocking factor of less than 512 bytes and attempted to perform read operations.
Action: Use the **-b** option to specify a block size of at least 512 bytes.

Message: blocking factor of 0 not allowed
Cause: You specified the **-b** option with an argument that evaluated to zero.
Action: Specify a non-zero value as the argument to the **-b** option.

Message: can not read archive from terminal
Cause: You attempted to extract or list an archive from a tty device.
Action: Specify a non-tty file name to **pax**.

Message: can't use -a or -u with stdout
Cause: You specified the **-a** or **-u** option when sending output to the standard output. These options can only be used with archive files.
Action: Make sure that you specify an archive file when using the **-a** or **-u** options.

Message: cannot create file "*filename*": system error
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: cannot create parent directory to "*pathname*": system error
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: cannot link "*name1*" to "*name2*": system error
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: checksum error on tape (*hexnum1* != *hexnum2*)
Cause: A bad checksum was found in a tar header.
Action: Check to see if the archive was corrupted.

Message: compress: *compression error*
Cause: A problem occurred in the compression of the archive.
Action: See the **compress** manual page for a full list of possible compression errors.

Message: decompress: *compression error*
Cause: Normally implies the archive is corrupted.
Action: See the **uncompress** manual page for a full list of possible compression errors.

Message: directory "*pathname*": system error
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: error in string replacement: *regular expression error*
Cause: See **regerror(3)**.
Action: See **regerror(3)**.

Message: Existing file "*filename*" is newer
Cause: *filename* was not extracted from the archive because an existing file with the same name was newer.
Action: If you really want to extract *filename*, use the **-u** option.

Message: fifo special file "*filename*": fifo not supported by local o/s
Cause: You attempted to extract an archive file containing a FIFO file, and the host operating system does not support FIFOs.
Action: Since the operating system does not support FIFOs, no action is possible.

Message: file "*filename*": Unable to represent filename in ISO/IEC 8859 -- not saved
Cause: Characters in *filename* cannot be represented in the character set used in **tar** archives.
Action: Rename the specified file to contain only characters in ISO/IEC 8859.

Message: *filename* is a special file--not dumped
Cause: You attempted to dump a special file when writing a non-USTAR **tar** file.
Action: Do not specify special files to be included in **tar** archives. If you want to archive special files, use a USTAR format archive.

Message: *filename*: cannot set mode: *system error*
Cause: When extracting a file, an attempt was made to set the file mode to the mode it had at archive time. This may have failed if you were extracting to pre-existing files with different owners. See **syserror(3)**.
Action: See **syserror(3)**.

Message: *filename*: cannot set uid/gid: *system error*
Cause: When extracting a file, an attempt was made to set the file owners to the same owners as at archive time. See **syserror(3)**.
Action: Do not use the **-p o** option.

Message: *filename*: grew in size
Cause: While writing *filename* to an archive, the file grew in size, probably due to some other process writing to it while this utility was running. Only part of the file (the number of bytes indicated in the header) was written to the archive.
Action: If possible, avoid access to files while they are being archived.

Message: *filename*: links not supported by OS
Cause: The **pax**, **tar**, or **cpio** file being extracted contained hard links, which are not supported by the operating system. These files are not extracted.
Action: Since this message appears only on systems with no hard link support, there is no way to extract the file as a hard link. One can manually make a copy of the file referenced by the link.

Message:	<i>filename: shrank in size</i>
Cause:	While writing <i>filename</i> to an archive, the file shrank in size, probably due to some other process truncating it while this utility was running. The file written to the archive was padded with binary zeroes to fill it out to the number of bytes indicated in the header.
Action:	If possible, avoid accessing <i>filename</i> while it is being written to an archive.
Message:	<i>filename: symbolic links not supported by OS</i>
Cause:	You attempted to extract a file specified as a symbolic link in the archive. Symbolic links are not supported on all operating systems.
Action:	Do not use symbolic links on this system.
Message:	<i>incomplete tape block</i>
Cause:	When reading a tape archive header, a block that was not the same size as the archive block size was read.
Action:	Check to see if the archive was corrupted.
Message:	<i>input file "filename": system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	<i>insufficient memory: system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	<i>interactive EOF</i>
Cause:	When using the interactive rename option, an end-of-file was encountered.
Action:	None.
Message:	<i>invalid archive format selected: 'format'</i>
Cause:	You specified an argument to the -x option that is not a supported format.
Action:	Check the <i>DESCRIPTION</i> section of this man page for a list of supported archive formats.
Message:	<i>invalid option on substitution-"letter"</i>
Cause:	You specified a trailing character with a -s substitution that was neither g nor p .
Action:	Correct the argument to the -s option and retry the command.
Message:	<i>io buffer allocation: system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	<i>medium not seekable</i>
Cause:	You attempted to append to an archive which was not seekable.
Action:	Create a new archive instead.

Message: Missing blocking factor after "b"
Cause: You specified the **-b** option without providing an argument that indicated the size of an output block.
Action: Provide the missing block size.

Message: Missing file characteristics after "p"
Cause: You specified the **-p** option without providing an argument that indicated the file characteristics to be preserved.
Action: Provide the missing argument.

Message: Missing filename after "f"
Cause: You specified the **-f** option without providing a file name as an argument.
Action: Provide the missing file name.

Message: Missing format after "x"
Cause: You specified the **-x** option without providing an archive format as its argument.
Action: Provide the missing archive format.

Message: Missing keyword list after "o"
Cause: You specified the **-o** option without providing a keyword list as an argument.
Action: Provide the missing keyword list.

Message: missing *number* links to *filename*
Cause: Not all links to a given file were archived.
Action: None.

Message: Missing substitution after "s"
Cause: You specified the **-s** option without providing a substitution command as an argument.
Action: Provide the missing substitution command.

Message: Missing volume pattern after "V"
Cause: You specified the **-V** option without providing a volume pattern as an argument.
Action: Provide the missing volume pattern.

Message: *name1* link to *name2*: system error
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: *name1* symbolic link to *name2*: system error
Cause: When extracting an archive member that is a symbolic link, the `symlink()` system call failed. See **syserror**(3).
Action: See **syserror**(3).

Message:	non-USTAR header in USTAR archive at " <i>filename</i> "
Cause:	When reading a USTAR format archive, pax encountered a header without the USTAR magic number
Action:	Check to see if your archive has been corrupted.
Message:	Option <i>-option</i> argument missing
Cause:	You did not provide an argument for <i>-option</i> .
Action:	Provide the missing argument.
Message:	out of memory for link tables
Cause:	There were not enough free system resources to create the needed link tables. When archiving files with multiple links, each link must be remembered.
Action:	Archive in smaller pieces.
Message:	overflow in blocking factor: " <i>blocksize</i> "
Cause:	You specified a <i>blocksize</i> argument to the -b option that was too large.
Action:	Use a smaller value for <i>blocksize</i>
Message:	" <i>pathname</i> " not found.
Cause:	You specified the name of an archive member, but it was not found in the archive.
Action:	Get a full table of contents of the archive to see if you are using the correct name.
Message:	<i>pathname</i> : final component of name too long
Cause:	The USTAR format extends the old tar file name limit from 100 to 256 bytes; however, this requires breaking up the file name into one piece of 156 bytes or less and another piece of 100 bytes or less. The break occurs between directory components (that is, at a slash). In the case of <i>pathname</i> , the second component could not be made to fit into 100 bytes.
Action:	Move or rename <i>pathname</i> to have shorter path components.
Message:	<i>pathname</i> : name too long
Cause:	The path name <i>pathname</i> was too long to be included in a tar archive.
Action:	Rename or move <i>pathname</i> , such that its path name is shorter.
Message:	<i>pathname</i> : Not a directory
Cause:	You specified pass mode with either the -p option for cpio or the -r and -w options for pax , but the destination given was not a directory.
Action:	Make sure that the destination <i>pathname</i> is a directory.
Message:	<i>pathname</i> : system error
Cause:	See syserror(3) .
Action:	See syserror(3) .

Message: *pathname*: Unable to split name to fit in tar header
Cause: The USTAR format extends the old **tar** file name limit from 100 to 256 bytes; however, this requires breaking up the file name into one piece of 156 bytes or less and another piece of 100 bytes or less. The break occurs between directory components (that is, at a slash). In this case, the characteristics of *pathname* would not allow it to be broken up in such a manner.
Action: Move or rename *pathname* to have shorter path components.

Message: *pathname*: Unknown file type field value '*char*'
Cause: A file with an invalid file type was encountered when extracting or listing an archive's contents.
Action: This archive is invalid. No action is possible.

Message: read error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: requested format differs from the existing archive format
Cause: You used the **-a** option with **-x format**, where the archive already existed with a different format.
Action: Do not specify the format when appending to an existing archive, or specify the correct format.

Message: scratch file: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: sorting: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: special file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: string allocation: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Symbolic link name too long: Not extracted
Cause: Couldn't allocate enough memory to hold the symbolic link's name.
Action: Archive contains symbolic name which is too large; no action possible.

Message: symbolic link *filename*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: tape read: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: try "c" option for ASCII archive
Cause: The magic number in the **cpio** archive header appeared to be in ASCII.
Action: Try using the **-x** **cpio** option instead of **-x** **cpio**b.

Message: Unable to convert from codeset
Cause: The host file name character set (*codeset1*) was unable to map to and from the archive character set (*codeset2*).
Action: Correctly specify to and from keywords with the **-o** option of **pax**.

Message: Unable to open terminal "*term*"
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Unknown mode *octnum*
Cause: The type of the file specified in the *mode* field of the **tar** archive entry is not supported by the operating system.
Action: No action possible, as the file can not exist on the host system.

Message: Unknown mode field *octnum*
Cause: The type of the file specified in the *mode* field of the **cpio** archive is not supported by the operating system.
Action: No action possible, as the file cannot exist on the host system.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **pax**.
Action: Check the *DESCRIPTION* section for a list of valid **pax** options.

Message: unsupported file mode *octnum*
Cause: When creating a **cpio** archive, the mode (file type) of the specified file on the file system is not valid for including in a **cpio** archive.
Action: Check the file type of the named file, and correct if possible. (The file type may be an extension to POSIX, which is valid on the host operating system, but shouldn't be included in a portable **cpio** archive.)

Message: updating archive: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: write error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

The **-L**, **-q**, **-V**, and **-z** options are extensions to the POSIX standard.

MPE/iX NOTES

The current MPE/iX implementation of **pax** has the following limitations:

- It displays file owner names as 17 character fields and group names as 8 character fields.
- It converts non-byte stream files to byte stream files before archiving them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When you extract files from the archive, they are written as a byte stream file.
- Because this release of MPE/iX does not provide the `lstat()` API, **pax** cannot return information on the link itself. It attempts to determine when a symbolic link has been referenced, but can only return the information on the target of the link, rather than the link itself.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

compress(1), **cpio**(1), **ls**(1), **tar**(1), **uncompress**(1), **cpio**(2), **pax**(2), **tar**(2), **iconv**(3)

NAME

pcat — display Huffman packed files on standard output

SYNOPSIS

pcat *file* ...

DESCRIPTION

pcat uncompresses argument *files* which were compressed by **pack**(1) using a Huffman minimal redundancy code. The uncompressed data is sent to the standard output. This is handy for packed text files, but inappropriate for binary files, since the standard output is treated as a text stream. Binary files can be decoded in place by **unpack**(1).

The names of compressed input files are expected to end in .z. If a specified input file name does not end in this suffix, **zcat** automatically adds the .z; for example, if the command line specifies file abc, **zcat** looks for abc.z.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- n Indicates that n files could not be unpacked properly. For example, if three out of six files could not be packed properly, the exit status is 3.

Messages

See the man page for **unpack**(1) for a list of error messages that **pcat** may produce.

PORTABILITY

x/OPEN Portability Guide 4.0. UNIX System V. The UNIX command appends .z to the names of packed files.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cat(1), **file**(1), **pack**(1), **unpack**(1)

NAME

pr — display and format files

SYNOPSIS

```
pr [-adFmprtW] [-e[char][gap]] [-H header-fmt] [-h header]
[-i[char][gap]] [-l n] [-n[char][n]] [-o n] [-s[char]] [-w n]
[+n] [-n] [file ...]
```

DESCRIPTION

pr displays the specified *files* on the standard output in a paginated form. If you do not specify any *files* or you specify a file name of **-**, **pr** reads the standard input. By default, **pr** formats the given files into single-column 66-line pages. Each page has a 5-line header. By default, the current file's pathname, its last modified date, and current page number appear on the third line; the other lines are blank. A 5-line trailer consists of blank lines.

If you specify multiple columns, **pr** places its output in columns of equal width separated by at least one space, truncating each line to fit in its column. Input lines may be ordered down the columns or across the page on output; or different columns may each represent different files.

Options

pr accepts the following options:

- +n** starts displaying with the *n*th page of each file. The default for *n* is 1.
- n** displays *n* columns of output. When you specify this option, **pr** behaves as though you had also specified the **-e** and **-i** options. When you specify both this option and **-t**, **pr** uses the minimum number of lines possible to display the output. You should not specify this option with **-m**.
- a** orders input lines across the page on output, instead of down. You should only use this option with **-n**.
- d** produces double-spaced output.
- e[*char*][*gap*]** expands each occurrence of the input tab character to the next greater column position specified by the formula $n*gap+1$ where *n* is a positive integer. **pr** expands all input tab characters to an appropriate string of spaces. If you omit *gap*, or if it is zero, **pr** assumes that *gap* is eight. If you specify the nondigit character *char*, **pr** treats it as the input tab character; otherwise **pr** uses the standard tab character.
- F** uses formfeeds to separate pages. **pr** normally separates pages by sending a series of newline characters to fill the length of a page.

-H *header_fmt*

lets you customize your header line by specifying a format with the string *header_fmt*. **pr** recognizes the following special formatting commands:

%C	date and time
%F	current filename, or <i>header</i> string given by -h
%P	page number
%L	line number
%D	date
%T	time
%u	current user name

The default header format is equivalent to the option:

```
-H "%C %F Page %P"
```

-h *header*

uses the *header* string instead of the file name on each succeeding page header.

-i[*char*][*gap*]

replaces white space with tabs on output. The nondigit character *char*, if given, is the output tab character. The default is the tab character. **pr** sets tabs every *gap* positions; the default for *gap* is eight. If this tab character differs from the input tab character, and the actual data contains this tab character, the result is liable to be quite a mess.

-l *n* sets the number of lines per page of output. The default is 66. The actual number of lines displayed per page is this number less 5 for the header and 5 for the trailer. When you also specify the **-t** option, **pr** uses all *n* lines. If *n* is less than 10 (the number of lines needed for the header and the trailer), **pr** behaves as if you had specified the **-t** option and displays neither the header nor the trailer.

-m displays each file in its own column down the page. This overrides the **-a** option, forcing the **-n** option to be the number of files given. When you also specify the **-n** option, it gives line numbers for the first column only.

-n[*char*][*n*]

numbers the lines of each file. Each number takes up *n* positions; the default for *n* is 5. The character *char* separates the number from the line; this defaults to the tab character. For multi-column output, **pr** adds line numbers to each column. The **-m** option gives the line number for the first column only.

-
- o *n*** precedes each line of output with *n* spaces.
 - p** pauses between pages if output is to a terminal device. **pr** sounds the bell and waits for a carriage return from the controlling terminal (not the input files).
 - r** suppresses error messages due to failures when opening files.
 - s[*char*]**
separates text columns with the single character *char* instead of the appropriate number of spaces. This character is never replaced by the output tab character. The default value for *char* is the tab character. Normally **pr** pads each column with spaces or truncates it to the exact column width.
 - t** does not display the headers and trailers but uses the full length of the page for file output.
 - W** folds lines at the column width when you do not specify the **-s** option; **pr** treats each separate part of the line as a separate line.
 - w *n*** sets the width of the page to *n* column positions. If you do not specify this option, the default page width depends on whether or not you specified the **-s** option. If you did specify the **-s** option, the default width is 512; otherwise, it is 72. This width does not normally apply to single column output; however, single column output with the **-W** option does use this width.

ENVIRONMENT VARIABLES

pr uses the following environment variable:

- TZ*** contains the local time zone. **pr** uses this value when displaying times in header lines.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: *filename : system error*

Cause: See **syserror(3)**.

Action: See **syserror(3)**.

Message: *insufficient memory*

Cause: **pr** ran out of system resources while allocating buffer space.

Action: Free up more system resources.

Message: Missing header.

Cause: You specified the **-h** option without specifying a *header* string as its argument, or you specified the **-H** option without specifying a *header_fmt* string.

Action: Provide the missing *header* or *header_fmt* string.

Message: Too many files for merge(-m) option; limit *num*

Cause: You specified too many files for the **-m** option to handle. The limit was *num* files.

Action: Specify fewer files.

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **pr**.

Action: Check the *DESCRIPTION* section for a list of valid **pr** options.

Message: Width is insufficient

Cause: The line was not wide enough to hold the given number of columns with the given column width; or a column was not wide enough to hold the minimum amount of data.

Action: Use the **-w** option to increase the width of the page.

Message: write error on standard output: *system error*

Cause: See **syserror(3)**.

Action: See **syserror(3)**.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0.

This version of **pr** is compatible with the UNIX System V version of the command, which differs substantially from versions of **pr** found in earlier UNIX releases.

The **-H**, **-p**, and **-W** options are extensions to the POSIX standard.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

c(1), **cat(1)**, **expand(1)**, **fold(1)**, **unexpand(1)**

NAME

print — display arguments from the shell

SYNOPSIS

print [-npRrs] [-u[*descriptor*]] [*argument* ...]

DESCRIPTION

Calling **print** without options or with only the **-** option outputs each *argument* to the standard output using the same escape conventions as **echo**(1). In this case, **print** and **echo** have the same functionality; see **echo**(1). The options accepted by **print** increase its functionality beyond that of **echo**.

Options

print accepts the following options:

- n** does not automatically add a newline to the end of the output.
- p** sends output to a co-process. For a description of a co-process, see **sh**(1).
- R** is similar to **-r** except that **print** treats all subsequent options (except **-n**) as arguments rather than as options.
- r** ignores escape conventions.
- s** appends output to the command history file rather than sending it to standard output.
- u[*descriptor*]**
redirects the output to the file corresponding to the single digit file *descriptor*. The default file descriptor is 1.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

x/OPEN Portability Guide 4.0..

print is a built-in command of the KornShell on UNIX, but not of the Bourne Shell.

NOTES

This command is built into the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

echo(1), **fc(1)**, **read(1)**, **sh(1)**

NAME

printf — display a formatted string

SYNOPSIS

printf *format* [*argument* ...]

DESCRIPTION

printf writes the *argument* operand(s) to standard output, formatted according to the *format* operand.

format is a format string composed of conversion specifications that convert and add the next *argument* to the output. These conversions are similar to those used by the ANSI C standard. Conversion specifications have the form

`%[flag][width][.precision][char]`

where *flag* is one of the following:

– left justifies the field; default is right justification.

+ always prefixes a signed value with a sign (+ or –).

space reserves a character position at the start of the string for the minus sign (for negative numbers) or a space (for positive numbers). If both space and – appear as flags, the space flag is ignored.

prefixes octal values with 0 and hexadecimal values with 0x or 0X. For floating point values, this forces the decimal point to be displayed, even if no characters follow it.

0 pads numeric values with leading zeros. If both 0 and – appear as flags, the 0 flag is ignored.

width is the minimum field width of the output field. If the converted value is shorter than the minimum width, **printf** pads it with spaces or zeros.

In a string, *precision* is the maximum number of characters to be printed from the string; in a number, the precision is the number of digits to be printed to right of the decimal point in a floating point value. *width* or *precision* may be specified as *, in which case the value is read from the next argument, which must be an integer. For example:

```
printf "%*.*d\n" 20 10 200
```

is equivalent to

```
printf "%20.10d\n" 200
```

The conversion character *char* is one of the following:

- b a string which may contain a backslash-escape sequence. Valid escape sequences are those described on the **echo**(1) man page, `\0ddd` where *ddd* is a zero- to three-digit octal number, and `\c` which causes **printf** to ignore the remainder of that *argument*, any other *arguments*, and the remainder of the *format* string.
- c single character of an integer value; the first character of a string.
- d decimal integer.
- E, e floating point (scientific notation).
- F, f floating point.
- G, g the shorter of e and f (suppresses non-significant zeros).
- i decimal integer.
- o unsigned octal integer.
- s string.
- u unsigned decimal integer.
- X, x unsigned hexadecimal integer.

When there are more *arguments* than positions in *format*, the *format* string is applied again to the remaining *arguments*. When there are fewer *arguments* than there are positions in the *format* string, **printf** fills the remaining positions with null-strings (character fields) or zeros (numeric fields).

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- >0 The numbers of failures.

Messages

- Message:** Missing format specification
- Cause:** You did not specify a format specification on the command line.
- Action:** Provide the missing format specification.
- Message:** not a valid integer argument "*string*(dq
- Cause:** You specified a format specification that was expecting an integer, but you provided the argument *string* which was not an integer.
- Action:** Provide a valid integer in place of *string*
- Message:** not a valid real argument "*string*"
- Cause:** You specified a format specification that was expecting a real (that is, floating point) number, but you provided the argument *string* which was not a valid real number.
- Action:** Provide a valid real number in place of *string*

Message: unused argument at "*arg*"
Cause: You specified a format string without any conversion specifications.
Action: Add at least one conversion specification to your format string.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.. UNIX System V.

The **%F** format and the handling of * as a width or precision argument are extensions to the POSIX standard.

WARNING

The POSIX.2 **printf** facility (like the C language **printf** () on which it is based) does not gracefully accommodate multi-byte characters when using **%c** conversion, or either of **%b** or **%s** conversions with a specified precision. Use these features cautiously when you have multi-byte characters in the character set.

MPE/iX NOTES

On MPE/iX, **printf** is available as both a built-in shell utility and an external utility.

SEE ALSO

echo(1), **print(1)**

NAME

ps — display process status

SYNOPSIS

```
ps [-Aacdefjln] [-G|g grouplist] [-n name] [-o format] ... [-p proclist]
[-s idlist] [-t termlist] [-U|u userlist]
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

ps displays information about processes, provided that you have appropriate privileges to obtain information about the requested processes.

Options

ps accepts several options. When a description says that **ps** lists *all processes*, it means all the processes on the system, provided that you have appropriate privileges.

- A** displays information on all accessible processes. You cannot specify both **-a** and **-A**.
- a** displays information on all processes associated with terminals.
- c** displays more detailed information about processes for the **-f** and **-l** options. Accepted but not currently implemented.
- d** displays information for all processes except group leaders.
- e** displays information on all accessible processes.
- f** displays information as if the user specified


```
-o ruser=UID,pid,ppid,pcpu=C,stime,
tty=TTY,atime,args
```
- G grouplist**
- g grouplist** displays information on processes with group ID numbers in *grouplist*. Separate numbers in *grouplist* with commas.
- j** displays information as if the user specified


```
-o pid,sid,pgid=PGRP,tty=TTY,atime,comm
```

-
- l** displays information as if the user specified
 - `-o flags,state,ruid=UID,pid,ppid,pcpu=C,`
 - `pri,nice,addr,vsz=SZ,wchan,TTY,ptime,`
 - `comm=COMM`
 - o *format*** displays information according to the given *format* specifications. For further information, see *Format Specifications*.
 - n *name*** specifies the name of the executable containing the kernel symbol table.
 - p *proclist*** displays information for processes with process ID numbers in *proclist*. Separate numbers in *proclist* with commas.
 - s *idlist*** displays information for processes with session ID numbers in *idlist*. Separate numbers in *idlist* with commas.
 - t *termlist*** displays information for processes with terminals in *termlist*. You denote terminals in *termlist* in the same format as **who** uses to display terminals. They are separated with commas.
 - U *userlist***
 - u *userlist*** displays information for processes with user IDs in *userlist*. Items in *userlist* can be user ID numbers or login names, and are separated with commas.

Format Specifications

The *format* specified with **-o** is a list of names separated with blanks or commas. At the beginning of the output display, **ps** displays column headings to tell you what you are seeing. For example, if you specify `ruser` (indicating that you want to see real user names), **ps** normally puts the heading `RUSER` at the top of the column that shows real user names.

If you do not specify the **-o** option, **ps** displays the information as though you specified

```
-o pid,TTY,time,comm
```

The following list shows the names that **ps** recognizes. At the end of each description, we put the default column heading inside square brackets. The following names are POSIX-compliant.

args	displays the command that is executing, with all its arguments. [COMMAND]
comm	displays the name of the command that is executing. This string is padded on the right if necessary. [COMMAND]
etime	displays the amount of real time that has elapsed since the process began execution. ps shows the time in the form: [[<i>dd</i> -] <i>hh</i> :] <i>mm</i> : <i>ss</i> where <i>dd</i> is the number of days, <i>hh</i> is the number of hours, <i>mm</i> is the number of minutes, and <i>ss</i> is the number of seconds. [ELAPSED]
group	displays the effective group ID of the process, as a group name if possible and as a decimal group ID if not. [GROUP]
nice	displays the nice value (urgency) of the process as a decimal value. [NI]
pcpu	displays a percentage value giving the ratio of CPU time used to CPU time available. [%CPU]
pgid	displays the process group ID as a decimal value. [PGID]
pid	displays the process ID as a decimal value. [PID]
ppid	displays the parent process ID as a decimal value. [PPID]
rgroup	displays the real group ID of the process, as a group name if possible and as a decimal group ID if not. [RGROUP]
ruser	displays the real userid of the process, as a username if possible and as a decimal user ID otherwise. [RUSER]
time	displays the amount of CPU time that the process has used since it began execution. ps displays this time in form similar to that used by etime . [TIME]
tty	displays the name of the controlling terminal (if any). [TT]
user	displays the effective userid of the process, as a username if possible and as a decimal user ID otherwise. [USER]
vsz	displays the amount of (virtual) memory that the process is using, as a decimal number of kilobytes. [VSZ] The following names are extensions to the POSIX implementation of ps .
addr	displays the address of the process. [ADDR]

`atime` displays the abbreviated CPU time of the process. [TIME]
`flags` displays the process flags. [F]
`gid` displays the effective group ID of the process. [EGID]
`pri` displays the process priority. [PRI]
`rgid` displays the real group ID of the process. [GID]
`ruid` displays the real user ID of the process. [UID]
`sid` displays the session ID of the process. [SID]
`state` displays the process state. [S]
`stime` displays the start time of the process. [STIME]
`uid` displays the effective user ID of the process. [EUID]
`wchan` displays the channel upon which the process is waiting. [WCHAN]

If you want to specify your own column heading instead of the defaults, put

=heading

after the name in the *format* list. For example,

```
ps -o args,ruser=WHO
```

displays the command and the real user name. The heading for the command column is the default `COMMAND` but the heading for the user name column is `WHO`. If you specify `=` with no heading, **ps** displays that column without a heading. If all columns have no heading, **ps** displays no heading line.

ENVIRONMENT VARIABLES

ps uses the following environment variable:

COLUMNS

contains the maximum number of columns to display on one line.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

- Message:** bad numeric ID at "*-option list*"
Cause: You specified a numeric identifier for a process, group, or session that was not a valid number.
Action: Make sure that all numeric IDs are valid numbers.
- Message:** badly constructed format string "*format*"
Cause: The output format string was not correct.
Action: Check the *DESCRIPTION* section of the **ps** man page for a list of possible format specifications.
- Message:** can't access your terminal
Cause: The terminal associated with the standard input was not accessible.
Action: When running **ps** without a controlling terminal, you must specify one of the **-G**, **-g**, **-p**, **-t**, **-U**, or **-u** options to identify the processes on which **ps** is to report.
- Message:** Missing format string after **-o**
Cause: You specified the **-o** option but did not provide a format string as its argument.
Action: Provide the missing format string.
- Message:** Missing idlist after *-option*
Cause: You specified the option *option* but did not provide a list of IDs as its argument.
Action: Provide the missing list of IDs.
- Message:** Missing namelist after **-n**
Cause: You specified the **-n** option but did not provide the name of an executable as its argument.
Action: Provide the missing name.
- Message:** more than *num* items in "*-option*" list at "*string*"
Cause: You specified more than *num* items in the list given as an argument to *-option*.
Action: Specify no more than *num* items in the *-option* argument list.
- Message:** no matching processes found.
Cause: **ps** did not find any find any processes which matched the specified search criteria.
Action: Confirm the command options for **ps**
- Message:** process table: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: Unknown option "*option*"
Cause: You specified an option that is not valid for this command.
Action: Check the *Options* section of the command's man page for a list of valid options.

Message: unknown user ID at "-u *userlist*"
Cause: You specified an unknown login name or a bad user ID as an argument to the **-u** option.
Action: Check the arguments to the **-u** option carefully.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

The **-c**, **-d**, **-e**, **-f**, **-g**, **-j**, **-l**, **-n**, **-s**, and **-u** options are extensions to the POSIX standard.

MPE/iX NOTES

Due to limitations in the current implementation of MPE/iX, there are a number of limitations in the behavior of the **ps** command.

- The **-n name** option is ignored.
- **comm** displays the command name using MPE name syntax (that is *file.group.account*). If an INFO string is passed by the command, it is also displayed.
- **nice** simply displays a value indicating whether or not the process is to undergo cyclical degradation (see the *MPE/iX NOTES* section of the **nice**(1) man page for details). If yes, **nice** displays 1. If no, **nice** displays 0.
- **vsz** displays only the current stack size. It does not include data and code size.
- **addr** displays only the low 32 bits of the process address.
- **state** displays one of the following values to indicate the process state:

O	Currently running process
R	Running
W	Waiting
Z	Dead or dying process
READY	Process ready to go when it gets a time slice
- **args**, **etime**, **pcpu**, **flags**, and **stime** are not supported. The values shown for these specifications have no real meaning.
- **wchan** displays an abbreviated string indicating the reason why the process is waiting. The following table shows these abbreviations and their full meanings:

Abbrev.	Code	Full Meaning
nmcdpgft	0	nm code page fault
nmstpgft	1	nm stack page fault
nmtrpgft	2	nm transient page fault
filepgft	3	file page fault
cmcdpgft	4	cm code page fault
cmstpgft	5	cm stack page fault
cmtrpgft	6	cm transient page fault
termread	7	terminal read wait
termwrit	8	terminal write wait
discio	9	disc io wait
otherio	10	other io wait
ipctrans	11	ipc trans complete
sirwait	12	sir wait
rinwait	13	rin wait
mmprefet	14	memory manage prefetch
quantexp	15	quantum expiration
timewait	16	timer wait
prntwait	17	parent wait
cntlblok	18	control block wait
chldwait	19	child wait
datacomm	20	data comm wait
ritwait	21	rit wait
dispwork	22	disp work
portwait	23	port wait
mailwait	24	mail wait
junkwait	25	junk wait
msgwait	26	message wait
impede	27	impede
break	28	break wait
waitq	29	wait queue
mmwait	30	memory management wait
ptblkmkp	31	port blocked make present
fileblk	32	file blocked
fileunbk	33	file unblocked
strgmt	34	storage management

Table 1-9: wchan Abbreviations

Abbrev.	Code	Full Meaning
usrdebug	35	user to debug message
iocnfgwt	36	io configuration wait
pfpreply	37	pfreply wait
dbmonitr	38	db monitor wait
filldesc	39	fill disc wait
hilowait	40	hilo wait
fsystmio	41	file system terminal io wait
mmpostwt	42	memory manager post wait
sgnltmr	43	signal timer wait
preempt	44	preemption
dsciopmt	45	disc io preemption
pritypmt	46	priority preemption
sqllock	47	sql lock wait
sqltch1	48	sql latch level 1 wait
sqltch2	49	sql latch level 2 wait
sqltch3	50	sql latch level 3 wait
sqltch4	51	sql latch level 4 wait
sqltch5	52	sql latch level 5 wait
sqltch6	53	sql latch level 6 wait
sqltch7	54	sql latch level 7 wait
sqltch8	55	sql latch level 8 wait
sqltch9	56	sql latch level 9 wait
sqlth10	57	sql latch level 10 wait
sqlth11	58	sql latch level 11 wait
sqlth12	59	sql latch level 12 wait
sqlth13	60	sql latch level 13 wait
sqlth14	61	sql latch level 14 wait
sqlth15	62	sql latch level 15 wait
sqlth16	63	sql latch level 16 wait
sqlth17	64	sql latch level 17 wait
sqlth18	65	sql latch level 18 wait
sqlth19	66	sql latch level 19 wait
sqlth20	67	sql latch level 20 wait
sqlth21	68	sql latch level 21 wait
sqlth22	69	sql latch level 22 wait

Table 1-9: wchan Abbreviations (continued)

Abbrev.	Code	Full Meaning
sqlth23	70	sql latch level 23 wait
sqlth24	71	sql latch level 24 wait
sqlth25	72	sql latch level 25 wait
sqlth26	73	sql latch level 26 wait
sqlth27	74	sql latch level 27 wait
sqlth28	75	sql latch level 28 wait
sqlth29	76	sql latch level 29 wait
sqlth30	77	sql latch level 30 wait
sqlth31	78	sql latch level 31 wait
sqlth32	79	sql latch level 32 wait
sqlbuffr	80	sql buffer wait
longpaus	81	long pause_wait
mmfreeze	82	memory manager freeze and other
release	83	release
dfrdpmt	84	deferred preempt
mmpsiord	85	memory manager pseudo ioread
mmpsiowr	86	memory manager pseudo iowrite
other	87	other wait
dispntbl	100	dispatcher not blocked
dead	101	dead process

Table 1-9: wchan Abbreviations (continued)

SEE ALSO

jobs(1), kill(1)

NAME

pwd — display working directory

SYNOPSIS

pwd

DESCRIPTION

pwd displays the absolute pathname of the current working directory to standard output.

If the current directory is a symbolic link to another directory, the pathname displayed depends upon the setting of the shell's logical flag; see **set**(1) for more information.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 **pwd** cannot determine the current working directory.

Message

Message: cannot allocate buffer for pathname: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: cannot determine PATH_MAX: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: cannot determine working directory: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

NOTE

pwd is both an alias built into the shell and a separate utility. The shell defines **pwd** as:

```
alias pwd='print - $PWD'
```

When a symbolic link is used to get to a directory, the built-in alias may not return the *real* name of the working directory.

SEE ALSO

set(1), sh(1)

NAME

r — edit and re-execute previous command

SYNOPSIS

r [*old=new*] [*specifier*]

DESCRIPTION

The **r** command re-executes a command you ran previously, possibly editing the command first. Commands are obtained from your *command history* file; see **fc**(1) and **sh**(1) for more details.

The *specifier* tells which command you want to re-execute. It can have any of the following forms:

An unsigned number

r run the command with that number.

A negative number *-n*

r runs the command that came *n* commands before the current one.

A character string

r runs the most recent command beginning with that string.

If no *specifier* is given, **r** runs the most recent command.

The *old=new* feature lets you edit a command before running it. *old* and *new* must be character strings. **r** replaces the *first* occurrence of *old* with *new* and then re-executes the command.

EXAMPLES

```
r cp
```

runs the most recent command beginning with the characters *cp*. The *cp* could be the whole command name or it could be part of a longer command name (for example, **cpio**).

```
cp file1 /dir
r 1=2
r 2=3
```

This is equivalent to

```
cp file1 /dir
cp file2 /dir
cp file3 /dir
```

Compare this with

```
cp file1 /dir/file1
r 1=2
```

which is equivalent to

```
cp file1 /dir/file1
cp file2 /dir/file1
```

Since **r** only replaces the *first* occurrence of the *old* string 1, the second 1 does not change. This shows that you have to be careful when you use the substitution feature.

r is a built-in alias, defined with

```
alias r='fc -s'
```

ENVIRONMENT VARIABLES

r uses the following environment variables:

HISTFILE

contains the pathname of the history file.

HISTSIZE

gives the maximum number of previous commands that are accessible.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - missing history file
 - inability to find the desired command in the history file
- 2 Failure due to an invalid command line option or argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. UNIX systems with the KornShell.

NOTE

This is an alias built into the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

alias(1), **fc(1)**, **sh(1)**

NAME

rcs — change RCS file attributes

SYNOPSIS

```
rcs [-Aoldfile] [-alogins] [-B] [-b[rev]] [-cstring] [-e[logins]] [-Ffile...]
[-G] [-I] [-i] [-K] [-k] [-L] [-l[rev]] [-Nname[:rev]] [-nname[:rev]]
[-O] [-orange] [-q] [-Rdiff_exec] [-sstate[:rev]] [-T] [-t[txtfile]] [-U]
[-u[rev]] [-Yfile] file ...
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rcs creates new RCS files or changes attributes of existing ones. An RCS file contains multiple revisions of text, an access list, a change log, descriptive text, and some control attributes. For **rcs** to work, the user's login name usually must be on the access list. However, you may also use **rcs** if the access list is empty, if you are the owner of the file, if you are the system administrator, or if you specify the **-u** option.

Options

rcs accepts the following options:

- A***oldfile*
appends the access list of *oldfile* to the access list of the RCS file.
- a***logins*
appends the login names appearing in the comma-separated list *logins* to the access list of the RCS file.
- B**
sets the file format to binary. The **-B** option cannot be used if the file already contains revisions checked in with text file format.
- b**[*rev*]
sets the default branch to *rev*. If *rev* is omitted, the default branch is reset to the trunk.
- c***string*
sets the comment leader to *string*. The comment leader is inserted before every log message line generated by the keyword \$Log\$ during check-out (see **co**(1)). This is useful for programming languages that do not have multi-line comments. In **rcs -i** or **ci** operations, the comment leader is guessed from the suffix of the working file.
- e**[*logins*]
erases the login names appearing in the comma-separated list *logins* from the access list of the RCS file. If *logins* is omitted, the entire access list is erased.

-Ffile...

provides an alternate way to specify file names. The given *file* is a text file containing a list of file names, one file name per line. **rccs** changes all the files named in *file*, using the options specified on the command line. Multiple **-F** options may be specified on the command line, and can either be grouped together or interspersed between options.

-G sets the RCS file date to the current date. Normally, when updating, the date stamp of the RCS file is set to the check-in date of the head revision.

-I allows **rccs** to accept redirected input from a file or a pipe instead of standard input. Input is a sequence of strings separated by lines containing only a single dot.

-i creates and initializes a new RCS file, but does not deposit any revision. If the RCS file has no path prefix, **rccs** tries to place it first into the subdirectory RCS, and then into the current directory. If the RCS file already exists, an error message is printed.

-K compresses the archive file specified.

-k uncompresses the archive file specified.

-L sets locking to *strict*. Strict locking means that the owner of a RCS file is not exempt from locking for check-in. This option should be used for files that are shared.

-l[rev]

locks the revision with number *rev*. If a branch is given, the latest revision on that branch is locked. If *rev* is omitted, the latest revision on the default branch is locked. Locking prevents overlapping changes. A lock is removed with **ci** or the **rccs -u** option (see the **-u** option).

-Nname[:rev]

same as **-n**, except that it overrides a previous assignment of *name*.

-nname[:rev]

associates the symbolic name *name* with the branch or revision *rev*. **rccs** prints an error message if *name* is already associated with another number. If *:rev* is omitted, the symbolic name is deleted. If *rev* is the empty string, the *name* is associated with the *head* revision.

-O ignores any default options found in the local configuration file.

-orange

deletes (*outdates*) the revisions given by *range*. A range consisting of a single revision number means that revision only. A range consisting of a branch number means the latest revision on that branch. If you delete the default branch, the default branch is reset to the trunk. A range of the form *rev1-rev2* means revisions *rev1* to *rev2* on the same branch; *- rev* means from the beginning of the branch containing *rev* up to

and including *rev*; *rev -* means from revision *rev* to the end of the branch containing *rev*; and *-* with no range specified, means that all revisions of the file are automatically outdated. None of the outdated revisions may have branches or locks.

- q** quiet mode; diagnostics are not printed.
- Rdiff_exec**
 specifies the path name of the **diff** command to use. This allows you to use your own system **diff** for everything but RCS.
- sstate[:rev]**
 sets the state attribute of the revision *rev* to *state*. If *rev* is a branch number, the latest revision on that branch is assumed. If *rev* is omitted, the latest revision on the default branch is assumed. Any identifier is acceptable for *state*. A useful set of states is Exp (for experimental), Stab (for stable), and Rel (for released). By default, **ci** sets the state of a revision to Exp.
- T** sets the file format to text. The **-T** option cannot be used if the file already contains revisions checked in with binary file format.
- t[txtfile]**
 writes descriptive text into the RCS file (replacing the existing descriptive text). The descriptive text is copied from the file *txtfile*. If *txtfile* is omitted, **rcs** prompts you to enter such text from the standard input; when you have finished entering the text, type in a line containing a single period (.), the string ~., or end-of-file. If the **-i** option is specified, descriptive text is requested even if **-t** is not given. The prompt is suppressed if the standard input is not a terminal.
- u[rev]**
 unlocks the revision with number *rev*. If a branch is given, the latest revision on that branch is unlocked. If *rev* is omitted, the most recent lock that has been set is removed, if there is one. Normally, only the locker of a revision may unlock it. Somebody else unlocking a revision breaks the lock. This sends a mail message to the original locker. When **rcs** sends this message, it asks you to provide an explanation of why you are breaking the lock. When you have finished entering your explanation, type in a line containing a single period (.), the string ~. or end-of-file. The mail message is sent by the **mailx** command. Alternatively, if the **MAILER** environment variable is set, **rcs** uses its value as the mail delivery command.
- U** sets locking to non-strict. Non-strict locking means that the owner of a file need not lock a revision for check-in. This option should *not* be used for files that are shared. The default (**-L** or **-U**) is determined by what is in your configuration file.
- Yfile** specifies *file* as the local configuration file.

Files

rcs creates a semaphore file in the same directory as the RCS file to prevent simultaneous update. For changes, **rcs** always creates a new file. On successful completion, **rcs** deletes the old one and renames the new one. This strategy makes links to RCS files useless.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

The RCS file name and the revisions outdated are written to the diagnostic output.

Messages

- Message:** -Z overrides -z
Cause: You specified both the **-Z** option and the **-z** option. These two options are mutually exclusive. The command behaves as though only the **-z** option was specified.
Action: If you do not want the behaviour described under **CAUSE**, specify only one of the two options.
- Message:** cannot change file format of existing RCS file *filename*
Cause: You attempted to check a text file in as a binary file, or vice versa, and revisions already existed in the other format.
Action: Check the file in using the existing format.
- Message:** Can't change states in an empty tree
Cause: You attempted to use the **-s** option to set the state of an RCS file that does not contain any revisions.
Action: Since states are associated with individual revisions, and not the RCS file as a whole, make sure that there is at least one revision in a file, before changing its state.
- Message:** Can't create RCS file *name1*; saved in *name2*: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** Can't delete nonexistent symbol *sym_name*
Cause: You attempted to delete a symbolic name using:
`rcs -nsym_name filename`
 but *sym_name* was not a symbolic name assigned to *filename*.
Action: Make sure that both *sym_name* and *filename* are correct and try again.

Message: Can't find delta for revision *rev*
Cause: The **rcs** command could not find the edit script for the revision *rev*.
Action: The **RCS** file is corrupt. Find a revision that is not corrupted and rebuild from there.

Message: Can't lock an empty tree
Cause: You attempted to use the **-l** option to lock an RCS file that does not contain any revisions.
Action: None. Until an initial revision is created, no locks are possible.

Message: Can't lock nonexistent revision *rev*
Cause: You tried to use the **-l** option to lock a revision that does not exist.
Action: Make sure that the revision you specified is correct, and try again.

Message: Can't open temporary file *filename*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Can't remove a nonexistent accessor *username*
Cause: You attempted to use the **-e** option to remove *username* from a RCS file's access list, but *username* was not on the list.
Action: Make sure that the user name and the RCS file name provided are both correct.

Message: Can't remove branch point *rev*
Cause: You attempted to remove revision *rev*, but that revision is the root of a branch, and **rcs** will not remove branch points.
Action: Remove the entire branch first, then remove the branch point.

Message: Can't remove locked revision *rev*
Cause: You attempted to use the **-o** option to remove a locked revision. **rcs** will not remove locked revisions.
Action: If the revision requested is correct, then talk to the holder of the lock, or break the lock.

Message: Can't set mode of *rcsfile*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Can't set state of nonexistent revision *rev* to *state*
Cause: You tried to use the **-s** option to set the state of a revision that does not exist.
Action: Make sure that the revision you specified is correct, and try again.

Message: Can't unlock an empty tree
Cause: You attempted to use the **-u** option to unlock an RCS file that does not contain any revisions.
Action: None. Until an initial revision is created, no locks are possible.

-
- Message:** Can't unlock nonexistent revision *rev*
Cause: You tried to use the **-u** option to unlock a revision that does not exist.
Action: Make sure that the revision you specified is correct, and try again.
- Message:** Could not allocate in strdup
Cause: There were not enough free system resources to copy the environment variable *MAILER*.
Action: Check to see if *MAILER* is set to a large amount of text. If so, assign a shorter string to the variable. If not, free up more system resources.
- Message:** Error closing input file *filename*
Cause: The RCS file *filename* is compressed and an error occurred during decompression.
Action: The file is possibly corrupt. Try again with another copy of the file.
- Message:** error in compression checking for *oldfile*
Cause: You attempted to use the **-A** option to merge the access list from *oldfile* into the specified RCS file; however *oldfile* did not pass the compression consistency check.
Action: *oldfile* is possibly corrupt. Try again with another copy of the file.
- Message:** file *filename* exists already
Cause: You tried to create an RCS file when one already existed with the same name.
Action: Make sure that you need to create the file.
- Message:** Invalid branch range *rev* after **-o**
Cause: You specified an invalid branch range with the **-o** option.
Action: Make sure that the branches listed are both the correct format, and the correct revisions, and try again.
- Message:** Invalid range *rev1 rev2* after **-o**
Cause: You specified a range as an argument to the **-o** that was syntactically incorrect.
Action: Correct the syntax error in the range.
- Message:** Invalid revision range *rev1-rev2*
Cause: You specified a range of revisions that was not valid.
Action: Make sure that the revisions listed are both the correct format, and the correct revisions, and try again.
- Message:** Invalid string *string* after option **-n** or **-N**
Cause: A space or colon (:) did not follow the argument to the **-n** or **-N** option. It must be followed by one of these two characters.
Action: Provide a valid string.

Message:	Login name missing after <code>-a</code>
Cause:	You specified the <code>-a</code> option without providing a login name as its argument.
Action:	Provide the missing login name.
Message:	Missing <code>':'</code> after state in option <code>-s</code>
Cause:	You specified the <code>-s</code> option and provided, as its argument, a string that appears to be a state followed by a revision; however, you did not separate the state from the revision with a colon (<code>:</code>).
Action:	Provide the missing colon.
Message:	Missing <code>;'</code> after access list in <i>rcsfile</i> .
Cause:	The RCS file <i>rcsfile</i> contained the keyword access followed by a list of users who are allowed access to the file; however, this list was not terminated by the required semicolon (<code>;</code>).
Action:	Manually edit <i>rcsfile</i> to insert the required semicolon (<code>;</code>). See rcsfile(3) for the format of the RCS file.
Message:	Missing <code>;'</code> after head in <i>rcsfile</i> .
Cause:	The RCS file <i>rcsfile</i> contained the keyword head followed by the number of the head revision of the file; however, this line was not terminated by the required semicolon (<code>;</code>).
Action:	Manually edit <i>rcsfile</i> to insert the required semicolon (<code>;</code>). See rcsfile(3) for the format of the RCS file.
Message:	Missing <code>;'</code> after suffix in <i>rcsfile</i> .
Cause:	The RCS file <i>rcsfile</i> contained the keyword suffix followed by a suffix; however, this line was not terminated by the required semicolon (<code>;</code>).
Action:	Manually edit <i>rcsfile</i> to insert the required semicolon (<code>;</code>). See rcsfile(3) for the format of the RCS file.
Message:	Missing access list in <i>rcsfile</i>
Cause:	The RCS file <i>rcsfile</i> contained the keyword branch ; however, the keyword access did appear on the following line.
Action:	Manually edit <i>rcsfile</i> to insert the required access keyword and associated access list. See rcsfile(3) for the format of the RCS file.
Message:	Missing branch in <i>rcsfile</i>
Cause:	The RCS file <i>rcsfile</i> contained the keyword head ; however, the keyword branch did appear on the following line.
Action:	Manually edit <i>rcsfile</i> to insert the required branch keyword. See rcsfile(3) for the format of the RCS file.
Message:	Missing delta text
Cause:	The edit script for one of the RCS file's revisions is missing.
Action:	The RCS file is corrupt. Find an uncorrupted revision and rebuild from there.

Message: Missing file name after -A
Cause: You specified the **-A** option without providing a file name as its argument.
Action: Provide the missing file name.

Message: Missing head in *rcsfile*
Cause: The RCS file *rcsfile* does not contain the keyword **head**.
Action: Manually edit *rcsfile* to insert the required **head** keyword and the number of the head revision. See **rcsfile**(3) for the format of the RCS file.

Message: Missing login name after option -a or -e
Cause: You specified the **-a** option or the **-e** option without providing a login name as its argument.
Action: Provide the missing login name.

Message: Missing revision range after -o
Cause: You specified the **-o** option without providing a revision range as its argument.
Action: Provide the missing revision range.

Message: Missing symbolic name after -N
Cause: You specified the **-N** option without providing a symbolic name as its argument.
Action: Provide the missing symbolic name.

Message: Missing symbolic name after -n
Cause: You specified the **-n** option without providing a symbolic name as its argument.
Action: Provide the missing symbolic name.

Message: no delta for default branch *rev*; default branch removed
Cause: You attempted to use the **-b** option to set the default branch to *rev*, but there was no revision with the revision number *rev*.
Action: Make sure that the RCS file name and revision number provided are correct and try again.

Message: No filename present for -F option.
Cause: You specified the **-F** option, but did not provide a file name as its argument.
Action: Provide the missing file name.

Message: No input file.
Cause: You failed to specify an input file on the command line.
Action: Provide the missing file name.

Message: no lock set on revision *rev*
Cause: You attempted to use the **-u** option to unlock a revision that was not locked.
Action: Make sure that the revision you entered is correct.

Message: Option `-L` overrides `-U`
Cause: You specified both the `-L` option and the `-U` option. These two options are mutually exclusive. The command behaves as though only the `-L` option was specified.
Action: If you do not want the behaviour described under **CAUSE**, specify only one of the two options.

Message: Redefinition of `-t` option
Cause: You specified the `-t` option more than once on the command line.
Action: Specify the `-t` option, at most, once per command line.

Message: Redefinition of file format specifier
Cause: You specified both the `-B` option (binary) and the `-T` option (text) on the same command line.
Action: Specify either `-B` or `-T`, but not both.

Message: Redefinition of option `-A`
Cause: You specified the `-A` option more than once on the command line.
Action: Specify the `-A` option, at most, once per command line.

Message: Redefinition of option `-b`
Cause: You specified the `-b` option more than once on the command line.
Action: Specify the `-b` option, at most, once per command line.

Message: Redefinition of option `-c`
Cause: You specified the `-c` option more than once on the command line.
Action: Specify the `-c` option, at most, once per command line.

Message: Redefinition of option `-o`
Cause: You specified the `-o` option more than once on the command line.
Action: Specify the `-o` option, at most, once per command line.

Message: *rev* still locked by *username*
Cause: You attempted to break *username*'s lock on revision *rev*, but the attempted failed because **rcs** was unable to send mail to inform *username* of the broken lock.
Action: Try again, or speak to the holder of the lock directly.

Message: Revisions *rev1*-*rev2* don't exist
Cause: You attempted to delete a range of revisions from the rcs file which do not exist.
Action: Check that the revision numbers you provided are correct, and try again.

Message: State missing after `-s`
Cause: You specified the `-s` option without providing a state as its argument.
Action: Provide the missing state.

Message: There are no locks set.
Cause: You attempted to use the `-u` option to unlock an RCS file, but that file was not locked by anyone.
Action: None.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for `rcs`.
Action: Check the *DESCRIPTION* section of this man page for a list of valid `rcs` options.

Message: unterminated string in `rcs encrypt` routine
Cause: The encrypted RCS file has been truncated.
Action: Data has been lost. It might be possible to recover some data from the encrypted RCS file, but you will not get all of it back. If a backup of the file is available, then recover from the backup.

For a list of error messages common to all RCS utilities, see `rcserror`(3).

PORTABILITY

All UNIX systems.

The `-B`, `-F`, `-G`, `-g`, `-I`, `-K`, `-k`, `-O`, `-T`, `-Y`

MPE/iX NOTES

The current MPE/iX implementation of `rcs` has the following limitations:

- Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional `,v` naming convention is not currently implemented. This means that you must have a subdirectory named RCS under your current directory or RCS will not work properly.
- For compatibility with traditional MPE/iX security features, you can only rename a file in an MPE/iX group if you own the file or if you have SM capability. Because this command attempts to rename files to which it may not have write access, this feature can interfere with the command's operation. For this reason, RCS archives should not be placed in an MPE/iX group, but rather should be located elsewhere in the hierarchical file system where the restriction does not apply. For example, the default `RCSPATH` places the archives in a subdirectory named RCS in the current working directory.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

`ci`(1), `co`(1), `ident`(1), `mail`(1), `rcsclean`(1), `rcsdiff`(1), `rcsmerge`(1), `rlog`(1), `rcsedit`(3), `rcsfile`(3)

NAME

rcsclean — clean up working files

SYNOPSIS

rcsclean [-F*file*...] [-K] [-k] [-O] [-q[*rev*]] [-r[*rev*]] [-x] [-Y*file*] *file* ...

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rcsclean removes working files that were checked out and never modified. For each *file* given, **rcsclean** compares the working file and a revision in the corresponding RCS file. If it finds no difference, it removes the working file. If the revision was locked by the person who checked it out, **rcsclean** also unlocks the revision.

Each *file* may name either an RCS file or a working file.

rev specifies a revision to which the working file is compared. If *rev* is omitted, **rcsclean** compares the working file with the latest revision on the default branch (normally the highest branch on the trunk).

rcsclean is useful to implement *clean* targets in a Makefile (if you have the MAKE software package).

Note: **rcsdiff**(1) may be used to print out differences. Also, **ci**(1) normally asks whether to check in a file if it was not changed.

Options

rcsclean accepts the following options:

- F *file* provides an alternate way to specify file names. The given *file* is a text file containing a list of file names, one file name per line. **rcsclean** cleans up all the files named in *file*, using the options specified on the command line. Multiple -F options may be specified on the command line, and can either be grouped together or interspersed between options.
- K suppresses keyword expansion and removes all existing expansions. This option takes precedence over the -k.
- k suppresses keyword expansion, even if KeywordExpand is specified in the configuration file. This is useful for non-readable binary files such as object files. To ensure that **rcsclean** works properly, specify this option for any *file* that was checked out with the -k option of **co**.

-
- O** ignores any default options found in the configuration file.
 - q[*rev*]**
quiet mode; suppresses diagnostics. See **-r** for the handling of *rev*.
 - r[*rev*]**
specifies the revision that is compared to the working file. The chosen revision is the latest one with a revision number is less than or equal to *rev*. If *rev* indicates a branch rather than a revision, the latest revision on that branch is used. If *rev* is omitted, the latest revision on the default branch is used (see the **-b** option for **rcs(1)**). *rev* is composed of one or more numeric or symbolic names separated by a period (.). For example, you have assigned the value 1.2 to the symbolic name changes. You can now refer to revision 1.2.1.9 as changes.1.9. You can assign a numeric value to a symbolic name using the **-n** option of either **ci(1)** or **rcs(1)**.
 - x** Forces keyword expansion. This option takes precedence over the **-K** option.
 - Yfile** specifies *file* as the local configuration file.

EXAMPLES

The command

```
rcsclean *.c *.h
```

removes all working files ending in .c or .h that were not changed since their check-out.

DIAGNOSTICS

Possible exit status values are:

- 0 There were no differences during the last comparison, or the last working file did not exist.
- 1 There were differences and the working file was not cleaned away.
- 2 An error occurred.

Messages

```

Message: Can't open checked out file filename: system error
Cause: See syserror(3).
Action: See syserror(3).

Message: Can't open filename: system error
Cause: See syserror(3).
Action: See syserror(3).

```

Message:	Can't unlink <i>filename</i> : <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	co failed: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	No filename present for -F option.
Cause:	You specified the -F option, but did not provide a file name as its argument.
Action:	Provide the missing file name.
Message:	No input file.
Cause:	You failed to specify an input file on the command line.
Action:	Provide the missing file name.
Message:	no revisions present
Cause:	You specified a file which has an associated RCS file that does not contain any revisions. This is probably because it was created with 'rscs -i' and no revisions have been checked in yet.
Action:	rcsclean will not clean up such files.
Message:	too many revision numbers
Cause:	You specified more than one revision number on the command line.
Action:	Specify only one revision number on the command line.
Message:	Unknown option " <i>-option</i> "
Cause:	You specified an option that is not valid for rcsclean .
Action:	Check the <i>DESCRIPTION</i> section of this man page for a list of valid rcsclean options.
Message:	unlocking failed: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).

For a list of error messages common to all RCS utilities, see **rcserror**(3).

PORTABILITY

All UNIX systems.

The **-F**, **-K**, **-O**, **-q**, and **-Y** options are extensions to traditional implementations of **rcsclean**.

MPE/iX NOTES

Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional ,v naming convention is not currently implemented. This means that you must have a sub-directory named RCS under your current directory or RCS will not work properly.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

ci(1), co(1), ident(1), rcs(1), rcsdiff(1), rcsmerge(1), rlog(1), rcsfile(3)

NAME

rcsdiff — compare RCS revisions

SYNOPSIS

```
rcsdiff [-befHhikmntwx] [-C n] [-c [n]] [-D name] [-F file...]
[-O] [-q] [-Rdiff_exec] [-rrev1] [-rrev2] [-Y file] file ...
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rcsdiff compares two revisions of each given *file*. Files may be either RCS files or working files. If revisions of a given file are stored in binary format, **rcsdiff** uses **diffb**(1) to determine the differences between the two revisions. If revisions are stored in text format, **rcsdiff** uses **diff**(1).

Options

The options **-b**, **-c**, **-C**, **-D**, **-e**, **-f**, **-h**, **-H**, **-i**, **-m**, **-t**, and **-w** are passed to **diffb** or **diff**. See **diffb**(1) and **diff**(1) for the effects of these options.

In addition, **rcsdiff** supports the following options:

-F*file*...

provides an alternate way to specify file names. The given *file* is a text file containing a list of file names, one per line. **rcsdiff** compares all the files named in *file* to their corresponding RCS files, using the command line options specified. Multiple **-F** options may be specified on the command line, and can either be grouped together or interspersed between options.

-K suppresses keyword expansion and removes all existing expansions. This option takes precedence over the **-k** option.

-k suppresses keyword expansion, even if KeywordExpand is specified in the configuration file. This is useful for non-readable binary files such as object files. To ensure that **rcsdiff** works properly, you should specify this option for any *file* that was checked out with the **-k** option of **co**.

-n generates an edit script in the format used by RCS.

-O ignores any default options found in the configuration file.

-q suppresses diagnostic output.

-R*diff_exec*

specifies the path name of the **diff** command to use. This allows you to use your own system **diff** for everything but RCS.

-rrev1

-rrev2 specifies revisions being compared. **rcsdiff** compares revision *rev1* to *rev2*.

If both *rev1* and *rev2* are omitted, **rcsdiff** compares the latest revision on the default branch (normally the highest branch on the trunk) with the corresponding working file. This is useful for determining what you changed since the last check-in.

If *rev1* is given, but *rev2* is omitted, **rcsdiff** compares revision *rev1* of the RCS file with the contents of the corresponding working file.

If both *rev1* and *rev2* are given, **rcsdiff** compares revisions *rev1* and *rev2* of the RCS file.

Both *rev1* and *rev2* may be given numerically or symbolically.

-x forces keyword expansion. This option takes precedence over the **-K** option.

-Yfile specifies *file* as the local configuration file.

EXAMPLES

The command

```
rcsdiff f.c
```

runs **diff** on the latest revision on the default branch of the RCS file for *f.c* and the working file *f.c*.

DIAGNOSTICS

Possible exit status values are:

- 0 There were no differences during the last comparison.
- 1 There were differences between the versions.
- 2 An error occurred.

Messages

Message: -K has precedence over -k

Cause: You specified both **-K** and **-k**. These two options are mutually exclusive. The command behaves as though you only specified **-K**.

Action: To avoid the result described under **CAUSE**, use only one of the two options.

Message: -x has precedence over -k

Cause: You specified both **-x** and **-k**. These two options are mutually exclusive. The command behaves as though you only specified **-x**.

Action: To avoid the result described under **CAUSE**, use only one of the two options.

Message: Can't open *filename*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: co failed: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Missing #ifdef symbol after -D
Cause: You specified the **-D** option without providing a #ifdef symbol as its argument.
Action: Provide the missing #ifdef symbol.

Message: Missing number after -C
Cause: You specified the **-C** option without providing a number as its argument.
Action: Provide the missing number.

Message: No filename present for -F option.
Cause: You specified the **-F** option, but did not provide a file name as its argument.
Action: Provide the missing file name.

Message: No input file.
Cause: You failed to specify an input file on the command line.
Action: Provide the missing file name.

Message: no revisions present
Cause: You specified a file which has an associated RCS file that does not contain any revisions. This is probably because it was created with 'rcs -i' and no revisions have been checked in yet.
Action: **rcsdiff** will not work with such files.

Message: option "-D" not supported for binary files
Cause: You attempted to use option **-D** when working with binary files. This option only works with text files.
Action: Only specify **-D** with text files.

Message: option "*opt*" not supported for binary files
Cause: You attempted to use option *opt* when working with binary files. This option only works with text files.
Action: Only specify *opt* with text files.

Message: too many revision numbers
Cause: You specified more than one revision number on the command line.
Action: Specify only one revision number on the command line.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **rcsdiff**.
Action: Check the *DESCRIPTION* section for a list of valid **rcsdiff** options.

For a list of error messages common to all RCS utilities, see **rcserror**(3).

PORTABILITY

All UNIX systems.

The **-F**, **-K**, **-O**, **-q**, **-R**, **-x**, and **-Y** options are extensions to traditional implementations of **rcsdiff**.

MPE/iX NOTES

Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional ,v naming convention is not currently implemented. This means that you must have a sub-directory named RCS under your current directory or RCS will not work properly.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

ci(1), **co**(1), **diff**(1), **diffb**(1), **rcs**(1), **rcsclean**(1), **rcsmerge**(1), **rlog**(1),
rcsfile(3)

NAME

rcsmerge — merge RCS revisions

SYNOPSIS

rcsmerge [-h] [-O] [-p] [-q] [-rrev1] [-rrev2] [-Yfile] file

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rcsmerge incorporates the changes between *rev1* and *rev2* of an RCS file into the corresponding working file. By default, the result overwrites the working file.

The *file* may be either an RCS file or a working file.

rcsmerge displays a warning if there are overlaps, and delimits the overlapping regions as explained in **co -j**.

The command is useful for incorporating changes into a checked-out revision.

Options

rcsmerge accepts the following options:

- h** forces **diff** to use the **-h** option when called by **rcsmerge**. This saves time if you know that the file is large enough to require the **-h** option.
- O** ignores default options found in the configuration file.
- p** sends the result to standard output, rather than overwriting the working file.
- q** quiet mode; suppresses diagnostics.
- rrev1**
- rrev2** specifies two revisions. The changes needed to make *rev1* into *rev2* are incorporated into the working file.

rev1 may not be omitted. If *rev2* is omitted, the latest revision on the default branch (normally the highest branch on the trunk) is assumed. Both *rev1* and *rev2* may be given numerically or symbolically.
- Yfile** specifies *file* as the local configuration file.

EXAMPLES

Suppose you have released revision 2.8 of `f.c`. Also, assume that you have just finished revision 3.4 when you receive updates to 2.8 from someone else. To combine the updates to 2.8 and your changes between 2.8 and 3.4, put the *updated* 2.8 into file `f.c` and run

```
rcsmerge -p -r2.8 -r3.4 f.c >f_merged.c
```

If there were any overlaps reported you will want to examine `f_merged.c`. Alternatively, if you want to save the updates to 2.8 in the RCS file, check in the updated file as revision 2.8.1.1 and execute `co -j`:

```
ci -r2.8.1.1 f.c
co -r3.4 -j2.8:2.8.1.1 f.c
```

As another example, the following command undoes the changes between revision 2.8 and 3.4 in your currently checked-out revision in `f.c`.

```
rcsmerge -r3.4 -r2.8 f.c
```

Note the order of the arguments, and that `f.c` is overwritten.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: Can't open *filename*: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: can't use rcsmerge on binary file *filename*

Cause: You attempted to use **rcsmerge** on the binary file *filename*. **rcsmerge** only supports merging revisions of text files.

Action: No action is possible.

Message: co failed: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: merge failed: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: no base revision number given
Cause: You specified one or more invalid revision numbers on the command line.
Action: Check the syntax of the command line options.

Message: No input file.
Cause: You failed to specify an input file on the command line.
Action: Provide the missing file name.

Message: no revisions present
Cause: You specified a file which has an associated RCS file that does not contain any revisions. This is probably because it was created with 'rcs -i' and no revisions have been checked in yet.
Action: **rcsmerge** will not work with such files.

Message: too many arguments
Cause: You specified more than one file name on the command line.
Action: Specify only one file name on the **rcsmerge** command line.

Message: too many revision numbers
Cause: You specified more than two revision numbers on the command line.
Action: Specify only one or two revision numbers on the command line.

Message: Unknown option "-option"
Cause: You specified an option that is not valid for **rcsmerge**.
Action: Check the *DESCRIPTION* section for a list of valid **rcsmerge** options.

For a list of error messages common to all RCS utilities, see **rcserror**(3).

PORTABILITY

All UNIX systems.

The **-O** option is an extension to traditional implementations of **rcsmerge**.

LIMITS

rcsmerge does not work on binary files.

MPE/iX NOTES

The current MPE/iX implementation of **rcsmerge** has the following limitations:

- Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional ,v naming convention is not currently implemented. This means that you must have a subdirectory named RCS under your current directory or RCS will not work properly.
- For compatibility with traditional MPE/iX security features, you can only rename a file in an MPE/iX group if you own the file or if you have SM capability. Because this command attempts to rename files to which it may not have write access, this feature can interfere

with the command's operation. For this reason, RCS archives should not be placed in an MPE/iX group, but rather should be located elsewhere in the hierarchical file system where the restriction does not apply. For example, the default *RCSPATH* places the archives in a subdirectory named RCS in the current working directory.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

ci(1), co(1), ident(1), merge(1), rcs(1), rcsclean(1), rcsdiff(1), rlog(1), rcsfile(3)

NAME

read — input a line to the shell

SYNOPSIS

read [-**prs**] [-**u**[*d*]] [*variable*?*prompt*] [*variable* ...]

DESCRIPTION

When you call **read** without options, it reads one line from the standard input, breaks the line into fields, and assigns the fields to each *variable* in order.

To determine where to break the line into fields, **read** uses the built-in variable *IFS* (*Internal Field Separator*). Encountering any of the characters in *IFS* means the end of one field and the beginning of the next. The default value of *IFS* is blank, tab, and newline.

In general, a single *IFS* character separates fields. For example, if *IFS* is colon (:), **read** considers the input *a : b* to have three fields: *a*, an empty field, and *b*; however, if *IFS* contains blanks, tabs and/or escaped newlines, **read** considers a sequence of multiple blanks, tabs, and/or escaped newlines to be a single field separator. For example, *a b* has two fields, even though there are several blanks between the *a* and *b*.

The *n*th *variable* in the command line is assigned the *n*th field. If there are more input fields than there are *variables*, the last *variable* is assigned all of the unassigned fields. If there are more variables than fields, the extra variables are assigned the null string ("").

The environment variable *REPLY* is assigned the input when no variables are given. The exit status of **read** is 0, unless it encounters end-of-file.

When the first variable parameter has the form

variable?*prompt*

it defines a prompt for input. If the shell is interactive, **read** sends the *prompt* to the file descriptor *d* if it is open for write and is a terminal device. The default file descriptor for the *prompt* is 2.

Options

read accepts the following options:

- p** receives input from a co-process. For a description of a co-process, see **sh**(1).
- r** reads input in raw mode, ignoring escape conventions. For example, it does not interpret a final backslash (\) as a line continuation character, but as part of the input.
- s** adds input to the command history file as well as to the *variables*.

-u[*d*] reads input from the single digit file descriptor *d*, rather than from the standard input. The default file descriptor is 0.

EXAMPLE

```
while read firstword junk
do
    echo $firstword
done </etc/profile
```

displays the first word of each line of the system profile file.

ENVIRONMENT VARIABLES

The following environment variables affect **read**:

- IFS* contains a string of characters to be used as internal field separators.
- PS2* contains the prompt string that an interactive shell uses when it reads a line ending with a backslash and you did not specify the **-r** option, or if a here-document is not terminated after you enter a newline.
- REPLY* contains the input (including separators) if you did not specify any variables.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - end-of-file on input
 - invalid *variable*
 - incorrect *descriptor* specified after **-u**
 - missing co-process
- 2 Failure due to an invalid command line argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

read is a built-in command of the Bourne Shell and KornShell on UNIX systems. The Bourne Shell does not implement parameters of the form *variable?prompt*, or any options.

The **-p**, **-s**, and **-u** options are extensions to the POSIX standard.

NOTE

This command is built into the shell.

MPE/iX NOTES

On MPE/iX, the end-of-file sequence is :eod followed by ENTER.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

continue(1), **fc(1)**, **print(1)**, **sh(1)**

NAME

readonly — mark variable as readonly

SYNOPSIS

readonly [-p] [*name*[=*value*] ...]

DESCRIPTION

readonly prevents subsequent changes in the value of any of the *name* arguments. Parameters of the form

name=*value*

assign *value* to *name* as well as marking *name* readonly. Calling **readonly** without arguments lists, with appropriate quoting, the names which you have set as readonly in the following format:

Variable= "*value* "

This format is suitable for reading by a shell script, but to ensure readonly access, use the **-p** option.

Options

readonly accepts the following option:

-p displays *export name=value* pairs which when read by a shell ensures the readonly status and values of variables.

Note: Unless you go to a new shell, or unset the variables, sourcing the output fails with errors, since you can't attempt to change readonly variables.

DIAGNOSTICS

Possible exit status values:

- 0 Successful completion.
- 2 Failure due to invalid command line argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. **readonly** is a built-in command of the Bourne Shell and KornShell on UNIX systems.

The behavior given for calling **readonly** with no arguments is an extension to the POSIX standard.

NOTE

This is a special built-in command of the shell.

SEE ALSO

alias(1), **sh(1)**, **typeset(1)**

NAME

renice — set priorities of running processes

SYNOPSIS

```
renice [-n increment] [-g|-p|-u] ID ...
renice priority [-p] pid ... [-g pgrp ...] [-p pid ...] [-u user ...]
renice priority -g pgrp ... [-g pgrp ...] [-p pid ...] [-u user ...]
renice priority -u user ... [-g pgrp ...] [-p pid ...] [-u user ...]
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

renice changes the priority of one or more running processes. Normal users can only change the priority of processes that have the same real or effective user ID as the real or effective user ID of the process that calls **renice**. Privileged users can set the priority of any process.

You can specify the new *priority* as a decimal integer, with lower values indicating more urgent priority. The range of priorities is site-specific, and you may require appropriate privileges for some priority values.

When you change the priority of a process group, this changes the priority of all processes in that group.

If the string **--** appears in the arguments, **renice** does *not* interpret it as the end of command line arguments. This is an exception to the usual POSIX syntax rules.

Options

renice accepts the following options:

- g** treats all following *IDs* (or just *pgrps* in the obsolescent versions) as process group IDs.
- n *increment*** adjusts the system scheduling priority of the specified processes by *increment*. Positive *increments* lower the priority while negative *increments* result in a higher priority.

Note: Negative *increments* may require appropriate privileges.
- p** treats all following *IDs* (or just *pids* in the obsolescent versions) as process IDs.
- u** treats all following *IDs* (or just *users* in the obsolescent versions) as either user names or numeric user IDs.

priority a number that indicates an absolute priority value (higher numbers reflect higher priorities).

If no **-p**, **-g**, or **-u** option appears on the command line, **renice** assumes **-p**.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to an invalid command line argument, the wrong number of command line arguments, a *priority* that is outside the valid range, an invalid *priority* argument, an invalid *ID* argument, or missing arguments following one of the options.
- 2 Failure because the system does not recognize the *ID* in a **-u** option.

Messages

Message: Nice priority must range from *num1* to *num2*
Cause: You specified a *priority* value that was not in the range *num1* to *num2*.
Action: Specify a *priority* value that falls in the given range.

Message: No such user as "*user*"
Cause: You specified a user name or a user ID that could not be found in the user database.
Action: Check the user database for valid user names and IDs.

Message: Not able to read/write process information
Cause: For some reason, the underlying MPE/iX routines were unable to read or write process information.
Action: Contact your system manager.

Message: Not owner
Cause: You attempted to change the priority of a process that you do not own.
Action: Only attempt to change the priority of your processes.

Message: Option *-option* argument missing
Cause: You did not provide an argument for *-option*.
Action: Provide the missing argument.

Message: Unknown option *-option*
Cause: You specified an option that is not valid for this command.
Action: Check the *Options* section of the command's man page for a list of valid options.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

POSIX considers all but the first form of the **renice** command to be obsolescent.

MPE/iX NOTES

Normally, the priority of an MPE/iX process undergoes cyclical degradation. When the process begins running, it has a high priority. As the process continues to run, this priority is lowered until it hits the lowest point in the cycle. At this point, the priority begins to get higher and higher until it hits the original high priority. The cycle then begins again. The **renice** command turns this degradation off and locks the process at the given priority.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

nice(1)

NAME

return — return from shell function or . (dot) script

SYNOPSIS

return [*expression*]

DESCRIPTION

return returns from a shell function or . (dot) script. The exit status is the value of *expression*. The default value of *expression* is the exit status of the last command executed.

DIAGNOSTICS

The current function or script returns the value of *expression*. If no *expression* is given, the exit status is the exit status of the last command executed.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0.

return is a built-in command of the Bourne Shell and KornShell on UNIX systems.

Allowing an expression, rather than just a number, is an extension found in the KornShell.

NOTE

This is a special built-in command of the shell.

SEE ALSO

exit(1), **sh**(1)

NAME

rev — reverse character order of input lines

SYNOPSIS

rev [*file* ...]

DESCRIPTION

rev processes each line read from each input *file*, or from the standard input when no *file* is specified. Output consists of each line with the characters in reverse order except that the newline character (if present) remains at the end of each output line.

EXAMPLES

One possible use of **rev** is to sort a dictionary by suffixes, as in:

```
rev dictionary | sort | rev
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because **rev** cannot open the input file.

Messages

Message: *filename: system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

PORTABILITY

Often found on UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

sort(1)

NAME

rlog — display info about RCS files

SYNOPSIS

```
rlog [-b] [-ddates] [-Ffile...] [-H] [-h] [-L[lockers]] [-l[lockers]] [-O]  
[-R] [-rrevisions] [-ssstates] [-T] [-t] [-w[authors]] [-Yfile] file ...
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rlog prints information about RCS files. Each *file* may be either an RCS file or a working file.

rlog displays the following information for each RCS file: RCS file name, working file name, head (that is, the number of the latest revision on the trunk), default branch, access list, locks, symbolic names, suffix, total number of revisions, number of revisions selected for display, file format, and descriptive text. This is followed by entries for the selected revisions in reverse chronological order for each branch. For each revision, **rlog** displays revision number, author, date/time, state, number of lines or bytes added/deleted (with respect to the previous revision), locker of the revision (if any), and log message.

Options

Without options, **rlog** displays complete information. The following options restrict this output.

-b displays information about the revisions on the default branch (normally the highest branch on the trunk).

-ddates displays information about revisions with a check-in date/time in the ranges given by the semicolon-separated list of *dates*. A range of the form *d1*<*d2* or *d2*>*d1* selects the revisions that were deposited between *d1* and *d2*. A range of the form <*d* or *d*> selects all revisions dated *d* or earlier. A range of the form *d*< or >*d* selects all revisions dated *d* or later. A range of the form *d* selects the single, latest revision dated *d* or earlier. The date/time strings *d*, *d1*, and *d2* are in the free format explained in **co**(1). Quoting is normally necessary, especially for < and >. The separator is a semicolon.

-Ffile... provides an alternate way to specify file names. The given *file* is a text file containing a list of file names, one file name per line. **rlog** checks all the files named in *file*, using the options specified on the command line. Multiple **-F** options may be specified on the command line, and can either be grouped together or interspersed between options.

-
- H** displays information about the head revision only.
- h** displays only RCS file name, working file name, head, default branch, access list, locks, symbolic names, and suffix.
- L[*lockers*]**
ignores RCS files that have no locks set. If the comma-separated list of login names *lockers* is given, **rlog** ignores all RCS files not locked by someone on the list. If *lockers* is not specified, an RCS file is ignored if no revisions of the file are locked. This option can be convenient in combination with **-R**, **-h**, or **-l**.
- l[*lockers*]**
displays information about locked revisions. If the comma-separated list of login names *lockers* is given, only the revisions locked by the given login names are displayed. If the list is omitted, all locked revisions are displayed.
- O** ignores any default options found in the configuration file.
- R** only displays the name of the RCS file; convenient for translating a working file name into an RCS file name.
- r*revisions***
displays information about revisions given in the comma-separated list *revisions* of revisions and ranges. A range *rev1-rev2* means revisions *rev1* to *rev2* on the same branch, *-rev* means revisions from the beginning of the branch up to and including *rev*, and *rev-* means revisions starting with *rev* to the end of the branch containing *rev*. An argument that is a branch means all revisions on that branch. A range of branches means all revisions on the branches in that range.
- s*states***
displays information about any revision with a state that matches one of the *states* given in the comma-separated list.
- T** displays information using only one line per revision. Each line has the following format:

 <workfilename> <rev. number> <date> <locker> <symp. names>

This is often useful in combination with other **rlog** options.
- t** displays the same as **-h**, plus the descriptive text.
- w[*authors*]**
displays information about revisions checked in by users with login names appearing in the comma-separated list *authors*. If *authors* is omitted, the user's login is assumed.

-Yfile specifies *file* as the local configuration file.

rlog displays the intersection of the revisions selected by **-d**, **-l**, **-s**, and **-w**, with the union of the revisions selected by **-b** or **-r**.

EXAMPLES

```
rlog -L -R RCS/*
rlog -L -h RCS/*
rlog -L -l RCS/*
rlog RCS/*
```

The first command displays the names of all RCS files in the subdirectory RCS which have locks. The second command displays the headers of those files, and the third displays the headers plus the log messages of the locked revisions. The last command displays complete information.

```
rlog -Luser -luser -T RCS/*
```

displays a one line description of each RCS file in the subdirectory RCS that is locked by *user*.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message:	Allocation error during <code>strdup()</code>
Cause:	There were not enough free system resources for <code>strdup()</code> to do its job.
Action:	Free up more system resources or delete some revisions from the RCS file.
Message:	Can't parse date/time: <i>dates</i>
Cause:	You specified an improperly formatted date/time string with the -d option.
Action:	Check the <i>DESCRIPTION</i> section for the proper format for the date/time string provided with the -d option.
Message:	Could not find expected delta text.
Cause:	The named revision of an RCS file is built by applying a number of diffs to a base revision. In this case, RCS found fewer diffs than expected when building the named revision.
Action:	The RCS file is corrupt. Try again with another copy of the file.

Message:	Error in RCS file, delta text is damaged
Cause:	Something in the RCS header is corrupt. An end-of-file character was encountered while parsing past the header to get to the RCS info.
Action:	Remove the end-of-file character in the RCS header.
Message:	Inconsistent date/time: <i>date</i>
Cause:	You specified an argument with the -d option that was not a valid date/time string.
Action:	Make sure that the time you entered was correct, and try again.
Message:	Incorrect range in edit script
Cause:	For each revision, the RCS file contains an edit script (similar to diff output) that describes how to build that revision from the base revision. This error occurs when a non-numeric character appears in the range of an a , c , or d command in one of these scripts. The RCS file is corrupt.
Action:	Edit the RCS file manually to correct the invalid range or retrieve a previous revision that does not involve this edit script and continue from that new base.
Message:	Insufficient memory to hold <i>construct</i>
Cause:	There were not enough free system resources to store the given construct.
Action:	Free up more system resources.
Message:	Invalid branch or revision pair <i>rev1 : rev2</i>
Cause:	You specified a revision pair with the -r option that crossed a branch point.
Action:	Check the <i>DESCRIPTION</i> section for details on the -r option.
Message:	Missing date/time after -d
Cause:	You specified -d without providing a date/time string as its argument.
Action:	Provide the missing date/time string.
Message:	Missing delta text
Cause:	The RCS file is damaged.
Action:	The RCS file is corrupt. Find an uncorrupted revision and rebuild from there.
Message:	Missing line number in edit script
Cause:	For each revision, the RCS file contains an edit script (similar to diff output) that describes how to build that revision from the base revision. This error occurs when an a , c , or d command appears without a line number in one of these scripts. The RCS file is corrupt.
Action:	Edit the RCS file manually to insert the missing line number or retrieve a previous revision that does not involve this edit script and continue from that new base.

Message:	Missing log entry
Cause:	While parsing the RCS file, rlog could not find the log entry. The RCS file is corrupt.
Action:	Retrieve an earlier revision of the RCS file and build from there.
Message:	Missing revision or branch number after -r
Cause:	You specified the -r option without providing a revision or branch number as its argument.
Action:	Provide the missing revision or branch number.
Message:	Missing state attributes after -s options
Cause:	You specified the -s option without providing a state as its argument.
Action:	Provide the missing state.
Message:	No filename present for -F option.
Cause:	You specified the -F option, but did not provide a file name as its argument.
Action:	Provide the missing file name.
Message:	No input file.
Cause:	You failed to specify an input file on the command line.
Action:	Provide the missing file name.
Message:	option -t overrides -h
Cause:	You specified both -t and -h . You specified both the -t option and the -h option. These two options are mutually exclusive. The command behaves as though only the -t option was specified.
Action:	If you do not want the behaviour described under CAUSE , specify only one of the two options.
Message:	separator expected near <i>rev</i>
Cause:	You used the -r option to specify a list of revisions, but the list did not follow the expected syntax.
Action:	Check the <i>DESCRIPTION</i> section for the proper syntax when providing a list of revisions with the -r option.
Message:	syntax error; expecting EOF
Cause:	The RCS file did not contain an end-of-file character as the last character in the file.
Action:	Edit the RCS file manually and save it. This inserts an end-of-file character at the end of the file. Be sure to remove any whitespace characters that will immediately precede the new end-of-file character before saving.

Message: Too many delta texts, rcs files may be damaged
Cause: The named revision of an RCS file is built by applying a number of diffs to a base revision. In this case, RCS found more diffs than expected when building the named revision. The RCS file is corrupt.
Action: Retrieve an earlier revision of the RCS file and build from there.

Message: Unknown command in edit script: *cmd*
Cause: For each revision, the RCS file contains an edit script (similar to **diff** output) that describes how to build that revision from the base revision. This error occurs when a command other than **a**, **c**, or **d** appears in one of these scripts. The RCS file is corrupt.
Action: Edit the RCS file manually to correct the command or retrieve a previous revision that does not involve this edit script and continue from that new base.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **rlog**.
Action: Check the *DESCRIPTION* section for a list of valid **rlog** options.

For a list of error messages common to all RCS utilities, see **rcserror**(3).

PORTABILITY

All UNIX systems.

The **-F**, **-H**, **-O**, **-T**, and **-Y** options are extensions to traditional implementations of **rlog**.

MPE/iX NOTES

Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional *,v* naming convention is not currently implemented. This means that you must have a sub-directory named RCS under your current directory or RCS will not work properly.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

ci(1), **co**(1), **ident**(1), **rcs**(1), **rcsclean**(1), **rcsdiff**(1), **rcsmerge**(1), **rcsfile**(3)

NAME

rm — remove files

SYNOPSIS

rm [-fiRr] *file* ...

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

rm removes each specified *file* argument (provided that it is a valid path name). If you specify either `.` or `..` as the final component of the path name for a *file*, **rm** displays an error message, and moves onto the next file. If you specify a file for which you do not have write permission, **rm** asks you for confirmation. Type the yes expression defined in *LC_MESSAGES* (the English expression is typically `y` or `yes`) if you really want it deleted.

Options

rm accepts the following options:

- f** deletes read-only files immediately, without asking for confirmation. When you specify this option and a file does not exist, **rm** does not display an error message and does not modify the exit status. If you specify both **-f** and **-i**, **rm** uses the option that appears last on the command line.
- i** prompts for confirmation before deleting each file. If you specify both **-f** and **-i**, **rm** uses the option that appears last on the command line.
- R** recursively removes the entire directory structure if *file* is a directory.
- r** is equivalent to **-R**.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - inability to remove a file
 - tried to remove directory without specifying **-r** or **-R**
 - inability to find file information when using **-r** or **-R**
 - inability to read directory when using **-r** or **-R**
- 2 Failure due to any of the following:
 - invalid command line option
 - no *files* specified

Messages

- Message:** cannot open directory "*pathname*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** cannot remove directory "*pathname*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** cannot stat entry "*pathname*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** cannot unlink entry "*pathname*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** directory *pathname*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** fatal error during "-r" option: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** not allowed to remove *pathname*
Cause: You specified either . (current directory) or .. (parent directory) as a *pathname*. **rm** will not remove these directories.
Action: Do not specify . or .. as a *pathname*.
- Message:** *pathname*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** Unknown option "*-option*"
Cause: You specified an option that is not valid for **rm**.
Action: Check the *DESCRIPTION* section for a list of valid **rm** options.
- Message:** use "-r" to remove directory "*pathname*"
Cause: You attempted to use **rm** to remove a directory without specifying the **-r** option.
Action: Specify the **-r** option when you want to use **rm** to remove a directory.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

Although groups and accounts are treated as directories in the hierarchical file system, the current MPE/iX implementation of **rm** does not allow you to remove the root directory, account directories, or group directories. Do not attempt to use the **-r** or **-R** options to remove them.

In addition, this release of MPE/iX does not provide the `lstat()` API. As a result, this command cannot return information on the link itself. It attempts to determine when a symbolic link has been referenced, but can only return the information on the target of the link, rather than the link itself.

On MPE/iX, **rm** is available as both a built-in shell utility and an external utility.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cp(1), **mv(1)**, **rmdir(1)**

NAME

rmdir — remove directory

SYNOPSIS

rmdir [-p] *directory* ...

DESCRIPTION

The **rmdir** command removes each requested *directory*. Each directory must be empty for **rmdir** to be successful.

Options

rmdir accepts the following option:

-p removes all intermediate components. For example,

```
rmdir -p abc/def/ghi
```

is equivalent to

```
rmdir abc/def/ghi
rmdir abc/dec
rmdir abc
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because *directory* is not a directory, or because it still contains files or subdirectories.
- 2 Failure because of an invalid command line option, or no *directory* names specified.

Messages

Message: rmdir: *directory pathname*: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **rmdir**.

Action: Check the *DESCRIPTION* section for a list of valid **rmdir** options.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

Although groups and accounts are treated as directories in the hierarchical file system, the current MPE/iX implementation of **rmdir** does not allow you to remove the root directory, account directories, or group directories.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

mkdir(1), **rm(1)**

NAME

scs2rcs — SCCS to RCS conversion utility

SYNOPSIS

scs2rcs [-F*file*...] [-O] [-v] [-Y*file*] *file* ...

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

scs2rcs takes SCCS files as input and produces equivalent RCS files as output. SCCS is a UNIX revision control system. Each input *file* must be an SCCS file.

scs2rcs attempts to preserve as much information as possible when converting from SCCS to RCS, as follows:

- The author, date, and time of all revisions are preserved. The state of each revision is set to Exp.
- The descriptive text and all log messages are preserved.
- The access list of users allowed to make revisions is preserved.
- If the SCCS file has its **m** (working file name) flag set, the name of the output RCS file is the name specified with the **m** flag; otherwise, the name of the RCS file is the same as the name of the SCCS file, with the **s.** prefix removed if present.
- If the SCCS file has its **d** (default revision) flag set, the corresponding revision in the RCS file is set to be the default branch, as if **rscs -b** had been used. See **rscs(1)** for more information.
- If MR (Modification Request) numbers are provided with any SCCS revisions, these numbers are added to the log messages associated with the corresponding RCS revisions.

The file permissions for output RCS files are set according to your RCS configuration file.

At present, **scs2rcs** does not preserve locks. Files locked under SCCS are not locked in the corresponding RCS file. These files can be relocked using **rscs -l**.

The base name of the path specified by *file* must begin with the prefix **s.** (the standard SCCS file prefix).

If the directory containing *file* has an RCS subdirectory, the RCS output file is placed there; otherwise, the RCS output file is placed in the same directory as *file*. In both cases, the RCS suffix **,v** is appended to the output file name.

Options

sccs2rcs accepts the following options:

- Ffile...** provides an alternate way to specify file names. The given *file* is a text file containing a list of file names, one file name per line. **sccs2rcs** converts all the files named in *file*, using the options specified on the command line. Multiple **-F** options may be specified on the command line, and can either be grouped together or interspersed between options.
- O** ignores any default options found in the configuration file.
- v** displays extra information about the conversion. At present, this information consists of the input file name, the output file name, and any renumberings performed.
- Yfile** specifies *file* as the local configuration file.

Revision Numbers

If possible, **sccs2rcs** keeps revision numbers the same as in the original SCCS file. However, there is a discrepancy between the way RCS and SCCS assign numbers to revisions, and this may cause problems. In SCCS, all branch revision numbers, including those of branches of branches, have only four components. For example, suppose you want to branch off from revision 1.2.3.4. In RCS, the first version of the branch would be numbered 1.2.3.4.1.1; in SCCS, it would be numbered 1.2.4.1.

In this situation, preserving the original SCCS numbers would give an entirely different revision structure. **sccs2rcs** therefore renumbers all branches according to RCS conventions, eliminating this problem.

DIAGNOSTICS

Possible exit status values are

- 0 Successful completion.
- 1 n error occurred.

Messages

- Message:** bad control d line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad control f line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad default revision in d flag in SCCS file *filename*
Cause: The SCCS file contains an invalid default revision number, probably because it has been corrupted somehow.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad input file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad revision in d flag in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad revision number in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: bad username in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: directory *dir* does not exist
Cause: You specified a directory (derived from the file name provided on the command line) that does not exist.
Action: Make sure that the file name provided was correct, and try again.

Message: expecting control t line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: file *filename* exists already
Cause: You specified a SCCS file that would generate an output file that already exists. **sccs2rcs** does not overwrite an existing RCS file.
Action: Change the *RCPATH* environment variable, or move the RCS file to a different place and try again.

Message: filename in m flag of SCCS file *filename* is too long
Cause: The file name associated with the **m** flag in the SCCS file was longer than the maximum file name length allowed by the file system.
Action: Using the SCCS command **admin**, change or remove the value of the **m** flag in the SCCS file and try again.

Message: input file *filename* is not an SCCS file
Cause: You specified an input file that does not contain the **s.** prefix common to SCCS files.
Action: Specify a valid SCCS file as the input file.

Message: input file *filename* not in SCCS format
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: Insufficient memory for operation
Cause: There were not enough free system resources to perform the requested operation.
Action: Try something simpler.

Message: missing comment in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control c or e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control d line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control f or t line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control g, m, c or e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control i, x, g, m, c or e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control m, c or e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control t line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control T line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control u line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control U line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing control x, g, m, c or e line in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: missing username in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: No filename present for -F option.
Cause: You specified the **-F** option, but did not provide a file name as its argument.
Action: Provide the missing file name.

Message: No input file.
Cause: You failed to specify an input file on the command line.
Action: Provide the missing file name.

Message: no trunk revisions in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: SCCS file *filename* has a branch as the lowest revision
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: trunk revision cannot be child of branch in SCCS file *filename*
Cause: The SCCS file has become corrupted in some way, and cannot be converted by **sccs2rcs**.
Action: Recover a clean copy of the SCCS file from backups and try again.

Message: unable to change permissions on output file *filename*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: unable to open input file *sccsfile*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: unable to open output file *filename*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: unable to write branch of revision *rev* in file *filename*:
system error

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: unable to write text for revision *rev* in file *filename*: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: unexpected end of control d line in SCCS file *filename*

Cause: The SCCS file has become corrupted in some way, and cannot be converted by **scs2rcs**.

Action: Recover a clean copy of the SCCS file from backups and try again.

Message: unexpected end of d flag line in SCCS file *filename*

Cause: The SCCS file has become corrupted in some way, and cannot be converted by **scs2rcs**.

Action: Recover a clean copy of the SCCS file from backups and try again.

Message: unexpected end of m flag line in SCCS file *filename*

Cause: The SCCS file has become corrupted in some way, and cannot be converted by **scs2rcs**.

Action: Recover a clean copy of the SCCS file from backups and try again.

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **scs2rcs**.

Action: Check the *DESCRIPTION* section of this man page for a list of valid **scs2rcs** options.

For a list of error messages common to all RCS utilities, see **rcserror**(3).

PORTABILITY

All UNIX systems.

MPE/iX NOTES

Due to the fact that the comma (,) is not a valid character in MPE/iX file names, the traditional ,v naming convention is not currently implemented. This means that you must have a sub-directory named RCS under your current directory or RCS will not work properly.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

ci(1), **co**(1), **ident**(1), **rscs**(1), **rscsclean**(1), **rscsdiff**(1), **rscsmmerge**(1), **rlog**(1), **rscsfile**(3)

NAME

sed — stream editor (non-interactive)

SYNOPSIS

sed [-En] [*script*] [*file* ...]

sed [-En] [-e *script*] ... [-f *scriptfile*] ... [*file* ...]

DESCRIPTION

The **sed** command applies a set of editing commands contained in *script* to each input *file*. If you did not specify a *file*, **sed** reads the standard input.

sed reads each input line into a special area known as the *pattern buffer*. Certain commands [gGhHx] use a second area called the *hold buffer*. By default, after each pass through the script, **sed** writes the final contents of the *pattern buffer* to the standard output.

Options

sed accepts the following options:

-E uses extended regular expressions. Normally, **sed** uses Basic regular expressions. For more information, see **regexp**(3).

-e script
adds the argument *script* to the end of the script.

-f scriptfile
adds the commands in the file *scriptfile* (one command per line) to the script.

-n suppresses all output except that generated by explicit commands in the **sed** script [acilnpPr]

If you have need of only one *script* argument, you may omit the **-e** and use the first form of the command.

Commands

sed commands are similar to those of the interactive text editor **ed**, except that **sed** commands necessarily view the input text as a stream rather than a directly addressable file. Script commands can begin with zero, one, or two addresses, as in **ed**. Zero-address commands reference every input line. One-address commands select only those lines matching that address. Two-address commands select those input line ranges commencing with a match on the first address up to an input line matching the second address, inclusive. Permissible addressing constructions are:

n The number *n* matches only the *n*th input line.

\$ This address matches the last input line.

/regexp/

This address selects an input line matching the specified regular expression *regexp*. You can use a character other than the slash (/) to delimit the regular expression by putting a backslash (\) before the first one. For example, to use % to enclose the regular expression, write `\%regexp%`.

Each line of a script contains up to two addresses, a single letter command, possible command modifiers, and a terminating newline. The newline is optional in script strings typed on the command line.

The following **sed** command summary shows the commands with the maximum number of legitimate addresses. A command may be given fewer than the number of addresses specified, but not more.

aa *appends* subsequent text lines from the script to the standard output. **sed** outputs the text after completing all other script operations for that line and before reading the next record. Text lines are terminated by the first line which does not end with a backslash (\). **sed** does not treat the \ characters on the end of lines as part of the text.

a,bb [label]

branches to :label. If you omit *label*, **sed** branches to the end of the script.

a,bc *changes* the addressed lines by deleting the contents of the pattern buffer (input line) and sending subsequent text (similar to the **a** command) to the standard output. When you specify two addresses, **sed** delays text output until the final line in the range of addresses; otherwise, the behavior would surprise many users. The rest of the script is skipped for each addressed line, except the last.

a,bd *deletes* the contents of the pattern buffer (input line) and restarts the script with the next input line.

a,bD *deletes* the pattern buffer only up to and including the first newline and then restarts the script from the beginning and applies it to the text left in the pattern buffer.

a,bg *grabs* a copy of the text in the hold buffer and places it in the pattern buffer, overwriting the original contents.

a,bG *grabs* a copy of the text in the hold buffer and appends it to the end of the pattern buffer after appending a newline.

a,bh *holds* a copy of the text in the pattern buffer by placing it in the hold buffer, overwriting its original contents.

-
- a,bH** *holds* a copy of the text in the pattern buffer by appending it to the end of the hold buffer after appending a newline.
- ai** *inserts* text. This command is similar to the **a** command, except that its text is output immediately.
- a,bl** *lists* the pattern buffer (input line) onto the standard output so that non-printable characters are visible. This command works analogously to the **l** command in **ed**. **sed** folds long lines to suit the output device, indicating the point of folding with a backslash (\).
- a,bn** prints the pattern space on standard output if the default printing of the pattern space is not suppressed (because of the **-n** option). The *next* line of input is then read, and the processing of the line continues from the location of the **n** command in the script.
- a,bN** appends the *next* line of input to the end of the pattern buffer, using a newline to separate the appended material from the original. The current line number changes.
- a,bp** *prints* the text in the pattern buffer to the standard output. The **-n** option does not disable this form of output. If you do not use **-n**, the pattern buffer is printed twice.
- a,bP** operates like the **p** command, except that it prints the text in the pattern buffer only up to and including the first newline character.
- aq** *quits* **sed**, skipping the rest of the script and reading no more input lines.
- ar file** *reads* text from *file* and places it onto the standard output before reading the next input line. The timing of this operation is the same as for the **a** command. If *file* does not exist or cannot be read, **sed** treats it as an empty file.
- a,bs/reg/sub/[gpn][w file]**
 substitutes the new text string *sub* for text matching the regular expression, *reg*. Normally, the **s** command only replaces the first such matching string in each input line. You can use any single printable character other than space or newline instead of the slash (/) to delimit *reg* and *sub*. The delimiter itself may appear as a literal character in *reg* or *sub* if you precede it with a backslash (\). You may omit the trailing delimiter.
- If an ampersand (&) appears in *sub*, **sed** replaces it with *reg*. A \n in *reg* matches an embedded newline in the pattern buffer (resulting, for example, from an **N** command).
- The command may be followed by a combination of the following:
- n** substitutes only the *n*th occurrence of *regex*.
- g** forces all occurrences (rather than the default first occurrence) of *regex* to be replaced.

- p** executes the print (**p**) command only if a successful substitution occurs.
- w file** writes the contents of the pattern buffer to the end of *file*, if a substitution occurs.
- a,bt [label]** branches to the indicated *label* if any successful substitution has occurred since either reading the last input line or executing the last **t** command. If you do not specify *label*, **sed** branches to the end of the script.
- a,bw file** writes the text in the pattern buffer to the end of *file*.
- a,bx** exchanges the text in the hold buffer with that in the pattern buffer.
- a,by /set1 /set2 /** transliterates any input character occurring in *set1* to the corresponding element of *set2*. The sets must be the same length. You can use any character other than backslash or newline instead of the slash, to delimit the strings.
- a,b{** groups all commands until the next matching **}** command, so that **sed** executes the entire group only if the **{** command is selected by its address(es).
- : label** designates a *label* which can be the destination of a **b** or **t** command.
- a,b!cmd** executes the specified *cmd* only if the addresses do *not* select the **!** command.
- #** treats the script line as a comment unless it is the first line in the script. If the first line in a script is **#n**, it is equivalent to specifying **-n** on the command line. Any empty script line is also treated as a comment.
- a=** writes the decimal value of the current line number onto the standard output.

EXAMPLES

Here is a filter to switch political allegiance:

```
sed 's/democrat\(ic\)*/republican/g'
```

ENVIRONMENT VARIABLES

sed used the following environment variable:

COLUMNS

contains the width of the screen in columns. If set, **sed** uses this value to fold long lines on output; otherwise, **sed** uses the appropriate value from the terminal database for the terminal in use and if that is not valid, it uses a default of 80.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

- Message:** bad regular expression delimiter after \
Cause: You used a backslash (\) to indicate an alternate regular expression delimiter, but you did not follow it with a valid delimiter.
Action: Provide a valid delimiter following the \ (that is, any character other than new-line, space, tab, or EOF).
- Message:** badly formed file name for "cmd" command
Cause: You specified the *cmd* which requires a file name as an argument, but the given argument does not have the syntax of a file name.
Action: Specify a valid file name.
- Message:** cannot allocate buffer: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** Can't chain "cmd" command: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** cannot determine PATH_MAX: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** cannot nest "!" command
Cause: You attempted to execute one ! command from within another.
Action: Remove any nested ! commands.
- Message:** cannot open file "*filename*" in "cmd" command
Cause: For some reason, **sed** was unable to open the file *filename* that was specified as an argument to the *cmd* command.
Action: Check that the file name exists, that it was spelled correctly, and that you have appropriate permissions.
- Message:** "cmd" command needs a label
Cause: You specified a command that requires a label as an argument, but you did not provide the label name.
Action: Provide the missing label name.

Message: End of file in "*cmd*" command
Cause: **sed** encountered an end of file while parsing the command *cmd*.
Action: Check the script file for missing closing quotes, missing regular expression delimiters, and other syntactical errors.

Message: garbage after command
Cause: You specified invalid characters after a script command.
Action: Remove the surplus commands.

Message: hold space overflow during H command
Cause: The contents of the pattern buffer was too long to be appended to the hold buffer.
Action: Place a smaller amount of text in the pattern buffer.

Message: in "*y/set1/set2/*", the strings "*set1*" and "*set2*" must be the same length
Cause: You specified two strings *set1* and *set2* as arguments to the **y** command that were not the same length.
Action: Make sure that the *set1* and *set2* strings are the same length.

Message: input file "*filename*": system error
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: input file "*filename*" is binary
Cause: You specified the binary file *filename* as a **sed** input file. **sed** only works on text files.
Action: Only specify text files as **sed** input files.

Message: input line too long
Cause: A line in the input file was longer than 10240 bytes.
Action: Make sure that the input file is a text file.

Message: insufficient memory for buffers
Cause: There were not enough free system resources for **sed** to allocate to its buffers.
Action: Free up more resources.

Message: insufficient memory to compile command
Cause: There were not enough free system resources for **sed** to compile a given command.
Action: Free up more resources.

Message: label "*label*" not found in script
Cause: You specified *label* as an argument to the **b** or **t** command, but *label* does not exist in the script.
Action: Make sure that **b** and **t** commands refer to labels that exist in the script.

Message:	Missing script
Cause:	You specified the -e option but did not provide a script as its argument.
Action:	Provide the missing script.
Message:	newline or end of file found in pattern
Cause:	sed encountered a newline or end of file character when reading a pattern from the script or script file.
Action:	Check the pattern for a missing delimiter.
Message:	no memory file file table
Cause:	There were not enough free system resources to perform the requested operation.
Action:	Free up more resources.
Message:	no remembered regular expression
Cause:	You issued a command that tried to use a remembered regular expression, but there was no remembered regular expression.
Action:	Specify the regular expression explicitly.
Message:	non-matching "{" and "}" commands
Cause:	You specified a { command without the matching }.
Action:	Provide the missing }.
Message:	<i>num1</i> addresses given for command expecting at most <i>num2</i>
Cause:	You specified a command with <i>num1</i> addresses that uses a maximum of <i>num2</i> addresses.
Action:	Use the correct number of addresses.
Message:	Option <i>-option</i> argument missing
Cause:	You did not provide an argument for <i>-option</i> .
Action:	Provide the missing argument.
Message:	pattern space overflow during G command
Cause:	The contents of the hold buffer was too long to be appended to the pattern buffer.
Action:	Place a smaller amount of text in the hold buffer.
Message:	reading from file " <i>filename</i> ": system error
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	regular expression error: <i>regular expression error</i>
Cause:	See regerror (3).
Action:	See regerror (3).

Message: script file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: unknown command
Cause: You specified a command that **sed** does not recognize.
Action: Check the *Commands* subsection for a list of valid **sed** commands.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **sed**.
Action: Check the *DESCRIPTION* section for a list of valid **sed** options.

Message: unmatched { } commands
Cause: There is a { command in your script which does not have a corresponding } to terminate it.
Action: Make sure that there are as many { as there are }.

Message: "y" command may not be followed by a newline
Cause: You followed the y command with a newline rather than its required arguments.
Action: Provide the missing arguments.

Message: "\" must terminate the "*cmd*" command
Cause: You specified the *cmd* command, but you did not provide the backslash (\) required to terminate its input.
Action: Provide the missing \.

LIMITS

sed allows a limit of 1024 bytes per line and 500,000 lines per file. It does not allow the NUL character. The maximum length of a global command is 256 characters, including newlines.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

The **-E** option is an extension to the POSIX standard.

MPE/iX NOTES

Although the current MPE/iX implementation of the **sed** command can read non-byte stream files, it can only write byte stream files. As a result, if you edit a non-byte stream file with **sed** and save it, that file is now a byte stream file. File characteristics like file code, record size, and so forth are not preserved by this conversion.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

awk(1), diff(1), ed(1), grep(1), vi(1), regexp(3)

NAME

set — set shell flags and positional parameters

SYNOPSIS

set [**±abCefhiKkmpstuvx-**] [**±A***name*] [**±o**[*flag*]] [*parameter* ...]

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

Calling **set** without arguments displays the names and values of all environment variables, sorted by name, in the following format:

Variable= "*value* "

The quoting allows the output to be re-input to the shell using the built-in command **eval**.

Options

Arguments of the form **-option** set each shell flag specified as an option. Similarly, arguments of the form **+option** turn off each of the shell flags specified as an option.

Note: All of the **set** options except **±A**, **-s**, **-**, and **--** are *shell flags*. Shell flags can also be set on the **sh** command line at invocation.

set accepts the following options:

+A *name*

assigns the parameter list to the elements of *name*, starting at *name*[0].

-A *name*

unsets *name*, then assigns the parameter list to the elements of *name* starting at *name*[0].

-a sets all subsequently defined variables for export.

-b notifies you when background jobs finish running.

-C prevents the output redirection operator **>** from overwriting an existing file. Use the alternate operator **>|** to force an overwrite.

-e tells a non-interactive shell to execute the ERR trap and then exit, whenever a simple command returns a non-zero exit. This flag is disabled when reading profiles.

-f disables file name generation.

-h	makes all commands used tracked aliases.
-i	makes the shell interactive.
-K	tells the shell to use Korn-compatible behavior in any case where the POSIX.2 behavior is different from the behavior specified by Korn.
-k	allows assignment parameters anywhere on the command line and still includes them in the environment of the command.
-L	makes the shell a login shell. Setting this flag is effective only at shell invocation.
-m	runs each background job in a separate process group and reports on each (to standard error) as they complete.
-n	tells a non-interactive shell to read commands but not execute them.
-o <i>flag</i>	sets shell <i>flag</i> . If you do not specify <i>flag</i> , this option lists all shell flags which are currently set. <i>flag</i> can be one of the following:
allexport	same as -a option.
errexit	same as -e option.
bgnice	runs background jobs at a lower priority.
emacs	specifies emacs style in-line editor for command entry.
gmacs	specifies gmacs style in-line editor for command entry.
ignoreeof	tells shell not to exit on end-of-file.
interactive	same as -i option
keyword	same as -k option.
korn	same as -K option
logical	specifies that cd , pwd , and the <i>PWD</i> variable use logical pathnames in directories with symbolic links. If this flag is not set, these built-ins and <i>PWD</i> use physical directory pathnames. For example, assume <i>/usr/spool</i> is a symbolic link to <i>/var/spool</i> and that it is your current directory. If <i>logical</i> is not set, <i>PWD</i> has the value <i>/var/spool</i> , and cd .. changes the current directory to <i>/var</i> . If <i>logical</i> is set, <i>PWD</i> has the value <i>/usr/spool</i> and cd .. changes the current directory to <i>/usr</i> .
login	same as -L option of sh (1).

markdirs	adds trailing / to file name generated directories.
monitor	same as -m option.
noclobber	same as -C option.
noexec	same as -n option.
noglob	same as -f option.
nolog	does not record function definitions in the history file.
notify	same as -b option.
nounset	same as -u option.
privileged	same as -p option.
trackall	same as -h option.
verbose	same as -v option.
vi	specifies vi style in-line editor for command entry.
xtrace	same as -x option.

See **shedit(3)** for a description of the effect of setting options **emacs**, **gmacs**, or **vi**.

- p** resets *PATH* variable to default value, disables processing of *\$HOME/.profile* and uses file */etc/suid_profile* instead of the file in the *ENV* variable.
- s** sorts the positional parameters.
- t** exits after reading and executing one command.
- u** tells the shell to give an error message if an unset parameter is used in a substitution.
- v** prints shell input lines as they are read.
- x** prints commands and their arguments as they execute.
- turns off **-v** and **-x** flags. Also, parameters which follow this option do not set shell flags, but are assigned to positional parameters (see **sh(1)**).
- parameters which follow this option do not set shell flags, but are assigned to positional parameters.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to an invalid command line argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

set is a built-in command of the Bourne Shell and KornShell on UNIX. The Bourne shell only has the **-a**, **-e**, **-h**, **-k**, **-n**, **-t**, **-u**, **-v**, and **-x** flags.

The shell flags **+A**, **+h**, **+i**, **-K**, **+k**, **+p**, **-s**, **+t**, **bgnice**, **emacs**, **gmacs**, **interactive**, **keyword**, **korn**, **logical login**, **markdirs**, **nolog**, **privileged**, and **trackall** are extensions to the POSIX standard.

NOTE

This is a special built-in command of the shell.

MPE/iX NOTES

The current release of MPE/iX does not support job control. As a result, the **-m**, and **-o monitor** options are not currently implemented.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

alias(1), **export**(1), **sh**(1), **trap**(1), **typeset**(1), **shedit**(3)

NAME

sh, rsh — POSIX-compliant (Korn) shell and command interpreter

SYNOPSIS

```
[r]sh [-abCefhiKkLmnp rtuvx] [-o option] [cmd_file [argument...]]  
[r]sh -c cmdstring [-abCefhiKkLmnp rtuvx] [-o option] [cmd_name [argument...]]  
[r]sh -s [-abCefhiKkLmnp rtuvx] [-o option] [argument...]
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

This manual page for **sh** contains the following subsections:

- Options and Invocation
- Command Syntax
- Command Execution
- Word Expansion
- Quoting
- Directory Substitution
- Parameter Substitution
- Arithmetic Substitution
- Command Substitution
- File Descriptors and Redirection
- File Name Generation
- Variables
- Shell Execution Environments
- Built-in Commands

Subsections dealing with substitution and interpretation of input appear in the order in which the shell performs those substitutions and interpretations.

Much of the functionality of the shell comes from built-in commands like **cd**(1) and **alias**(1). The man pages for such commands describe additional features of the shell not included here.

Options and Invocation

MPE/iX Shell (**sh**) is a sophisticated command interpreter which is a variant of the popular KornShell found on the UNIX operating system.

Normally you invoke the shell by logging in. You can also invoke the shell by typing an explicit **sh** command. Some people find it useful to copy the **sh** file into a file named **rsh**. If you invoke the shell under the name **rsh**, the shell operates in *restricted* mode. This mode is described in connection with the **-r** option.

If you invoke the shell with a name that begins with the `-` character, it is a *login shell*. (You can also get a login shell if you invoke the shell with the `-L` option.) A login shell begins by executing the file

```
/etc/profile
```

It then executes

```
$HOME/.profile
```

using the `.` command (see **dot(1)**). If `$HOME` is not set, the shell searches the current directory for

```
.profile
```

and executes this file with the `.` command if it exists. The shell does not complain if any of these files cannot be found.

You can use these profile files to customize your session with **sh**. For example, your profile files can set options, create aliases, or define functions and variables.

If there is at least one argument on the **sh** command line, **sh** takes the first argument as the name of a shell script to execute. (The exception to this is when `-s` is used.) Any additional arguments are assigned to the positional parameters; usually, these serve as arguments to the shell script. See *Parameter Substitution* for information about positional parameters, and see **set(1)** for information about changing these parameters.

If **sh** finds the `ENV` environment variable set when it begins execution (after profile processing), **sh** executes the file named by the expansion of the value of this variable (see *Variables*).

The shell accepts the following options on the command line:

-c *cmdstring*

executes *cmdstring* as if it were an input line to the shell and then exits. This is used by programs (for example, editors) that call the shell for a single command. **sh** assigns arguments after *cmdstring* to the positional parameters. If you specify *cmd_name*, special parameter 0 is set to this string for use when executing the commands in *cmdstring*.

-i invokes an interactive shell, as opposed to running a script. With **-i**, the shell catches and ignores interrupts. Without **-i**, an interrupt terminates the shell. For shells which read from the terminal, **-i** is the default.

-K specifies Korn-compatible behavior in any case where the POSIX.2 behavior is different from the behavior specified by Korn. Without **-K**, the shell defaults to POSIX.2 behavior.

- L** makes the shell a *login shell* as described earlier.
- r** invokes a restricted shell. (As noted earlier, you can also invoke a restricted shell by using the name **rsh**). In a restricted shell, you cannot do the following: use the **cd** command; change the values of the variables *ENV*, *PATH*, or *SHELL*; use **>** or **>>** to redirect output; or specify command names containing **/**. These restrictions do not apply during execution of your *profile* files.
- s** reads commands from standard input and assigns all *arguments* to the positional parameters. Normally, if there is at least one *argument* to the shell, the first such *argument* is the name of a file to execute.

If you specify *cmd_file* without either the **-c** or **-s** option, the shell takes it as the name of a file which contains commands to be run. Special parameter 0 is set to this name.

In addition, you can use the **-a**, **-b**, **-C**, **-e**, **-f**, **-h**, **-i**, **-k**, **-L**, **-m**, **-n**, **-o**, **-p**, **-r**, **-t**, **-u**, **-v**, and **-x** options. The **set(1)** man page describes these options.

Command Syntax

The shell implements a sophisticated programming language that gives you complete control over the execution and combination of individual commands. When the shell scans its input, it always treats the following characters specially:

```

;      &      (      )      <      >      |      `      \
space   tab    newline

```

If you want to use any of these characters inside an actual argument, you must quote the argument (so that the shell doesn't use the special meanings of the characters). See *Quoting* for more information.

A *simple command* is a list of *arguments* separated by blanks or tabs.

When a word begins with an unescaped hash mark (**#**), the remainder of the line is treated as a *comment*, and the shell discards input up to but not including the next newline.

When a command starts with a defined alias, **sh** replaces the alias with its definition (see **alias(1)**).

A *reserved word command* starts with a *reserved word* (for example, **if**, **while**, **for**). Reserved word commands provide flow of control operations for the shell. These are described later in this section.

A *command* may be any of the following:

```

command:      simple command
               reserved word command
               ( command )
               command | command

```

```

command && command
command | | command
command & command
command &
command | &
command ; command
command ;
command <newline>

```

The following table gives the order of precedence of the preceding operators. Highest priority operators are listed first and operators on the same line have equal priority.

```

( )
|
&&      ||
&  |&   ;   <newline>

```

The meaning of these operations is as follows:

(*command*)

executes *command* in a subshell. This means that the current shell invokes a second shell, and this second shell actually executes *command*. In this way, *command* executes in a completely separate execution environment; it can change working directories, change variables, open files, and so on without affecting the first shell. The subshell's environment begins as a copy of the current environment, so the value of the *ENV* environment variable is not run when a subshell starts.

| creates a pipe between the two *commands* that the | operator connects. This means that the standard output of the first *command* becomes the standard input of the second *command*. A series of commands connected by pipes is called a *pipeline*. The exit status is that of the last command in the pipeline.

&& is the logical AND operator. The shell executes the second *command* if and only if the first *command* returns a true (zero) exit status.

| | This is the logical OR operator. The shell executes the second *command* if and only if the first *command* returns a false (non-zero) exit status.

& executes the *command* that precedes it asynchronously. This means that the shell just starts the *command* running and then immediately goes on to take new input, before the *command* finishes execution. On systems where asynchronous execution is not possible, this operation is effectively equivalent to ;.

- | & executes the *command* that precedes it as a *co-process*. The *command* runs asynchronously, as with the & operator, but *command*'s standard input and standard output are connected to the shell by pipes. The shell sends input to *command*'s standard input with the **print -p** command, and reads from *command*'s standard output with the **read -p** command. The *command* should not buffer its output. Because of this and other limitations, co-processes should be designed to be used as co-processes. On systems where asynchronous execution is not possible, co-processes are not supported.
- ; is the sequential execution operator. The second *command* is executed only after the first *command* has completed.

<newline>

the unescaped newline is equivalent to the ; operator.

The shell contains a rich set of *reserved word commands* which provide flow of control and let you create compound commands. In the following list, a *command* can also be a sequence of *commands* separated by *newlines*. Italic square brackets (*[]*) indicate optional portions of commands, and are never part of the command syntax.

! *command*

The exclamation point is the logical NOT command. When its operand is false (non-zero), this command returns true (zero). When its operand is true (zero), this command returns false (non-zero).

{ *command* ; }

Enclosing a command in braces is similar to the (*command*) construct except that the shell executes the *command* in the same environment rather than under a sub-shell. { and } are simply reserved words to the shell. To make it possible for the shell to recognize these symbols, you must put a blank or newline after the {, and a semicolon or newline before the }.

case word in

[([*pattern*[|*pattern*] ...) *command* ; ;] ...

[([*pattern*[|*pattern*] ...) *command* ; ;] ...

esac

The **case** statement is similar to the **switch** statement of the C programming language or the **case** statement of Pascal. If the given *word* matches any one of the *patterns* separated by or-bar (|) characters, **sh** executes the corresponding *command*. The *patterns* should follow the rules given in *File Name Generation* except that the period (.) and slash (/) are not treated specially. Patterns are matched in the order they are given, so more inclusive patterns should be mentioned later. You must use the double semicolon (; ;) to delimit *command* and introduce the next *pattern*.

```

for variable [in word ...]
do command
done

```

The **for** statement sets *variable* to each *word* argument in turn, and executes the set of *commands* once for each setting of *variable*. If you omit the **in word** part, **sh** sets *variable* to each positional parameter. You may divert the flow of control within the loop with the **break**(1) or **continue**(1) statements.

```

function variable {
    command
}

variable () {
    command
}

```

Either of these forms defines a **function** named *variable*, the body of which consists of the sequence of *commands*. You invoke a function just like any other command; when you actually call the function, **sh** saves the current positional parameters. The function's command line arguments then replaces these parameters until the function finishes. If the option flag **-K** is set, **sh** also saves the current ERR and EXIT traps and any flags manipulated with the **set** command; these are restored when the function finishes. The function terminates either by falling off the end of the code of the function body, or by reaching a **return**(1) statement. If the function uses **typeset** to declare any variables in the function body, the variables are local to the function.

```

if command
then command
[elif command
then command] ...
[else command]
fi

```

In the **if** statement, if the first (leftmost) *command* succeeds (returns a zero exit status), **sh** executes the *command* following **then**; otherwise, **sh** executes the *command* (if any) following the **elif** (which is short for "else if"); if that succeeds, **sh** executes the *command* following the next **then**. If none of these cases hold, **sh** executes the *command* following the **else** (if any).

```

select variable [in word ...]
do commands
done

```

The **select** statement can handle menu-like interactions with the user. Its syntax is like the **for** statement. Each *word* is printed on the standard error file, one per line, with an accompanying number. If you omit the "**in word**..." part, **sh** uses the

positional parameters. **sh** then displays the value of the variable *PS3* to prompt the user to enter a numerical reply. If the reply is an empty line, **sh** displays the menu again; otherwise, **sh** assigns the input line to the variable *REPLY*, sets *variable* to the *word* selected, then executes the *commands*. **sh** does this over and over until the loop is terminated by interrupt, end-of-file, or an explicit **break**(1) statement in the *commands*.

```
until command1
do command2
done
```

The **until** statement executes *command1* and tests its exit status for success (zero) or failure (non-zero). If *command1* succeeds, the loop terminates; otherwise, **sh** executes *command2*, then goes back to execute and test *command1* again. **break**(1) and **continue**(1) commands in the *commands* can affect the operation of the loop.

```
while command1
do command2
done
```

The **while** statement works similarly to the **until** statement; however, the loop terminates whenever *command1* is unsuccessful (non-zero exit status).

Shell reserved words are recognized only when they are the unquoted first token of a command. This lets you pass these reserved words as arguments to commands executed from the shell. The full list of reserved words is:

!	{	}
case	do	done
elif	else	esac
fi	for	function
if	select	then
until	while	

Command Execution

A simple command consists of three optional parts: arguments, variable assignments, and redirection. For example,

```
variable=value argument0 argument1 <filename
```

is a simple command with one variable assignment, two arguments, and a redirection.

The command is processed as follows:

1. **sh** performs word expansion on command arguments (see *Word Expansion*). The first word of the expanded arguments is the command name. If there are no arguments, **sh** only performs variable assignments and temporary redirection.

2. **sh** performs word expansion on variable assignments. If there is no command or the command is a special built-in command (see *Built-in Commands*), variable assignments affect the current environment; otherwise, variable assignments affect the execution environment of the command.
3. **sh** does redirection, performing word expansion on any file names (see *File Descriptors and Redirection*).

sh next searches for the command name and executes the command. If the command name is a special built-in command, **sh** invokes it. Most errors in special built-ins cause a non-interactive shell to exit.

If the command name is a function, **sh** executes the function. You can disable the search for functions with the built-in command named **command**.

If the command name is a regular built-in command, **sh** invokes it.

If the command name is not a regular or special built-in command or a function, **sh** searches for an executable file containing a shell script or a program. The shell uses one of the following two methods to locate this file.

- If the command name typed to the shell has slash (/) characters in its name, the command is taken to be a full path name (absolute or relative). The shell tries to execute the contents of that file.
- Otherwise, the shell performs a *path search*. To do this, the shell obtains the value of the *PATH* variable. The value should be a list of directory names. **sh** searches under each directory for a file names that matches the command name and executes the first matching file found.

If the path search fails, the command exit status is 127. If **sh** cannot execute the program and it is not a shell script, the exit status is 126.

Command names may be marked as tracked aliases. The first time you execute a command with a tracked alias, the shell does a normal *PATH* search. If the search is successful, the shell remembers the file it finds. The next time you execute a command with the same name, **sh** immediately executes the file found on the last *PATH* search; there is no new search. This speeds up the search for the appropriate file.

The **set -h** command tells the shell that all commands should be treated as tracked aliases. See **alias**(1) and **set**(1) for more information.

Word Expansion

sh performs word expansion for simple commands, some reserved word commands, redirection file names, some shell variables (*ENV*, *MAILPATH*, *PS1*, and *PS4*), and unquoted here documents. There are four steps to expansion: substitution, word splitting, path expansion, and quote removal.

Directory substitution, parameter substitution, command substitution, and arithmetic substitution are each described in the appropriate section of this man page.

Word splitting checks each unquoted character from the previous step. If the character is one of those indicated by the *IFS* variable (by default, space, tab, and newline), **sh** splits the word into multiple words. When *IFS* contains an empty string, word expansion is not performed.

If a word contains an unquoted *, ?, or], that word is subject to path name expansion (see *Path Name Expansion*). Path name expansion is disabled if the **-f** or **-o noglob** shell flag is set (see **set**(1)).

Finally, **sh** removes any quote characters (\, ', and ") from the original word. In here documents (see the description of *number*<<[-]*name* in the section *File Descriptors and Redirection*) and shell variables that expand, single and double quotes have no special meaning and are not removed.

sh may or may not do all of these steps, depending on where word expansion is performed. Table 1-10, *Word Expansion* summarizes what steps are done. The **Arguments** entry refers to the word list of **for** and **select** commands as well as simple commands.

	Directory Substitution	Other Substitution	Word Splitting	Path Expansion
Arguments	yes	yes	yes	yes
Assignments	yes	yes	no	no
Redirection	yes	yes	no	yes/no*
Here documents	no	yes	no	no
Case statement	yes	yes	no	no
Shell variables	no	yes	no	no
* yes for interactive shell, no otherwise				

Table 1-10: Word Expansion

Quoting

To let you override the special meaning of certain *words* or special characters, the shell provides several quoting mechanisms. In general, you can turn off the special meaning of any character by putting a backslash (\) in front of the character. This is called *escaping* the character.

For example, you can tell the shell to disregard the special meaning of the newline character by putting a backslash at the very end of a line. The shell ignores the escaped newline, and joins the next line of input to the end of the current line. In this way, you can enter long lines in a convenient and readable fashion.

Escaping characters by putting a backslash in front of them is the most direct way of telling the shell to disregard special meanings; however, it can be awkward and confusing if you have several characters to escape.

As an alternative, you can put arguments in various types of quotes. Different quote characters have different *strengths*. The apostrophe (single quote) characters are the strongest. When you enclose a command line argument in apostrophes, the shell disregards the special meanings of everything inside the apostrophes. For example,

```
echo ' * '
```

just displays the * character.

Double quote characters are weaker. Inside double quotes, the shell performs command substitutions of the form

```
$( command )  
or  
`command`
```

(See *Command Substitution*.) The shell does not perform such substitutions when they appear inside apostrophes. In addition, the shell performs parameter substitutions of the form

```
$parameter
```

when they are inside double quotes but not when they're inside apostrophes (see *Parameter Substitution*). As well, you can use the backslash to escape another character when they appear inside double quotes, but inside apostrophes, the shell ignore this special meaning.

The shell treats internal field separator characters (that is, characters in the value of the *IFS* variable) literally inside quoted arguments, whether they're quoted with double quotes or apostrophes. This means that a quoted argument is considered a single entity, even if it contains *IFS* characters.

Quoting can override the special meanings of reserved words and aliases. For example, in

```
"select" program
```

the quotes around **select** tell the shell not to interpret **select** as a shell reserved word. Instead, **sh** does a normal command search for a command named **select**.

You must always quote the following characters if you want **sh** to interpret them literally:

```
|  &  ;  <  >  (  )  $  '  "  `  \
<space>  <tab>  <newline>
```

The following characters need to be quoted in certain contexts if they are to be interpreted literally.

```
*  ?  [  #  %  =  ~
```

Directory Substitution

When a word begins with an unquoted tilde (~), **sh** tries to perform *directory substitution* on the word. **sh** obtains all characters from the tilde (~) to the first slash (/) and uses this as a *user name*. **sh** looks for this *name* in the user database. If **sh** finds a matching name, it replaces ~*name* with the name of the user's *home directory*, as given in the matching */etc/passwd* entry.

For example, if you specify a file name as

```
~jsmith/file
```

sh would look up jsmith's home directory and put that directory name in place of the ~jsmith construct.

If you just specify a ~ without an accompanying name, **sh** replaces the ~ with the current value of your *HOME* variable (see *Variables*). For example,

```
echo ~
```

displays the name of your home directory. Similarly, **sh** replaces the construct tilde plus (~+) with the value of the *PWD* variable (the name of the your current directory), and replaces tilde hyphen (~-) with the value of *OLDPWD* (the name of your previous current directory). In variable assignments, tilde expansion is also performed after colons (:).

Parameter Substitution

The shell uses three types of parameters: positional parameters, special parameters, and variables. A positional parameter is represented with either a single digit (except 0) or one or more digits in curly braces (for example, 7 and {15} are both valid representations of positional parameters). Positional parameters are assigned values from the command line when you invoke **sh**.

A special parameter is represented with one of the following characters:

* @ # ? ! - \$ 0

The values to which special parameters expand are listed later in this section.

Variables are named parameters. For details on naming and declaring variables, see *Variables*.

The simplest way to use a parameter in a command line is to enter a dollar sign (\$) followed by the name of the parameter. For example, if you enter the command

```
echo $x
```

sh replaces \$x with the value of the parameter `x` and then displays the results (because **echo** displays its arguments). Other ways to expand parameters are shown later in this section.

Some parameters are built-in to the shell. These are as follows:

\$1, \$2, ... \$9

expands to the *d*th positional parameter (where *d* is the single digit following the \$. If there is no such parameter, \$*d* expands to a null string.

\$0 expands to the name of the shell, the shell script, or a value assigned when you invoked the shell.

\$# expands to the number of positional parameters.

\$@ expands to the complete list of positional parameters. If **\$@** is quoted, the result is separate arguments, each quoted. This means that

```
"$@"
```

is equivalent to

```
"$1" "$2" ...
```

\$* expands to the complete list of positional parameters. If **\$*** is quoted, the result is concatenated into a single argument, with parameters separated by the first character of the value of *IFS* (see *Variables*). For example, if the first character of *IFS* is a blank

```
"$*"
```

is equivalent to

```
"$1 $2 ..."
```

\$- expands to all options that are in effect from previous calls to the **set**(1) command and from options on the **sh** command line.

\$? expands to the exit status of the last command executed.

\$\$ expands to the process number of the original parent shell.

\$! expands to the process number of the last asynchronous command.

These constructs are called *parameters* of the shell. They include the positional parameters, but are not restricted to the positional parameters.

We have already mentioned that you can expand a parameter by putting a **\$** in front of the parameter name. More sophisticated ways to expand parameters are:

\${parameter}
expands any parameter.

\${number}
expands to the positional parameter with the given number. (When using **\$d** to refer to the *d*th positional parameter, *d* must be a single digit; with brace brackets, *number* can be greater than nine.) Since braces mark the beginning and end of the name, you can immediately follow the expression with a letter or digit.

\${variable[arithmetic expression]}
expands to the value of an element in an array named *variable*. The *arithmetic expression* gives the subscript of the array. (See *Arithmetic Substitution*.)

\${variable[*]}
expands to all elements in the array *variable*, separated by the first character in *IFS*.

\${variable[@]}
when unquoted, is the same as **\${variable[*]}**. When quoted as **"\${variable[@]}"**, it expands to all the elements in the array *variable*, each quoted individually.

\${#parameter}
expands to the number of characters in the value of the given *parameter*.

\${#*}, **\${#@}**
expands to the number of positional parameters.

\${#variable[*]}
expands to the number of elements in the array named *variable*. Elements that do not have assigned values do not count. For example, if you only assign values to elements 0 and 4, the number of elements is 2. Elements 1 through 3 do not count.

\${parameter:-word}
expands to the value of *parameter* if it is defined and has a non-empty value; otherwise, it expands *word*. This means that you can use *word* as a default value if the parameter isn't defined.

`${parameter-word}`

is similar to the preceding construct, except that the parameter is expanded if defined, even if the value is empty.

`${variable:=word}`

expands *word* with parameter expansion and assigns the result to *variable*, provided that *variable* is not defined or has an empty value. The result is the expansion of *variable*, whether or not *word* was expanded.

`${variable=word}`

is similar to the preceding construct, except that the *variable* must be undefined (it can't just be null) for *word* to be expanded.

`${parameter:?word}`

expands to the value of *parameter* provided that it is defined and non-empty. If *parameter* isn't defined or is null, **sh** expands and displays *word* as a message. If *word* is empty, **sh** displays a default message. Once a non-interactive shell has displayed a message, it terminates.

`${parameter?word}`

is similar to the preceding construct, except that **sh** displays *word* only if *parameter* is undefined.

`${parameter:+word}`

expands to *word*, provided that *parameter* is defined and non-empty.

`${parameter+word}`

expands to *word*, provided that *parameter* is defined.

`${parameter#pattern}`

attempts to match *pattern* against the value of the specified *parameter*. The *pattern* is the same as a case *pattern*. **sh** search for the shortest prefix of the value of *parameter* that matches *pattern*. If **sh** finds no match, the previous construct expands to the value of *parameter*; otherwise, the portion of the value that matched *pattern* is deleted from the expansion.

`${parameter##pattern}`

is similar to the preceding construct, except that **sh** deletes the longest part that matches *pattern* if it finds such a match.

`${parameter%pattern}`

searches for the shortest suffix of the value of *parameter* matching *pattern* and deletes the matching string from the expansion.

`${parameter%%pattern}`

is similar to the preceding construct, except that **sh** deletes the longest part that matches *pattern* if it finds such a match.

Arithmetic Substitution

Arithmetic substitution is available with the syntax:

`$((arithmetic expression))`

or

`$([arithmetic expression])`

sh replaces this sequence with the value of *arithmetic expression*. Arithmetic expressions consist of expanded variables, numeric constants, and operators.

Numeric constants have the form

`[base#]number`

where the optional *base* is a decimal integer between 2 and 36 inclusive, and *number* is a non-negative number in the given base. The default base is 10. Undefined variables evaluate to zero.

Table 1-10, *Shell Operators*, lists the operators in decreasing order of precedence. Operators sharing a heading have the same precedence. Evaluation within a precedence group is from left to right, except for the assignment operator which evaluates from right to left.

Arithmetic expressions may be used without the enclosing `$((and))` in assignment to an integer variable (see **typeset**(1)); as an argument to the following built-in commands:

break continue exit let return shift

Summary of Operators	
<i>Unary Operators</i>	
-	unary minus
!	logical negation
+ ~	identity, bitwise negation
<i>Multiplicative Operators</i>	
* / %	multiplication, division, remainder
<i>Additive Operators</i>	
+ -	addition, subtraction
<i>Bitwise Shift Operators</i>	
<< >>	bitwise shift right, bitwise shift left
<i>Relational Operators</i>	
< >	less than, greater than
<= >=	less than or equal, greater than or equal
= = ! =	equal to, not equal to
<i>Bitwise And Operator</i>	
&	and
<i>Bitwise Exclusive Or Operator</i>	
^	exclusive or
<i>Bitwise Inclusive Or Operator</i>	
	inclusive or
<i>Logical And Operator</i>	
&&	logical and
<i>Logical Or Operator</i>	
	logical or
<i>Conditional Operator</i>	
? :	if-else
<i>Assignment Operator</i>	
= *= /= %=	assignment
+= -= <<=	
>>= &= ^= =	

Table 1-11: Shell Operators

Command Substitution

In *command substitution*, **sh** uses the expansion of the standard output of one command in the command line for a second command. There are two syntaxes.

The first syntax (called *backquoting*) surrounds a command with grave accents ```, as in

```
ls -l `cat list`
```


To process this command line, **sh** first executes the **cat** command and collects its standard output. The shell then breaks this output into arguments and puts the result into the command line of the **ls** command. The previous command therefore lists the attributes of all files, the names of which are contained in the file **list**.

This syntax is easy to type, but is not useful if you want to put one command substitution inside another (*nesting* command substitutions). A more useful syntax is

```
$(command)
```

as in

```
vi $(fgrep -l function $(find . -name '*.c'))
```

This command uses **find** to search the current directory and its subdirectories to find all files, the names of which end in **.c**. It then uses **fgrep** to search each such file for those that contain the string **function**. Finally, it calls **Vi** to edit each such file.

There is an historical inconsistency in the backquoting syntax. A backslash (****) within a backquoted command is interpreted differently depending on its context. Backslashes are interpreted literally unless they precede a dollar sign (**\$**), grave accent (**`**), or another backslash (****); in these cases, the leading backslash becomes an escape character to force the literal interpretation of the **\$**, **`**, or ****. Consequently, the command

```
echo '\$x'
```

issued at system level produces the output

```
\$x
```

while the same command nested in a backquoted syntax

```
echo `echo '\$x'`
```

produces the output

```
$x
```

We recommend the `$(command)` syntax for command substitutions.

sh performs command substitutions as if a new copy of the shell is invoked to execute the command. This affects the behavior of **\$-** (standing for the list of options passed to the shell). If a command substitution contains **\$-**, the expansion of **\$-** does not include the **-i** option, since the command is being executed by a non-interactive shell.

File Descriptors and Redirection

The shell sometimes refers to files using *file descriptors*. A file descriptor is a number in the range 0 through 9. It may have any number of digits. For example, the file descriptors 001 and 01 are identical to file descriptor 1. Various operations (for example, **exec**) can associate a file descriptor with a particular file.

Some file descriptors are set up at the time the shell starts up. These are the standard input/output streams:

- standard input (file descriptor 0)
- standard output (file descriptor 1)
- standard error (file descriptor 2)

Commands running under the shell can use these descriptors and streams too. When a command runs under the shell, the streams are normally associated with your terminal; however, you can *redirect* these file descriptors to associate them with other files (so that I/O on the stream takes place on the associated file instead of your terminal). In fact, the shell lets you redirect the I/O streams associated with file descriptors 0 through 9, using the following command line constructs.

number<*file*

uses *file* for input on the file descriptor *number*. If you omit *number*, as in <*file*, the default is 0; this redirects the standard input.

number>*file*

uses *file* for output on the file descriptor *number*. If you omit *number*, as in >*file*, the default is 1; this redirects the standard output. The shell creates the file if it doesn't already exist. The redirection fails if the file already exists and **noclobber** is set (see **set**(1)).

number>|*file*

is similar to *number*>*file* but if *file* already exists, overwrites the current contents of the file.

number<>*file*

uses *file* for input and output with the file descriptor *number*. This is most useful when the file is another terminal or modem line. If you omit *number*, as in <>*file*, the default *number* is zero; this redirects the standard input. Output written to the file overwrites the current contents of the file (if any). The shell creates the file if it doesn't already exist.

number>>*file*

is similar to *number* > *file* except that output is appended to the current contents of *file* (if any).

number<<[-]*name*

lets you specify input to a command from your terminal (or from the body of a shell script). This notation is known as a *here document*. The shell reads from the standard input and feeds that as input to file descriptor *number* until it finds a line that exactly matches the given *name*. If you omit *number*, the default is the standard input. For example, to process the command

```
cat <<abc >out
```

the shell reads input from the terminal until you enter a line that consists of the word `abc`. This input is passed as the standard input to the `cat` command, which then copies the text to the file `out`.

If any character of *name* is quoted or escaped, **sh** does not perform substitutions on the input; otherwise, it performs variable and command substitutions, respecting the usual quoting and escape conventions. If you put `-` before *name*, **sh** deletes all leading tabs in the *here document*.

number1<&*number2*

makes the input file descriptor *number1* a duplicate of file descriptor *number2*. If you omit *number1*, the default is the standard input (file descriptor 0). For example, `<&4` makes the standard input a duplicate of file descriptor 4. In this case, entering input on 4 has the same effect as entering input on the standard input. A value of `p` for *number2* stands for the standard output of the current co-process.

number1>&*number2*

makes the output file descriptor *number1* a duplicate of file descriptor *number2*. If you omit *number1*, the default is the standard output (file descriptor 1). For example, `>&2` makes the standard output a duplicate of file descriptor 2 (the standard error). In this case, writing output on the standard output has the same effect as writing output on the standard error. A value of `p` for *number2* stands for the standard input of the current co-process.

number<&-

closes input descriptor *number*. If you omit *number*, it closes the standard input.

number>&-

closes output descriptor *number*. If you omit *number*, it closes the standard output.

Normally, redirection only applies to the command where the redirection construct appears; however, see **exec**(1).

The order of *redirection* specifications is significant, since an earlier redirection can affect a later one; however, these specifications may be freely intermixed with other command arguments. Since the shell takes care of the redirection, these constructs are not passed to the command itself.

Note: The shell performs the implicit redirections needed for pipelines before performing any explicit redirections.

File Name Generation

The characters `*?[]` are called *glob characters* or *wild card characters*. If an unquoted argument contains one or more glob characters, the shell processes the argument for *file name generation*. The glob characters are part of *glob patterns* which represent file and directory names. These patterns are similar to regular expressions, but differ in syntax, since they are intended to match file names and words (not arbitrary strings). The special constructions that may appear in glob patterns are:

- ?** Matches exactly one character of a file name, except for the separator character `/` and a `.` at the beginning of a file name. `?` only matches an actual file name character and does not match nonexistent characters at the end of the file name. `?` is analogous to the metacharacter `.` in regular expressions.
- *** Matches zero or more characters in a file name, subject to the same restrictions as `?`. `*` is analogous to the regular expression `.*`.

[chars]

Defines a *class* of characters; the glob pattern matches any single character in the class. A class may contain a range of characters by writing the first character in the range, a dash `-`, and the last character. For example, `[A-Za-z]`, in the POSIX locale, stands for all the uppercase and lowercase letters. If you want a literal `-` character in the class, put it as the first or last character inside the brackets. If the first character inside the brackets is exclamation mark (`!`), the pattern matches any single character that is *not* in the class.

Some sample patterns are:

```
[!a-f]*.c
```

matches all `.c` files beginning with something other than the letters `a` through `f`.

```
/???/?..?
```

matches all files which are under the root directory in a directory that has a three letter name, and which have a base name containing one character followed by a `.` followed by another single character.

```
*/*.[chyl]
```

matches all `.c`, `.h`, `.y`, and `.l` files in a subdirectory of the current directory.

```
~mks/*.ksh
```

matches all shell scripts in the home directory of user `mks` (see *Directory Substitution* for the use of `~`).

If no files match the pattern, **sh** leaves the argument untouched. If the **set** option **-f** or **-o noglob** is in effect, the shell does not perform file name generation.

Variables

The shell maintains variables and can expand them where they are used in command lines; see *Parameter Substitution* for details.

A variable name must begin with an uppercase or lowercase letter or the underscore (`_`). Subsequent characters in the name, if any, may be upper or lowercase letters, underscores, and/or digits 0 through 9. You can assign a value to a variable with

```
variable=value
```

You may implicitly declare a variable as an array by using a subscript expression when assigning a value, as in

```
variable [ arithmetic expression ] =value
```

You can use a subscripted array variable anywhere that the shell allows an ordinary variable. See the section on *Arithmetic Substitution* for the syntax of an *arithmetic expression*. Also see **typeset**(1), **export**(1), and **readonly**(1) for details about the attributes of shell variables, and how shell variables may be exported to child processes.

For a list of variables that the shell either sets or understands, see *ENVIRONMENT VARIABLES*.

Shell Execution Environments

A shell execution *environment* is the set of conditions affecting most commands executed within the shell. It consists of:

- open files
- the current working directory (see **cd**(1))
- the file creation mask (see **umask**(1))
- the traps currently set (see **trap**(1))
- the shell parameters (see **set**(1) and **export**(1))
- the shell functions currently defined (see *Command Execution*)
- options (see **set**(1))

A *subshell environment* starts as a duplicate of the shell environment, except that traps caught by the shell are set to default values in the subshell. Since the subshell environment starts as a duplicate, the value of the *ENV* environment variable is not run. Changes made to a subshell environment do not affect the shell environment.

Command substitutions, commands within parentheses (that is, *(command)*), and commands to be run asynchronously (that is, *command&*) all run in subshell environments. Each command in a pipeline *command | command* runs in a subshell environment.

Shell utilities also run in a separate environment which does not affect the shell environment, except for certain built-in utilities (for example, **cd** and **umask**) which explicitly alter the

shell environment. The shell sets up a shell utility's environment to include the following:

- open files, subject to redirection
- current working directory (see **cd**(1))
- file creation mask (see **umask**(1))
- traps; traps caught by the shell are set to default values and traps ignored by the shell are ignored by the utility
- variables defined inside the shell and having the **export** attribute

Built-in Commands

The following commands are built into the shell. Building such commands into the shell increases the performance of shell scripts and allows access to the shell's internal data structure and variables. For details on a command, see its man page. These internal commands have semantics indistinguishable from external commands.

:	.	[alias	break
cd	continue	echo	eval	exec
exit	export	false	fc	getopts
let	newgrp	print	pwd	read
readonly	return	set	shift	test
time	times	trap	type	typeset
ulimit	unmask	unalias	unset	wait
whence				

POSIX.2 recognizes a subset of these commands as *special* built-ins. Syntax errors in special built-in commands cause a non-interactive shell to exit with the exit status set by the command. The special built-in utilities are:

:	.	break	continue
eval	exec	exit	export
readonly	return	set	shift
trap	typeset	unset	

As well as built-in commands, the shell has a set of predefined aliases:

functions	hash	history	integer
nohup	r	stop	suspend

See **alias**(1) for details.

EXAMPLES

Software distributed over computer networks such as Usenet is often distributed in a form known as a *shell archive*. In essence, a shell archive is a shell script containing the data of one or more files, plus commands to reconstruct the data files and check that the data was transmitted correctly. The following shows a sample shell archive.

```
# This is a shell archive.
# It contains the one file "frag.ksh"
# To extract contents, type
# sh file
#
if [ -f frag.ksh ]
then echo frag.ksh exists: will not overwrite
else
    echo extracting frag.ksh
    sed 's/^X//' >frag.ksh <<_EOF_
X# This is frag.ksh
X# Not very interesting, really.
Xecho frag.ksh here!
_EOF_
    if [ "`sum frag.ksh|awk '{print $1}'`" != 52575 ]
    then echo frag.ksh damaged in transit
    fi
fi
```

The following simple script produces as much of the Fibonacci sequence as can be calculated using integers.

```
# Print out Fibonacci sequence; start sequence
# with first two positional parameters:
# default 1 1
typeset -i x=${1:-1} y=${2:-1} z
while [ x -gt 0 ] # until overflow
do
    echo $x
    let z=y+x x=y y=z
done
```

The following implements the **basename(1)** utility as a shell function.

```
# basename utility as shell function
function basename {
    case $# in
        1)    ;;
        2)    eval set \${1%$2} ;;
        *)    echo Usage: $0 pathname '[suffix]'
              return 1 ;;
    esac
    echo ${1##*/}
    return 0
}
```

ENVIRONMENT VARIABLES

sh uses the following environment variables:

- (underscore) expands to the last argument from the previously executed command. For every command that is executed as a child of the shell, **sh** sets this variable to the full path name of the executable file and passes this value through the environment to that child process. When processing the *MAILPATH* variable, this variable holds the value of the corresponding mail file.

CDPATH

contains a list of directories for the **cd(1)** command to search. Directory names are separated with colons. *CDPATH* works in a similar way to the *PATH* variable.

COLUMNS

contains the maximum width of the edit window in the KornShell's Vi or EMACS editing mode. It is also used by several other commands to define the width of the terminal output device.

EDITOR

when ending with any of *vi*, *emacs*, or *gmacs*, enables the corresponding editing mode (see **set(1)**, **shedit(3)**).

ERRNO contains the system error number of the most recently failed system call. The shell only sets this variable for errors which occur in the current environment. Assigning a value of 0 to this variable clears it.

ENV

contains a value that **sh** performs parameter substitution on and uses the result as the name of an initialization file. This file is executed with the **.** command (see **dot(1)**). This facility lets you define functions (see *Command Syntax*), aliases (see **alias(1)**), and other non-exported items during shell initialization.

FCEDIT

contains the name of the default editor for the **fc** command. If this variable is not set, the default is the **ed** command.

HISTFILE

contains the path name of a file to be used as the history file. When the shell starts, the value of this variable overrides the default history file. See *FILES*.

HISTSIZE

contains the maximum number of commands that the shell keeps in the history file. If this variable contains a valid number when the shell starts, it overrides the default of 127.

HOME contains your home directory. This is the default directory for the **cd**(1) command.

IFS contains a series of characters to be use as *internal field separator* characters. During word expansion (see *Word Expansion*), the presence of any of these characters within a word causes that word to be split. In addition, the shell uses these characters to separate values put into variables with the **read** command. Lastly, the first character in the value of *IFS* separates the positional parameters in *\$** expansion. By default, *IFS* contains space, tab, and newline.

LINENO

contains the number of the line currently being executed by a shell script.

LINES contains a numeric value that limits the number of output lines used by the **select** statement in printing its menu.

MAIL contains the path name of a *mailbox*. If *MAILPATH* is not set, the MPE/iX Shell tells you when new mail arrives in this file. The shell assumes that new mail has arrived if the file modify time changes.

MAILCHECK

contains the number of seconds of elapsed time that must pass before checking for mail; if not set, the default value is 600 seconds. When using the *MAIL* or *MAILPATH* variables, the MPE/iX Shell checks for mail before issuing a prompt.

MAILPATH

contains a list of mailbox files. This overrides the *MAIL* variable. The mailbox list is separated by colons. If any name is followed by *?message* or *%message*, **sh** displays the message if the corresponding file has changed. **sh** performs parameter and command substitution on *message* and the variable *_* (temporarily) expands to the name of the mailbox file. If no *?message* or *%message* is present, the default message is you have mail in *\$_..*

OLDPWD

contains the name of the previous directory. The **cd** command sets this variable.

PATH contains a list of directories which constitute the search path for executable commands. Directories in this list are separated with colons. **sh** searches each directory in the order specified in the list until it finds a matching executable. If you want the shell to search the current directory, put a null string in the list of directories (for example, starting the list with a colon/semicolon tells the shell to search the current directory first).

PID contains the decimal value of the process ID of the parent of the shell. See **ps**(1).

PS1 contains the primary prompt string used when the shell is interactive. The default value is a dollar sign followed by a space (\$). The shell expands parameters before the prompt is printed. A single exclamation mark (!) in the prompt string is replaced by the command number from the history list (see **fc**(1)); for a real exclamation mark in the prompt, use ! !.

PS2 contains the secondary prompt, used when completing the input of such things as *reserved word commands*, quoted strings, and here documents. The default value of this variable is a greater than sign followed by a space (>).

PS3 contains the prompt string used in connection with the **select** reserved word. The default value is a number sign followed by a question mark and a space (#?).

PS4 contains the prefix for traced commands with **set -x**. The default value is a plus sign followed by a space (+).

PWD contains the name of the current working directory. When the shell starts, the current directory name is assigned to *PWD* unless the variable already has a value.

RANDOM

expands to a random integer. Assigning a value to *RANDOM* sets a new seed for the random number generator.

REPLY contains the user input from the **select** statement (see *Command Syntax*) The **read**(1) command also sets this variable if no variable is specified.

SECONDS

contains elapsed time. The value of this variable grows by 1 for each elapsed second of real time. Any value assigned to this variable sets the *SECONDS* counter to that value; initially the shell sets the value to 0.

SHELL contains the full path name of the current shell. It is not set by the shell, but is used by various other commands to invoke the shell.

TMOUT contains the number of seconds before user input times out. If user input has not been received within this length of time, the shell terminates.

VISUAL

overrides the *EDITOR* variable in setting *vi*, *emacs*, or *gmacs* editing modes (see **shedit**(3)).

FILES

sh uses the following files:

.sh_history

default history storage file.

.profile

profile for login shell.

/etc/profile

system-wide profile for login shells.

/etc/suid_profile

Profile used under the *privileged* option and when effective and real uids are different

*/tmp/sh**

Temporary files for here documents, command substitution, history re-execution, etc. The default directory */tmp* can be overridden by setting the shell variable *TMPDIR* to the name of some other directory. See **environ**(3).

DIAGNOSTICS

Possible exit status values are:

0 Successful completion.

1 An error occurred.

Otherwise, the exit status of the shell defaults to the exit status of the last command executed by the shell. This default may be overridden by explicit use of the **exit** or **return** commands. The exit status of a pipeline is the exit status of the last command in the pipeline.

Most diagnostics are self explanatory. See separate man pages for diagnostics from built-in commands.

Messages

Message: <(command) and >(command) not implemented

Cause: You attempted to use <(command) or >(command) which are not implemented in this version of the shell.

Action: Do not use these constructs.

Message:	<< <i>name</i> unclosed
Cause:	The shell encountered an end of file character while reading a here document before it encountered <i>name</i> .
Action:	Make sure that <i>name</i> appears in the text of the input file.
Message:	ambiguous redirection
Cause:	You specified a target for a redirection that required word expansion and expanded to more than one word.
Action:	Make sure that any targets requiring word expansion expand to only one word.
Message:	assign only to variable
Cause:	You specified an assignment where the left hand side that was not a variable.
Action:	Only use the assignment operators to assign values to variables.
Message:	bad \${} modifier
Cause:	You specified an invalid modifier in a \${} construct.
Action:	Check the <i>Parameter Substitution</i> subsection for a list of valid modifiers in \${} constructs.
Message:	bad file descriptor " <i>fd</i> "
Cause:	You tried to read from, or write to, the file descriptor <i>fd</i> which was not open for that operation.
Action:	Open the file descriptor <i>fd</i> for the appropriate operation.
Cause:	Invalid string given where a number was expected. (<i>MAILCHECK</i> , <i>TMOU</i> , <i>OPTIND</i> , <i>HISTSIZ</i> , and <i>COLUMNS</i> environment variables, or array subscript.)
Action:	Specify a decimal number (containing only the digits '0' through '9') to the appropriate environment variables or subscripts.
Message:	bad shift count <i>expr</i>
Cause:	You specified an expression that did not evaluate to a number in the range from 0 to the number of remaining positional parameters.
Action:	Specify an expression that evaluate to a number in the range from 0 to the number of remaining positional parameters.
Message:	base must be in [2,36]
Cause:	You specified a base that was not in the range 2 to 36.
Action:	Specify a base in the 2 to 36 range.
Message:	base " <i>number</i> " not in [2,36]
Cause:	You used the -i option of typeset to specify a base for an integer, but the base was not in the range from 2 to 36.
Action:	Specify a base in the range from 2 to 36.

Message:	cannot continue job: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	cannot create temporary file
Cause:	sh or one of its built-in utilities needs a temporary file to perform some operations. It was unable to create this file, for example, because the disk was full.
Action:	Free up more disk space.
Message:	cannot fork: <i>system error</i>
Cause:	The system refused a shell request to fork, despite several attempts. See syserror (3).
Action:	See syserror (3).
Message:	cannot open " <i>filename</i> " for input/output: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	cannot open " <i>filename</i> ": <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	cannot open script " <i>scriptfile</i> ": <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	cannot redirect (dup2): <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	Cannot restore privileged state
Cause:	You specified set +o privileged or -p , but for some reason, the shell cannot restore the affected values.
Action:	Exit the current shell and start a new one.
Message:	<i>command</i> : cannot execute: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	<i>command</i> : not found
Cause:	The specified <i>command</i> could not be found when you tried to execute it.
Action:	Check that <i>command</i> exists, that it was named properly, that you have appropriate permissions and that its directory is included in your search path.
Message:	divide by 0
Cause:	You attempted to divide by 0.
Action:	Do not divide by 0.

-
- Message:** *error in arithmetic expression "expr" near substr "*
- Cause:** An *error* occurred in the arithmetic expression *expr* near the substring *substr*. *error* is one of the errors listed in this section. See the error listing for possible causes.
- Action:** See the error listing for suggested actions.
- Message:** *error in arithmetic expression "expr"*
- Cause:** An *error* occurred in the arithmetic expression *expr*. *error* is one of the errors listed in this section. See the error listing for possible causes.
- Action:** See the error listing for suggested actions.
- Message:** file descriptor *fd* already redirected
- Cause:** You attempted to redirect the file descriptor *fd* which was already being redirected in the same command.
- Action:** Only redirect a file descriptor once.
- Message:** file "*filename*" already exists
- Cause:** You attempted to redirect output into an existing file, but you have turned on the **noclobber** option (see **set**(1)).
- Action:** Use the construct `>|filename` to redirect the output into an existing file or turn the **noclobber** option off with
- `set +o noclobber`
- Message:** *filename*: not found
- Cause:** The shell was unable to find the file *filename*.
- Action:** Check that the file exists, and was named properly.
- Message:** get limit failed
- Cause:** See **syserror**(3).
- Action:** See **syserror**(3).
- Message:** getgroups failed
- Cause:** See **syserror**(3).
- Action:** See **syserror**(3).
- Message:** history: system error
- Cause:** See **syserror**(3).
- Action:** See **syserror**(3).
- Message:** history not available
- Cause:** The shell was unable to open a history file when you logged in.
- Action:** Make sure that the environment variable *HISTFILE* is set to a file which is named properly and for which you have appropriate permissions. You may have to log in again.

Message: Insufficient memory
Cause: There were not enough free system resources to perform the specified operation.
Action: Free up more resources.

Message: job [*job-id*] not job controlled
Cause: You specified the job identifier of a job which was not being job controlled.
Action: Use the **jobs** command to get a list of jobs currently being job controlled.

Message: job control disabled
Cause: You attempted to use the **fg** or **bg** command when **set -o monitor** (or **set -m**) was not set.
Action: Turn on monitor mode with **set -o monitor** or **set -m**. This mode is not supported on all systems.

Message: *job-id*: No such job
Cause: You specified a nonexistent *job-id*.
Action: Use the **jobs** command to get a list of jobs that are currently job controlled.

Message: "*job-id*" is not a job
Cause: You specified a job-identifier that is not valid.
Action: Specify a valid job-identifier.

Message: misplaced subscript
Cause: The subscript for an array was missing or invalid.
Action: Provide the missing subscript.

Message: missing closing "*char*"
Cause: You specified a {, =, ', `, ", (, ((, or [and did not provide the corresponding closing character.
Action: Provide missing closing character.

Message: missing command after -c
Cause: You specified the **-c** option but did not provide a command as an argument.
Action: Provide the missing command.

Message: *name*: cannot assign
Cause: You attempted to use the special parameter @ or * either as part of the undefined variable *name* in the construct **\${name=word}** or as part of the empty or undefined variable *name* in the construct **\${name:=word}**.
Action: Do not use the special parameters @ and * as part of *name* when using these two constructs.

Message: *name*: no expansion of unset variables
Cause: You attempt to expand an unset variable when **set -o nounset** was on.
Action: Use **set +o nounset** to turn **nounset** off and retry the expansion.

Message:	<i>name</i> : not a function
Cause:	You tried to declare the given name as a function, but the name already referred to something that was not a function (for example, a variable).
Action:	Make sure that <i>name</i> is a function and spelled correctly.
Message:	<i>name</i> : parameter null or not set
Cause:	You specified a <code>\${name?}</code> construct where <i>name</i> was not set and no message followed the <code>?</code> .
Action:	Set <i>name</i> and specify a message after the <code>?</code> .
Message:	<i>name</i> : readonly variable
Cause:	You attempted to change or remove the variable <i>name</i> which was marked as read-only.
Action:	Do not attempt to change or remove a read-only variable.
Message:	" <i>name</i> " is not an identifier
Cause:	You attempted to use a non-alphanumeric <i>name</i> as an identifier.
Action:	Use only alphanumeric names for identifiers.
Message:	<i>name</i> is not found
Cause:	You specified a <i>name</i> that type was unable to find.
Action:	Check that the <i>name</i> exists, was spelled properly, and that you have the appropriate permissions.
Message:	" <i>name</i> " not a valid trap name
Cause:	You specified an unrecognized trap name.
Action:	Check that you spelled the trap name correctly.
Message:	no active co-process
Cause:	You attempted to send output to or receive input from a co-process when there was no active co-process.
Action:	Do not use the -p option with print or read when there are no active co-processes.
Message:	no command matches " <i>string</i> "
Cause:	You attempted to use fc to edit a command beginning with a particular <i>string</i> , but there was no such command in the history file.
Action:	Use the fc command to browse through the history file to ensure that <i>string</i> is entered correctly.
Message:	no command substitution permitted
Cause:	The POSIX.2a <code>wordexp()</code> function called the shell to expand a string that contained command substitution, such as <code>\$(cmd)</code> or <code>f(CW`cmd`)</code> .
Action:	Check the program that called <code>wordexp()</code> and ensure that the string to be expanded does not contain any command substitutions.

Message:	no file descriptor available
Cause:	You attempted to redirect a file descriptor but none were available. When a file descriptor is redirected, the old value is remembered by the shell by duplicating it to yet another file descriptor. The total number of file descriptors is limited by the system and hence the shell may run out while it looks like your command is using far fewer than the maximum number of descriptors.
Action:	Free up a file descriptor.
Message:	no memory: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	no pipes available: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	not an identifier
Cause:	You specified a for , function , or select statement, but did not follow it with a valid identifier.
Action:	Provide a valid identifier after the statement.
Message:	not executing function
Cause:	You specified a return command when you were not executing a function.
Action:	Only use return to return from a function.
Message:	Octal mode may contain only digits [0-7] in <i>numstring</i>
Cause:	When using the octal mode to indicate new access permissions, you specified a string <i>numstring</i> which contained a character other than the digits 0 to 7.
Action:	Make sure that all <i>mode</i> values in octal mode are valid octal numbers, containing only the digits 0 through 7.
Message:	only one co-process allowed
Cause:	You tried to create more than one co-process.
Action:	Do not attempt to create more than one co-process.
Message:	<i>operation</i> : restricted
Cause:	You were using a restricted shell and attempted to perform an <i>operation</i> that is not allowed in a restricted shell.
Action:	Use a non-restricted shell to perform <i>operation</i> .
Message:	Option <i>-option</i> argument missing
Cause:	You did not provide an argument for <i>-option</i> .
Action:	Provide the missing argument.

Message:	pipe for coprocess: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	reading: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	reading script: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	recursion too deep
Cause:	You have defined a function that has too many levels of recursion.
Action:	Simplify the function to use fewer levels of recursion.
Message:	<i>script</i> : not found
Cause:	exec was unable to find the specified shell script to execute it.
Action:	Check that the shell script exists, that it was named properly, that you have appropriate permissions and that its directory is included in your search path.
Message:	set limit failed
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	shell metacharacter in wordexp()
Cause:	The POSIX.2a wordexp() function called the shell to expand a string that contained special shell characters.
Action:	Check the program which calls wordexp() and ensure that the string to be expanded does not contain any special shell characters.
Message:	" <i>signal</i> " not a valid signal
Cause:	You specified a non-integer signal for kill that was not a valid signal name, or you specified a signal that is outside the range of valid signal numbers.
Action:	Make sure that you specify a valid signal number or name for <i>signal</i> .
Message:	signal number <i>num</i> not conventional
Cause:	You specified a conventional signal number <i>num</i> , but this system does not use conventional signal numbers.
Action:	Use the corresponding signal name.
Message:	stack overflow
Cause:	You specified an expression that was too complicated for the stack to handle.
Action:	Try simplifying the expression.

Message: strcoll error, cannot malloc space.
Cause: There are not enough free system resources to allocate string space.
Action: Free up more resources.

Message: syntax error
Cause: A syntax error occurred.
Action: Correct the syntax.

Message: syntax error: got *string1*, expecting *string2*
Cause: When processing your input, the shell encountered *string1* when it was expecting *string2*.
Action: Check the *DESCRIPTION* section for a description of the syntax for various shell commands. Re-enter your input with the correct syntax.

Message: temporary file error using here document: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: too many << in line
Cause: You specified more than 10 here documents using <<.
Action: Simplify your command line to use fewer here documents.

Message: Traced functions not effective unless -o korn is set
Cause: You specified **typeset -ft** (turn on tracing for the named function) was specified, but Korn Shell mode wasn't enabled.
Action: Don't specify "typeset -ft", or enable Korn Shell mode with "set -o korn".

Message: Undefined functions not implemented
Cause: **typeset -fu** specifies attributes for a function which will be defined later. This is currently not implemented.
Action: Specify the function's attributes when defining it, instead of using **typeset -fu**.

Message: unknown operator
Cause: You specified an unknown operator.
Action: Check the *Arithmetic Substitution* subsection of the **sh**(1) man page for a table showing the valid arithmetic operators.

Message: Unknown option "-option"
Cause: You specified an option that is not valid for **sh** or one of its built-in utilities.
Action: Check the *DESCRIPTION* section of this man page or of the appropriate built-in utility for a list of valid options.

Message:	Unknown option " <i>option</i> "
Cause:	When using the set command, you specified an unknown option after the -o option.
Action:	Check the <i>DESCRIPTION</i> section of the set (1) man page for a list of options that you can specify with -o .
Message:	Unknown or missing operator in symbolic mode " <i>mode-string</i> "
Cause:	When using the symbolic mode to indicate new access permissions, you specified a string <i>modestring</i> which was either missing an operator or contained an operator that chmod does not recognize.
Action:	Make sure that all <i>mode</i> values in symbolic mode contain one of the following operators: +, -, or =.
Message:	unmatched ? :
Cause:	You specified the ? operator without the :.
Action:	Specify the missing :.
Message:	writing: system error
Cause:	See syserror (3).
Action:	See syserror (3).

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. Upward compatible with the Bourne Shell on UNIX systems.

The **select** and **function** reserved word commands are from the KornShell. The shell variables *ERRNO*, *LINENO*, *PS3*, *PWD*, *OLDPWD*, *TMOUT* are from the KornShell. Arrays and subscripted variables are from the KornShell. All the predefined aliases are from the KornShell. The restricted shell and invocation option **-r** are from SVID and the KornShell.

The construct `$[arithmetic expression]` is an extension to the POSIX standard.

LIMITS

The size of the command argument and exported variables passed between the shell and the utilities it runs is dependent on the operating system. On MPE/iX, this limit is 8192 bytes and includes both the command line arguments and the environment being passed.

The maximum length of an executable file name, including subdirectories and extensions, is dependent on the operating system.

MPE/iX NOTES

Due to limitations in the current implementation of MPE/iX, there are a number of limitations in the behavior of the **sh** command.

- You cannot currently use **sh** as your login shell. To invoke the MPE/iX Shell from the MPE/iX CI so that it performs all of the actions associated with a login shell, run the following commands:

```
CHGROUP
SH.HPBIN.SYS -L
```

If you want to run the shell immediately upon logging onto the system, you can place these lines in a logon UDC.

The default configuration for the MPE/iX Shell is to treat the current directory as your *HOME* directory when you start it with **-L**. This is configured in the system profile */etc/profile* and it is possible to alter this behavior by editing that file.

It is recommended that you always start the shell in the same place — usually your home group. The **CHGROUP** command ensures this.

- The **ulimit** command is currently non-functional.
- Child processes cannot survive the death of the parent process.
- The General Terminal Interface described in POSIX.1 is not currently implemented. The MPE/iX Shell and Utilities commands use the MPE/iX Subsystem break (**CTRL-Y**) to permit the user to interrupt programs. This facility is a weak emulation of the POSIX facilities, but it does allow you to interrupt the program currently running in the foreground.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

alias(1), break(1), cd(1), continue(1), dot(1), echo(1), eval(1), exec(1), exit(1), export(1), fc(1), getopts(1), let(1), print(1), ps(1), pwd(1), read(1), readonly(1), return(1), set(1), shift(1), test(1), trap(1), true(1), typeset(1), unalias(1), unset(1), whence(1), shedit(3)

NAME

shift — shift positional parameters

SYNOPSIS

shift [*expression*]

DESCRIPTION

shift renames the positional parameters so that *i*+*n*th positional parameter becomes the *i*th positional parameter, where *n* is the value of the given arithmetic *expression*. If you omit *expression*, the default value is 1. The value of *expression* must be between zero and the number of positional parameters (\$#), inclusive.

EXAMPLE

The commands:

```
set a b c d
shift 2
echo $*
```

produce:

```
c d
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because the *expression* had a negative value or was greater than the number of positional parameters.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

Allowing an expression, rather than just a number, is an extension found in the KornShell.

NOTE

This is a special built-in command of the shell.

SEE ALSO

set(1), **sh**(1)

NAME

sleep — suspend execution for a specified time

SYNOPSIS

sleep *seconds*

DESCRIPTION

The **sleep** command continues running until the specified number of *seconds* has elapsed. **sleep** can delay execution of a program or produce periodic execution in conjunction with shell commands.

The *seconds* argument can be either a number of seconds, or a more general time description of the form *nhmmss*, with the *nh*, *nm*, and the *s* being optional.

EXAMPLES

```
sleep 20h10m
```

sleeps for 20 hours and 10 minutes (or 72600 seconds).

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 2 Failure because you specified no *seconds* value or because *seconds* is an invalid argument (for example, invalid format).

Message

Message:	Improper sleep interval specification in " <i>seconds</i> "
Cause:	You specified a value for <i>seconds</i> on the command line that contained a character other than a digit, h, m, or s.
Action:	Specify a value for <i>seconds</i> that does not contain any invalid characters.
Message:	Unknown option " <i>-option</i> "
Cause:	You specified an option that is not valid for this command.
Action:	Check the <i>DESCRIPTIONS</i> section for a list of valid options.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

sleep(1)

MPE/iX Shell and Utilities

sleep(1)

SEE ALSO

date(1)

NAME

sort — sort/merge utility

SYNOPSIS

```
sort [-cmu] [-o outfile] [-t char] [-y[n]] [-zn] [-bdfiMnr]
[-k startpos[,endpos]] ... [file ...]
```

```
sort [-cmu] [-o outfile] [-t char] [-yn] [-zn] [-bdfiMnr]
[+startposition [-endposition]] ... [file ...]
```

DESCRIPTION

The **sort** command implements a full sort and merge facility. **sort** operates on input files containing records which are separated by the newline character.

When you do not specify either the **-c** or the **-m** option, **sort** sorts the concatenation of all input files and produces the output on standard output.

Options

sort accepts the following options:

- b** skips, for comparison purposes, any leading white space (blank or tab) in any field (or key specification).
- c** checks input files to ensure that they are correctly ordered according to the key position and sort ordering options specified, but does not modify or output the files. This option only affects the exit code.
- d** uses *dictionary* ordering. **sort** examines only blanks, upper and lowercase letters, and numbers when making comparisons.
- f** converts lowercase letters to uppercase for comparison purposes.
- i** ignores, for comparison purposes, non-printable characters.
- k** [*startpos* [, *endpos*]] specifies a sorting key. See the *Sorting Keys* section of this man page for more information.
- M** assumes that the field contains a month name for comparison purposes. Any leading white space is ignored. If the field starts with the first three letters of a month name in upper or lowercase, the comparisons are in month-in-year order. Anything that is not a recognizable month name compares less than JAN.
- m** merges *files* into one sorted output stream. This option assumes that each input file is correctly ordered according to the other options specified on the command line; you can check this with the **-c** option.

- n** assumes that the field contains an initial numeric value. **sort** sorts first by numeric value and then by the remaining text in the field according to options. This option treats a field which contains no digits as if it had a value of zero.
- o outfile** writes output to the file *outfile*. By default, **sort** writes output onto the standard output. The output file can be one of the input files. In this case, **sort** makes a copy of the data to allow the (potential) overwriting of the input file.
- r** reverses the order of all comparisons so that **sort** writes output from largest to smallest rather than smallest to largest.
- t char** indicates that the character *char* separates input fields. When you do not specify the **-t** option, **sort** assumes that any number of white space (blank or tab) characters separate fields.
- u** ensures that output records are unique. If two or more input records have equal sort keys, **sort** writes only the first record to the output. When you use **-u** with **-c**, **sort** prints a diagnostic message if the input records have any duplicates.
- y[n]** restricts the amount of memory available for sorting to *n* K of memory (where a K of memory is 1024 bytes). If *n* is missing, **sort** chooses a reasonable maximum amount of memory for sorting, dependent upon system configuration. **sort** needs at least enough memory to hold five records simultaneously. If you try to request less, **sort** automatically takes enough. When the input files overflow the amount of memory available, **sort** automatically does a polyphase merge (external sorting) algorithm which is, of necessity, much slower than internal sorting. When you use **-u** with **-c**, **sort** prints a diagnostic message if the input records have any duplicates. Using the **-y** option may therefore improve sorting performance substantially for medium to large input files.
- zn** indicates that the longest input record (including the newline character) is *n* characters in length. By default, record length is limited to `LINE_MAX`.
- +startposition[-endposition]** is an obsolete method of specifying a sorting key. See the *Sorting Keys* section of this man page for more information.

The **-b**, **-d**, **-f**, **-i**, **-M**, **-n**, **-r**, and **-t** options control the way in which **sort** compares records to determine the order in which the records are written to the output. These ordering options apply globally to all sorting keys except those keys for which you individually specify the ordering option. For more on sorting keys, see the next section.

Sorting Keys

By default, **sort** examines entire input records to determine ordering. By specifying *sorting keys* on the command line, you can tell **sort** to restrict its attention to one or more parts of each record.

You can indicate the start of a sorting key with

```
-k m[.n][options]
```

where *m* and the optional *n* are positive integers. You can choose *options* from the set **bdfiMnr** (described previously) to specify the way in which **sort** does comparisons for that sorting key. When you set one or more ordering options for a key, **sort** uses those options instead of the global ordering options for that key. If you do not specify any *options* for the key, the global ordering options are used.

The number *m* specifies which field in the input record contains the start of the sorting key. The character given with the **-t** option separates input fields; if this option is not given, spaces or tabs separates the fields. The number *n* specifies which character in the *n*th field marks the start of the sorting key; if you do not specify *n*, the sorting key starts at the first character of the *m*th field.

You can also specify an ending position for a key, with

```
-k m[.n][options],p[.q][options]
```

where *p* and *q* are positive integers, indicating that the sort key ends with the *q*th character of the *p*th field. If you do not specify *q* or you specify a value of 0 for *q*, the sorting key ends at the last character of the *p*th field. For example,

```
-k 2.3,4.6
```

defines a sorting key that extends from the third character of the second field to the sixth character of the fourth field.

sort also supports a historical method of defining the sorting key. Using this method, you indicate the start of the sorting key with

```
+m[.n][options]
```

which is equivalent to

```
-k m+1[.n+1][options]
```

You can also indicate the end of a sorting key with

```
-p[.q][options]
```

which when preceded with `+m[n]` is equivalent to

`-k m+1[.n+1],p.0[options]` if `q` is specified and is zero

or

`-k m+1[.n+1],p+1[.q][options]` otherwise.

For example,

`+1.2 -3.5`

defines a sorting key with a starting position that **sort** finds by skipping the first field and then the first 2 characters of the next field and an ending position that **sort** finds by skipping the first three fields and then the first five characters of the next field. In other words the sorting key extends from the third character of the second field to the sixth character of the fourth field. This is the same key as defined under the **-k** option described earlier.

With either syntax, if the end of a sorting key is not a valid position after the beginning key position, the sorting key extends to the end of the input record.

You can specify multiple sort key positions by using several **-k** options or several **+** and **-** options. In this case, **sort** uses the second sorting key only for records where the first sorting keys are equal, the third sorting key only when the first two are equal, and so on. If all key positions compare equal, **sort** determines ordering by using the entire record.

When you specify the **-u** option to determine the uniqueness of output records, **sort** only looks at the sorting keys, not the whole record. (Of course, if you specify no sorting keys, **sort** considers the whole record to be the sorting key.)

EXAMPLES

To sort an input file having lines consisting of the day of the month, white space, and the month, as in:

```
30 December
23    MAY
25 June
10    June
```

use the command:

```
sort -k 2M -k 1n
```

To merge two dictionaries, with one word per line:

```
sort -m -d fi dict1 dict2 >newdict
```

ENVIRONMENT VARIABLES

sort uses the following environment variable:

TMPDIR

contains the path name of the directory to be used for temporary files.

FILES

sort uses the following file:

/tmp/stm*

temporary files used for merging and **-o** option. You can specify a different directory for temporary files using the *TMPDIR* environment variable. For further information, see **environ**(3).

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion. Also returned if **-c** is specified and the file is in correctly sorted order.
- 1 Returned if you specified **-c** and the file is not correctly sorted. Also returned to indicate a non-unique record if you specified **-cu**.
- 2 An error occurred.

Messages

Message: -position "*endpos*" must follow +position

Cause: You specified a **-endpos** option either before or without a **+startpos** option.

Action: Reverse the order of the **-** and **+** options on the command line, or provide the missing **+startpos** option.

Message: Badly formed sort key position "*pos*"

Cause: You specified a sort key position *pos* that did not have a valid syntax.

Action: Check the *Sorting Keys* subsection of this man page for a description of the syntax for sort key positions.

Message: input file "*filename*": system error

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: insufficient memory for buffers

Cause: There were not enough free system resources for **sort** to allocate its buffers.

Action: Free up more resources.

Message:	insufficient memory for mapping table
Cause:	There were not enough free system resources for sort to allocate to a character mapping table for use with a -d , -f , or -i option.
Action:	Free up more resources.
Message:	line too long -- truncated
Cause:	A record in your input file was longer than the maximum specified by the -z option (or the default of <code>LINE_MAX</code>) and was truncated to that length.
Action:	This message does not stop execution. To get the full record, re-run sort and use the -z option to specify a larger maximum record size.
Message:	Missing -o file
Cause:	You specified the -o option without providing a file name as an argument.
Action:	Provide the missing file name.
Message:	Missing character after -t
Cause:	You specified the -t option without providing a field separator character as an argument.
Action:	Provide the missing field separator character.
Message:	Missing keydefinition after -k
Cause:	You specified the -k option without providing a key definition as an argument.
Action:	Provide the missing key definition.
Message:	Must specify number in "-option string"
Cause:	You specified the option <i>-option</i> which requires a numeric argument; however, the argument <i>string</i> was not a valid number.
Action:	Specify a valid number as the argument to <i>-option</i> .
Message:	non-unique key in record: ...
Cause:	You specified the -c and -u options and the indicated record had a sorting key that duplicated that of another record.
Action:	Remove one of the records with the duplicate key or expand the sorting key so that the records are unique.
Message:	not ordered properly at: ...
Cause:	You specified the -c option to verify that the input file was sorted and the indicated record was found to be out of order.
Action:	Use sort to sort the file into the desired order.
Message:	Only one character allowed after -t
Cause:	You specified more than one character as the argument to the -t option.
Action:	Specify only one character with -t .

Message: Only one *"-option"* option allowed
Cause: You specified *-option* more than once on the command line.
Action: Specify *-option* only once.

Message: Option *"-option"* unknown in field *"field"*
Cause: You specified an option as part of the sort key definition *field* that is not a valid ordering option.
Action: Check the *DESCRIPTION* section of this man page for a list of valid **sort** ordering options.

Message: output file *"filename"*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: strcoll error, cannot malloc space.
Cause: There are not enough free system resources to allocate string space.
Action: Free up more resources.

Message: tempfile error on *"filename"*: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: tempnam() error: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: temporary file error (no space) for *"filename"*
Cause: Insufficient disk space was available for a temporary file.
Action: Make sure that you have a directory named */tmp*, and that this directory has space to create files.

Message: too many key field positions specified
Cause: You specified more than 64 key field positions.
Action: There is no simple way to sort with more than 64 key field positions set.

Message: Unknown option *"-option"*
Cause: You specified an option that is not valid for **sort**.
Action: Check the *DESCRIPTION* section of this man page for a list of valid **sort** options.

Message: write error (no space) on output
Cause: Insufficient disk space was available for the output file.
Action: Make sure that the output device has sufficient space to create files.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0.

Available on all UNIX systems, with only UNIX System V.2 or later having the full functionality described here.

The **-M**, **-y**, and **-z** options are extensions to the POSIX standard. The POSIX.2 standard regards the historical syntax for defining sorting keys as obsolete. Therefore, you should use only the **-k** option in the future.

NOTES

The **sortgen** AWK script is a useful way to handle complex sorting tasks. It is described in the *AWK Tutorial* in the *User's Guide*. It originally appeared in *The AWK Programming Language*, by Aho, Weinberger, and Kernighan.

MPE/iX NOTES

The **sort** command provided in MPE/iX Shell and Utilities should not be confused with the MPE/iX CI **SORT** command.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

awk(1), **cut(1)**, **comm(1)**, **join(1)**, **uniq(1)**, **environ(3)**

NAME

split — split a file into manageable pieces

SYNOPSIS

```
split [-a n] [-l n] [file [prefix]]  
split -b n[b|k|m] [-a n] [file [prefix]]  
split [-n] [-a n] file [prefix]
```

DESCRIPTION

split breaks a file up into a set of files. By default, **split** starts a new file every time it has copied 1000 lines.

split names the files that it creates as a prefix followed by a suffix. *x* is the prefix unless you specify a different *prefix* on the command line. Unless altered by options, the suffix begins as *aa* and is incremented with each new file. By default, therefore, the first file is *xaa* followed by *xab*, and so on.

Options

split accepts the following options:

-a *n* uses a suffix *n* letters long. The default is two.

-b *n*[*b*|*k*|*m*]
splits the file every *n* units. The default unit size is bytes. When you follow *n* with **b**, **k**, or **m**, **split** uses a corresponding unit size of 512 bytes, 1K (1024 bytes), or 1 megabyte (1,048,576 bytes).

-l *n* splits the file every *n* lines.

-*n* is an obsolescent version of the **-l** option.

If the *file* is - (dash) or no file is specified, **split** reads the standard input.

DIAGNOSTICS

Possible exit status values are:

0 Successful completion.

1 An error occurred.

Messages

Message: Generated filenames would be too long

Cause: You specified a prefix and an argument to the **-a** option (length of suffix) that would result in file names longer than the maximum allowed by the configuration variable NAME_MAX.

Action: Specify a shorter prefix or a shorter suffix.

Message: input file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Invalid byte count specification "**-b** *n*"
Cause: You specified an argument with the **-b** option that was not a valid count specification (that is, a number optionally followed by one of **b**, **k**, or **m**, the unit size modifiers.
Action: Specify a valid count specification with the **-b** option.

Message: invalid count specification "**-***n*"
Cause: You specified an argument with the **-** option that was not a valid number.
Action: Specify a valid number with the **-** option.

Message: Invalid line count specification "**-l** *n*"
Cause: You specified an argument with the **-l** option that was not a valid number.
Action: Specify a valid number with the **-l** option.

Message: Invalid "**-a** *n*" option
Cause: You specified an argument with the **-a** option that was not a valid number, or it was valid number with a value greater than the configuration variable NAME_MAX.
Action: Specify a valid number with the **-a** option that is less than the value of NAME_MAX.

Message: Missing byte count after **-b**
Cause: You specified the **-b** option without providing a byte count as its argument.
Action: Provide the missing byte count.

Message: Missing line count after **-l**
Cause: You specified the **-l** option without providing a line count as its argument.
Action: Provide the missing line count.

Message: Missing number after "**-option**" option
Cause: You specified **-option** but did not provide a number as its argument.
Action: Providing the missing number.

Message: out of memory for binary split buffer: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: output file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: read error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: too many names generated, use -a
Cause: **split** generated more files than could be named with the suffix length specified.
Action: Use the **-a** option to specify a longer suffix, thus allowing more file names to be generated.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **split**
Action: Check the *DESCRIPTION* section of this man page for a list of valid **split** options.

Message: write error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

The **b** suffix of the **-b** option is an extension to the POSIX.2 standard.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

csplit(1)

NAME

strings — display printable strings in binary files

SYNOPSIS

strings [-aopx] [-n *number*] [-t *format*] *file* ...

strings [-] [-opx] [-t *format*] [-*number*] *file* ...

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

If the command line specifies a file name of **-**, **strings** reads the standard input. **strings** finds interesting pieces of information in binary files. It is frequently used for looking through executable files to uncover copyright notices, error messages, undocumented features, etc.

The command displays strings of printable characters that are at least 4 characters in length. Strings must be terminated by a NUL character, or a newline.

strings recognizes the following options:

- a** examines all of an executable file; normally **strings** ignores the header and the symbol table. On systems with sufficient information in executable files to differentiate code from data, the code is normally ignored as well.
- n *number***
displays strings of printable characters that are at least *number* characters in length.
- o** displays each string with its octal offset within the file. This is the same as **-t o**.
- p** only examines the bottom seven bytes of each character.
- t *format***
displays each string with an offset within the file. The base of the offset is set to decimal, octal, or hexadecimal by specifying *format* as d, o, or x respectively.
- x** displays each string with its hexadecimal offset within the file. This is the same as **-t x**.
- is the obsolescent version of **-a**.
- number***
is the obsolescent version of **-n *number***.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: file *"filename"*: system error

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: Insufficient memory: system error

Cause: There were not enough free system resources for **strings** to allocate space for a single string of the length requested.

Action: Ask for shorter strings.

Message: Unknown option *"-option"*

Cause: You specified an option that is not valid for **strings**.

Action: Check the *DESCRIPTION* section of this man page for a list of valid **strings** options.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

A Berkeley addition to most UNIX systems. Most Berkeley versions do not require the terminating NUL or newline.

The **-o**, **-p**, and **-x** options are extensions to the POSIX standard.

NOTE

NUL-terminated strings are a convention used primarily by the C programming language. Other languages and programs may not terminate strings with a newline or NUL. The **strings** utility will not find these strings.

MPE/iX NOTES

The current MPE/iX implementation of **strings** does not recognize or understand executable files; it always behaves as if you specified the **-a** option.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

strip — remove debug information from executable files

SYNOPSIS

strip *file* ...

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

strip removes debug and other information not required for execution from an executable file with a view to conserving disk space for production (that is, already debugged) programs.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

The following messages are generated by the **strip** front-end.

Message: *'filename'* is not a valid program (file code should be NMPRG) - file ignored

Cause: The file code of the specified file was not NMPRG

Action: Make sure that you have specified the correct file and that it is a valid native-mode program.

Message: invalid option *'option'*

Cause: You specified an option for **strip**. **strip** does not accept any options.

Action: Do not specify any options on the command line.

Message: strip failed

Cause: **strip** was unable to run the native strip utility.

Action: Make sure that your *PATH* environment variable includes the directory containing the native strip utility, and that you have the necessary permissions to run the program.

The following messages are generated by the native strip utility.

Message: cannot open temporary file

Cause: **strip** could not open the temporary file to which it was trying to write its output.

Action: Check permission bits of temporary directory (usually /tmp).

Message:	cannot overwrite original file: <i>filename</i>
Cause:	strip writes to a temporary file first. If all goes well, it overwrites the existing program file. If it cannot purge and overwrite the existing file, there may be a permission problem.
Action:	Check permission bits on original file.
Message:	cannot read header for <i>filename</i>
Cause:	strip cannot read the som header for the specified <i>filename</i>
Action:	Check the specified program file. It may be corrupt.
Message:	cannot recreate stripped file <i>filename</i>
Cause:	Strip had a problem reading and processing <i>filename</i> .
Action:	Check permission bits on original file.
Message:	<i>filename</i> : bad magic Expected filecode NMPRG for file <i>filename</i>
Cause:	You specified <i>filename</i> as an argument to strip that was neither an object file nor a program file. strip expects program files.
Action:	Specify a program file as the strip argument.
Message:	<i>filename</i> cannot open
Cause:	strip was unable to open <i>filename</i> .
Action:	Check that the file name exists, that it was spelled correctly, and that you have appropriate permissions.
Message:	<i>filename</i> : Cannot recreate header
Cause:	strip was unable to write out a new LST header.
Action:	Something is wrong with the LST. Check for file corruption.
Message:	<i>filename</i> : relocation entries; cannot strip Expected filecode NMPRG for file <i>filename</i>
Cause:	You specified a file <i>filename</i> as an argument to strip that was a relocatable library or an object file. strip expects program files.
Action:	Specify a program file as the strip argument.
Message:	Seek failed in <i>filename</i> Read failed in <i>filename</i>
Cause:	strip had problems seeking and reading <i>filename</i> .
Action:	Check to see if <i>filename</i> is corrupt.
Message:	strip executable_file...
Cause:	You called strip without specifying any arguments.
Action:	Specify a file on the strip command line.

Message: Warning! Som should be the last item in the file
Copying file end as is

Cause: **strip** expected the som at the end of the file but found something else instead.
strip will copy the end of file as is.

Action: Verify that the program file was compiled/linked on a PA-RISC system.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

On MPE/iX, this command is implemented as a script-driven front end.

If the environment variable *ECHO* is defined, the **strip** utility displays the commands that are passed to the MPE/iX CI for execution. For example

```
$ ECHO=1 strip myprog
```

displays each of the commands submitted to the MPE/iX CI.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

stty — set or display terminal options

SYNOPSIS

stty [**-ag**] [*operand*]

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

stty sets or reports the terminal I/O characteristics for the standard input device. **stty**, entered without options or operands, reports only the terminal I/O characteristics that differ from the defaults. **stty** entered with *operands* enables, disables, or selects the full range of terminal I/O characteristics.

Options

stty accepts the following options:

- a** displays all of the terminal I/O characteristics.
- g** displays all of the terminal I/O characteristics in a format that can be used as input to the **stty** command.

The **-a** option gives you a clear readable description while the **-g** option provides the ability to save and restore the terminal I/O characteristics.

Control Mode Operands

The valid *operands* for setting *control modes* are:

- par**en**b** Enable parity generation and detection.
- par**en**b** Disable parity generation and detection.
- par**od**d** Select odd parity.
- par**od**d** Select even parity.
- par**fi**x** When set, the **par**od**d** operand enables 1's parity (that is, all parity bits are set to 1) and the **-par**od**d** operand enables 0's parity (that is, all parity bits are set to 0).
- par**fi**x** Standard POSIX behavior of **par**od**d**.
- cs5** Select character size CS5.

cs6	Select character size CS6.
cs7	Select character size CS7.
cs8	Select character size CS8.
<i>number</i>	Set the input and output baud rates to <i>number</i> . A <i>number</i> of zero hangs up the modem line.
ispeed <i>number</i>	Set the input baud rate to <i>number</i> . A <i>number</i> of zero sets the input baud rate to the same value as the output baud rate.
ospeed <i>number</i>	Set the output baud rate to <i>number</i> . A <i>number</i> of zero hangs up the modem line.
hupcl	Hang up the modem line on the last close.
-hupcl	Do not hang up the modem line on the last close.
hup	Hang up the modem line on the last close.
-hup	Do not hang up the modem line on the last close.
cstopb	Use two stop bits per character.
-cstopb	Use one stop bit per character.
cread	Enable the receiver.
-cread	Disable the receiver.
clocal	Assume a line without modem control.
-clocal	Assume a line with modem control.

Input Mode Operands

The valid *operands* for setting *input modes* are:

ignbrk	Ignore break on input.
-ignbrk	Do not ignore break on input.
brkint	Signal INTR on break.
-brkint	Do not signal INTR on break.
ignpar	Ignore parity errors.

-ignpar	Do not ignore parity errors.
parmrk	Mark parity errors.
-parmrk	Do not mark parity errors.
inpck	Enable input parity checking.
-inpck	Disable input parity checking.
istrip	Strip input characters to seven bits.
-istrip	Do not strip input characters to seven bits.
inlcr	Map newline to carriage return on input.
-inlcr	Do not map newline to carriage return on input.
igncr	Ignore carriage return on input.
-igncr	Do not ignore carriage return on input.
icrnl	Map carriage return to newline on input.
-icrnl	Do not map carriage return to newline on input.
ixon	Enable START/STOP output control.
-ixon	Disable START/STOP output control.
ixoff	Ask the system to send START/STOP characters to regulate the size of the input queue.
-ixoff	Ask the system not to send START/STOP characters to regulate the size of the input queue.

Output Mode Operands

The valid *operands* for setting *output modes* are:

opost	Post-process output.
-opost	Do not post-process output. Ignore all other output modes.

Local Mode Operands

The valid *operands* for setting *local modes* are:

isig	Enable character checking against the special control characters INTR, QUIT and SUSP.
-------------	---

-isig	Disable character checking against the special control characters INTR, QUIT and SUSP.
icanon	Enable canonical input mode (ERASE and KILL processing).
-icanon	Disable canonical input mode (ERASE and KILL processing).
iexten	Enable any custom special control characters.
-iexten	Disable any custom special control characters.
echo	Echo every character typed.
-echo	Do not echo every character typed.
echoe	Enable the ERASE character to visibly erase the latest character.
-echoe	Do not enable the ERASE character to visibly erase the latest character.
echok	Echo newline after a KILL character.
-echok	Do not echo newline after a KILL character.
echonl	Echo newline (even when <code>echo</code> is disabled).
-echonl	Do not echo newline when <code>echo</code> is disabled.
noflsh	Disable flush after INTR, QUIT and SUSP.
-noflsh	Enable flush after INTR, QUIT and SUSP.
tostop	Send the signal SIGTOU for background output.
-tostop	Do not send the signal SIGTOU for background output.

Control Character Operands

The valid *operands* for assigning *special control characters* are:

min <i>number</i>	Set <code>min</code> to <i>number</i> .
time <i>number</i>	Set <code>time</code> to <i>number</i> .
eof <i>string</i>	Set end of file character to <i>char</i> .
eol <i>char</i>	Set end of line character to <i>char</i> .
erase <i>char</i>	Set ERASE character to <i>char</i> .
intr <i>char</i>	Set INTR character to <i>char</i> .

kill <i>char</i>	Set KILL character to <i>char</i> .
quit <i>char</i>	Set QUIT character to <i>char</i> .
susp <i>char</i>	Set SUSP character to <i>char</i> .
start <i>char</i>	Set START character to <i>char</i> .
stop <i>char</i>	Set STOP character to <i>char</i> .

Combination Mode Operands

The valid *operands* for setting *combination modes* are:

<i>saved-settings</i>	Set the terminal I/O characteristics to the saved settings produced by the -g option.
evenp	Enable parenb and cs7; disable parodd.
parity	Enable parenb and cs7; disable parodd.
oddp	Enable parenb, cs7 and parodd.
-parity	Disable parenb and set cs8.
-evenp	Disable parenb and set cs8.
-oddp	Disable parenb and set cs8.
nl	Enable icrnl.
-nl	Disable icrnl; unset inlcr and igncr.
ek	Reset ERASE and KILL characters to system defaults.
sane	Reset all modes to reasonable values.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message:	bad number " <i>n</i> " after " <i>operand</i> "
Cause:	You specified a number, <i>n</i> , as an argument to <i>operand</i> that was not an acceptable value for that operand.
Action:	Use an appropriate value for <i>n</i> .

Message: badly formed *operand* character "*char*"
Cause: You specified *char* as the argument to *operand* but *char* is not a valid control character.
Action: Specify a valid control character.

Message: error setting *termios* attributes: *system error*
Cause: A call to `tcsetattr()` failed. See **syserror(3)**.
Action: See **syserror(3)**.

Message: missing character after "*operand*"
Cause: You did not specify a control character as the argument of *operand*.
Action: Supply an appropriate argument for *operand*.

Message: missing number after *operand*
Cause: You did not specify a numeric value as the argument of *operand*.
Action: Supply an appropriate number as the argument of *operand*.

Message: reading *termios* attributes
Cause: A call to `tcgetattr()` failed to return the necessary information.
Action: Consult your system administrator.

Message: *operand* must be in range from 0 to 127
Cause: You specified a numeric argument for *operand* that was not in the 0 to 127 range.
Action: Supply an argument for *operand* that is in 0 to 127 range.

Message: unknown mode "*operand*"
Cause: You specified an unknown **stty** operand.
Action: Check the *DESCRIPTION* section for a list of valid **stty** operands.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. UNIX System V.

The **parfix** operand is an extension found only on MPE/iX systems.

MPE/iX NOTES

The current MPE/iX implementation of **stty** has the following limitations:

- The following operands are not currently implemented:

cs5	cs6	ispeed	ospeed	hupcl
hup	cstopb	cread	clocal	ignbrk
brkint	ignpar	parmrk	inpck	istrip
inclr	igncr	icrnl	ixon	ixoff
-opost	iexten	echoe	echok	echonl
noflsh	min	eof	quit	susp

MPE/iX systems currently behave as though these operands have not been set or have been set to the opposite settings.

- The START character on MPE/iX is always CTRL-Q and the STOP character is always CTRL-S. The ability to change these characters with the **start** and **stop** operands is not currently implemented.
- Only the baud rates of 300, 1200, 2400, 4800, 9600, and 19200 are currently implemented. These can be set with the *number* operand.

Note: Due the lack of either the **ispeed** or **ospeed** operand, **stty** uses the baud rate set by the *number* operand for both input and output.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

sum — compute checksum and block count for file

SYNOPSIS

sum [-cprt] [*file* ...]

DESCRIPTION

The **sum** command calculates a checksum for each input *file*. It also displays the number of 512-byte blocks in each *file*. If you do not specify any *files* or you specify **-** as the file name, **sum** reads the standard input. The checksum is useful as a quick way to compare a file or files that have been moved from one system to another to ensure that no data have been lost.

sum differs from **cksum** only in the format of the output. **sum**'s output has the form

checksum *blockcount* *filename*

where *blockcount* is the number of 512-byte blocks in the file.

sum can calculate checksums in a variety of ways. The default checksum algorithm produces a 16-bit unsigned integer resulting from the arithmetic addition of each input byte. This checksum algorithm is insensitive to byte order.

Options

sum accepts the following options:

- c** uses a standard 16-bit Cyclical Redundancy Check (CRC-16).
- i** uses the CCITT standard Cyclic Redundancy Check (CRC-CCITT). Data communications network protocols often use a cyclic redundancy check to ensure proper transmission. This algorithm is more likely to produce a different sum for inputs which differ only in byte order.
- p** uses the POSIX.2 checksum algorithm.
- r** enables the use of an alternate checksum algorithm which has the advantage of being sensitive to byte order.
- t** also produces a line containing the total number of blocks of data read as well as the checksum of the concatenation of the input files.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - inability to open input file
 - error reading the input file
- 2 Unknown command line option.

Messages

Message: input file "*filename*": *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **sum**.

Action: Check the *DESCRIPTION* section of this man page for a list of valid **sum** options

PORTABILITY

x/OPEN Portability Guide 4.0.

The default checksum algorithm is compatible with UNIX System V.2 and later. The **-r** algorithm is also available on UNIX System V.2 and is the default algorithm for Berkeley and Version 7. The **-c**, **-i**, and **-t** options are not available under UNIX.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cmp(1), **cksum**(1), **diff**(1), **ls**(1), **wc**(1)

NAME

tabs — set terminal tab stops

SYNOPSIS

```
tabs [+m[margin]] [-T term] [- number]  
tabs [+m[margin]] [-T term] -t tablist  
tabs [+m[margin]] [-T term] num1[,num2,...]  
tabs [+m[margin]] [-T term] tabspec
```

DESCRIPTION

tabs outputs a series of characters to the standard output, designed to clear the terminal hardware's tab stops and then set new ones. The characters that **tabs** outputs depends on your type of terminal.

The first column of your terminal screen is column 1. If you set a tab stop at position *N* and then tab to that position, the next character displayed on the screen appears in column *N+1* of the line (that is, after the tab stop).

tabs may not be able to set the tab stops on some types of terminals. In this case, it simply issues an error message and exit with a status greater than zero. If you call **tabs** with no arguments, it sets tab stops every 8 positions.

Options

tabs accepts the following options:

+m[*margin*]

sets the left margin to *margin*. *margin* defaults to 10 if you do not specify a value. All tab positions are relative to the left margin. To find the actual tab positions, you add the value of *margin* to each tab position.

-T *type*

indicates the type of terminal you have. The *term* argument is a site-specific name for your terminal type.

If you do not specify **-T**, **tabs** looks for an environment variable named *TERM* and uses its value for *type*. If *TERM* is not defined, **tabs** assumes a default terminal type.

-t *tablist*

sets tab stops as specified by *tablist*. *tablist* consists of one or more positive decimal integers, separated by commas; the numbers in the list should be in strictly increasing order.

If only one number *N* is given, tabs are set every *N* columns. If more than one number is given, tabs are set at those column numbers.

num1[,*num2*,...]

sets tab stops to the given numbers. The numbers in the list should be positive decimal integers in strictly increasing order. Except for the first number, any number in the list may be preceded by a plus sign (+), in which case the number is considered to be an increment on the previous setting rather than a column position. For example,

```
tabs 4,8,12
tabs 4,+4,+4
```

are equivalent.

tabspec can be one of **-a**, **-a2**, **-c**, **-c2**, **-c3**, **-f**, **-p**, **-s** or **-u** and sets tab stops at the positions indicated below:

```
-a    1,10,16,36,72
-a2   1,10,16,40,72
-c    1,8,12,16,20,55
-c2   1,6,10,14,49
-c3   1,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,67
-f    1,7,11,15,19,23
-p    1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61
-s    1,10,55
-u    1,12,20,44
```

Each *tabspec* is designed for a particular programming language. Assembler uses **-a**, **-a2**, and **-u**. COBOL uses **-c**, **-c2**, and **-c3**. FORTRAN, PL/I, and SNOBOL use **-f**, **-p**, and **-s** respectively.

-number

sets tab stops every *number* positions along the line. *number* must be a single-digit decimal number. If *number* is zero (**-0**), **tabs** clears all the tab stops and does not set new ones.

ENVIRONMENT VARIABLES

tabs uses the following environment variables:

TERM

contains the name of your terminal.

TERMINFO

contains the path name of the terminfo database.

DIAGNOSTICS

tabs may return the following status values:

- 0 Successful completion.
- 1 Missing definition in terminfo database.
- 2 Usage error.
- 3 Unknown terminal or can't find terminfo database.
- 4 Illegal tabs.
- 5 An error occurred.

Messages

- Message:** `"tablist"` are not in ascending order.
Cause: You specified a list of tab stops that was not in ascending order.
Action: Specify the tab stops in ascending order.
- Message:** Cannot set margins on terminal `"term"`.
Cause: You specified the `+m margin` option, but the terminfo database does not support margins for the terminal `term`.
Action: Check your terminal definition against the terminal's operation manual for missing information. If the terminal's manual does not provide the necessary information then your terminal does not support margins.
- Message:** Cannot set tabs on terminal `"term"`.
Cause: You attempted to set tab stops on the terminal `term`, but the terminfo database does not support tabs on that terminal.
Action: Check your terminal definition against the terminal's operation manual for missing information. If the terminal's manual does not provide the necessary information then your terminal does not support tabs.
- Message:** Illegal tabs in `"tablist"`.
Cause: You specified a `tablist` which contained either a negative or non-numeric value.
Action: Specified a `tablist` that contains only numbers in ascending order.
- Message:** Missing terminal type after `-T`.
Cause: You specified the `-T` option but did not provide a terminal type as its argument.
Action: Provide the missing terminal type.

Message: Missing tab list after `-t`.
Cause: You specified the `-t` option but did not provide a tab list as its argument.
Action: Provide the missing tab list.

Message: No terminfo database.
Cause: **tabs** was unable to find the terminfo database.
Action: Set the environment variable `TERMINFO` to point at a valid database of terminal information.

Message: Unknown option "`-option`".
Cause: You specified an option that is not valid for **tabs**.
Action: Check the *DESCRIPTION* section for a list of valid **tabs** options.

Message: Unknown terminal "`term`".
Cause: You specified a terminal type with the `-T` option, but that terminal type was not found in the terminfo database.
Action: Check that the terminal type exists, and that you spelled it correctly.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

The `+m`, `-t`, and *tabspec* arguments are all extensions to the POSIX standard.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

stty(1)

NAME

tail — display last lines of file

SYNOPSIS

tail [-f] [-bcklmn [\pm]*number*] [*file*]

tail [-f] [\pm *number*[bcklmn]] [*file*]

DESCRIPTION

Calling **tail** without options displays the last 10 lines of *file*. This is useful for seeing the most recent entries in log files and any file where new information is added on the end.

Options

tail accepts the following options:

+number

skips to line *number*, then displays the rest of the file. For example, +100 prints from line 100 to the end of the file.

-number

prints *number* lines from the end of the file. For example, -20 prints the last 20 lines in the file. You can precede or follow both **+number** and **-number** with one of these letters to indicate the unit to be used:

b blocks

c characters

k kilobytes

l,n lines

m megabytes

The default unit is lines.

-f monitors a file as it grows. At the end of the file, **tail** wakes up every two seconds and prints any new data at the end of the file. This flag is ignored if reading from the standard input and standard input is a pipe.

DIAGNOSTICS

Possible exit status values are:

0 Successful completion.

1 An error occurred.

Messages

- Message:** Badly formed line/character count "*string*"
Cause: You specified a line/character count *string* that was not a valid integer.
Action: Make sure that the line/character count is a valid integer.
- Message:** *filename : system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** Missing number after "*option*" option
Cause: You specified *option* but did not provide the required numeric argument.
Action: Provide the missing number.
- Message:** not enough memory for buffering: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** re-opening file descriptor "*num*" : *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.
- Message:** Unknown option "*-option*"
Cause: You specified an option that is not valid for **tail**.
Action: Check the *DESCRIPTION* section of this man page for a list of valid **tail** options.
- Message:** write error on standard output: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

The POSIX standard does not include the use of **b**, **k**, **l** or **m** as either options or suffixes.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cat(1), **head(1)**, **more(1)**

NAME

tar — USTAR-compatible tape archiver to copy and back up files

SYNOPSIS

```
tar -c[#sbfvwlzU] [-V volpat] [tapefile] [blocksize] file ...
tar -r[#sbfvwlzU] [-V volpat] [tapefile] [blocksize] file ...
tar -t[#sbfvzU] [-V volpat] [tapefile] [blocksize] [file ...]
tar -u[#sbfvwlzU] [-V volpat] [tapefile] [blocksize] file ...
tar -x[#sbfvwpmozU] [-V volpat] [tapefile] [blocksize] [file ...]
```

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

tar manipulates *archives*. An archive is a single file which contains the complete contents of a set of other files; an archive preserves the directory hierarchy that contained the original files, in a manner similar to **cpio**. The name **tar** was derived from *Tape ARchiver*; however, you can use archives with any medium, including diskettes.

This version of the **tar** utility writes and reads the original **tar** format from UNIX systems as well as the USTAR format defined by the POSIX (IEEE P1003.1) standards group.

Options

The five forms of the command shown in the synopsis represent the main functions of **tar** as follows:

- c** creates an archive. This command writes each named *file* into a newly-created archive. Directories recursively include all components. Under the USTAR (**-U**) option, **tar** records directories and other special files in the tape archive; otherwise, it ignores such files. If **-** appears in place of any *file* name, **tar** reads the standard input for a list of files one per line. This allows other commands to generate lists of files for **tar** to archive.
- r** writes the named *files* to the end of the archive. It is possible to have more than one copy of a file in a tape archive using this method. To use this form of the command with a tape, it must be possible to backspace the tape.
- t** displays a table of contents. This displays the names of all the files in the archive, one per line. If you specify one or more *files* on the command line, **tar** prints only those file names. Under the verbose (**-v**) option, more information about each tape archive member is printed, in a format similar to that produced by **ls -l**.

- u** updates an archive. This works like the **-r** form of the command, except that **tar** adds files to the end of the tape archive only if they are not already there, or they have been modified since the copy already in the archive. This option is not currently implemented but will be included in a future release.
- x** extracts files from an archive. **tar** extracts each named *file* to a file of the same name. If you do not specify any files on the command line, **tar** extracts all files in the archive. This extraction restores all file system attributes as controlled by other options.

You must specify one of these basic options as the first character of an option string. You may add other characters to the option string. Unlike other commands, you must give options as a single string; for example, you might say **-tv**, but cannot separate them as in **-t -v**. You may omit the leading dash **-** if you want. Other possible options in the option string are:

- b** sets the number of 512-byte blocks used for tape archive read/write operations to *blocksize*. The *blocksize* argument must be specified, and *blocksize* may only be specified when **b** is in the option string. When reading from the tape archive, **tar** automatically determines the blocking factor by trying to read the largest legal blocking factor and using the actual number read to be the *blocksize*. For UNIX compatibility, the largest valid blocksize is 20 blocks; in USTAR mode, it is 60 blocks.
- C *pathname*** is an unusual option because it is specified in the middle of your *file* list. When **tar** encounters a **-C *pathname*** option while archiving files, it changes the current directory (for **tar** only) to *pathname* and treats all following entries in your *file* list (including another **-C**) as being relative to *pathname*.
- f** uses the file *tapefile* for the tape archive rather than the default. The *tapefile* argument must be specified, and *tapefile* may only be specified when **f** is in the option string. The *tapefile* argument must precede the *blocksize* argument if both are present. If *tapefile* is the character **-**, the standard input is used for reading and the standard output is used for writing archives.
- #s** The default archive file name used by **tar** is */dev/mt/0m*. This option is the least general way to override this default. For a more general method, see the **f** option. The file name generated by this option has the form */dev/mt/#s*. The **#** may be any digit between 0 and 7, inclusive, to select the tape unit. The density selector *s* may be **l**(low), **m**(medium), or **h**(high).
- l** complains if all links are not resolved when adding files to the tape archive.
- m** does not restore a file's modification time stamp when extracting it from an archive. The default behavior is to restore the time stamp from information contained in the archive.

- o when writing files to an archive, does not record owner and modes of directories in the archive. If this is specified when extracting from an existing **tar** archive, **tar** does not restore any owner and group information in the archive. The default is to record this information when creating a tar archive, and to restore it when extracting from the archive.
 - p when extracting, restores the three high-order file attribute bits, exactly as in the archive. On UNIX and POSIX-compliant systems, they indicate the set-user-ID, set-group-ID, and saved-text attributes. To use **p** on these systems, you must have appropriate privileges; **tar** restores the modes restored exactly as in the archive and ignores the UMASK.
 - U when creating a new tape archive with the **-c** option, forces **tar** to use the USTAR format. The default format used when creating a new archive is the original UNIX **tar** format. When you do not specify **-c**, **tar** can deduce whether or not the tape archive is in USTAR format by reading it, so you can use **U** to suppress a warning about USTAR format.
 - v displays each file name, along with the appropriate action key letter as it processes the archive. With the **-t** form of the command, this option gives more detail about each archive member being listed.
- V** *volpat*
provides automatic multi-volume support. **tar** writes output to files — the names of which are formatted using *volpat*. Any occurrence of # in *volpat* is replaced by the current volume number. When you invoke **tar** with this option, it asks for the first number in the archive set, and waits for you to type the number and a carriage return before proceeding with the operation. **tar** issues the same sort of message when a write error or read error occurs on the archive; the reasoning is that this kind of error means that **tar** has reached the end of the volume and should go on to a new one.
- w is used to confirm each operation, such as replacing or extracting. **tar** displays the operation and the file involved. You can then confirm whether or not you want the operation to take place. Typing in an answer that begins with **y** tells **tar** to do the operation; anything else tells **tar** to go on to the next operation.
 - z Reads and/or writes the tape archive by first passing through a compression algorithm compatible with that of **compress(1)**.

EXAMPLES

The compression option provides a more efficient way of expressing:

```
tar -cvf - directory | compress >archive
```

as the one command line:

```
tar -cvzf archive directory
```

To identify all files that have been changed in the last week (7 days), and to archive them to a file on diskette, you might type:

```
find directory -mtime -7 | tar -cvf a:archive -
```

DIAGNOSTICS

Possible exit status values:

- 0 Successful completion.
- 1 An error occurred.

Messages

- Message:** Blocking factor "*blocksize*" is non-numeric
Cause: You specified the **-b** option, but the *blocksize* argument was not a valid number.
Action: Specify a valid number as the value of *blocksize*.
- Message:** Blocking factor larger than *number*
Cause: You specified the **-b** option, but the *blocksize* argument that you provided is too large.
Action: Use a smaller *blocksize*.
- Message:** chdir to *pathname*: system error
Cause: See **syserror**(3).
Action: See **syserror**(3).
- Message:** Missing blocking factor after "b"
Cause: You specified the **b** option but you did not specify a blocking factor as its argument.
Action: Provide the missing blocking factor.
- Message:** missing directory after -C
Cause: You specified the **-C** but did not provide a directory name as an argument.
Action: Provide the missing the directory name.

Message:	Missing file name after "f"
Cause:	You specified the f option but you did not specify the name of an archive file as its argument.
Action:	Provide the missing file name.
Message:	Must specify one of 'c', 'r', 't', 'u', or 'x'
Cause:	tar requires that you specify one of the c , r , t , u , or x options as the first character of its option string. You failed to do this. Specify one of the required options at the beginning of the option string.
Message:	opening archive " <i>filename</i> " : system error
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	tape archive medium not seekable
Cause:	You attempted to use the replace (r) option on an archive file that was not seekable.
Action:	Only use the r option with archive files that are seekable.
Message:	TAR file already set
Cause:	You specified the f option more than once on the command line.
Action:	Specify the f option only once.
Message:	'u' function not implemented--using 'r'
Cause:	You attempted to use the u option which is not currently implemented. tar uses the r option instead.
Action:	Use the pax command instead of tar .
Message:	Unknown option "-option"
Cause:	You specified an option that is not valid for tar .
Action:	Check the <i>DESCRIPTION</i> section for a list of valid tar options.
Message:	Unknown tape density " <i>density</i> "
Cause:	You specified a tape drive number followed by an argument that should be a tape density, but the argument was not l, m, or h.
Action:	Specify a valid tape density (l, m, or h).
Message:	Warning: blocking factor <i>number</i> not portable to UNIX
Cause:	You specified a blocking factor (<i>blocksize</i>) that was larger than 20. This may create an archive that does not work on a UNIX system.
Action:	To guarantee portability to a UNIX system, use a <i>blocksize</i> of 20 or less. A larger value may work but is not guaranteed.

Message: "z" (compress) option unavailable with "*option*"
Cause: You cannot use the compression option (**z**) with the update (**u**) or replace (**r**) options.
Action: Do not use compression on archives that you plan on updating.

tar may also produce several of the error messages listed on the **pax**(1) man page. See that man page for more details.

PORTABILITY

4.2 BSD UNIX.

The **-U** option is an extension to provide POSIX USTAR format compatibility. The **-p** option is an common extension on BSD UNIX systems which is not available on UNIX System V systems.

MPE/iX NOTES

The current MPE/iX implementation of **tar** has the following limitations:

- It converts non-byte stream files to byte stream files before archiving them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When you extract files from the archive, they are written as byte stream files.
- This release of MPE/iX does not provide the `lstat()` API. As a result, this command cannot return information on the link itself. It attempts to determine when a symbolic link has been referenced, but can only return the information on the target of the link, rather than the link itself.

It displays file owner names as 17 character fields in the form *username.accountname* and group names as 8 character fields in the form *groupname*.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

compress(1), **cpio**(1), **pax**(1), **uncompress**(1), **cpio**(2), **tar**(2)

NAME

tee — clone output stream

SYNOPSIS

tee [-ai] [*file* ...]

DESCRIPTION

The **tee** command clones an output stream. It copies the standard input to each output *file* as well as to the standard output.

Options

tee accepts the following options:

- a appends to (rather than overwrites) each output *file*.
- i ignores interrupt signals, making it suitable for use as a background process.

EXAMPLES

```
prog | tee file
```

This runs the program *prog* and pipes the program's standard output into **tee**. As a result, **tee** writes the output to both the standard output and the specified *file*.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - invalid command line option
 - out of memory when allocating I/O buffers
 - I/O error reading or writing to a file
 - error creating an output file
 - error opening an output file for appending.

Messages

Message: creating file "*filename*": system error
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: insufficient memory
Cause: There were not enough free system resources for **tee** to allocate file descriptors.
Action: Free up more system resources.

Message: I/O buffer allocation: *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: opening file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: read error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **tee**.
Action: Check the *DESCRIPTION* section of this man page for a list of valid **tee** options.

Message: write error on file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cat(1)

NAME

test — test for condition

SYNOPSIS

test *expression*

[*expression*]

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

The **test** command checks for various properties of files, strings and integers. It produces no output (except error messages) but returns the result of the test as the exit status; see *DIAGNOSTICS* for more information.

The command line is a Boolean *expression*. The simplest expression is a *string* which is true if the string is non-empty (that is, has non-zero length). More complex expressions are composed of operators and operands, each of which is a separate argument (that is, surrounded by white space). The operators imply the number and type of their operands. The operators taking a *file* operand evaluate as false (without error) if the file does not exist.

Operators

test accepts the following operators:

- b file** true if the *file* is a block special file
- c file** true if the *file* is a character special file
- d file** true if the *file* is a directory
- e file** true if the *file* exists
- f file** true if the *file* is an ordinary file
- g file** true if the setgid attribute of the *file* is on
- k file** true if the save text attribute of the *file* is on
- L file** true if *file* is a symbolic link
- n string** true if the length of *string* is greater than zero
- p file** true if the *file* is a FIFO (named pipe)
- r file** true if the *file* is readable

-s *file* true if the size of the *file* is non-zero
-t *fd* true if the numeric file descriptor *fd* is open and associated with a terminal
-u *file* true if the setuid attribute of the *file* is on
-w *file* true if the *file* is writable
-x *file* true if the *file* is executable
-z *string* true if the length of the *string* is zero
string true if *string* is not a null string
string1 = *string2*
 true if *string1* and *string2* are identical
string1 != *string2*
 true if *string1* and *string2* are not identical
number1 -eq *number2*
 true if *number1* and *number2* are equal
 Both *number1* and *number2* must be integers.
number1 -ge *number2*
 true if *number1* is greater than or equal to *number2*
number1 -gt *number2*
 true if *number1* is greater than *number2*
number1 -le *number2*
 true if the first *number1* is less than or equal to *number2*
number1 -lt *number2*
 true if *number1* is less than *number2*
number1 -ne *number2*
 true if *number1* is not equal to *number2*
file1 -nt *file2*
 true if *file1* is newer than *file2*
file1 -ot *file2*
 true if *file1* is older than *file2*
file1 -ef *file2*
 true if *file1* has the same device and i-node number as *file2*

expr1 **-a** *expr2*
logical AND; true if both *expr1* and *expr2* are true

expr1 **-o** *expr2*
logical OR; true if either *expr1* or *expr2* is true

! *expr* logical negation; true if *expr* is false

(*expr* **)** binding; true if *expr* is true

The precedence of the operators, in descending order, is:

- unary operators
- comparison operators
- logical AND
- logical OR

The second form of the test command

[*expression*]

is synonymous with the first.

EXAMPLES

This command reports on whether the first positional parameter is a directory or a file:

```
if [ -f $1 ]
then
    echo $1 is a file
elif [ -d $1 ]
then
    echo $1 is a directory
else
    echo $1 neither file nor directory
fi
```

This example illustrates the use of **test**, and is not intended to be an efficient method.

DIAGNOSTICS

Possible exit status values are:

- 0 The *expression* was true.
- 1 The *expression* was false or missing.
- 2 The *expression* was badly formed.

Message

Message: bad number "*string*"
Cause: Invalid string given where a number was expected. (*MAILCHECK*, *TMOUT*, *OPTIND*, *HISTSIZ*E, and *COLUMNS* (DOS only) environment variables, or array subscript.)
Action: Specify a decimal number (containing only the digits '0' through '9') to the appropriate environment variables or subscripts.

Message: expression syntax error
Cause: You specified an expression that did not have a valid syntax.
Action: Check the *DESCRIPTION* section for the valid syntax for expressions.

Message: getgroups failed
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Insufficient memory
Cause: There were not enough free system resources to perform the specified operation.
Action: Free up more resources.

Message: missing closing)
Cause: You specified a (as part of the test expression but did not provide the closing).
Action: Provide the missing).

Message: unbalanced []
Cause: You specified a [without providing the matching].
Action: Provide the missing].

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

The **-k**, **-L**, **-nt**, **-ot**, **-ef**, **-a**, and **-o** operators, plus the use of parentheses to group operators together, are all extensions to the POSIX standard.

NOTE

test is built into the shell and is also implemented as a separate utility.

Failure to quote variable expansions is a common mistake. For example,

```
test $NULL != string
```

If **NULL** is undefined or empty, this results in

```
test != string
```

which is not a valid test expression. This problem can be fixed by enclosing **\$NULL** in quotes.

MPE/iX NOTES

This release of MPE/iX does not provide the `lstat()` API. As a result, this command cannot return information on the link itself. It attempts to determine when a symbolic link has been referenced, but can only return the information on the target of the link, rather than the link itself.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

expr(1), find(1), let(1), ls(1), sh(1)

NAME

tobyte — convert MPE record files to byte stream files

SYNOPSIS

```
tobyte -at mpe_file [hfs_filename]
```

DESCRIPTION

The **tobyte** utility reads the file specified as *mpe_file* and writes it to the file specified as *hfs_filename* in byte stream form. *mpe_file* must be either an MPE *file.group.acct* style name or an HFS (Hierarchical File System) name with a leading slash (that is, */name*) or dot-slash (that is, *./name*) *hfs_filename* must be an HFS name. If *hfs_filename* is omitted, the standard output is used. If no options are specified, **tobyte** treats *mpe_file* as a binary file.

Options

- a** opens *mpe_file* as an ASCII file.
- t** strips trailing blanks from each line in an ASCII file. You can only use this option when you have also specified the **-a** option.

EXAMPLES

To copy an MPE/iX text file to a byte stream file in the HFS, use the following command:

```
tobyte -at zork.c.sys /usr/src/zork.c
```

To perform the same task using HFS names for both files, use:

```
tobyte -at /SYS/C/ZORK /usr/src/zork.c
```

To copy an executable program file to standard output and pipe it into the **strings** utility:

```
tobyte LS.HPBIN.SYS | strings
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: opening output file "filename":*system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: output file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: read error on input file "*filename*"
Cause: **tobyte** failed in attempt to read the next record from the input file.
Action: Make sure that you still have access to the file.

Message: unable to open input file "*filename*"
Cause: The utility was unable to open the file.
Action: Check to make sure that the file exists, that you have named it properly and that you have the necessary permissions.

Message: unknown option "*-option*"
Cause: You specified an option that is not valid for **tobyte**&.
Action: Check the *DESCRIPTION* section for a list of valid **tobyte** options.

PORTABILITY

The **tobyte** utility is unique to MPE/iX Shell and Utilities.

SEE ALSO

frombyte(1)

MPE/iX NOTES

tobyte is available as both a built-in shell utility and an external utility.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

touch — change file modification date

SYNOPSIS

```
touch [-acm] [-f agefile] [-r agefile] [-t time] file ...
touch [-acm] time file ...
```

DESCRIPTION

The **touch** command changes certain dates for each *file* argument. By default, **touch** sets both the date of last file modification and the date of last file access to the current time. This is useful for maintaining correct release times for software and is particularly useful in conjunction with the MAKE software development facility.

Options

touch accepts the following options:

- a** sets only the access time.
- c** does not create any *files* that do not already exist. Normally, **touch** creates such files.
- m** sets only the modification time.

If you do not specify **-a** or **-m**, **touch** behaves as though you specified both.

To tell **touch** to use a time other than the current, use one of the following options:

- f agefile**
is an obsolete version of the POSIX-compliant **-r** option.
- r agefile**
sets the access and modification times (as indicated by the other options) to those kept for *agefile*.
- t time**
specifies a particular time using the format accepted by **date** (see **date(1)** in the *MPE/iX Shell and Utilities Reference Manual*). An obsolete (but still supported) version of this command lets you omit the **-t**.

EXAMPLES

```
touch newfile
```

sets the modification time of *newfile* to the present.

```
touch -t 8001031305 oldfile
```

sets the modification time of *oldfile* to 13:05 on January 3, 1980.

```
touch -r oldfile newfile
```

sets the modification time of `newfile` to that of `oldfile`.

ENVIRONMENT VARIABLES

`TZ` contains the time zone that **touch** is to use when interpreting times.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: Bad date conversion
Cause: You specified an invalid date string on the command line.
Action: Specify a valid date string.

Message: file "*filename*": system error
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Missing age file argument
Cause: You specified the **-r** or **-f** option without an argument giving the name of an age file.
Action: Provide the missing age file argument.

Message: Missing date/time argument
Cause: You specified the **-t** option without a date/time argument.
Action: Provide the missing date/time argument.

Message: Only one -r (-f) or -t flag allowed
Cause: You specified a **-f**, **-r**, or **-t** option on the same command line with one or more other **-f**, **-r**, or **-t** options.
Action: Remove the excess options, leaving only one **-f**, **-r**, or **-t** option.

Message: Option *-option* argument missing
Cause: You did not provide an argument for *-option*.
Action: Provide the missing argument.

Message: stat: age file "*filename*" inaccessible
Cause: You specified a *filename* that either does not exist, or one for which you do not have appropriate permissions.
Action: Check that *filename* exists, was named properly, and that you have appropriate permissions.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **touch**.
Action: Check the *DESCRIPTION* section for a list of valid **touch** options.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

cp(1), **date(1)**

NAME

tput — change terminal characteristics

SYNOPSIS

tput [-**T** *type*] *action* ...

tput [-**T** *type*] -**S** *action* ...

DESCRIPTION

tput lets you change your terminal's characteristics. The *action* arguments indicate how you want to change the characteristics. Possible *actions* are:

clear clears the screen.

init initializes your terminal.

reset resets your terminal.

An additional action is supported for System V:

longname

returns the long descriptive name of the terminal.

An extension to provide System V capabilities allows *action* to be a capability from the *TERMINFO* database. If the capability requires arguments, they appear following the *action*.

tput does its work by outputting appropriate character sequences to the standard output. These character sequences are terminal-specific.

Normally, **tput** looks for an environment variable named *TERM*. If *TERM* exists, **tput** uses its value as the terminal *type*. If *TERM* does not exist, **tput** assumes a default terminal type.

Options

tput accepts the following option:

-**T** *type*

identifies the *type* of your terminal. This overrides the *TERM* environment variable.

The second format of this command provides extensions for XPG/System V. This format of **tput** accepts an additional option, -**S**.

-**S** take input from standard input, one capability/action per line. A blank line terminates input.

ENVIRONMENT VARIABLES

tput uses the following environment variables:

TERM contains the current terminal type.

TERMINFO

can be used to override the default database.

DIAGNOSTICS

tput may return the following status values:

- 0 **tput** successfully wrote an appropriate character sequence to change the terminal's characteristics or a boolean terminfo variable is TRUE.
- 1 A boolean terminfo variable is FALSE.
- 2 *action* was not one of the recognized keywords or you specified invalid command line option.
- 3 **tput** has no information about the terminal type given by **-T** or *TERM*.
- 4 Requested *action* cannot be performed on your type of terminal.
- >4 An error occurred.

Messages

Message: Missing terminal type after **-T**.

Cause: You specified the **-T** option without specifying the terminal type as an argument.

Action: Provide the missing terminal type.

Message: No terminfo database.

Cause: **tput** was unable to find the terminfo database.

Action: Set the environment variable *TERMINFO* to point at a valid terminfo database.

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **tput**.

Action: Check the *DESCRIPTION* section for a list of valid **tput** options.

Message: Unknown terminal "*term*".

Cause: You specified a terminal type with the **-T** option, but that terminal type was not found in the terminfo database.

Action: Check that the terminal type exists, and that you spelled it correctly.

Message: Unknown terminfo capability "*action*".
Cause: You specified a value for *action* that **tput** did not recognize as valid terminfo capability.
Action: Check the *DESCRIPTION* section for a list of valid terminfo capabilities.

PORTABILITY

POSIX.2. All UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

stty(1)

NAME

tr — translation filter

SYNOPSIS

```
tr [-cs] string1 string2
tr -s [-c] string1
tr -d [-c] string1
tr -ds [-c] string1 string2
```

DESCRIPTION

tr copies data read from the standard input to the standard output, substituting or deleting characters as specified by the options and *string1* and *string2*. *string1* and *string2* are considered to be sets of characters. In its simplest form, **tr** translates each character in *string1* into the character at the corresponding position in *string2*.

Options

tr accepts the following options:

- c** complements the set of characters specified by *string1*. This means that **tr** constructs a new set of characters, consisting of all the characters not found in *string1* and uses this new set in place of *string1*.
- d** deletes input characters found in *string1* from the output. This string is in ascending order.
- s** **tr** checks for sequences of a *string1* character repeated several consecutive times. When this happens, **tr** replaces the sequence of repeated characters with one occurrence of the corresponding character from *string2*; if *string2* is not specified, the sequence is replaced with one occurrence of the repeated character itself. For example,

```
tr -s abc xyz
```

translates the input string `aaaabccccb` into the output string of `xyzy`.

If you specify both the **-d** and **-s** options, you must specify both *string1* and *string2*. In this case, *string1* contains the characters to be deleted while *string2* contains characters which are to have multiple consecutive appearances replaced with one appearance of the character itself. For example,

```
tr -ds a b
```

translates the input string `abbbbaaacbb` into the output string `bcb`.

The actions of the **-s** option take place after all other deletions and translations.

String Elements

You can use the following conventions to represent elements of *string1* and *string2*.

character

Any character not described by the conventions that follow represents itself.

\ooo An octal representation of a character with a specific coded value. It can consist of one, two, or three octal digits.

\character

The \ (backslash) character is used as an escape to remove the special meaning of characters. It also introduces escape sequences for non-printing characters, in the manner of C character constants: \b, \f, \n, \r, \t, and \v.

c1-c2 This represents all characters between characters *c1* and *c2* (in the current locale's collating sequence) including the end values. For example, a-z represents all the lowercase letters in the POSIX locale while A-Z represents all that locale's uppercase letters. One way to convert lowercase and uppercase is with the following filter:

```
tr 'a-z' 'A-Z'
```

This is not, however, the recommended method, use the `[:class:]` construct instead.

*c*n* This represents *n* repeated occurrences of character *c*. (If *n* has a leading zero, **tr** assumes it is octal; otherwise, it is assumed to be decimal.) You can omit the number for the last character in a subset. This representation is only valid in *string2*.

`[:class:]`

This represents all characters that belong to the character class *class* in the locale indicated by *LC_CTYPE*. When the class `[:upper]` or `[:lower:]` appears in *string1* and the opposite class, `[:lower:]` or `[:upper:]` appears in *string2*, **tr** uses the *LC_CTYPE* *tolower* or *toupper* mappings in the same relative positions.

`[=c=]` This represents all characters which belong to the same equivalence class as the character *c* in the locale indicated by *LC_COLLATE*. Only internationalized versions of the code support this format.

EXAMPLES

```
tr -cs "[ :alpha:]" "\n*" <file1 >file2
```

creates a list of all words (strings of letters) found in file1 and puts it in file2.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because of unknown command line option, or too few arguments.

Messages

- Message:** [x*0] construct may only occur once
Cause: You attempted to fill the string using the [x*0] construct more than once.
Action: Remove the second fill request.
- Message:** Collation string is not supported in [=equiv=].
Cause: You specified a string for *equiv* in a [=equiv=] expression that contained more than one character. **tr** accepts only a single character for the equivalence class.
Action: Specify a one character equivalence class.
- Message:** expanded length of string too long; limit *char_set_size*
Cause: You specified a string that expanded to a length greater than the number of characters in the character set. Since a given character may appear only once in the first string, you have specified a character more than once in that string.
Action: Remove any repeated characters in the first string.
- Message:** Invalid character class *class*
Cause: You specified a character class *class* that is not defined in the locale indicated by *LC_CTYPE*.
Action: Specify a character class that is defined in the locale indicated by *LC_CTYPE*.
- Message:** Only classes [:upper:] and [:lower:] are valid as translate result
Cause: You specified a *class* in a [:class:] construct in *string2* that was not lower or upper.
Action: Specify *string2* in a form that give an equivalent result without using the [:class:].
- Message:** syntax error in [x*n] expression
Cause: You did not specify the closing] in a [x*n] expression
Action: Provide the missing].
- Message:** Unknown option "-option"
Cause: You specified an option that is not valid for **tr**.
Action: Check the *DESCRIPTION* section for a list of valid **tr** options.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0.

Backward compatible with both the UNIX Version 7 and System V variants of this command, but with extensions (C escapes, handles ASCII NUL, internationalization).

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

trap — intercept abnormal conditions and interrupts

SYNOPSIS

trap [*'handler'*] [*event ...*]

DESCRIPTION

trap intercepts certain kinds of exception conditions. Any signal may be intercepted by specifying an event corresponding to the signal number.

With an *event* of **ERR**, **trap** invokes the *handler* upon any command having a non-zero exit status. The exception to this is conditions in **if**, **while**, and **until** statements. This trap is not inherited within a function.

With a trap number of 0 or **EXIT**, **trap** invokes the handler during exit from the shell. Within a function, it is invoked during exit from the function.

Any other event corresponds to a signal number or signal name. See the **kill**(1) man page for a table of valid signal numbers and their names. If a signal is being ignored when you enter the shell, the shell continues to ignore it without regard to any traps.

The *handler* argument is a command list. It is usually more than one word, and so you must quote it to appear as a single argument. It is scanned when the trap function is initially invoked. When the trap condition is raised, the shell scans the command list again and executes the commands. A missing argument or an argument of - (dash) resets the default trap condition. A null argument (``) causes the trap condition to be ignored.

If there are no arguments at all, **trap** prints a list of all the traps and their commands.

EXAMPLES

```
trap 'rm -f /tmp/xyz$$; exit' ERR EXIT
trap 'read REPLY?"ABORT??"
case $REPLY in
y)    exit 1;;
esac' 2
```

On error or exit, this example deletes a temporary file created during command execution. Upon an interrupt signal, the example asks whether to abort, and exits if the answer is y.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - invalid signal name
 - invalid signal number
- 2 Failure due to an invalid command line argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

A built-in function of the Bourne Shell and KornShell on UNIX systems.

NOTE

This is a special built-in command of the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

sh(1)

NAME

true — do nothing, successfully

SYNOPSIS

true [*argument* ...]

DESCRIPTION

The **true** command simply yields an exit status of zero (success). It ignores any arguments given on the command line. This can be surprisingly useful, for example, when you are evaluating shell expressions for their side effects.

DIAGNOSTICS

Since this command always succeeds, the only possible exit status is:

0 Successful completion.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

NOTE

This command is provided as both an external utility and a shell built-in.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

sh(1)

NAME

tty — display terminal name

SYNOPSIS

tty [-s]

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

tty displays the file name of the terminal device associated with the standard input.

Options

tty accepts the following option:

-s does not display the name; the exit status of tty indicates whether or not the standard input is a terminal.

DIAGNOSTICS

Possible exit status values are:

- 0 Standard input is a terminal.
- 1 Standard input is not a terminal.
- 2 Failure because of unknown command line option, or too many arguments.

Message

Message: not a tty
Cause: The standard input was not associated with a terminal.
Action: Check if tty was mean to be used on a redirected file.

Message: Unknown option "-option"
Cause: You specified an option that is not valid for tty/
Action: Check the *DESCRIPTION* section for a list of valid tty options.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. All UNIX systems.

The POSIX standard considers the **-s** option to be obsolete.

MPE/iX NOTES

The current MPE/iX implementation of **ttty** uses the CI variable `HPLDEVNO` to get the `LDEV` number of your terminal (for example, `ldev20`).

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

NAME

type — tell how shell interprets name

SYNOPSIS

type *name* ...

DESCRIPTION

type identifies the nature of one or more names. Names can be shell reserved words, aliases, shell functions, built-in commands, or executable files. For executable files, the path name of the file is given.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 2 Failure due to an invalid command line argument.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

Bourne Shell. KornShell.

See **command**(1) for the POSIX.2 replacement.

NOTE

This command is built into the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

alias(1), **command**(1), **sh**(1), **whence**(1)

NAME

typeset — assign attributes and values to variables

SYNOPSIS

```
typeset ±f[tux] name name ...
typeset [±lprtuxH] [±iLRZ[number]] [variable[=value] ...]
```

DESCRIPTION

Invoking **typeset** with no options displays a list of all variables, and their attributes. This list is sorted by variable name and includes quoting so that it can be re-input to the shell with the built-in command **eval**. When only arguments of the form **+option** are specified, **typeset** displays a list of the variables which have all specified attributes set. When only arguments of the form **-option** are present, **typeset** displays a list of all the variables having all the specified attributes set, and also displays their values.

When the **f** option is used, **typeset** applies to functions; otherwise, it applies to variables. For functions, the only other applicable options are **-t**, **-u** and **-x**.

If the command line contains at least one *variable*, the attributes of each *variable* are changed. In this case, parameters of the form **-option** turn on the associated attributes. Parameters of the form **+option** turn off the associated attributes. Parameters of the form *variable=value* turn on the associated attributes and also assign *value* to *variable*.

When **typeset** is invoked inside a function, a new instance of each *variable* is created. After the function terminates, each *variable* is restored to the value and attributes it had before the function was called.

Options

typeset accepts the following options:

- H** performs POSIX to host-name file mapping.
- i[number]** marks each variable as having an integer value, thus making arithmetic faster. If *number* is given and non-zero, the output base of each *variable* is *number*.
- l** converts uppercase characters to lowercase in any value assigned to a *variable*. If the **-u** option is currently turned on, this option turns it off.
- r** makes each *variable* read-only. See **readonly(1)**.
- t** tags each *variable*. Tags are user-defined, and have no meaning to the shell. For functions (with the **-f** option), this turns on the *xtrace* option. See **set(1)** for a discussion of the *xtrace* option.

-u converts lowercase characters to uppercase in any value assigned to a *variable*. If the **-l** option is currently turned on, this option turns it off.

When used with **-f**, **-u** indicates that the functions named in the command line are not yet defined. The attributes specified by the **typeset** command are applied to the functions once they are defined.

-x sets each *variable* for automatic export. See **export**(1).

The last three options that follow justify, within a field, the values assigned to each *variable*. The width of the field is *number* if it is defined and non-zero; otherwise, the width is that of the first assignment made to *variable*.

-L[*number*]
left justifies the values assigned to each *variable* by first removing any leading blanks. Leading zeroes are also removed if the **-Z** option has been turned on. Then blanks are added on the end or the end of the value is truncated as necessary. If the **-R** flag is currently turned on, this option turns it off.

-R[*number*]
right justifies the values assigned to each *variable* by adding leading blanks or by truncating the start of the value as necessary. If the **-L** flag is currently turned on, this option turns it off.

-Z[*number*]
right justifies values assigned to each *variable*. If the first non-blank character of value is a digit, leading zeroes are used. See also the **-L** option.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 2 Failure due to an invalid command line argument.

If the command is used to display the values of variables, the exit status value is the number of names that are invalid.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

typeset is a built-in command of the KornShell on UNIX systems, but is not a Bourne Shell command.

NOTE

This is a special built-in command of the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

export(1), **readonly(1)**, **sh(1)**

NAME

umask — get or set the file mode creation mask

SYNOPSIS

umask [-s] [*mode*]

DESCRIPTION

umask sets the file mode creation mask of the invoking process to the given *mode*. You can specify the *mode* in any of the formats recognized by **chmod**; see **chmod**(1) for more information.

The file mode creation mask (often called the *umask*) determines the default permissions for any file created by the process. For example, a file created by the **create** command has the permissions specified by the *umask* unless the **create** command specifies explicit permissions itself.

Calling **umask** without a *mode* argument displays the current *umask*.

Options

umask accepts the following option:

-s displays the *umask* in a symbolic form:

u=perms, g=perms, o=perms

giving user, group, and other permissions. Permissions are specified as combinations of the letters *r* (read), *w* (write), and *x* (execute).

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to an invalid command line argument, or invalid *mode*.

Messages

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

umask(1)

MPE/iX Shell and Utilities

umask(1)

SEE ALSO

chmod(1)

NAME

unalias — remove alias definitions

SYNOPSIS

unalias *name*...
unalias -a

DESCRIPTION

unalias removes each alias *name* from the current shell execution environment.

Options

unalias accepts the following option:

-a removes all aliases in the current shell execution environment.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- >0 A *name* was not an alias or an error occurred.

Message

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0.

On UNIX systems, **unalias** is built into the KornShell, but not the Bourne Shell.

NOTE

This command is built into the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

alias(1), **sh**(1)

NAME

uname — display system name information

SYNOPSIS

uname [**-amnrsv**]

DESCRIPTION

The **uname** command lets shell scripts and other programs determine configuration information about the machine upon which the shell is running.

Options

uname accepts the following options:

- a** displays all fields (equivalent to **-mnrsv**).
- m** displays the CPU or machine type.
- n** displays the node name of this particular machine. The node name usually differentiates machines running at one location.
- r** displays the release (minor version) number of the operating system.
- s** displays the name of the operating system. This is the default output, when no options are given.
- v** displays the version (major version) number of the operating system.

uname displays the selected information in the following order:

<system name> <nodename> <release> <version> <machine>

EXAMPLES

This shell command changes the prompt to identify the computer location.

```
export PS1="`uname -n`$ "
```

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to an inability to find the desired information.
- 2 Failure due to an invalid command line option.

Messages

Message: uname: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **uname**.

Action: Check the *DESCRIPTION* section for a list of valid **uname** options.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. UNIX System V.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

sh(1)

NAME

uncompress — Undo Lempel-Ziv compression of a file

SYNOPSIS

uncompress [-cDfVv] [*file*]

DESCRIPTION

uncompress uncompresses data written by the Lempel-Ziv compression program **compress**(1). Data is read from *file* or the standard input. On UNIX systems, **uncompress** looks for *file* with a .Z extension to uncompress. It places the uncompressed output in a file with the same name but without the .Z extension. If this file already exists, **uncompress** asks if you want to overwrite it, unless you specify the **-f** option.

Since the number of bits of compression is encoded in the compressed data, **uncompress** automatically uses the correct number of bits.

Options

uncompress accepts the following options:

- c** writes uncompressed output to the standard output (like **zcat**).
- D** must be used to uncompress a sorted dictionary file compressed using the **-D** option of **compress**.
- f** forces file to be uncompressed, regardless of whether or not a file with the same base name already exists.
- V** prints version number information for **uncompress**.
- v** displays name of each file when it is uncompressed.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: compressed file is corrupt
Cause: You specified a compressed file that was damaged.
Action: Get a new copy of file and try again.

Message:	compressed with <i>num1</i> bits, can only handle <i>num2</i> bits
Cause:	You specified a file to be uncompressed that was compressed with <i>num1</i> bits, but this version of uncompress handles a maximum of <i>num2</i> bit compression.
Action:	Request a copy of the file compressed using <i>num2</i> bit compression.
Message:	<i>filename</i> already exists; Do you wish to overwrite <i>filename</i> (y or n)?
Cause:	The output file <i>filename</i> already existed.
Action:	To overwrite the existing file, type an affirmative response when asked or specify -f on the command line. To uncompress the file into a different file name, use the -c option to send the output to the standard output and redirect it.
Message:	file " <i>filename</i> ": Incorrect format for -D option
Cause:	You attempted to use the -D option to decompress a file that was not compressed with the -D option of compress
Action:	Only use the -D option of uncompress to decompress files compressed with the -D option of compress
Message:	<i>filename</i> has <i>num</i> other links: unchanged
Cause:	You specified an input file that has more than one link.
Action:	Remove the additional links and try uncompressing again.
Message:	<i>filename</i> not a regular file: unchanged
Cause:	You specified a file that was not a regular file. uncompress does not uncompress directories, FIFOs, or other such files.
Action:	Make sure that the specified file is a regular file.
Message:	<i>filename</i> : system error
Cause:	See syserror(3) .
Action:	See syserror(3) .
Message:	insufficient memory
Cause:	There were not enough free system resources to perform the specified operation.
Action:	Free up more resources.
Message:	no space for decompress tables
Cause:	There were not enough free system resources for uncompress to allocate to the decompress tables.
Action:	Free up more resources.
Message:	not in compressed format
Cause:	You specified a file to be uncompressed that was not in compressed format.
Action:	Specify a compressed file.

Message:	output file " <i>filename</i> " : <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	reading file " <i>filename</i> " : <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	stderr: <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	unknown error
Cause:	An unknown decompression error occurred.
Action:	Contact your system manager.
Message:	Unknown option " <i>-option</i> "
Cause:	You specified an option that is not valid for uncompress .
Action:	Check the <i>DESCRIPTION</i> section for a list of valid uncompress options.

PORTABILITY

uncompress is found on many UNIX systems.

The **-D** option is an extension to traditional implementations of **uncompress**.

MPE/iX NOTES

The current MPE/iX implementation of **compress** converts non-byte stream files to byte stream files before compressing them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When you use **uncompress** to decompress the compressed file, it is written as a byte stream file.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

compress(1), **cpio**(1), **pack**(1), **unpack**(1), **zcat**(1)

NAME

unexpand — compress spaces into tabs

SYNOPSIS

unexpand [**-a**] [**-t** *tablist*] [*file* ...]

DESCRIPTION

unexpand replaces spaces with tabs in the data from each *file* argument. If you do not specify any files, **unexpand** reads the standard input. The result is sent to standard output.

Backspace characters are preserved. By default, **unexpand** compresses only leading spaces into tabs; tab stops are set every eight positions.

Options

unexpand accepts the following options:

- a** compresses spaces into tabs wherever the resulting output is shorter, regardless of where the spaces occur in the line.
- t** *tablist* specifies tab stops. The numbers in *tablist* are delimited by blanks or commas. If *tablist* is a single number, then **unexpand** places tab stops every *tablist* positions. If *tablist* contains multiple numbers, **unexpand** places tab stops at those specific positions. Multiple numbers in *tablist* must be in ascending order. This option, like the **-a** option, compresses spaces to tabs at any appropriate point in the line. If you specify **-t**, **unexpand** ignores the presence or absence of **-a**.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to an invalid command line argument, or an inability to open the input file(s).

Message

Message: file "*filename*": system error .CAUSE See **syserror**(3).
Action: See **syserror**(3).

Message: insufficient memory: system error
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Option *-option* argument missing
Cause: You did not provide an argument for *-option*.
Action: Provide the missing argument.

Message: Unknown option "-option"
Cause: You specified an option that is not valid for **unexpand**.
Action: Check the *DESCRIPTION* section for a list of valid **unexpand** options.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. 4.2 BSD UNIX.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

expand(1), **pr(1)**

NAME

uniq — display unique lines of sorted file

SYNOPSIS

uniq [-c|-d|-u] [-f *number1*] [-s *number2*] [*input_file* [*output_file*]]

uniq [-cdu] [-*number*] [+*number*] [*input_file* [*output_file*]]

DESCRIPTION

uniq manipulates lines which occur more than once in a file. The file must be sorted, since **uniq** only compares adjacent lines. When you invoke this command with no options, it writes only one copy of each line in *input_file* to *output_file*. If you do not specify *input_file* or you specify **-**, **uniq** reads the standard input. If you do not specify *output_file*, **uniq** uses the standard output.

Options

uniq accepts the following options:

- c** precedes each output line with the number of times that line occurred in the input.
- d** displays only lines which are repeated (one copy of each line).
- f *number1***
ignores the first *number1* fields when comparing lines. Blanks separate fields in the input.
- s *number2***
ignores the first *number2* characters when comparing lines. If you specify both **-s** and **-f**, **uniq** ignores the first *number2* characters after the first *number1* fields.
- u** displays only those lines which are not repeated.

You may choose only one of the **-c**, **-d**, or **-u** options.

-*number*
equivalent to **-f *number*** (obsolescent).

+*number*
equivalent to **-s *number*** (obsolescent).

EXAMPLES

uniq

is a filter which prints one copy of each different line in its sorted input.

```
uniq -f 2 -s 1
```

compares lines starting with the 2nd character of the 3rd field.

```
uniq -d
```

outputs one instance of each repeated line in the input (and omits all unique lines).

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message: characters skip not a number in "*string*"

Cause: You specified an argument to the **+s** option or the **-s** option that was not a valid number.

Action: Specify a valid number.

Message: fields skip not a number in "*string*"

Cause: You specified an argument to the **-f** option or the **-f** option that was not a valid number.

Action: Specify a valid number.

Message: input file "*filename*": *system error*

Cause: See **syserror(3)**.

Action: See **syserror(3)**.

Message: Missing character skip count

Cause: You specified the **-s** option without providing the number of characters to skip as its argument.

Action: Provide the missing number of characters.

Message: Missing number of fields to skip

Cause: You specified the **-f** option without providing the number of fields to skip as its argument.

Action: Provide the missing number of fields.

Message: output file "*filename*": *system error*

Cause: See **syserror(3)**.

Action: See **syserror(3)**.

Message: Unknown option "*-option*"
Cause: You specified an option that is not valid for **unq**.
Action: Check the *DESCRIPTION* section for a list of valid **unq** options.

PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

comm(1), **sort**(1)

NAME

unpack — decode Huffman packed files

SYNOPSIS

unpack *file* ...

DESCRIPTION

unpack uncompresses argument *files* compressed by **pack**(1) using a Huffman minimal redundancy code. By default, **unpack** looks for *file* with a .z extension to decompress. It places the decompressed output in a file with the same name, but without the .z extension. The times of last access and last modification are also preserved. Packed files can be identified by **file**(1). Packed text files can be viewed without being unpacked in place by using **pcat**(1).

FILES

pk\$* temporary copy of input file.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- n Indicates that n files could not be unpacked properly. For example, if three out of six files could not be unpacked properly, the exit status is 3.

Messages

Message:	data truncated
Cause:	You specified a packed file that was damaged.
Action:	Specify a packed file that is not damaged.
Message:	decoding tree truncated
Cause:	You specified a packed file that was damaged.
Action:	Specify a packed file that is not damaged.
Message:	file " <i>filename</i> ": system error
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	not a packed file
Cause:	You specified an input file that was not a packed file.
Action:	Make sure that you specified the correct file name. If it is correct, use the file utility to see if it was a compressed file.

Message: rename *filename1* to *filename2*: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: setting time on file "*filename*": *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: tempfile error on "*filename*": *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

Message: tempfile error
Cause: An error occurred while writing the unpacked file.
Action: Make sure that *TMPDIR* points to a writable directory, or if *TMPDIR* is not set, that */tmp* is a writable directory.

Message: tempnam() error: *system error*
Cause: See **syserror(3)**.
Action: See **syserror(3)**.

PORTABILITY

x/OPEN Portability Guide 4.0. UNIX System V.

MPE/iX NOTES

The current MPE/iX implementation of **pack** converts non-byte stream files to byte stream files before packing them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When you unpack the packed file, it is written as a byte stream file.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

file(1), **pack(1)**, **pcat(1)**, **environ(3)**

NAME

unset — remove shell variable or function

SYNOPSIS

unset *name...*

unset -fv *name...*

DESCRIPTION

Calling **unset** with no options removes the value and attributes of each variable *name*.

unset cannot remove names which have been set read-only.

Options

unset accepts the following options:

-f removes the value and attributes of each function *name*.

-v is equivalent to calling **unset** with no options.

DIAGNOSTICS

Possible exit status values are:

0 Successful completion.

1 Failure due to an invalid command line argument.

Otherwise, **unset** returns the number of specified *names* which are invalid, not currently set, or read-only.

Messages:

Message: *name*: readonly variable

Cause: The given *name* cannot be deleted because it has been marked read-only.

Action: Do not specify read-only variables as arguments to **unset**.

Message: Unknown option "*-option*"

Cause: You specified an option that is not valid for **unset**.

Action: Check the *DESCRIPTION* section for a list of valid **unset** options.

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0.

unset is a built-in command of the Bourne and Korn shells on UNIX System V.

NOTE

This is a special built-in command of the shell.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

sh(1), **readonly(1)**

NAME

uudecode — decode transmitted binary file

SYNOPSIS

uudecode [*file*]

DESCRIPTION

uudecode decodes data that was encoded by **uuencode**(1). If a file is specified on the command line, **uudecode** decodes that file; if no file is specified on the command line, input is read from the standard input. Output is written to the file name that was specified when the file was encoded; see **uuencode**(1) for more details.

uudecode automatically strips off any leading and trailing lines added by mailers.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure due to any of the following:
 - inability to open the input file
 - missing begin line in the input file
 - inability to create the output file
 - missing end line in the input file
 - a file that is too short
- 2 Failure because of an invalid command line option.

Messages

Message:	Begin line missing filename
Cause:	There was no file name specified on the begin line of the input file, most likely due to a corrupt file.
Action:	Get another copy of the encoded file.
Message:	Directory " <i>pathname</i> ": <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	input file " <i>filename</i> ": <i>system error</i>
Cause:	See syserror (3).
Action:	See syserror (3).
Message:	Insufficient memory
Cause:	There were not enough free system resources to perform the specified operation.
Action:	Free up more resources.

Message: line *line_num*: Line too short (*n1* bytes, expecting *n2*)
Cause: The length of a line did not match the length indicated by the first character in the line; perhaps the input file was corrupted.
Action: Check that the input is valid uuencoded data.

Message: line *line_num*: Bad length
Cause: The length of a line did not match the length indicated by the first character in the line; perhaps the input file was corrupted.
Action: Check that the input is valid uuencoded data.

Message: No begin line
Cause: **uudecode** did not find a `begin` line in the input file.
Action: Make sure that the file was encoded by **uuencode**.

Message: No end line
Cause: **uudecode** did not find a `end` line in the input file.
Action: Make sure that the file has not been truncated.

Message: Octal mode may contain only digits [0-7] in *numstring*
Cause: When using octal mode to indicate new access permissions, the `Begin` line specified a string *numstring* containing characters other than the digits 0 to 7.
Action: Make sure that all *mode* values in octal mode are valid octal numbers, containing only the digits 0 through 7.

Message: output file "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Short file
Cause: **uudecode** encountered an end of file character before encountering the end of the encoded text.
Action: Make sure that the file has not been truncated.

Message: Unable to set mode on "*filename*": *system error*
Cause: See **syserror**(3).
Action: See **syserror**(3).

Message: Unknown or missing operator in symbolic mode "*mode-string*"
Cause: When using the symbolic mode to indicate new access permissions, the `Begin` line specified a string *modestring* which was either missing an operator or contained an operator that **chmod** does not recognize.
Action: Make sure that all *mode* values in symbolic mode contain one of the following operators: +, -, or =.

Message: Warning: no such user as "*username*"
Cause: You specified a file name that used tilde () expansion, but there no user with the given *username* exists on the local system.
Action: Specify the file name without using tilde expansion, or specify a *username* that does exist.

PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. Generally found on most UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

uuencode(1)

NAME

uuencode — encode a file for safe transmission

SYNOPSIS

uuencode [*file*] *remote*

DESCRIPTION

When files are transmitted over a network or over phone lines, non-printable characters (for example, control characters) may be interpreted as commands, telling the network to do something. In general, therefore, it is not safe to transmit a file if it contains non-printable characters.

uuencode translates a file into a special code that consists entirely of printable characters. A file encoded in this way is generally safe for transmission over networks and phone lines (although we make no guarantees).

If a *file* is specified on the **uuencode** command line, **uuencode** reads that file as input; otherwise, it reads the standard input. **uuencode** always writes the encoded result to the standard output. The encoded version of the data is about 35% larger than the original.

The *remote* command line argument is the name that the file should be given after it has been transmitted to its destination. When the file reaches its destination, you can use **uudecode**(1) to translate the encoded data into its original form.

Since the encoded file consists entirely of printable characters, you may use a text editor like Vi to edit the file. Of course, the only things you are likely to edit are the name of the original file or the name of the remote file.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because of an invalid command line option, or a missing command line argument.

Message

Message: input file "*filename*": *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: write error on standard output: *system error*

Cause: See **syserror**(3).

Action: See **syserror**(3).

PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. Generally found on most UNIX systems.

MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

SEE ALSO

uudecode(1)

NAME

vi — display-oriented interactive text editor

SYNOPSIS

vi [-eRrsvx] [-c *command*] [-t *tag*] [-w *size*] [*file* ...]

vi [-eRrsvx] [+*command*] [-t *tag*] [-w *size*] [*file* ...]

CONVENTIONS

Throughout this document the following symbols are used:

CTRL-L CTRL followed by a single letter indicates the control character transmitted by holding down the CTRL key and the letter key at the same time.

BACKSPACE This indicates the real backspace key. This may differ from the CTRL-H key.

ENTER This indicates the ENTER key, which is labelled RETURN on some keyboards.

ESC This indicates the Escape key.

INTERRUPT This indicates the break key; often CTRL-C.

→ This indicates the right arrow key.

← This indicates the left arrow key.

↓ This indicates the down arrow key.

↑ This indicates the up arrow key.

DESCRIPTION

Note: The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

There are two components to **vi**: a screen editor (Vi), and a line editor (Ex). Each has a different set of commands; you can invoke the line editor from within the screen editor and conversely, you can invoke the screen editor from within the line editor.

In the screen editor, you are in either *insert mode* or *command mode*. In command mode, every character you type is immediately interpreted as a command. In insert mode, every character you type is added to the text that you are editing.

There are two ways to start your session in Ex mode: you can invoke the command under the name **ex**; or you can invoke it under the name **vi** but specify the **-e** option. Similarly, there are two ways to start your session in Vi mode; you can invoke the command under the name **vi** (without specifying **-e**); or you can invoke it under the name **ex** but specify **-v**.

Vi and Ex work on text files. If a file contains the NUL character (value 0 or \0); it is turned into the value 0x7F. The newline character is interpreted as a line delimiter. Each line is limited to a maximum length of {`LINE MAX`}-1 bytes, including the newline. If any lines exceed that length, they are truncated at that length. If the last line in the file does not end in a newline, a newline is added. In all these abnormal cases, **vi** marks the file as modified and displays a message.

Options

vi accepts the following options:

-c *command*

runs *command* before displaying any text on the screen. *command* is any Ex command. To specify multiple Ex commands, separate them with a vertical line character (|) and enclose them in quotes. The quotes ensure that the shell does not interpret the | as a pipe character. For example,

```
-c 'set all | ver'
```

runs both the **set all** and **ver** commands prior to displaying text.

-e invokes **ex**.

-R sets the `readonly` variable, preventing the accidental overwriting of files. Any command that writes to a file requires the **!** suffix.

-r tries to recover all specified *files* after a system or editor crash. If you do not specify any *files*, **vi** ignores the `EXINIT` environment variable and any `.exrc` files, and displays a list of all recoverable files.

-s turns on *quiet mode*; this tells the editor not to display file information messages, thus allowing Ex to be used as a filter.

-t *tag* lets you search for a tag in the same way that you use with the Ex **tag** command (described later).

-v puts the editor into Vi mode. With **vi**, its use is redundant.

-x prompts you for an encryption key. All files read and written are run through the **crypt**(1) program using the key that you enter. The **crypt** program must be in the current search path.

-w *size* sets the option variable `window` to *size*. See section *Set Option Variables* for more information.

+command

is an obsolete version of the **-c** option.

Current Position Pointer

The *current position pointer* indicates a position in the text that is currently being edited (or has just been edited). In Ex mode, the current position pointer is just the line number of the line being edited. In Vi mode, the pointer gives this line number plus the position of the cursor within the line. The line indicated by the current position pointer is always on the screen.

Display Conventions

vi uses three display conventions that should be noted.

- **vi** displays the input for search commands (/ and ?), Ex commands (:), and system commands (!) on the bottom line of the screen. Error and informational messages also appear on this line.
- If the last line in the file is above the bottom of the screen, screen lines beyond the end of the file are displayed with a single ~ character in column one.
- In certain infrequent circumstances (usually involving lines longer than the width of the screen), **vi** is unable to fill the display with complete lines. In this case, one or more screen lines are shown with a single @ character in column one.

These lines are not part of the file content and should be ignored.

Vi Command Summary

Vi commands may be divided into several categories.

- (a) *Scrolling commands* adjust the position of text on the screen. The current position pointer only changes if the current line is scrolled off the screen. For example, **CTRL-E** scrolls the text on the screen up one line. The cursor remains pointing to the same text that it was pointing to, unless that text is moved off the screen.
- (b) *Movement commands* move the cursor in the file. For example, the character **j** moves the cursor down one line and the screen is scrolled only if necessary. There are two types of movement commands: *absolute* movements and *context-dependent* movements. An absolute movement moves the cursor, regardless of the nature of the surrounding text; for example, **j** always moves the cursor down one line. A context-dependent movement moves the cursor based on the nature of the text; for example, **w** moves the cursor to the beginning of the next word, so it must look at the text to determine where the next word begins.
- (c) *Manipulation commands* let you change the text that is already in the file.
- (d) *Text insertion commands* let you add new text to the existing text.

Vi scrolling and movement commands may be preceded by a decimal integer which serves as a *count*, as in:

[*count*] *command*

count means different things with different commands. If you type *count*, it is not displayed anywhere on the screen.

Scrolling

CTRL-B scrolls text back a page, less two lines. The cursor is placed on the bottom line of the screen. *count* specifies a number of pages to scroll. The default value for *count* is 1.

CTRL-D

scrolls text onto the bottom of the screen. The current position pointer moves forward the same amount in the text, which means that the cursor stays in the same relative position on the screen. If *count* is given, the screen scrolls forward by the given number of lines; this number is used for all future **CTRL-D** and **CTRL-U** commands (until a new *count* is given). The default scrolling amount is half the screen.

CTRL-E scrolls a new line onto the bottom of the screen. The current position pointer is not changed unless the current line scrolls off the top of the screen; then the pointer is set to the top line. If *count* is given, the screen scrolls forward the given number of lines. The default value for *count* is 1.

CTRL-F scrolls text forward a page (that is, a screen), less two lines. The cursor is placed on the top line of the screen. *count* specifies the number of pages to scroll. The default value for *count* is 1.

CTRL-U

scrolls text onto the top of the screen. The current position pointer moves backward the same amount in the text, which means that the cursor stays in the same relative position on the screen. *count* operates as for **CTRL-D**. The default scrolling amount is half the screen.

CTRL-Y

scrolls a new line onto the top of the screen. The current position pointer is not changed unless the current line scrolls off the bottom of the screen; then the pointer is set to the bottom line. If *count* is given, the screen scrolls backward the given number of lines. The default value for *count* is 1.

[*n*] z [*m*] *type*

redraws the screen in a window of *m* lines. *type* determines the position of the current line. If *type* is the newline character, the current line is placed at the top of the window. If *type* is a period (.), the current line is placed in the middle of the window.

If *type* is a minus sign (–), the current line is placed at the bottom of the window. If *n* is given, the current position pointer is first set to that absolute line number; then the screen is positioned according to *type*. If you omit *n*, it defaults to the current line. If you omit *m*, it defaults to window (see *Set Option Variables*).

Absolute Movement

All the following movement commands except **m**, **0**, **^**, **`**, and **'** may be preceded by *count* to repeat the movement that many times.

G moves to the absolute line number specified as *count*. If *count* is zero or is not specified, the cursor is moved to the last line of the file.

h

←

CTRL-H

BACKSPACE

moves the cursor one position to the left.

j

↓

CTRL-J

CTRL-N

moves the cursor to the next line at the same column on the screen. Scroll the screen one line if needed.

k

↑

CTRL-P moves the cursor to the previous line at the same column on the screen. Scroll the screen up one line if needed.

l

→

SPACE moves the cursor one position to the right.

m records the current position pointer under a *mark name*. A mark name is a single lowercase letter, given immediately after the **m**. For example, the command **ma** records the current location of the current position pointer under the name **a**.

0 (Zero) moves the cursor to the first character of the current line.

+

CTRL-M

moves the cursor to the first non-blank character on the next line. The screen scrolls one line if needed.

-
- moves the cursor to the first non-space character on the previous line. Scroll the screen up one line if needed.
 - | moves the cursor to the column number specified as *count*. This is a screen column number, not a line offset. If *count* is greater than the length of the current line, **vi** moves the cursor to the last character on the line. If the column indicated is spanned by a tab, **vi** moves the cursor to the first character after the tab.
 - ^ moves the cursor to the first non-blank character of the current line.
 - \$ moves the cursor forward to the end of a line. *count* specifies the number of lines, including the current line, to move forward.
 - ` when followed by a mark name, moves the cursor to the position that has been associated with that name. The position is set by the **m** command. A grave character followed by another grave character moves the cursor to the *previous context*. The previous context is typically the last place where you made a change. More precisely, the previous context is set whenever you move the cursor in a non-relative manner.
 - ‘ is similar to the grave (`) character, except that the cursor is set to the first non-blank character on the marked line.

Movement By Context

vi defines a *word* in the following two ways:

- a sequence of letters, digits, and underscores delimited at both ends by: (1) characters that are not letters, digits, or underscores, (2) the beginning or end of a line, or (3) the end of the editing buffer.
- a sequence of characters other than letters, digits, underscores, or white space delimited at both ends by: (1) a letter, digit, underscore, white space, (2) the beginning or end of a line, or (3) the end of the editing buffer.

vi defines a *full word* as a sequence of non-blank characters delimited at both ends by blank characters (SPACE, TAB, NEWLINE) or by the beginning or end of a line or file.

- B** moves the cursor back to the first character of the current full word. If the cursor is already at the beginning of a full word, **vi** moves it to the first character of the preceding full word.
- b** moves the cursor back to the first character of the current word. If the cursor is already at the beginning of a word, **vi** moves it to the first character of the preceding word.
- E** moves the cursor forward to the end of the current full word. If the cursor is already at the end of a full word, **vi** moves it to the last character of the next full word.

-
- e** moves the cursor forward to the end of the current word. If the cursor is already at the end of a word, **vi** moves it to the last character of the next word.
 - Fc** searches backward in the line for the single character *c* and positions the cursor on top of it. When *count* is given, the editor searches back for the *count*th such character.
 - fc** searches forward in the line for the single character *c* and positions the cursor on top of it. When *count* is given, the editor searches for the *count*th such character.
 - H** places the cursor on the first non-blank character of the top line of the screen. *count* specifies the number of lines from the top of the screen.
 - L** places the cursor on the first non-blank character of the bottom line of the screen. *count* specifies the number of lines up from the bottom of the screen.
 - M** places the cursor on the first non-blank character of the middle line of the screen.
 - N** repeats previous / or ? command, but in the opposite direction.
 - n** repeats previous / or ? command.
 - Tc** searches backward in the line for the character *c* and positions the cursor after the character being sought. *count* searches backward for the *count*th matching character and then positions the cursor after the character being sought.
 - tc** searches forward in the line for the character *c* and positions the cursor on the preceding character. *count* searches forward for the *count*th matching character and positions the cursor on the preceding character.
 - W** moves to the start of the next full word.
 - w** moves to the start of the next word.
 - (** moves back to the beginning of the current sentence. A sentence is bounded by a period (.), exclamation mark (!), or question mark (?); followed by any number of closing double quotes ("), closing single quotes ('), closing parentheses ()), or closing square brackets (]); followed by two spaces or the end of the line. Paragraph and section boundaries are also sentence boundaries; see **[** and **{**.
 -)** moves to the beginning of the next sentence. See **(** for the definition of a sentence.
 - {** moves back to the beginning of a paragraph. A paragraph begins on a blank line, a section boundary (see **[**) or a text formatter macro in the `paragraphs` variable.
 - }** moves to the beginning of the next paragraph. See **{** for the definition of a paragraph.

-
- [[moves back to the beginning of a section. A section begins on lines starting with a formfeed (**CTRL-L**); starting with an open brace {; a text formatter macro in the `sections` variable; or begin or end of file.
 -]] moves to the beginning of the next section. See [[for the definition of a section.
 - % finds the balancing character to that under the cursor. The character should be one of {(< or]>).
 - ; repeats the previous **F**, **f**, **T**, or **t** command.
 - , repeats the previous **F**, **f**, **T**, or **t** command in the opposite direction.
 - /regexp* searches forward in the file for a line matching the regular expression *regexp* and positions the cursor at the first character of the matching string. When used with an operator to define a text range, the range begins with the character at the current cursor position and ends with the first character of the matching string. You can specify whole lines by following *regexp* with */+n* or */-n* where *n* is the offset from the matched line.
 - ?regexp* is similar to */*, but searches backwards in the file.
 - CTRL-]** uses the word after the cursor as a tag. See *tag* under *Ex Commands*.

Object Manipulators

An object manipulator command works on a block of text. The command character is followed immediately by any kind of movement command. The object that is manipulated by the object manipulator command is the text from the current position pointer to wherever the movement command would leave the cursor.

For example, in **dL**, **d** is the object manipulator command to delete an object. It is followed by the movement command **L** which means move to the bottom line of the screen. The object manipulated by the command thus extends from the current line to the bottom line on the screen; these lines are deleted.

Normally an object extends up to, but not including, the position of the cursor after the move command; however, some movements work in a *line* mode; for example, **L** puts the cursor on the first non-blank character of the last line on the screen. If it is used in an object manipulation command, it includes the entire starting line and the entire ending line. Some other objects include the cursor position; for example, **d\$** deletes up to and including the last character on a line; by itself the **\$** would have placed the cursor on the final character. Repeating the command letter (or symbol) implies working on a line basis; thus **5dd** deletes five lines.

Objects that are deleted or otherwise manipulated have their original values placed in a *buffer*, an area of computer memory that can hold text. There are several ways this can be done:

- (a) You can use a *named* buffer. Buffers are named with single lowercase letters. To place an object in a buffer, type a double quote " followed by the buffer name, followed by the object manipulator command, as in

```
"adL
```

This deletes text from the current line to the bottom line on the screen and puts the deleted text in buffer **a**. Normally, this sort of operation overwrites the current contents of the buffer; however, if you use the same form but specify the buffer name in uppercase, the object is *appended* to the current contents of the buffer. For example,

```
"AdL
```

deletes from the current line to the bottom line on the screen, and adds the deleted text to buffer **a**.

- (b) If you are deleting material and delete at least one full line, **vi** uses buffers numbered 1 through 9. The first time a full line or more is deleted, the text is placed in buffer 1. The next time, the old contents of 1 are copied to 2, and the newly deleted text is put into 1. In the same way, deleted text continues to be *rippled* through the nine numbered buffers. When text is rippled out of buffer 9, it is gone for good.
- (c) In all other cases, the object manipulated goes to the *unnamed* buffer. For example, the unnamed buffer is used if you delete less than a line of text. The unnamed buffer is like the other buffers, but doesn't have a name.

The following examples show illustrate the use of buffers.

dL deletes text from current cursor position through to the bottom of the screen and places it into buffer 1; it also ripples numbered buffers.

"ad/fred/+0

deletes the current line through the line containing the string **fred** into buffer **a**.

dw deletes the current word and places it in an unnamed buffer.

The object manipulator commands are:

- c** deletes the object and enters insert mode for text insertion after the current cursor position. If less than one line is changed, a dollar sign (\$) is placed on the final character of the object and typing goes directly over top of the current object until the dollar sign (\$) is reached. Additional text is inserted, and the existing text shifts to make room for the new text.

-
- d** deletes the object.
 - y** *yanks* the object to the appropriate buffer; the original object is not changed. This may be used to duplicate or copy objects.
 - <** shifts the object left by the value of the variable *shiftwidth*. This operator always works on a line basis. This command replaces existing blanks and tabs at the beginning of the line with the minimum number of tabs and spaces required to create the new indent amount. *count* shifts *count* lines.
 - >** shifts the object right by the value of the variable *shiftwidth*. This operator always works on a line basis. This command replaces existing blanks and tabs at the beginning of the line with the minimum number of tabs and spaces required to create the new indent amount. *count* shifts *count* lines.
 - !** filters the object through an external command. After typing the object, the command line opens up for a system command which is parsed in the same manner as the Ex system command (:!). This operator then invokes the given command and sends the entire object on a line basis to that command. The object is then deleted and the output from the command replaces it. For example, **1G!Gsort** moves to the first line of the file; then takes all the text from the first line to the last line and runs it through the **sort** command.

Object Manipulator Abbreviations

To make things easier, **vi** supports the following shorthand commands. Each can be preceded by *count* and/or by a buffer name to save the manipulated text.

- C** changes to the end of the current line. This is equivalent to the **c\$** command.
- D** deletes to the end of the current line. This is equivalent to the **d\$** command.
- S** substitutes current line. This is equivalent to the **cc** command.
- s** substitutes current character. This is equivalent to the **cl** command.
- X** deletes the previous character. This is equivalent to the **dh** command.
- x** deletes current the character. This is equivalent to the **dl**.
- Y** yanks current line. This is equivalent to the **yy** command.

Inserting Text

vi supports the following commands for inserting text:

- A** enters insert mode at end of line. This is equivalent to the **\$a** command.
- a** enters insert mode after the current cursor position.
- I** enters insert mode before first non-blank character on line. This is equivalent to the **^i** command.
- i** enters insert mode before the current cursor position.
- O** opens up a new line before the current line and enters insert mode on it.
- o** opens up a new line after the current line and enters insert mode on it.
- R** replaces characters on the screen with characters typed up to the next ESC. Each character typed overlays a character on the screen. The newline character is an exception; it is simply inserted and no other character is replaced. While you are doing this, the screen may not correspond exactly to the contents of the file, due to tabs, etc. The screen is properly updated when you leave insert mode.
- r** replaces the character under the cursor with the next character typed. When *count* is given, *count* characters following the cursor are all changed to the next character typed. If *count* is given and the newline character is the replacement character, *count* characters are deleted (as usual) and replaced with a single newline character, not *count* newlines.

Miscellaneous

- J** joins *count* lines together. If you do not specify *count* or *count* is less than 2, **vi** uses a *count* of 2, joining the current line and the next line. This command supplies appropriate spacing: one space between words, two spaces after a period, and no spaces at all when the first character of the next line is a closing parenthesis (>). When a line ends with white space, **vi** retains the white space, does not add any further spaces, and then appends the next line.
- P** puts buffer contents before the cursor. This is also called a *paste* operation. If preceded by quote *buffername* (for example, "**b**"), the contents of that buffer are used; otherwise the contents of the unnamed buffer are used. If the buffer was created in Ex mode, the contents of the buffer are inserted before the current line. If the buffer was created in Vi mode, the contents are inserted before the cursor. As a special case, if a paste operation is repeated with the period (.) command and it used a numbered buffer, the number of the buffer is incremented. Thus, "**1p.....**", pastes in the contents of buffer 1 through buffer 6; in other words the last six things that were deleted are put back.

-
- p** is similar to **P** except that text is pasted after the cursor instead of before it.
- Q** switches to Ex mode. You leave Vi mode and the Ex prompt is shown on the bottom line of the screen.
- U** undoes all changes to current line. As soon as you move off a line or invoke an Ex command on the line, the original contents of the line are forgotten and **U** is not successful.
- u** undoes last change. If repeated, you undo the undo (that is, go back to what the text was before the undo). Some operations are treated as single changes; for example, everything done by a global **G** is undone with undo.
- ZZ** writes the file out, if changed, then exits. Equivalent to the Ex command **xit**.
- .** repeats the last command. Any command which changes the contents of the file may be repeated by this command. If you do not specify *count* with the **.** command, **vi** uses the *count* that was specified for the command being repeated.
- ~** toggles the case of the character under the cursor and move the cursor right by one. This command may be preceded by *count* to change the case of *count* characters.
- &** repeats the previous Ex substitute command using the current line as the target. Flags set by the previous command are ignored. Equivalent to the Ex command **&**.
- :** invokes an Ex command. The editor places the cursor on the bottom line of the screen and displays a colon (:) to prompt for input. You may then type an Ex command; when you press ESC or ENTER, the line you have entered is passed to Ex and run there.
- @** invokes a macro. When the next character is a letter from a through z, **vi** treats it as the name of a buffer. The contents of that buffer are treated as input typed to **vi**. The text of a macro may contain an @ calling another macro. A macro may call itself, provided it is invoked at the end of the macro (tail recursion). Such a macro runs forever or until an error occurs or the INTERRUPT key is pressed. A macro that invokes itself at the beginning (head recursion) loops until it runs out of memory. A **vi** error terminates all currently executing macros. All changes made during a macro call are treated as a unit and may be undone with a single **u** command.
- CTRL-G** displays the current path name, current line number, total number of lines in the file, and the percentage of the way through the file. This is equivalent to invoking the Ex command **file**.
- CTRL-L** redraws the screen assuming another process has written on it. This should normally never happen unless a filter **!** command writes to the screen rather than the standard output.

CTRL-R

redraws the screen, removing any deleted lines flagged with the @ convention.

CTRL-Z stops the editor and returns you to system level. You can return to the editor with the **fg** command; however, when you resume a Vi session in this way, all of the session's buffers are empty. The **jobs** command lists all the stopped **vi** jobs. The amount of available memory limits the number of Vi sessions that may be stopped at one time; see **fg(1)**, **jobs(1)**.

CTRL-^ switches to editing the alternate file (see **write** under *Ex Commands*). If you attempt this and you have not written out the file since you made the most recent change, **vi** does not switch to the alternate file.

Insert Mode

The object manipulation command **c**, and the text insertion commands [**AaIiOoRr**] put Vi into INSERT mode. In this mode, most characters typed are inserted in the file. The following characters have special meaning.

CTRL-D

decrements the *autoindent* for the current line by one level. This is only relevant if the variable *autoindent* is on. See the *Set Option Variables* section for more details.

CTRL-H**BACKSPACE**

deletes the last typed character. The character is not removed from the screen; however it is no longer in your file. When you backspace over characters, new text overwrites the old ones. You are permitted to backspace to the start of the current line regardless of where you started to insert text. (This is not true of some other versions of Vi.)

CTRL-J**CTRL-M**

ENTER ends the current line and starts a new one.

CTRL-Q**CTRL-V**

inserts the next character typed as that character instead of using its special meaning. This is normally used to escape, say, the ESC character itself. It is impossible to escape CTRL-J or the null character in your line.

CTRL-T increments the *autoindent* for the current line by one level. This is only relevant if the variable *autoindent* is on.

CTRL-W

deletes the word preceding the cursor and blanks. Even though the characters are not removed from the screen, they are no longer in your file.

CTRL-@

when this is the first character typed after entering insert mode, the previously typed insert mode contents are repeated; after this, you exit insert mode. Only up to the first 256 characters from the previous insertion are inserted.

@

deletes inserted line. The cursor is moved to the first character that was inserted on the current line. The characters are not removed from the screen; however they are no longer in your file. If you have backspaced past the point that you started inserting text, this deletes to the start of the current line.

ESC**INTERRUPT**

leaves insert mode.

Ex Command Mode

Ex commands may be typed if the program is invoked with the **-e** option or if the **Q** command is issued from Vi. A single Ex command may be issued from Vi using the **:** command.

An Ex command takes the general form

[address-list] [[command] [!] [parameters]]

Each part is optional and may be invalid for some commands. You may specify multiple commands on a line by separating them with a vertical line character (**|**).

address-list

Commands may take zero, one, or two addresses. The address **%** is a short form to indicate the entire file. You may omit any or all of the addresses. Any or all of the addresses may be omitted. In the command description in the *Ex Commands* section, the addresses shown are the addresses that the commands use by default.

Possible default addresses are:

- [.,]** Indicates a two address line range defaulting to the current line.
- [1,\$]** Indicates a two address line range defaulting to the entire file.
- [.+1]** Indicates a single address defaulting to the next line.

address

An address refers to a line in the text being edited. An address may be an expression involving the following forms:

- .** The value of the current line indicator.
- n*** A line number indicating an absolute line in the file; the first line has absolute line number 1.
- \$** The last line in the file.
- +[n]*** *n* lines forward in the file. If you omit *n*, it defaults to 1.
- [n]*** *n* lines backward in the file. If you omit *n*, it defaults to 1.
- 'x*** The value of the mark *x*.
- /pat/*** Search for regular expression *pat* forward from the current line.
- ?pat?*** Search for regular expression *pat* backwards from the current line.

Thus,

```
/pattern/+3
++
100
```

are three addresses: the first searches for a pattern and then goes three lines further; the second indicates two lines after the current line; and the third indicates the 100th line in the file.

command

The **command** is a word, which can be abbreviated. Characters shown in square brackets are optional. For example,

a[ppend]

indicates that the **append** command can be abbreviated to simply **a**.

- !** Some commands have a variant; this is usually toggled with an exclamation mark (!) immediately after the command.

parameters

Many Ex commands use parameters to allow you to specify more information about the command. Common parameters include:

- buffer*** specifies one of the named areas for saving text. For more information, see the description of buffers in the *Object Manipulators* section.
- count*** is a positive integer, specifying the number of lines to be affected by the command. If you do not *count*, it defaults to 1.
- file*** is the path name for a file. If *file* includes the % character, **vi** replaces that character with the path name of the current file. If *file* includes the # character, **vi** replaces that character with the path name of the alternate file. If you do not specify *file*, the default is the current file.

flags indicate actions to be taken after the command is run. It may consist of leading plus (+) and minus (-) signs to adjust the value of the current line indicator; followed by **p**, **l**, or **#** to display, list or number a line.

Thus

```
.+5 delete 6 ++#
```

deletes starting five lines down from the current line; six lines are deleted; the current line indicator is set to the following line, then incremented by two; and that line is displayed with its line number.

Regular Expressions and Replacements

Many Ex commands use *regular expressions* when searching and replacing text. A regular expression (indicated by *pat* in the command descriptions) is used to match a set of characters. A replacement (indicated by *repl* in the command descriptions) describes what to put back in a line for the set of characters matched by the regular expression.

A regular expression consists of a string of normal characters which exactly match characters in a line. These may be intermixed with special characters (known as *metacharacters*) which allow matching in some special manner. Metacharacters may themselves be matched directly by preceding them with the backslash (\) character. If the variable *magic* (see the *Set Option Variables* section) is turned off, all but two of the metacharacters are disabled; in this case, the backslash character must precede them to allow their use as metacharacters. See **regexp(3)** for examples.

Regular Expression Summary

- ^** matches the start of a line. This is only a metacharacter if it is the first character in the expression.
- \$** matches the end of a line. This is only a metacharacter if it is the last character in the expression.
- .** matches any single character.
- *** Matches zero or more occurrences of the previous expression.
- \<** matches the empty string preceding the start of a word. A word is a series of alphanumeric or underscore characters preceded and followed by characters which are not alphanumeric or underscore.
- \>** matches the empty string following the end of a word. A word is a series of alphanumeric or underscore characters preceded and followed by characters which are not alphanumeric or underscore.

[*string*] matches any of the characters in the class of characters defined by *string*. For example, [aeiouy] matches any of the vowels. You can put a range of characters in a class by specifying the first and last characters of the range, with a hyphen (-) between them. For example, in ASCII [A-Za-z] matches any upper or lowercase letter. If the first character of a class is the caret (^), the class matches any character not specified inside the square brackets. Thus, in ASCII [a-z_][^0-9] matches a single alphabetic character or the underscore, followed by any non-numeric character.

\(...\) (escaped parentheses) may surround a set of characters in the pattern. See the discussion of the \n replacement pattern, that appears under *Replacement Pattern Summary*, to find the meaning of this construct. This is not affected by the setting of the variable `magic` (see the *Set Option Variables* section).

~ matches the replacement part of the last substitute command.

Replacement Pattern Summary

& is replaced by the entire string of matched characters.

~ is replaced by the entire replacement pattern from the last substitute.

\n is replaced by the string that matched the *n*th occurrence of a \(...\) in the regular expression. For example, consider

```
s/\([a-zA-Z]*\)our/\1or/
```

The \1 represents the string that matched the regular expression \([a-zA-Z]*\). Thus the previous command might change the word `colour` to `color`.

\u turns the next character in the replacement to uppercase.

\l turns the next character in the replacement to lowercase.

\U turns subsequent characters in the replacement to uppercase.

\L turns subsequent characters in the replacement to lowercase.

\E, \e turns off the effects of \U or \L.

Ex Commands

These commands can be entered as shown in Ex mode. In Vi mode, they must be preceded by the colon (:) character.

ab[breviate] [*lhs rhs*]

indicates the string *lhs* is to be interpreted as an abbreviation for *rhs*. If you enter *lhs* surrounded by white space in Vi INSERT mode, it is automatically changed into *rhs*. If you do not specify any arguments for the **ab** command, it displays the abbreviations that are already defined.

[.] a[ppend][!]

enters Ex INSERT mode. Text is read and placed after the specified line. An input line consisting of one period (.) leaves INSERT mode without inserting the period. If you specify an address of zero, text is inserted before the first line of the file. The current line indicator points to the last line typed.

If an exclamation mark (!) is specified, the `autoindent` option is toggled during input. This command may not be invoked from Vi mode.

ar[gs] displays the current list of files being edited. The current file is shown enclosed by square brackets.

cd[!] [*path*]

changes the current directory to *path*. If you omit *path*, **cd** sets the current working directory to the directory identified by the environment variable `HOME` (usually, your home directory). If you have modified the buffer since the last write, **vi** displays a warning message. You can override this behavior by including the exclamation mark (!).

[.,.] c[hange][!] [*count*]

deletes the line range given and then enters INSERT mode. If an exclamation mark (!) is specified, `autoindent` is toggled during input. This command may not be invoked from Vi mode.

chd[ir][!] [*path*]

is the same as **cd**.

[.,.] co[py] *addr* [*flags*]

copies the line range given after *addr*. If *addr* is zero, the lines are inserted before the first line of the file. The current line indicator points to the last line of the inserted copied text.

[...]**d[delete]** [*buffer*] [*count*] [*flags*]

deletes the specified line range. After deleting the line range, the current line indicator points to the line after the deleted range. A *buffer* may be specified as a letter **a–z**; if so, deleted lines are saved in the buffer with that name. If an uppercase letter is specified for *buffer*, the lines are appended to the buffer of the corresponding lowercase name. If no buffer name is given, deleted lines go to the unnamed buffer.

e[dit] [**!**] [*+line*] [*file*]

ex [**!**] [*+line*] [*file*]

begins a new editing session on a new file; the new file replaces the old file on the screen. Normally, this command is invalid if you have modified the contents of the current file without writing it back to the file. Specifying an exclamation mark (**!**) goes on to start a new session even if you have not saved the changes of the current session.

You can specify *line* as either a line number or as a string of the form */regex* or *?regex* where *regex* is a regular expression. When *line* is a line number, the current line indicator is set to that position. When it has the form */regex*, **vi** searches forward through the file for the first occurrence of *regex* and sets the current line indicator to that line. *?regex* is similar to */regex*, except that **vi** searches through the file backwards. If you omit *line* and do not specify a *file*, the value of the current line indicator does not change; otherwise if a file is specified, the current line indicator is set to either the first or last line of the buffer, depending upon whether the command was issued in Vi or Ex mode.

The **edit** command does not destroy buffers, so you can use the **yank** and **put** commands to move text between files.

f[ile] [*file*]

changes the current file name to *file* and marks it [Not Edited]. If this file exists, it may not be overwritten without using the exclamation mark (**!**) variant of the **write** command. If no *file* is specified, the editor displays information about the current file.

[**1,\$**] **g[lobal]** [**!**] */pat/* [*commands*]

matches *pat* against every line in the given range. On lines which match, the *commands* are run. If the exclamation mark (**!**) variant is set, the *commands* are run on lines which do not match. This is the same as using the **v** command (described later in this section).

The **global** command and the **undo** command may not occur in the list of *commands*. A subsequent **undo** command undoes the effect of the entire **global** command. In Ex mode, multiple command lines may be entered by ending all but the last with backslash (****). Commands which would take input are permitted; the input is includ-

ed in the command list, and the trailing period (.) may be omitted at the end of the list. For example,

```
g/rhino/a\  
hippo
```

appends the single line `hippo` to each line containing `rhino`. The total length of a global command list is limited (see *LIMITS*).

You can use any non-alphabetic character to delimit *pat* instead of the slash (/).

[.] **i[nsert][!]**

enters Ex INSERT mode, reads text and places it before the specified line; otherwise, this is identical to the **append** command. This command may not be entered from Vi mode.

[.,,+1] **j[oin][!]** [*count*] [*flags*]

joins together the lines of text within the range. Unless an exclamation mark (!) is specified, all white space between adjacent joined lines is deleted. Two spaces are provided if the previous line ended in a period (.); zero spaces if the joined line begins with a closing parenthesis ()); and one space otherwise.

[.] **k x** is synonymous with the **mark** command.

[.,,] **l[ist]** [*count*] [*flags*]

displays the line range in a visually unambiguous manner. This command displays tabs as **^I**, and the end of lines as **\$**. The only useful flag is **#**, for line numbering. The current line indicator points to the last line displayed.

map[!] [*lhs rhs*]

defines macros for use in Vi. The *lhs* is a string of characters; whenever that string is typed exactly, **vi** behaves as if the string *rhs* had been typed. If *lhs* is more than one character long, none of the characters are echoed or acted upon until either a character is typed that isn't in the *lhs* (in which case all the characters up to that point in the *lhs* are run) or the last character of *lhs* is typed. If the variable `remap` is set, *rhs* itself may contain macros. If the flag **!** is specified, the map applies within Vi INSERT mode; otherwise it applies to command mode. A **map** command with no arguments lists all macros currently defined.

[.] **ma[rk]** *x*

records the specified line as being marked with the single lowercase letter *x*. The line may then be addressed at any point as **^x**.

[.,,] **m[ove]** *addr* [*flags*]

moves the specified line range after the *addr* given. If *addr* is zero, the text is moved to the start of the file. The current line indicator is set to the last line moved.

n[ext][!] [+*command*] [*file* ...]

begins editing the next file in the file list (where the file list was either specified on the command line or in a previous **next** command). If the current file has been modified since the last write, Ex normally prevents you from leaving the current file; you can get around this by specifying an exclamation mark (!). If **autowrite** is set, the current file is written automatically and you go to the next file.

If a list of files is specified, they become the new file list. If necessary, expressions in this list are expanded thus

```
next *.c
```

sets the file list to all the files in the current directory with names ending in **.c** (typically C source files).

[.,.] **nu[mber]** [*count*] [*flags*]

[.,.] **#** [*count*] [*flags*]

displays the specified line range with leading line numbers. The current line indicator points to the last line displayed.

[.] **o[pen]** [/pat/] [*flags*]

enters open mode, which is simply Vi mode with a variable length one line window. If a match is found for the regular expression *pat* in the specified line the cursor is placed at the start of the matching pattern.

You can use any non-alphabetic character to delimit *pat* instead of the slash (/).

pre[serve]

saves the current buffer in a form that can later be recovered using the **-r** option or by the **exrecover** command. **vi** sends you mail which tells you that you can recover this file and explains how to do so.

[.,.] **p[rint]** [*count*] [*flags*]

displays the specified line range. The current line indicator points to the last line displayed.

[.] **pu[t]** [*buffer*]

pastes deleted or yanked lines back into the file after the given line. If no buffer name is given, the most recently changed buffer is used.

Since the **edit** command does not destroy buffers, you can use that command in conjunction with **put** and **yank** to move text between files.

q[uit][!]

exits from Vi/Ex. If the current file has been modified, an exclamation mark (!) must be used or you cannot exit until you write the file.

[.] r[ead][!] [*file*]

reads the contents of *file* and inserts them into the current file after the given line number. If the line number is 0, the contents of the given file are inserted at the beginning of the file being edited. If the current file name is not set, a *file* must be given, and it becomes the current file name; otherwise, if a *file* is given, it becomes the alternate file name. If the *file* begins with an exclamation mark (!), it is taken as a system command. The output from that system command is read in via a pipe after the given line number.

rec[over] [*file*]

attempts to recover *file* if it was saved as the result of a **preserve** command or a system or editor crash. If you do not specify *file*, this command displays a list of all recoverable files.

rew[ind][!]

rewinds the file argument list back to the beginning and starts editing the first file in the list. If the current file has been modified, an exclamation mark (!) must be specified; otherwise, you cannot leave the current file until you have written it out. If **autowrite** is set, the current file is written out automatically if it needs to be.

se[t] [*parameter-list*]

assigns or displays the values of option variables. If you do not specify a parameter list, **set** displays all the variables with values that have changed since the editing session started. If the parameter **all** is specified, **Ex** displays all variables and their values. You may use the parameter list to set or display each of many variable values. Each argument in the list is a variable name; if it is a Boolean variable, the value is set on or off depending on whether the name is prefixed by **no**. Non-Boolean variables alone in an argument are a request to display their values. You may display a Boolean variable's value by appending a question mark (?) to the name. You can set numeric or string variables with

name=value

In a string variable, spaces must be preceded by a backslash. As an example,

```
set readonly? noautowrite shell=/bin/sh
```

shows the value of the **readonly** flag, sets **noautowrite**, and sets the shell to **/bin/sh**.

```
set report report=5
```

shows the value of the **report** variable and then sets the value to 5. See section *Set Option Variables* for further details.

sh[ell] invokes a subshell. The environment variable *SHELL* is used to find the name of the shell to run.

so[urce] *file*
runs editor commands from *file*. A file being run with **source** may contain **source** commands of its own.

st[op] suspends the editor session and returns to system level. For further information, see the description of the Vi command **CTRL-Z**.

[...] **s[ubstitute]** [*/pat/repl/*] [*options*] [*count*] [*flags*]
searches each line in the line range for the regular expression *pat* and replaces matching strings with *repl*. Normally, Ex only replaces the first matching string in each line; if *options* contains **g** (global), all matching strings are changed. If *options* contains **c** (confirm), Ex first displays the line with caret (^) characters marking the *pat* matching location; you can then type **y** if you want Ex to go ahead with the substitution. *pat* cannot match over a line boundary; however in Ex mode, *repl* may contain a newline, escaped by a preceding backslash (\). See the section on regular expressions for full information on both *pat* and *repl*. If there is no *pat* and/or *repl*, Ex uses the most recently specified regular expression and/or replacement string. You can use any non-alphabetic character in place of the slash (/) to delimit *pat* and *repl*.

su[spend]
is the same as **stop**.

[...] **t** *addr* [*flags*]
is the same as the **copy** command.

ta[g][!] *tagname*
looks up *tagname* in the files listed in the variable *tags*. If the tag name is found in a tags file, that file also contains the name of the file that contains the tag and a regular expression required within that file to locate that tag. If the given file is different from the one you are currently editing, Ex normally begins editing the new file; however, if you have modified the current file since the last time it was written out, Ex does not start editing a new file unless the **tag** command contains an exclamation mark (!). (If *autowrite* is on, the current file is automatically written out and the new file read in.) When the new file is read in, the regular expression from the tags file is invoked with the variable *magic* off (see the *Set Option Variables* section).

Tag names are typically used to locate C function definitions in C source files. The first step is to create a tags file using the **ctags(1)** command. Once you do this, you can use the Ex **tag** command to look up a particular function definition and go directly to that definition in the file that contains it.

All characters in tag names are significant unless the variable `taglength` is non-zero; in this case, only the given number of characters are used in the comparison.

una[bbreviate] *lhs*

The abbreviation *lhs* previously created by **abbreviate** is deleted.

u[ndo] undoes the last change or set of changes which modified the buffer. Global changes and Vi macros are considered single changes that can be undone. A second **undo** undoes the **undo** restoring the previous state. The **edit** command may not be undone, since it cleans up the temporary file used to maintain undo information. You cannot **undo** operating system commands and commands that write output to the file system.

unm[ap][!] *lhs*

deletes the map of *lhs*. If the flag **!**, this applies to the insert mode maps; otherwise it applies to the command mode maps.

[1,\$] v */pat/ commands*

is the same as the **global** command with the **!** flag; that is, a global for all non-matching lines. You can use any non-alphabetic character to delimit *pat* instead of the slash (/).

ve[rsion]

displays the current version information for Vi/Ex.

[.] vi[sual] [*type*] [*count*] [*flags*]

enters Vi mode. If no *type* is specified, the current line is at the top of the screen. If *type* is caret (^), the bottom line of the screen is one window before the current line. If *type* is a minus sign, (-), the current line is at the bottom of the screen and if *type* is a period (.), the current line is in the middle of the screen.

[1,\$] w[rite][!] [**>>**] [*file*]

writes the given range of lines to *file*. If two right angle brackets (>>) are included, the lines are appended to the file's current contents. If the current file name is not set, *file* must be given; this becomes the current file name; otherwise, *file* (if specified) becomes the alternate file name. If *file* begins with an exclamation mark (!), it is taken as a system command. **vi** writes the given range to the command through a pipe.

If a *file* is given, it must not already exist. The variable `readonly` must not be set. If a *file* is not given, the file must be *edited*; that is, it must be the same file as that read in. All these conditions may be overridden by using the flag **!**.

[1,\$] wn[!] [**>>**] [*file*]

is similar to **write**, except that it begins editing the next file in the file list immediately afterwards (if the write is successful).

[1,\$] **wq**[!] [>>] [*file*]

is similar to **write**, except that it exits the editor immediately afterwards (if the write is successful).

[1,\$] **x[it]**[!] [*file*]

if you have modified the current file since the last write, performs a **write** command using the specified range and file name and terminates.

[...] **y[ank]** [*buffer*] [*count*]

copies the given line range to the specified *buffer* (a letter from **a** through **z**). If a buffer is not specified, the unnamed buffer is used.

Since the **edit** command does not destroy buffers, you can use that command in conjunction with **put** and **yank** to move text between files.

[.+1]**z** [*type*] [*count*] [*flags*]

displays *count* lines. If no count is specified, Ex uses the current value of the `scroll` variable. The lines are displayed with the given line located according to the *type*. If *type* is a plus sign (+), the editor displays the given line and a screenful after that. If *type* is a period (.), the editor displays a screenful with the given line in the middle. If *type* is a minus sign (-), the editor displays a screenful with the given line at the end. If *type* is a caret (^), the editor displays the screenful before that and if *type* is an equals sign (=), the current line is centered on the screen with a line of hyphens displayed immediately before and after it. The current line indicator points to the last line displayed.

[...] <[<...] [*count*] [*flags*]

shifts the line range by the value of the `shiftwidth` variable. If there are multiple left angle brackets (<), each one causes another shift. The current line indicator points to the last line of the range. If a *count* is specified, that many lines are shifted.

[...] >[>...] [*count*] [*flags*]

shifts the line range right by the value of the `shiftwidth` variable. If there are multiple right angle brackets (>), each one causes another shift. The current line indicator points to the last line of the range. If a *count* is specified, that many lines are shifted.

[*range*] ! *command*

submits *command* to be run by the command interpreter named by the `shell` variable. If a *range* is given, the *command* is invoked with the contents of that line range as input. The output from the *command* then replaces that line range. Thus

```
1,$!sort
```

sorts the entire contents of the file.

Substitutions are made in *command* before it is run. Any occurrences of an exclamation mark (!) are replaced by the previous *command* line, while occurrences of percentage (%) and hash mark (#) characters are replaced with the path names of the current and alternate files, respectively. If any such substitutions actually take place, the new command line is displayed before it is run.

If the file has been modified and the variable `autowrite` is on, the file is written before calling the command. If **autowrite** is off, a warning message is given.

`[$] =` displays the given line number. The current line indicator is not changed.

`" a line of text`

This is a comment.

`[...]` & `[options]` `[count]` `[flags]`

Repeats the last **substitute** command. If any *options*, *count*, or *flags* are specified, they replace the corresponding items in the previous **substitute** command.

`[...] ~` `[options]` `[count]` `[flags]`

repeats the last **substitute** command; however, the regular expression that is used is the last regular expression; that is, if there has been a search, the search's regular expression is used. The simple **substitute** with no arguments, or the & command, uses the regular expression from the previous substitute. **substitute** with an empty regular expression uses the last regular expression, like ~. If any *options*, *count*, or *flags* are specified, they replace the corresponding items in the previous **substitute** command.

`@ buffer`

executes each line in *buffer* as an Ex command. If you do not specify *buffer* or you specify a buffer named @, the last buffer executed is used.

CTRL-D

displays the number of lines of text given by the `scroll` variable. The current line indicator points to the last line displayed.

Special Characters in Ex Commands

When an Ex command contains the percentage character (%), the character is replaced by the name of the current file. For example, if you are about to try out a macro and you are worried that the macro may damage the file, you could say

```
!cp % /tmp
```

to copy the current file to a safe holding place. As another example, a macro could use the percentage character (%) to refer to the current file.

When an Ex command contains the hash mark (#), the character is replaced by the name of the alternate file. The name of the alternate file may be set with the **read** command as described previously. Thus a command like

```
e #
```

tells Ex to edit the alternate file. Using an alternate file can be particularly convenient when you have two files that you want to edit *simultaneously*. The command just given lets you flip back and forth between the two files.

Set Option Variables

Option variables are set with the **set** command. For example,

```
set autowrite
```

sets the `autowrite` option. Options are turned off by putting `no` in front of the name in the **set** command, as in

```
set noautowrite
```

In the descriptions that follow, the minimal abbreviation of each option variable is shown after the comma.

`autoindent, ai`

When `autoindent` is on and you are entering text, the indentation of the current line is used for the new line. In Vi mode, you can change this default indentation by using the control keys **CTRL-D** (to shift left) and **CTRL-T** (to shift right). In Ex mode, a tab or spaces may be typed at the start of a line to increase the indent, or a **CTRL-D** may be typed at the start of the line to remove a level. **CTRL-D** places the current line at a zero indent level, restoring the indent level for the next line. **0CTRL-D** places the current line at a zero indent level, and the next line has this indent level as well.

The size of indent levels is defined by the variable `shiftwidth`. Based on this value and the value of `tabstop`, the editor generates the number of tabs and spaces needed to produce the required indent level.

The default is `noautoindent`.

`autoprint, ap`

When this option is set in Ex mode, the current line is displayed after the following commands: **copy**, **delete**, **join**, **move**, **substitute**, **undo**, **&**, **~**, **<**, and **>**. Automatic displaying of lines does not take place inside *global* commands.

The default is `autoprint`.

autowrite, aw

When this option is on, the current file is automatically written out if it has been changed since it was last written and you have run any of the following commands: **next**, **rewind**, **tag**, **CTRL-^** (Vi), and **CTRL-]** (Vi). Using an exclamation mark (!) with any of these commands stops the automatic write.

The default is **noautowrite**.

beautify, bf

When this option is on, the editor discards all non-printing characters from text read in from files.

The default is **nobeautify**.

directory, dir

The editor uses temporary files with unique names under the given directory. Any error on the temporary files is fatal.

The default is **directory=/tmp**.

edcompatible

When this option is on, the editor attempts to make *substitute* commands behave in a way that is compatible with the **ed** editor. The **g** and **c** options on the substitute commands are remembered and toggled by their occurrence. The **r** option uses the last regular expression rather than the last substitute regular expression. Percentage mark (%) as the entire pattern is equivalent to the previous pattern.

The default is **noedcompatible**.

errorbells, eb

When this option is on, **vi** precedes error messages with the alert character. When it is off, the editor warns you of an error by displaying a message using a standout mode of your terminal (such as inverse video).

The default is **noerrorbells**.

exrc When this option is on, Ex and Vi access any **.exrc** files in the current directory during initialization. If it is off, Ex and Vi ignore such files unless the current directory is the *HOME* directory.

The default is **noexrc**.

ignorecase, ic

When this option is on, the case of letters is ignored when matching strings and regular expressions.

The default is **noignorecase**.

list When this option is on, tabs are displayed as a control-I (^I) rather than being expanded with blanks, and the ends of lines are indicated with a dollar sign (\$).

The default is **nolist**.

magic When this option is off (**nomagic**), regular expression characters ^ \ and \$ become the only ones with special meanings. All other regular expression metacharacters must be preceded by a backslash (\) to have their special meaning.

The default is **magic**.

maxbuffers

This is the number of K units (1024 bytes) of memory which is to be used for the editor buffers. These are allocated in units of 16K.

The default is **maxbuffers=512**, but if that is not available upon entry this is set to the number actually obtained. At least 32K is needed. This is in addition to the code and data space required by **vi**; this may be as much as 128K. Changing **maxbuffers** has no effect.

mesg When this option is on, Ex allows others to use the **write** or **talk** commands to write to your terminal while you are in visual mode. The command

```
mesg n
```

overrides this option (see **mesg(1)**).

The default value is **mesg**.

number, nu

When this option is on, line numbers are displayed to the left of the text being edited.

The default is **nonumber**.

paragraphs

This list of character pairs controls the movement between paragraphs in Vi mode. Lines beginning with a period (.) followed by any pair of characters in the list are paragraph boundaries (for example, .IP). Such lines are typically commands to text formatters like **nroff** or **troff**.

The default is **paragraphs="IPLPPPQPP LIpplpipbp"**

prompt

When this option is on, Ex command mode prompts with a colon (:). (No prompts are given if input is not being read from a terminal.)

The default is **prompt**.

quiet When this option is on, **vi** does not display file information messages.

The default is set by the **-s** option.

readonly

When this option is on, **vi** does not let you write to the current file.

The default is based on the permissions of the current file. If you do not have write permission on this file, the default is **readonly**; otherwise the default is set by the **-R** option.

remap If this option is on and a **map** macro is expanded, the expansion is re-examined to see if it too contains **map** macros.

The default is **remap**.

report

The editor displays a message whenever you issue a command that affects more than this number of lines.

The default is **report=5**.

restrict

When this option is on, all file names are restricted to the current directory. No sub-commands may be called. This variable is automatically set if you invoke the editor with a command that starts with the letter **r**, as in **rvi**. Once the option is turned on, it cannot be turned off. The default is **norestrict**.

scroll

This sets the number of lines to scroll for the **z** (Ex), and **CTRL-D** (Ex) commands.

The default is the value of the variable **window** divided by two.

sections

This list of character pairs controls the movement between sections in Vi mode. Lines beginning with a period (.) followed by any pair of characters in the list are section boundaries (for example, **.SH**). Such lines are typically commands to text formatters like **nroff** or **troff**.

The default is **sections="SHNHH HU"**.

shell, sh

This is the name of the command interpreter to be used for **!** commands and the **shell** command.

The default value is taken from the **SHELL** environment variable.

`shiftwidth, sw`

This sets the width of indent used by shift commands and `autoindent`.

The default is `shiftwidth=8`.

`showmatch, sm`

If this option is on and you type a closing parenthesis (`)` or closing brace (`}`) in input mode, the cursor moves to the matching open parenthesis or brace. It stays there for about one second and then moves back to where you were. This lets you note the relationship between opening and closing parentheses/braces.

The default is `noshowmatch`.

`showmode`

When this option is on, **vi** displays an indicator in the bottom right-hand corner of the screen if you are in Insert/Open/Change/Replace mode. If no indicator is displayed, you are in Command mode.

The default is `noshowmode`.

`tabstop`

Tab stops for screen display in Vi mode are set to multiples of this number.

The default is `tabstop=8`

`taglength, tl`

If this variable is non-zero, tags are only compared for this number of characters.

The default is `taglength=0`.

`tags`

The value of this variable should be a list of space-separated file names separated by spaces. These are used by the **tag** Ex command and the **CTRL-]** Vi command. The files are typically created with the **ctags** program.

The default is `tags=tags`.

`term`

The value of this variable is the terminal type.

The default value is that of the `TERM` environment variable.

`terse` If this option is on, messages are displayed in a very abbreviated form.

The default is `noterse`.

warn When this option is on, commands with an exclamation mark (!) display a warning message if the current file has been modified. When off, no message is displayed.

The default is **warn**.

window

This variable gives the number of text lines available in Vi mode or the default number of lines to display for the **z** command.

The default is given by the **-w** option. If it is not specified with the **-w** option, its value defaults to the environment variable *LINES* or the value found in the terminfo database for *TERM*.

wrapmargin, wm

If this variable is non-zero in Vi insert mode, when a line reaches this number of characters from the right of the screen, the current word moves down to the next line automatically; you don't have to press ENTER.

The default is **wrapmargin=0**.

wrapscan, ws

If this option is off, forward searches stop at the end of the file and backward searches stop at the beginning.

The default is **wrapscan**.

writeany, wa

If this option is off, the editor does not let a file marked [Not edited] overwrite an existing file.

The default is **nowriteany**.

Editor Initialization

Initialization code consists of one or more Ex commands that are run when the editor starts up. Initialization code may be obtained in several ways.

- (a) If there is an environment variable named *EXINIT* with a non-null value, it is assumed to hold initialization code. **vi** runs this code using an Ex **source** command.
- (b) If *EXINIT* does not exist or has a null value, the editor attempts to find a file named *.exrc* under your home directory. If you have an environment variable named *HOME*, the value of this variable is assumed to be the name of your home directory. **vi** runs the *.exrc* file using an Ex **source** command. See **environ(3)** for more information on these environment variables.

- (c) If the *EXINIT* variable or the *\$HOME/.exrc* file sets the option variable *exrc* and there is a file named *.exrc* under the current directory, it is assumed to hold initialization code. **vi** runs this code using an Ex **source** command.
- (d) **vi** executes any commands given by the **-c** or **+** options.

vi reads the *.exrc* file as if it were a sequence of keystrokes typed at the beginning of an Vi session. As a result, the contents of *.exrc* must be the same as the characters you would type if you were in Vi. In particular, if the input contains an unusual character (for example, a carriage return) that you would normally precede with CTRL-V, there must be a CTRL-V in the *.exrc* file. When using **vi** to create *.exrc*, you must type CTRL-V CTRL-V to put a CTRL-V character into your initialization file, then CTRL-V followed by the special character. The *.exrc* file must show both CTRL-V and the special character.

FILES

vi uses the following files and directories:

<i>/tmp</i>	directory used for temporary files if neither <i>TMPDIR</i> nor <i>TMP</i> is defined
<i>/tmp/VInnnnn.mmm</i>	temporary files
<i>.exrc</i>	startup file

ENVIRONMENT VARIABLES

vi uses the following environment variables:

<i>COLUMNS</i>	contains the number of columns between the left and right margins (see option variable wrapmargin). This is also used as the horizontal screen size.
<i>ENV</i>	contains the path name of a file containing MPE/iX Shell commands. When you invoke sh , it runs this file before doing anything else.
<i>EXINIT</i>	contains a list of Vi commands to be run on editor startup.
<i>HOME</i>	contains the directory to be searched for the editor startup file.
<i>LINES</i>	contains the number of lines in a <i>screenful</i> (see option variable <i>window</i>). This is also used as the vertical screen size.
<i>PATH</i>	contains a list of directories to be searched for the shell command specified in the Ex commands read , write , and shell .
<i>SHELL</i>	contains the name of the command interpreter for use in ! , shell , read , write and other Ex commands with an operand of the form !string . The default is the sh utility.

<i>TERM</i>	contains the name of the terminal type.
<i>TERMINFO</i>	contains the path name of the terminfo database.
<i>TMP</i>	contains the path name that MPE/iX Shell and Utilities uses as the directory for temporary files, if <i>TMPDIR</i> is not defined. <i>TMPDIR</i> takes precedence over <i>TMP</i> .
<i>TMPDIR</i>	contains the path name that MPE/iX Shell and Utilities uses as the directory for temporary files.

DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

Messages

Message:	\\<digit> value too large
Cause:	When using a numerical reference to a subexpression within the regular expression, the number used exceeded the number of subexpressions present.
Action:	Ensure that numerical references to subexpressions are valid.
Message:	(<i>num1</i> null, <i>num2</i> non-Ascii)
Cause:	vi found <i>num1</i> null and <i>num2</i> non-printable characters in the current file. This may occur if you attempted to edit a file that vi does not recognize as a proper text file.
Action:	Specify a proper text file. Using vi to edit binary files is not recommended.
Message:	[Read Only]
Cause:	You specified an input file that was marked as read-only by the file system, or the set variable readonly was set on prior to reading the file. You can still read and edit the file, but you cannot save any changes.
Action:	Save the changes you have made to a different file name. Use chmod (1) to change the file access permissions, and reread the file. If you set the readonly variable to on, you can set it to off before writing the file with: <div style="margin-left: 40px;">:set noreadonly</div> or use the w! command to force the write.
Message:	Argument buffer overflow
Cause:	You specified a list of command arguments that, after the expansion of the current file name (%) or the alternate file name (#), overflowed the buffer.
Action:	Specify a shorter list of command arguments.

Message:	Argument list too long
Cause:	You specified an argument list that, after file name generation, exceeded the editor's limit.
Action:	Specify an argument list that expands to fewer arguments.
Message:	Bad tag
Cause:	You attempted to reference more than one tag with a command.
Action:	Specify only one tag name for a command.
Message:	Badly constructed regular expression
Cause:	You specified a regular expression that was parsed incorrectly due to invalid characters or the failure to provide matching brackets.
Action:	Correct the regular expression and try again.
Message:	Buffers are 1-9, a-z
Cause:	You specified an invalid buffer name. Buffers A to Z are valid in both Ex and Vi mode, while buffers 1 to 9 are valid only in Vi mode and read-only.
Action:	Specify a valid buffer name.
Message:	Can't escape newlines in visual
Cause:	You attempted to use a backslash at the end of a line to escape a newline. This is not permitted in Vi mode.
Action:	Do not use a backslash at the end of a line.
Message:	Can't escape newlines into regular expressions
Cause:	You attempted to search for a newline character in a regular expression. This is not possible.
Action:	Do not attempt to search for a newline in a regular expression.
Message:	Can't undo within global.
Cause:	You attempted to use an undo command within a global command. This is not permitted.
Action:	Do not use an undo command within a global command.
Message:	<i>command</i> No such command from open/visual
Cause:	In Vi mode, you attempted to use one of the Ex commands that are not permitted in this mode.
Action:	Do not use <i>command</i> in Vi mode.
Message:	<i>command</i> requires a trailing address
Cause:	You attempted to use <i>command</i> to move or copy a range of lines without specifying a target address.
Action:	Provide the missing target address.

Message:	<i>command</i> where?
Cause:	You attempted to use <i>command</i> to move or copy a range of lines without specifying a target address.
Action:	Provide the missing target address.
Message:	Command too long
Cause:	You entered a command line that exceeded the input buffer size.
Action:	Break the command line in smaller workable components. Create macros or source scripts if the task is going to be performed many times.
Message:	Destination cannot straddle source in 'm' and 't'
Cause:	You specified a destination for a move , copy , or t command that resides within the specified source range.
Action:	Make sure that the destination of a move , copy , or t command is not contained within the source range.
Message:	Digits required after =
Cause:	You attempted to assign a non-numeric value to a numeric variable using set .
Action:	Specify a valid number.
Message:	Environment variable HOME not defined.
Cause:	You attempted to change the current working directory to your home directory by using the cd or chdir command without specifying a path name; however, the environment variable <i>HOME</i> was not defined.
Action:	Set <i>HOME</i> to your home directory, or specify the complete path name of your home directory when using cd or chdir .
Message:	Fail
Cause:	You specified a regular expression that failed to match any text in the buffer.
Action:	Verify that the regular expression is correct.
Message:	Failed to allocate required memory.
Cause:	There were not enough free system resources to perform the desired operation.
Action:	Free up more resources.
Message:	File exists - use 'w! <i>filename</i> ' to overwrite
Cause:	You attempted to write to a file that already exists.
Action:	Specify an unused file name, or use the suggested command to overwrite the existing file.
Message:	File is read only
Cause:	You attempted to write to a file that is considered to be read-only by the file system, or you had enabled the set variable <i>readonly</i> .
Action:	Save the changes you have made to a different file name. Use chmod (1) to change the file access permissions, and reread the file. If you set the <i>readonly</i> variable to on, you can set it to off before writing the file with:

`:set noreadonly`

or you can use the **w!** command to force the write.

Message: `"filename": File not found`

Cause: You specified the name of a file that does not exist.

Action: Ensure that you spelled the file name correctly, and that you have appropriate permissions to access the file.

Message: `Filename too long`

Cause: You specified a file name that exceeded the maximum length allowed.

Action: Use a shorter name.

Message: `Give one tag per line`

Cause: You attempted to reference more than one tag on a line.

Action: Specify only one tag name on a line.

Message: `glob: system error`

Cause: See **syserror**(3).

Action: See **syserror**(3).

Message: `Global command too long`

Cause: You specified a global command line that exceeded the size of the input buffer.

Action: Break the command in smaller workable components. Create macros or source scripts if the task is going to be performed many times.

Message: `Incomplete shell escape command - use 'shell' to get a shell`

Cause: You attempted to use a shell escape without specifying a command.

Action: To invoke an interactive shell, use the **shell** command.

Message: `Insufficient memory for edit-line buffer.`

Cause: **vi** attempted to set up the necessary structures for line editing and failed.

Action: Contact your system manager.

Message: `Insufficient memory for GLOB argument list.`

Cause: There were not enough system resources to remember the argument list, after file name generation.

Action: Specify an argument list that expands to fewer arguments.

Message: `Insufficient memory for GLOB argument space.`

Cause: There were not enough system resources to serve as a buffer for the argument list that is needed to perform file name generation.

Action: Specify an argument list that expands to fewer arguments.

-
- Message:** Insufficient memory for GLOB argument table.
Cause: There were not enough system resources to remember the argument list, during file name generation.
Action: Specify an argument list that expands to fewer arguments.
- Message:** Insufficient memory for mapping.
Cause: There was not enough dynamic storage space to record the mapping, macro, or abbreviation.
Action: Use the **map** and **abbreviate** commands to view the current list of mappings and abbreviations, then use the **unmap** and **unabbreviate** commands to remove those that are not currently required.
- Message:** Insufficient memory for regular expression data.
Cause: There were not enough system resources to create an intermediate form of the regular expression.
Action: Specify a simpler expression
- Message:** Insufficient memory to initialize line number tables.
Cause: There were not enough free system resources to set up the necessary structures for file buffer operation.
Action: Contact your system manager.
- Message:** Insufficient memory to initialize pager.
Cause: **vi** tried to set up the necessary structures for paging the file buffer and failed.
Action: Contact your system manager.
- Message:** Insufficient memory to push an input string.
Cause: There was not enough dynamic storage space to place a mapping or macro on the input stack.
Action: The input stack is always flushed on an error; try the command again. If you are using macros, tail recursion is allowed while head recursion causes the input stack to fill up.
- Message:** Last repeatable command overflowed the repeat buffer
Cause: You attempted to repeat a command that overflowed the fixed size repeat buffer.
Action: Re-enter the command in full.
- Message:** Line too long
Cause: You attempted to add text to a line that would cause its length to exceed the maximum indicated by the configuration variable `LINE_MAX`.
Action: Make shorter lines.
- Message:** Mapping *macro* is not defined
Cause: You attempted to use *macro*, which was not defined with a **map** command.
Action: Use **map** to create *macro*.

Message: missing lhs
Cause: You attempted to **unmap** or **unabbreviate** a mapping without providing the necessary left-hand-side.
Action: Check the *Ex Commands* subsection of this man page for a description of the **unmap** and **unabbreviate** commands and their syntax.

Message: Missing filename
Cause: You specified a command that required a file name as an argument without providing the file name.
Action: Provide the missing file name.

Message: Missing rhs
Cause: The right-hand-side expansion of a mapping is missing.
Action: Provide the missing expansion to define a mapping or macro. Use the **unmap** command to remove a mapping or macro.

Message: No alternate filename to substitute for #
Cause: You attempted to use # to represent the alternate file name, but there was no alternate file name.
Action: Specify a full file name for the command.

Message: No current filename
Cause: You attempted to re-read the current file when there was no current file.
Action: Specify a file name with the command.

Message: No file
Cause: You attempted to re-read the current file when there was no current file.
Action: Specify a file name with the command.

Message: No filename to substitute for %
Cause: You attempted to use % to represent the current file name, but there was no current file name.
Action: Specify a full file name for the command.

Message: No identity mappings allowed.
Cause: You specified a mapping of the form:

 :map lhs rhs

where *lhs* and *rhs* were identical strings.
Action: You must specify two different strings for *lhs* and *rhs* in a mapping.

Message: No last buffer executed
Cause: You attempted to repeat a macro when no macros had been previously executed.
Action: Execute a specific macro before attempting to repeat it.

-
- Message:** No more space for mapping.
Cause: **vi** reached its limit on the number of mappings, macros, and abbreviations allowed.
Action: Use the **map** and **abbreviate** commands to view the current list of mappings and abbreviations, the use the **unmap** and **unabbreviate** commands to remove those that are not currently required.
- Message:** No newlines in re's
Cause: You attempted to search for a newline character in a regular expression. This is not possible.
Action: No solution.
- Message:** No previous command to substitute for !
Cause: You attempted to repeat a previous shell command when no initial shell command had been made.
Action: Specify the shell command explicitly.
- Message:** No previous re
Cause: You attempted to repeat a regular expression search when no initial search had been made.
Action: Specify a regular expression explicitly in your search command.
- Message:** No previous regular expression
Cause: You attempted to repeat a regular expression search when no initial search had been made.
Action: Specify a regular expression explicitly in your search command.
- Message:** No remembered regular expression
Cause: The currently is no remember regular expression that can be used.
Action: Specify the regular expression explicitly.
- Message:** No such option - 'set all' gives all option values
Cause: You attempted to reference an invalid **set** variable.
Action: Check the *Set Option Variables* subsection for a list of valid variables, or use the
- ```
:set all
```
- command to see the current settings of all variables.
- Message:** No such tag in tags file  
**Cause:** You attempted to reference a tag that was not present in the tags file.  
**Action:** Either use **ctags** to regenerate the tags file, or add the entry by hand to the tags file.

---

|                 |                                                                                                                                                                                                                |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | No tags file                                                                                                                                                                                                   |
| <b>Cause:</b>   | You specified a tags file with the <code>tags</code> variable that <b>vi</b> was unable to find.                                                                                                               |
| <b>Action:</b>  | Check the <i>Ex Commands</i> subsection for information on using the <b>set</b> command to set the <code>tags</code> variable, or the man page for <b>ctags</b> (1) for information on generating a tags file. |
| <b>Message:</b> | No write since last change ( <i>command!</i> overrides)                                                                                                                                                        |
| <b>Cause:</b>   | You attempted to run a command before you saved any changes to a file.                                                                                                                                         |
| <b>Action:</b>  | Either save the current changes or use the suggested command to override the error.                                                                                                                            |
| <b>Message:</b> | Nonzero address required on this command                                                                                                                                                                       |
| <b>Cause:</b>   | You specified zero (0) as a line address for a command which does not accept 0 as a valid line address.                                                                                                        |
| <b>Action:</b>  | Specify a non-zero line address.                                                                                                                                                                               |
| <b>Message:</b> | Not an editor command                                                                                                                                                                                          |
| <b>Cause:</b>   | You specified <i>command</i> in Ex mode; however, <i>command</i> is not a valid editor command.                                                                                                                |
| <b>Action:</b>  | Check the <i>Ex Commands</i> section of the <b>vi</b> man page for a list of valid editor commands.                                                                                                            |
| <b>Message:</b> | Not enough memory for screens                                                                                                                                                                                  |
| <b>Cause:</b>   | <b>vi</b> attempted to set up the necessary structures for full-screen operation and failed. There are not enough free system resources to run <b>vi</b> .                                                     |
| <b>Action:</b>  | Contact your system manager.                                                                                                                                                                                   |
| <b>Message:</b> | Not that many lines in buffer                                                                                                                                                                                  |
| <b>Cause:</b>   | You specified a line range that included at least one value that was greater than the number of lines in the file.                                                                                             |
| <b>Action:</b>  | Specify a correct line range. You can use the dollar sign (\$) to denote the last line in the file.                                                                                                            |
| <b>Message:</b> | Nothing in buffer ' <i>buf</i> '                                                                                                                                                                               |
| <b>Cause:</b>   | You attempted to use the <b>put</b> command to paste text, or the <b>@</b> command to execute a macro, from the buffer <i>buf</i> which was empty.                                                             |
| <b>Action:</b>  | Use the <b>yank</b> or <b>delete</b> commands to save text to a buffer.                                                                                                                                        |
| <b>Message:</b> | Replacement pattern too long - limit <i>num</i> characters                                                                                                                                                     |
| <b>Cause:</b>   | You specified a replacement pattern that was too long for the allotted buffer space.                                                                                                                           |
| <b>Action:</b>  | Perform the necessary replacements in increments using shorter replacement patterns.                                                                                                                           |



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|                 |                                                                                                                                                                                                                                                                                           |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Restricted environment                                                                                                                                                                                                                                                                    |
| <b>Cause:</b>   | You tried to use an operation that is not permitted in a restricted environment.                                                                                                                                                                                                          |
| <b>Action:</b>  | Use an unrestricted version of the editor. Contact your system manager if you do not have access to an unrestricted editor. Also, once the <b>set</b> variable <b>restrict</b> is enabled, it cannot be disabled during the editor session.                                               |
| <b>Message:</b> | Result line of join would be too long                                                                                                                                                                                                                                                     |
| <b>Cause:</b>   | You attempted to use the <b>join</b> command to combine several lines into a single line, the length of which would exceed the maximum line length indicated by the configuration variable <b>LINE_MAX</b> .                                                                              |
| <b>Action:</b>  | Specify fewer lines to be joined.                                                                                                                                                                                                                                                         |
| <b>Message:</b> | Result of delete would produce a line too long                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | You attempted to delete a range of text from the middle of one line to the middle of another. This would result in joining the remainders of the lines to form a line, the length of which would exceed the maximum line length indicated by the configuration variable <b>LINE_MAX</b> . |
| <b>Action:</b>  | Make shorter lines.                                                                                                                                                                                                                                                                       |
| <b>Message:</b> | Result of substitution would produce a line too long                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | You specified a replacement string in a substitution command that would produce a line that is too long for <b>ed</b> to handle.                                                                                                                                                          |
| <b>Action:</b>  | Specify a shorter replacement string or split the original line into shorter lines before performing the substitution.                                                                                                                                                                    |
| <b>Message:</b> | String too long in option assignment                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | You attempted to assign a string to a variable using the <b>set</b> command, but the size of the string exceeded the allocated storage space.                                                                                                                                             |
| <b>Action:</b>  | Specify a shorter string.                                                                                                                                                                                                                                                                 |
| <b>Message:</b> | System does not support job control                                                                                                                                                                                                                                                       |
| <b>Cause:</b>   | You attempted to use a job control command (for example, <b>stop</b> ) on a system that does not support job control.                                                                                                                                                                     |
| <b>Action:</b>  | Avoid using commands that require job control. Request that the system manufacturer support job control.                                                                                                                                                                                  |
| <b>Message:</b> | <i>tagname</i> : Bad tag file entry                                                                                                                                                                                                                                                       |
| <b>Cause:</b>   | <b>vi</b> encountered an entry in the tags file that it was unable to parse correctly.                                                                                                                                                                                                    |
| <b>Action:</b>  | See the man page for <b>ctags</b> (1) for information on how to generate a tags file, or <b>ctags</b> (2) for the correct format of a tags entry.                                                                                                                                         |
| <b>Message:</b> | Temporary file error                                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | <b>vi</b> tried to set up the necessary temporary files for file buffer operation and failed, possibly due to a lack of available disk space.                                                                                                                                             |
| <b>Action:</b>  | Contact your system manager.                                                                                                                                                                                                                                                              |

- 
- Message:** Temporary file i/o error--DANGER--write file somewhere else and exit ASAP!
- Cause:** A serious error occurred while performing I/O on the temporary files.
- Action:** Save the work space to a different work file name, exit the editor and re-enter using the recently saved work file. If the error persists, contact your system manager.
- Message:** Terminal "*term*" has insufficient capabilities for Curses
- Cause:** The terminal *term* does not have the features necessary to support the Curses library routine necessary for running **vi**.
- Action:** Use another terminal.
- Message:** Too dangerous to map that.
- Cause:** You specified a multi-key mapping that did not begin with a non-alphabetic character.
- Action:** Choose a multi-key mapping that begins with a non-alphabetic character.
- Message:** Too long
- Cause:** You attempted to delete a range of text from the middle of one line to the middle of another. This would result in joining the remainders of the lines to form a line, the length of which would exceed the maximum line length indicated by the configuration variable `LINE_MAX`.
- Action:** Make shorter lines.
- Message:** Too many file names
- Cause:** You specified multiple file names as arguments to a command that only accepts one file name.
- Action:** Check the *Ex Commands* subsection for list of valid Ex commands and their arguments.
- Message:** Too many nested sources
- Cause:** You attempted to nest too many source files within other source files.
- Action:** Reduce the level of nesting.
- Message:** Unknown terminal "*term*".
- Cause:** A path could not be determined for the terminal name, or none of standard input, standard output, and standard error were a terminal.
- Action:** Make sure that standard input is a terminal, not a redirected file or a pipe.
- Message:** Unknown uid *#num*. Unable to recover
- Cause:** Your user ID could not be found. This ID (typically your login name) is used to locate files that were lost or preserved by the use for subsequent recovery at a later time.
- Action:** Contact your system manager.

---

**Message:** What?

**Cause:** In Vi mode, you attempted to use one of the Ex commands that are not permitted in this mode.

**Action:** Do not use this command in Vi mode.

**Message:** Write error (out of space?)

**Cause:** A write error occurred. It is possible that there was no disk space left.

**Action:** Make room on the current disk, or save to another disk that you know has space available.

**Message:** Write forms are 'w' and 'w>>'

**Cause:** You specified an invalid syntax for the **write** command.

**Action:** Check the *Ex Commands* subsection for a description of the **write** command and its syntax.

## PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0. Most UNIX systems.

## LIMITS

- Maximum number of lines: 65279 (64K - 256 - 1).
- Longest command line: 256 bytes.
- Length of filenames: 128 bytes.
- Length of string options: 64 bytes.
- Length of remembered regular expressions: 256 bytes.
- Number of **map**, **map!** and **abbreviate** entries: 128 each.
- Number of saved keystrokes for . in Vi: 128.
- Length of the *lhs* of **map**, **map!** or **abbreviate**: No fixed limit. Limit is based on available memory.
- Max number of characters in a tag name: 30.
- Number of characters in a : escape from Vi: 256.
- Requires 128K of memory plus the set option `maxbuffers K` of auxiliary memory. During startup, `maxbuffers` is changed to reflect available memory; at least 32K is required.
- Number of nested source files is 3.

## MPE/iX NOTES

Due to limitations in the current implementation of MPE/iX, there are a number of limitations in the behavior of the **vi** command.

- There is no support for job control. As well, the **crypt** utility and the facilities for recovering files are not included. As a result the CTRL-Z command, the **-x** option, the **-r** option, and the **preserve**, **recover**, **stop**, and **suspend** Ex commands are not currently implemented.

- 
- The cursor keys do not work.
  - Although the current MPE/iX implementation of the **vi** command can read non-byte stream files, it can only write byte stream files. As a result, if you edit a non-byte stream file with **vi** and save it, that file is now a byte stream file. File characteristics like file code, record size, and so forth are not preserved by this conversion.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**SEE ALSO**

**ctags(1)**, **ed(1)**, **ex(1)** **jobs(1)**, **mesg(1)**, **sed(1)**, **write(1)**, **regexp(3)**,

**NAME**

wait — wait for process to complete

**SYNOPSIS**

**wait** [*pid*|*job-id*...]

**DESCRIPTION**

**wait** waits for the termination of one or more jobs or child processes in the background. If you specify *job-ids*, **wait** waits for all processes in each job to terminate. If you specify a *pid*, **wait** waits for the child process with that process ID to terminate. If no child process has that process ID, **wait** returns immediately.

If you specify neither a *pid* nor a *job-id*, **wait** waits for the termination of all process IDs known to the invoking shell.

**DIAGNOSTICS**

If you specified a *job-id* which has terminated or is unknown by the invoking shell, an error message and a return code of 127 is returned. If you specified a *pid* which has terminated or is unknown to the shell, a return code of 127 is returned. If a signal terminated the process abnormally, the exit status is a value greater than 128 unique to that signal; otherwise, possible exit statuses are:

- |       |                                                                                             |
|-------|---------------------------------------------------------------------------------------------|
| 0     | Successful completion.                                                                      |
| 1-126 | An error occurred.                                                                          |
| 127   | A specified <i>pid</i> or <i>job-id</i> has terminated or is unknown by the invoking shell. |

**Messages**

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

**PORTABILITY**

POSIX.2.x/OPEN Portability Guide 4.0. All UNIX systems.

**NOTE**

This command is built into the shell.

**MPE/iX NOTES**

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**SEE ALSO**

**sleep**(1)

---

**NAME**

wall — write to all logged in users

**SYNOPSIS**

**wall**

**DESCRIPTION**

**Note:** The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

The **wall** utility reads a message from the standard input until an end-of-file is reached. This message is then prefixed with Broadcast Message . . . ' and sent to all users that are currently logged in.

If a user has issued the

```
mesg n
```

command, that user does not receive the message.

**DIAGNOSTICS**

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

**Messages**

**Message:** target terminal "*term*": *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

**Message:** temporary file error: *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

**Message:** Unknown option "*-option*"

**Cause:** You specified an option that is not valid for **alias**.

**Action:** Check the *DESCRIPTION* section for a list of valid **wall** options.

**Message:** write error on temporary file: *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

---

**PORTABILITY**

x/OPEN Portability Guide 4.0. UNIX System V.

**MPE/iX NOTES**

The **wall** command is currently implemented as a call to the MPE/iX CI command **TELL** to send messages to all users. As a result, users receive each line of the message prefixed with the session number and the name of the user who sent the message. If an error occurs while using **TELL** to contact a user, the message is displayed on \$STDLIST. For more information on **TELL**, refer to the *MPE/iX Commands Reference Manual*.

On MPE/iX, the end-of-file sequence is :eod followed by ENTER. Typing a subsystem break (-CTRL-Y) also terminates the message, causing it to be sent.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**SEE ALSO**

**mesg(1)**, **write(1)**

**NAME**

wc — count of newlines, words, bytes, and characters

**SYNOPSIS**

**wc** [**-c** | **-m**] [**-l****w**] [*file* ...]

**DESCRIPTION**

**wc** counts the number of newlines, words, characters and bytes in text files. If you specify multiple files, **wc** produces counts for each file, plus totals for all files. If you did not specify any options, **wc** produces the following output:

*newline\_count word\_count byte\_count filename*

When you specify options, **wc** displays only the selected counts in the same order as the default output. If you specify **-m**, the character count replaces the byte count. For example, **-cw** displays the word count followed by the byte count and the file name and **-ml** displays the newline count followed by the character count and file name.

A word is considered to be a character or characters delimited by white space.

**Note:** The **-c** option of **wc** counts bytes, not characters. This is a change from previous versions of **wc**, dictated by the POSIX.2 standard which provides the **-m** option to count characters. If you have a file containing multibyte characters, the byte count is higher than the character count.

**Options**

**wc** accepts the following options:

- c** displays a byte count. You cannot specify this option with **-m**.
- l** displays a newline count.
- m** displays a character count. You cannot specify this option with **-c**.
- w** displays a word count.

**DIAGNOSTICS**

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because of an inability to open the input file.
- 2 Failure because of an invalid command line option.



---

**Messages**

**Message:** file "*filename*" : *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

**Message:** insufficient memory

**Cause:** There were not enough free system resources to perform the specified operation.

**Action:** Free up more resources.

**Message:** Unknown option "*-option*"

**Cause:** You specified an option that is not valid for **wc**.

**Action:** Check the *DESCRIPTION* section of this man page for a list of valid **wc** options.

**PORTABILITY**

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

**MPE/iX NOTES**

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**SEE ALSO**

**awk**(1), **ed**(1), **vi**(1)

**NAME**

whence — tell how shell interprets command name

**SYNOPSIS**

**whence** [-v] *name* ...

**DESCRIPTION**

**whence** tells how the shell would interpret each *name* if used as a command name. Shell keywords, aliases, functions, built-in commands, and executable files are distinguished. For executable files, the full path name is given unless the file is in the current directory, in which case, a relative path name is given.

The main difference between **whence** and **which** is that **whence** is built into the shell and thus can take into account shell internal commands.

**Options**

**whence** accepts the following option:

-v       gives a more verbose report.

**DIAGNOSTICS**

Possible exit status values are:

- 0    Successful completion.
- 1    Command *name* could not be found.
- 2    Failure due to an invalid command line argument.

**Messages**

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

**PORTABILITY**

On UNIX systems, **whence** is built into the KornShell, but is not in the Bourne Shell.

See **command**(1) for the POSIX.2 replacement.

**NOTE**

This command is built into the shell.

**MPE/iX NOTES**

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**whence(1)**

**MPE/iX Shell and Utilities**

**whence(1)**

---

**SEE ALSO**

**command(1), sh(1), which(1)**

**NAME**

which — display path name for executable command

**SYNOPSIS**

**which** [-a] *command* ...

**DESCRIPTION**

The MPE/iX Shell **sh**(1) uses the *PATH* environment variable to determine which directories are searched to find programs. For each *command*, **which** looks through the directories in the *PATH* variable, and displays the path name of the first executable file that matches *command*.

**Options**

**which** accepts the following option:

- a      displays all matching executable files from every directory in *PATH*, not just the first match. This can help you find conflicts between two executables of the same name.

**ENVIRONMENT VARIABLES**

**which** uses the following environment variable:

*PATH*    contains a list of directories for **which** to search when looking for *command*.

**DIAGNOSTICS**

Possible exit status values are:

- 0      An appropriate executable file can be found with the current *PATH*.
- 1      Failure due to any of the following:
  - an appropriate executable file cannot be found
  - invalid command line option

**Message**

Because this utility is built into the MPE/iX Shell, see the **sh**(1) man page for a complete list of error messages that you may receive when using it.

**PORTABILITY**

Available on some UNIX systems.

**NOTE**

This command does not know about shell keywords, aliases, functions, etc. For this reason, **whence**(1) is recommended when you are seeking information about a shell-related utility.

**MPE/iX NOTES**

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**which(1)**

**MPE/iX Shell and Utilities**

**which(1)**

---

**SEE ALSO**

**command(1), sh(1), whence(1)**

---

**NAME**

who — display information about current users

**SYNOPSIS**

```
who [-AabdlmprsTtuw] file
who am i
```

**DESCRIPTION**

**Note:** The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

The **who** command displays information about users that are currently logged into the system. By default, the output contains the user's login name, terminal name, and the time at which the user logged in. Normally, **who** consults the file `/etc/utmp` for information, but you can use the *file* argument to specify another accounting file (such as `/etc/wtmp`).

When called as:

```
who am i
```

**who** displays your login name, terminal, and login time.

**Options**

**who** accepts the following options:

- A** displays all accounting entries.
- a** displays all types of entries. This is equivalent to specifying **-AbdilprTtuw**.
- b** displays all entries written at system boot time.
- d** displays entries produced on the death of a process spawned from `/etc/init`.
- i** displays idle time for users.
- l** displays logged-out user entries.
- m** displays information about current terminal only.
- p** displays entries for processes spawned from `/etc/init`.
- r** displays all run-level change entries.
- s** displays only the three fields *user name*, *terminal*, and *time of entry*.
- T** displays the state of each terminal as a plus sign (+) if the terminal allows write access to other users, and a minus sign (-) if write access is denied. **who** displays a question mark (?) if the write access cannot be determined.

- t** displays all time change entries (both old and new time).
- u** displays only entries associated with logged-in users. **who** enables this option when you do not provide any options on the command line.
- w** displays the terminal state; this indicates whether or not the terminal is writable.

## DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion.
- 1 Failure because of an invalid command line option, or because of too many command line arguments.

## Messages

The **who** utility produces no error messages.

## PORTABILITY

POSIX.2. x/OPEN Portability Guide 4.0.

The **-A**, **-a**, **-b**, **-d**, **-i**, **-l**, **-p**, **-r**, **-s**, **-t**, **-w**, and **am i** options are extensions to the POSIX standard.

## MPE/iX NOTES

The **who** command is currently implemented on MPE/iX as a front-end to the MPE/iX CI command **SHOWJOB**. The `/etc/utmp` and `/etc/wtmp` files are not currently implemented.

**who** maps the information produced by **SHOWJOB** into the format required by **who**. In many cases, **SHOWJOB** does not provide the information that an option is supposed to display. This is detailed as follows:

- b** no corresponding information
- d** no corresponding information
- i** idle time is not available so `old` is printed
- l** no corresponding information
- p** no corresponding information
- r** no corresponding information
- T** write access cannot be determined so `?` is always displayed
- t** no corresponding information

Finally, **who** displays login time information exactly as provided by **SHOWJOB** and rather than displaying the users' PID, it displays the session ID. When you use `who -u`, the last field displayed is the session ID.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

---

**NAME**

write — write to another user

**SYNOPSIS**

**write** *user\_name* [*terminal*]

**DESCRIPTION**

**Note:** The MPE/iX implementation of this utility does not function exactly as this man page describes. For details, see the *MPE/iX NOTES* section at the end of this man page.

**write** sends a message directly to the terminal of another user logged in to the system. The *user\_name* argument indicates the user to whom you want to send your message. The *terminal* argument is an optional identifier for use when the other user is logged in on more than one terminal. The format of the *terminal* identifier is the same as returned by **who**.

When you issue a **write** command to send a message to another user, the other user receives a message of the form

Message from *your\_name* (*terminal*) [*date*] ...

When the system has established the connection to the other user, it sends two alert characters (usually beeps) to your terminal to tell you that it is ready to send your message. You can then type in your message and that message appears on the other user's terminal. To end your message, enter end-of-file or an interrupt (typically, CTRL-D for end-of-file or CTRL-C for an interrupt). When **write** receives an indication for end-of-message, it notifies the other user that the message is over and breaks the connection. When you are using the POSIX locale, **write** does this by sending the string EOT to the other terminal.

The other user can reply to your message with

**write** *your\_user\_name*

However, if both of you are trying to write on each other's terminal at the same time, the messages may get interleaved on your screens, making them difficult to read. For two-way conversations, use **talk** instead of **write**.

You can run a command while entering text to **write**. To do this, start a line with an exclamation mark (!) and put a standard system command on the rest of that line. **write** calls your shell to execute the command.



The **mesg** command lets you refuse **write** messages. With

```
mesg n
```

you can tell the system that you don't want to be interrupted by **write** messages. If people try to **write** to you, they are denied immediately; the system does not inform you about such attempts. For further details, see **mesg**(1).

## DIAGNOSTICS

Possible exit status values are:

- 0 **write** successfully wrote a message; or the intended recipient has used **mesg** to refuse messages (either before you start sending a message or as you are sending the message).
- 1 An error occurred.

## Messages

|                 |                                                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | insufficient memory                                                                                                                                                    |
| <b>Cause:</b>   | There were not enough free system resources to perform the specified operation.                                                                                        |
| <b>Action:</b>  | Free up more resources.                                                                                                                                                |
| <b>Message:</b> | no permission to write to <i>user</i> on terminal <i>tty</i>                                                                                                           |
| <b>Cause:</b>   | You tried to write to a <i>user</i> who had disabled communication with <b>mesg</b> .                                                                                  |
| <b>Action:</b>  | Send e-mail to <i>user</i> .                                                                                                                                           |
| <b>Message:</b> | Not setgid to <i>term_group</i> -- contact your system administrator                                                                                                   |
| <b>Cause:</b>   | The process does not belong to the <i>term_group</i> group.                                                                                                            |
| <b>Action:</b>  | Contact your system administrator.                                                                                                                                     |
| <b>Message:</b> | target terminal " <i>tty</i> ": <i>system error</i>                                                                                                                    |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                               |
| <b>Message:</b> | <i>term_group</i> group is missing -- contact your system administrator                                                                                                |
| <b>Cause:</b>   | <b>write</b> was unable to find <i>term_group</i> (that is, the group that owns all the terminals).                                                                    |
| <b>Action:</b>  | Contact your system administrator.                                                                                                                                     |
| <b>Message:</b> | <i>user</i> logged in more than once ... writing to <i>tty</i>                                                                                                         |
| <b>Cause:</b>   | You tried to write to <i>user</i> 's terminal but <i>user</i> was logged in multiple times. <b>write</b> writes to <i>user</i> 's session on the terminal <i>tty</i> . |
| <b>Action:</b>  | If you want to write to a different terminal than the one that <b>write</b> chose, specify the terminal argument on the command line.                                  |

---

**Message:** *user* not logged in  
**Cause:** You tried to write to *user*'s terminal but *user* was not logged in.  
**Action:** Send e-mail to *user*.

**Message:** *user* not logged in on that *tty*  
**Cause:** You tried to write to *user* at a specific terminal but *user* was not logged in on that terminal.  
**Action:** Retry your **write** command without specifying *terminal*.

## PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

## MPE/iX NOTES

The current MPE/iX implementation of the **write** uses the MPE/iX CI **TELL** command to send messages to other users. As a result, the user to whom you are sending receives each line of the message prefixed with the session number and your user name. (This does not occur when you send a message to yourself because, in that case, the message simply appears on your screen.) If an error occurs while using **TELL** to contact a user, the message appears on \$STDLIST. For example, **write** cannot determine if it has permission to write to a user before attempting to do it. It calls **TELL** to write the message and if **TELL** cannot do so, **TELL** generates an error message. For more information on **TELL**, refer to the *MPE/iX Commands Reference Manual*.

On MPE/iX, the end-of-file sequence is `:eod` followed by ENTER. Typing a subsystem break (-CTRL-Y) also terminates the message, causing it to be sent.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

## SEE ALSO

**mailx(1)**, **mesg(1)**, **talk(1)**, **who(1)**

**NAME**

xargs — construct and execute command lines

**SYNOPSIS**

```
xargs [-iplaceholder] [-lnumber] [-n number] [-ptx] [-eofstr]
[-s size] [command [argument ...]]
```

**DESCRIPTION**

The **xargs** command line typically contains the *skeleton* or *template* of another command. This template looks like a normal command, except that it is lacking some arguments. **xargs** adds arguments from the standard input to complete the command, then executes the resulting command. If more input remains, it repeats this process.

**Options**

**xargs** gets the needed arguments from the standard input. Different options tell how the standard input is to be interpreted to obtain these arguments.

**-iplaceholder**

causes **xargs** to consider each full line in the standard input to be a single argument. The *placeholder* following the **-i** is a string that can appear multiple times in the command template. **xargs** strips the input line of any leading white space characters and inserts it in place of the *placeholder* string. For example, with

```
xargs -i '{}' mv dir1/{} dir2/{}'
```

the standard input should consist of lines giving names of files that you want moved from *dir1* to *dir2*. **xargs** substitutes these names for the {} placeholder in each place that it appears in the command template.

When **xargs** creates arguments for the template command, no single argument can be longer than 255 characters after the input has replaced the placeholders. The **-x** option (described below) is automatically in effect if **-i** is used. If you omit the *placeholder* string, it defaults to the string {}. Thus, the previous example could be written as

```
xargs -i mv dir1/{} dir2/{}'
```

**-lnumber**

reads *number* lines from the standard input and concatenates them into one long string (with a blank separating each of the original lines). **xargs** then appends this string to the command template and executes the resulting command. This process is repeated until **xargs** reaches to the end of the standard input. If there are fewer than *number* lines left in the file the last time the command is executed, **xargs** uses whatever is available.

With this option, a line must contain at least one non-blank character; blank lines are skipped and do not count towards the number of lines being added to the template. **xargs** considers a line to end at the first newline character, unless the last character of the line is a blank or a tab, in which case, the current line is considered to extend to the end of the next non-empty line.

If you omit the **-l** option, the default number of lines read from standard input is 1. The **-x** option (described below) is automatically in effect if **-l** is used.

**-n number**

reads a maximum of *number* arguments from the standard input and puts them on the end of the command template. For example, in

```
xargs -n 2 diff
```

obtains two arguments from the standard input, appends them to the **diff** command, and executes the command. When you use this option, **xargs** considers arguments to be strings of characters separated from each other by white space characters (blanks, horizontal tabs, or newlines). Empty lines are always skipped (that is, they don't count as arguments).

If you want an input argument to contain blanks or horizontal tabs, enclose it in double quotes or apostrophes. If the argument contains a double quote character ("), you must enclose the argument in apostrophes. Conversely, if the argument contains an apostrophe ('), you must enclose the argument in double quotes.. You can also put a backslash (\) in front of a character to tell **xargs** to ignore any special meaning the character may have (for example, white space characters, or quotes).

**xargs** reads fewer than *number* arguments if:

- the accumulated command line length exceeds the *size* specified by the **-s** option (or {LINE\_MAX} if you did not specify **-s**)
- the last iteration has more than zero, but less than *number* arguments remaining.

A typical **xargs** command uses exactly one of the preceding. If you specify more than one, **xargs** uses the one that appears last on the command line. If you do not specify any of these options, **xargs** keeps reading input until it fills up its internal buffer, concatenating arguments onto the end of the command template. When the buffer is full, **xargs** executes the resulting command, then starts constructing a new command. For example,

```
ls | xargs echo
```

prints the names of files in the current directory as one long line. When you invoke **xargs** in this way, the total length of all arguments must be less than the size specified by the **-s** option (described below).

If no command template appears on the command line, **xargs** uses **echo** by default. When **xargs** executes a command, it uses your search rules to find the command; this means that you can run shell scripts as well as normal programs.

Note that the command you want to execute should be in your search *PATH*.

**xargs** terminates prematurely if it cannot execute a constructed command or if an executed command returns a non-zero status value. If an executed command is a shell program, it should explicitly contain an **exit** command to avoid returning a non-zero status value by accident; see **sh**(1) for details.

**xargs** also accepts the following options: You can use the following options with any of the three main options.

**-eofstr**

defines *eofstr* to represent end-of-file on the standard input. For example,

```
-e:::
```

tells **xargs** that `:::` represents the end of the standard input, even if it is not at the end of the file. If there is no **-e** option, a single underscore (`_`) marks the end of the input. If you specify **-e** without a following string, it indicates that there is no end-of-file marker string; this means that `_` is taken literally instead of as an end-of-file marker. **xargs** stops reading input when it reaches the specified end-of-file marker or the true end of the file.

**-p** prompts you before each command. This turns on the **-t** option so that you see each constructed command before it is executed. Then, **xargs** displays `? . . .`, asking if you really want to execute this command. If you type a string beginning with `y`, **xargs** goes ahead and executes the command as displayed; otherwise, the command is not executed, and **xargs** goes on to construct a new command.

**-s size** sets the maximum allowable size of an argument list to *size* characters (where *size* is an integer). The value of *size* must be less than or equal to the system variable `LINE_MAX`. The length of the argument list is the length of the entire constructed command; this includes the length of the command name, the length of each argument, plus one blank for separating each item on the line.

**-t** writes each constructed command to the standard error just before executing the command.

**-x** terminates **xargs** if it creates a command that is longer than the size given by the **-s** option (or `{LINE_MAX}` did not specify **-s**). This option comes into effect automatically if you specify **-i** or **-l**.

## EXAMPLES

The following displays file names in three columns:

```
ls | xargs -n 3 echo
```

## ENVIRONMENT VARIABLES

**xargs** uses the following environment variable:

*PATH*

contains a list of directories that constitute your search path.

## DIAGNOSTICS

Possible exit status values are:

- 0 Successful completion of all commands.
- 1-125 An error occurred.
- 126 **xargs** found *command* but could not invoke it.
- 127 **xargs** could not find *command*.

## Messages

- Message:** -l number too large
- Cause:** You specified the **-l** option with a numeric argument that was greater than 1023.
- Action:** Specify an argument to the **-l** option that is less than 1024.
- Message:** -n number too large
- Cause:** You specified the **-n** option with a numeric argument that was greater than 1023.
- Action:** Specify an argument to the **-n** option that is less than 1024.
- Message:** *command*: not executable: system error
- Cause:** See **syserror**(3).
- Action:** See **syserror**(3).
- Message:** Missing number after "-option" option
- Cause:** You specified *-option* without providing a numeric argument.
- Action:** Provide the missing number.
- Message:** more than *num* arguments
- Cause:** You specified more than 1023 arguments on the command line.
- Action:** Specify less than 1024 arguments.

---

**Message:** more than *num* bytes of arguments  
**Cause:** The resulting command line that was constructed was larger than the maximum allowed.  
**Action:** Specify arguments and options that produce a shorter command line.

**Message:** size for *-option* must be <*num*  
**Cause:** You specified a numeric argument for *-option* that was greater than or equal to *num*.  
**Action:** Specify a numeric argument that is less than *num*.

**Message:** Unknown option "*-option*"  
**Cause:** You specified an option that is not valid for **xargs**  
**Action:** Check the *DESCRIPTION* section for a list of valid **xargs** options.

#### PORTABILITY

POSIX.2. *x/OPEN* Portability Guide 4.0. All UNIX systems.

The **-e**, **-l**, **-i**, and **-p** options are extensions to the POSIX standard.

#### LIMITS

The maximum length of a constructed command is `LINE_MAX` characters.

#### MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

#### SEE ALSO

**echo(1)**, **find(1)**, **sh(1)**

---

**NAME**

yacc — parser generator language

**SYNOPSIS**

**yacc** [**-dhlmqstv**] [**-b** *file.prefix*] [**-D** *file.h*] [**-o** *file.c*] [**-p** *prefix*]  
[**-P** *yyparse.c*] [**-S** *statesfile*] [**-V** *stats*] *gram.y*

**DESCRIPTION**

**yacc** converts a context-free LALR(1) grammar found in the input file *gram.y* into a set of tables that together with additional C code constitute a parser to recognize that grammar. If you specify an input file named **-**, **yacc** reads the grammar from the standard input. By default, **yacc** places the parsing tables and associated C code into the file *y.tab.c*.

For detailed information on writing parsers using **yacc**, see the *YACC Programming Guide*.

**Options**

**yacc** accepts the following options:

- b** *file\_prefix*  
uses *file\_prefix* instead of *y* as the prefix for all output file names. For example, **yacc** would name the parsing table *file\_prefix.tab.c* rather than *y.tab.c*.
- D** *file.h*  
generates the file *file.h* which contains the constant definition statements for token names. This lets other modules of a multi-module program access these symbolic names.
- d**  
generates the file *y.tab.h* which contains the constant definition statements for token names. This lets other modules of a multi-module program access these symbolic names. This is the same as **-D** except that you do not specify the header file name.
- h**  
displays a brief list of the options and quits.
- l**  
disables the generation of `#line` statements in the parser output file. **yacc** uses these statements to produce correct line numbers in compiler error messages from *gram.y*.
- m**  
displays memory usage, timing, and table size statistics on the standard output.
- o** *file.c*  
places the generated parser tables into *file.c* instead of the default *y.tab.c*.
- P** *yyparse.c*  
indicates that the C parser template is found in the file *yyparse.c*. By default, this parser template is found in */etc/yyparse.c*.



**-p** *prefix*

prefixes all variables and defined parameters in the generated parser code with the string *prefix* in place of the default *yy* (or *YY*). This allows you to have more than one **yacc**-generated parser in a single program with each parser having unique variable names. *prefix* should be entirely in lowercase because **yacc** uses an uppercase version of the string to replace all *YY* variables. We recommend a short prefix (such as *zz*) because some C compilers have name length restrictions for identifiers. You can also set this identifier with a `%prefix` directive in the grammar file.

**-q** disables the display of warning messages.

**-S** *statesfile*

writes a State Description to the file *statesfile*. This file is indexed by pointers in the table *yyStates*, so that any state can be quickly read and displayed.

**-s** is similar to **-S** except that the State Description is always written to the file *states.out*.

**-t** enables debugging code in the generated parser. **yacc** does not normally compile this code because it is under the control of the preprocessor symbol *YYDEBUG*. This option is therefore equivalent to either setting *YYDEBUG* on the C compiler command line or specifying `#define YYDEBUG` statement in the first section of the grammar.

**-V** *stats*

writes a verbose description of the parsing tables and any possible conflicts to the file *stats*.

**-v** writes a verbose description of the parsing tables and any possible conflicts to the file *y.output*. This is the same as **-V** except you do not specify the file name.

**FILES**

**yacc** uses the following files:

*y.output* default statistics file generated when you specify **-v**.

*y.tab.c* default file for the generated parser.

*y.tab.h* default header file generated when you specify **-d**.

*/etc/ypyparse.c*  
default parser template.

*states.out* default state description file generated when you specify **-s**.

---

**DIAGNOSTICS**

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

**Messages**

- Message:** %prefix is already set to "*string*"  
**Cause:** Your grammar used more than one %prefix setting, or attempted to combine %prefix with **-p prefix**.  
**Action:** Remove extra %prefix, or avoid using both the %prefix directive and the **-p** option.
- Message:** %union declaration started at line *num* never ends  
**Cause:** Your grammar contained a %union { declaration that lacked an ending }.  
**Action:** Provide the missing }.
- Message:** cannot create temporary file: *system error*  
**Cause:** See **syserror(3)**.  
**Action:** See **syserror(3)**.
- Message:** Code segment started at line *num* never ends  
**Cause:** Your grammar contained a code segment that lacked an ending %}.  
**Action:** Provide the missing %}.
- Message:** Code started at line *num* never ends  
**Cause:** Your grammar contained a YACC action that was not terminated with a }.  
**Action:** Provide the missing }.
- Message:** Comment started at line *num* never ends  
**Cause:** Your grammar contained a comment that did not have a closing \*/.  
**Action:** Provide the missing \*/.
- Message:** Empty character string  
**Cause:** Your grammar contained a quoted character string with no characters.  
**Action:** Make sure that all quoted strings contain characters.
- Message:** End of file in character constant  
**Cause:** Your grammar contained a character constant that was missing the closing quote.  
**Action:** Provide the missing quote.

---

|                 |                                                                           |
|-----------------|---------------------------------------------------------------------------|
| <b>Message:</b> | file <i>"filename"</i> : system error                                     |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | file I/O error: system error                                              |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | grammar file <i>"filename"</i> : system error                             |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | header file <i>"filename"</i> : system error                              |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | listing file <i>"filename"</i> : system error                             |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | Mangled character constant                                                |
| <b>Cause:</b>   | Your grammar contained an illegal character constant.                     |
| <b>Action:</b>  | Check and correct grammar.                                                |
| <b>Message:</b> | Out of memory at <i>num</i> bytes                                         |
| <b>Cause:</b>   | YACC has run out of system resources for this input grammar.              |
| <b>Action:</b>  | Simplify your grammar, or free up more system resources.                  |
| <b>Message:</b> | parser file <i>"filename"</i> : system error                              |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                  |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                  |
| <b>Message:</b> | Sorry, value <i>num</i> is reserved for <i>token</i>                      |
| <b>Cause:</b>   | Your grammar attempted to use a YACC internal token number.               |
| <b>Action:</b>  | Use a different token number.                                             |
| <b>Message:</b> | Start symbol must be a variable                                           |
| <b>Cause:</b>   | Your grammar used a token as a start symbol.                              |
| <b>Action:</b>  | You must use a variable (nonterminal) as a start symbol.                  |
| <b>Message:</b> | String started at line <i>num</i> never ends                              |
| <b>Cause:</b>   | Your grammar contained a string in a YACC action that was not terminated. |
| <b>Action:</b>  | Make sure the offending string is terminated.                             |

---

**Message:** Undefined nonterminal *'name'*. No parser produced  
**Cause:** Your grammar attempted to use a variable (nonterminal) that was not defined.  
**Action:** Check the spelling of the variable name. All variables must be properly defined.

**Message:** Unknown reserved word: *%word*  
**Cause:** Your grammar contained a *%* keyword that YACC did not recognize, most likely due to a misspelling in *word*.  
**Action:** Correct the spelling of *word*.

**Message:** Useless variables: ... No parser produced  
**Cause:** Your grammar contained variables (nonterminals) that are not used.  
**Action:** Remove useless nonterminals.

**Message:** Variables aren't allowed here  
**Cause:** Your grammar attempted to set precedence/association of a variable (nonterminal).  
**Action:** You can only set precedence or association of tokens.

## PORTABILITY

POSIX.2. *x*/OPEN Portability Guide 4.0. All UNIX systems.

The **-D**, **-h**, **-m**, **-o**, **-P**, **-q**, **-S**, **-s** and **-V** options are extensions to the POSIX standard.

## MPE/iX NOTES

For information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

## SEE ALSO

**lex**(1)

*MPE/iX Shell and Utilities User's Guide*

---

**NAME**

**zcat** — uncompress and display data

**SYNOPSIS**

**zcat** **-DVv** [*file* ...]

**DESCRIPTION**

**zcat** takes one or more compressed data files as input. The data files should be compressed with the **compress** command. If no data files are specified on the command line, **zcat** reads the standard input. You can also pass the standard input to **zcat** by specifying **-** as one of the files on the command line.

**zcat** uncompresses the data of all the input files, and writes the result on the standard output. **zcat** concatenates the data in the same way **cat** does.

The names of compressed input files are expected to end in **.Z**. If a specified input file name does not end in this suffix, **zcat** automatically adds the **.Z**; for example, if the command line specifies file **abc**, **zcat** looks for **abc.Z**.

**zcat** is equivalent to

**uncompress -c**

**Options**

**zcat** accepts the following options:

- D** uncompresses files that were compressed using the dictionary option of **compress**.
- V** prints the version number of **uncompress** that **zcat** calls.
- v** prints the name of each file as it is uncompressed.

**DIAGNOSTICS**

Possible exit status values are:

- 0 Successful completion.
- 1 An error occurred.

**Messages**

See **uncompress(1)** for a list of error messages that **zcat** may produce.

**PORTABILITY**

All UNIX systems.

---

**MPE/iX NOTES**

The current MPE/iX implementation of **compress** converts non-byte stream files to byte stream files before compressing them. File characteristics like file code, record size, and so forth are not preserved by this conversion. When **zcat** decompress the compressed file, it is written as a byte stream file.

For more information on how the current MPE/iX implementation may affect the operation of this utility, see Appendix A, *MPE/iX Implementation Considerations*.

**SEE ALSO**

**cat(1)**, **compress(1)**, **uncompress(1)**

# 2

## File Formats

---

This chapter gives more detailed information on the formats of files used by the various commands and utilities described in Chapter 1.

**NAME**

cpio — format of **cpio** archives

**DESCRIPTION**

This document describes the format of archives read and written by the **cpio** utility. A **cpio** archive consists of the concatenation of one or more member files. Each member file contains a header (as described later in this man page) optionally followed by file contents as indicated in the header. The end of the archive is indicated by another header describing an (empty) file named TRAILER!!.

There are two types of **cpio** archives, differing only in the style of the header. ASCII archives have totally printable header information; thus, if the files being archived are also ASCII files, the whole archive is ASCII. By default, **cpio** writes archives with binary headers.

The information in ASCII archive headers is stored in fixed-width, octal (base 8) numbers zero-padded on the left. Table 2-1 gives the order and field width for the information in the ASCII header.

| Field Width | Field Name | Meaning                             |
|-------------|------------|-------------------------------------|
| 6           | magic      | magic number "070707"               |
| 6           | dev        | device where file resides           |
| 6           | ino        | I-number of file                    |
| 6           | mode       | file mode                           |
| 6           | uid        | owner user ID                       |
| 6           | gid        | owner group ID                      |
| 6           | nlink      | number of links to file             |
| 6           | rdev       | device major/minor for special file |
| 11          | mtime      | modify time of file                 |
| 6           | namesize   | length of file name                 |
| 11          | filesize   | length of file to follow            |

Table 2-1: ASCII Header Format for **cpio** File

Most of this information is compatible with that returned by the UNIX `stat()` function. After this information, *namesize* bytes of path name is stored. *namesize* includes the null byte of the end of the path name. After this, *filesize* bytes of the file contents are recorded.

**2-2 File Formats**



Binary headers contain the same information in 2 byte (short) and 4 byte (long) integers as shown in Table 2-2.

| Bytes | Field Name |
|-------|------------|
| 2     | magic      |
| 2     | dev        |
| 2     | ino        |
| 2     | mode       |
| 2     | uid        |
| 2     | gid        |
| 2     | nlink      |
| 2     | rdev       |
| 4     | mtime      |
| 2     | namesize   |
| 4     | filesize   |

Table 2-2: Binary Header Format for **cpio** File

After this information comes the file name (with *namesize* rounded up to the nearest 2 byte boundary). Then the file contents appear as in the ASCII archive. The byte ordering of the 2 and 4 byte integers in the binary format is machine dependent and thus portability of this format is not easily guaranteed.

Compressed **cpio** archives are exactly equivalent to the corresponding archive being passed to a 14-bit **compress** utility.

#### PORTABILITY

For maximum portability among different system architectures, only the ASCII archive format should be used.

#### SEE ALSO

**compress(1)**, **cpio(1)**, **pax(1)**, **tar(1)**, **pax(2)**, **tar(2)**

**NAME**

magic — format of the `/etc/magic` file

**DESCRIPTION**

The **file** command uses `/etc/magic` in its attempt to identify the type of a binary file. Essentially, `/etc/magic` contains *templates* showing what different types of files look like.

The `magic` file contains lines describing magic numbers which identify particular types of files. Lines beginning with a `>` character represent continuation lines to the main entry. If **file** finds a match on the main entry line, these additional patterns are checked and additional output may be generated for matching lines, separated by a single blank. Each line consists of four fields, separated by one or more tabs.

- (a) The first field is a byte offset in the file.
- (b) The next field is a type: `byte`, `short`, `long`, or `string`. `byte`, `short`, and `long` can be followed by an optional mask which is bitwise ANDed to the value prior to comparison, for example, `byte &0x80` looks at the high bit.
- (c) The next field is a value, preceded by an optional operator. Operators only apply to non-string types: `byte`, `short`, and `long`. The default operator is `=` (exact match). The other operators are:

|                                  |                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>=</code>                   | equal                                                                                                                                                |
| <code>!</code>                   | not equal                                                                                                                                            |
| <code>&gt;</code>                | greater than                                                                                                                                         |
| <code>&lt;</code>                | less than                                                                                                                                            |
| <code>&amp;</code>               | all bits in pattern must match                                                                                                                       |
| <code>^</code>                   | any bits in pattern may match                                                                                                                        |
| <code>x</code> or <code>?</code> | any value matches (must be the only character in the field) ( <code>?</code> is an extension to traditional implementations of <code>magic</code> .) |

string values to be matched may contain any valid ANSI C backslash sequence. Thus, to match a single backslash, `\\` must be entered in the `magic` file.

**Note:** Due to its format, the `magic` file must use a `\t` to match a tab character.

- (d) The rest of the line is a string to be printed if the particular file matches the template. The fourth field may contain a `printf( )`-type format indicator to output the magic number (See **printf(1)** for more details on format indicators).

**EXAMPLES**

Here are some sample entries:

|     |           |          |                                |
|-----|-----------|----------|--------------------------------|
| 0   | short     | 0x5AD4   | DOS executable                 |
| 0   | short     | 0xFDF0   | DOS library                    |
| 0   | string    | AH       | Halo bitmapped font file       |
| 0   | short     | 0x601A   | Atari ST contiguous executable |
| >14 | long      | >0       | - not stripped                 |
| 0   | string    | \037\036 | packed file                    |
| 0   | string    | \037\235 | compressed file                |
| >2  | byte&0x1F | ?        | - with %d bits                 |

**SEE ALSO**

**file(1), environ(3)**

**NAME**

pax — format of pax archives

**DESCRIPTION**

**pax** uses the USTAR archive format described in the **tar(2)** man page.

**PORTABILITY**

POSIX.2. *x*/OPEN Portability Guide 4.0.

**SEE ALSO**

**cpio(1)**, **pax(1)**, **tar(1)**, **cpio(2)**, **tar(2)**

**NAME**

tags — format of tags file

**DESCRIPTION**

When you use the **vi** or **ex :tag** command, the **more :t** command, or the **ex, more**, or **vi -t** option, that utility looks for a file called `tags` in the current directory. This lets you quickly locate various *points of interest* in a C program which may span more than one source file. These points of interest are *tags*. Typically, you use the **ctags** command to construct a tags file.

The `tags` file may contain tags for C function definitions, pre-processor macro definitions, and `typedef` definitions.

For each tag, the `tags` file contains one line in the following form:

*tagname*      *sourcefile*      *address*

The *tagname* field is the name of the C function, macro, or `typedef`. The *sourcefile* has the name of the C source file containing the tag named *tagname*. The *address* field is an editor address within *sourcefile* to reach the tag definition. This is either a line number in the file or a regular expression (enclosed in `?` or `/` characters) that uniquely matches the line of C source code where the tag appears. A tab character separates each field.

For **vi**(1) or **more**(1) to use the `tags` file correctly, it must be sorted by *tagname* using the POSIX locale's collation sequence.

**SEE ALSO**

**ctags**(1), **more**(1), **sort**(1), **vi**(1)

**NAME**

tar — format of **tar** archives

**DESCRIPTION**

This document describes the format of archives read and written by the **tar**(1) utility. The **tar** utility of MPE/iX Shell and Utilities actually supports both the older UNIX-compatible TAR formats, and the new USTAR format defined by the POSIX (IEEE P1003.1) standards group. The new USTAR format allows more information to be stored, and supports longer file path names.

A **tar** archive, in either format, consists of one or more blocks, which are used to represent member files. Each block is 512 bytes long; the **-b** option to **tar** can be used to indicate how many of these blocks are read and/or written at once.

Each member file consists of a header block (as described later in this page) followed by 0 or more blocks containing the file contents. The end of the archive is indicated by two blocks filled with binary zeros. Unused space in the header is left as binary zeros.

The header information in a block is stored in a printable ASCII form, so that **tar** archives are easily ported to different environments. If the contents of the files on the archive are all ASCII, the entire archive is ASCII.

Table 2-3 shows the format of the header block for a file, in the older UNIX-compatible TAR format.

| Field Width | Field Name | Meaning                 |
|-------------|------------|-------------------------|
| 100         | name       | name of file            |
| 8           | mode       | file mode               |
| 8           | uid        | owner user ID           |
| 8           | gid        | owner group ID          |
| 12          | size       | length of file in bytes |
| 12          | mtime      | modify time of file     |
| 8           | chksum     | checksum for header     |
| 1           | link       | indicator for links     |
| 100         | linkname   | name of linked file     |

Table 2-3: **tar** Header Block (TAR Format)

The *link* field is 1 for a linked file, 2 for a symbolic link, and 0 otherwise. A directory is indicated by a trailing slash (/) in its *name*.

For the new USTAR format, headers take on the format shown in Table 2-4. Note that **tar** can determine that the USTAR format is being used by the presence of the null-terminated string "ustar" in the *magic* field. All fields before the *magic* field correspond to those of the older format described earlier, except that the *typeflag* replaces the *link* field.

| Field Width | Field Name | Meaning                 |
|-------------|------------|-------------------------|
| 100         | name       | name of file            |
| 8           | mode       | file mode               |
| 8           | uid        | owner user ID           |
| 8           | gid        | owner group ID          |
| 12          | size       | length of file in bytes |
| 12          | mtime      | modify time of file     |
| 8           | chksum     | checksum for header     |
| 1           | typeflag   | type of file            |
| 100         | linkname   | name of linked file     |
| 6           | magic      | USTAR indicator         |
| 2           | version    | USTAR version           |
| 32          | uname      | owner user name         |
| 32          | gname      | owner group name        |
| 8           | devmajor   | device major number     |
| 8           | devminor   | device minor number     |
| 155         | prefix     | prefix for file name    |

Table 2-4: **tar** Header Block (USTAR Format)

This information is compatible with that returned by the UNIX `stat()` function. The *magic*, *uname*, and *gname* fields are null-terminated character strings. The fields *name*, *linkname*, and *prefix* are null-terminated unless the full field is used to store a name (that is, the last character is not null). All other fields are zero-filled octal numbers, in ASCII. Trailing nulls are present for these numbers, except for the *size*, *mtime*, and *version* fields.

The *name* field contains the name of the archived file. On USTAR format archives, the value of the *prefix* field, if non-null, is prefixed to the *name* field to allow names longer than 100 characters. For compatibility with older **tar** commands, MPE/iX **tar** leaves *prefix* null unless the file name exceeds 100 characters.

The *size* field is 0 if the header describes a link.

The *chksum* field is a checksum of all the bytes in the header, assuming that the *chksum* field itself is all blanks.

For USTAR, the *typeflag* field is a compatible extension of the *link* field of the older TAR format. Table 2-5 shows the values that are recognized.

| Type Flag | File Type                             |
|-----------|---------------------------------------|
| 0 or null | Regular file                          |
| 1         | Link to another file already archived |
| 2         | Symbolic link                         |
| 3         | Character special device              |
| 4         | Block special device                  |
| 5         | Directory                             |
| 6         | FIFO special file                     |
| 7         | Reserved                              |
| A-Z       | Available for custom usage            |

Table 2-5: Type Flag Values for USTAR Format Files

In USTAR format, the *uname* and *gname* fields contain the name of the owner and group of the file respectively. See also **passwd**(3).

Compressed **tar** archives are exactly equivalent to the corresponding archive being passed to a 16-bit **compress** utility.

## PORTABILITY

The ASCII digit 7 is commonly used in the *typeflag* field to indicate contiguous files. The use of 2 to indicate a symbolic link is particular to some UNIX versions. These common extensions are mentioned in the POSIX (IEEE P1003.1) standard.

## SEE ALSO

**cpio**(1), **tar**(1), **cpio**(2) **pax**(2)



## Miscellaneous Information

---

This chapter describes miscellaneous topics not covered in the other chapters including general overviews, tables, and system error messages.

**NAME**

ascii — table of ASCII collating sequence

**DESCRIPTION**

Table 3-1 gives hexadecimal values and their corresponding visual appearance (or interpretation, for control codes) for standard ASCII characters:

| Standard 7-bit ASCII Representation |        |        |        |        |        |        |        |
|-------------------------------------|--------|--------|--------|--------|--------|--------|--------|
| 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 |

Table 3-1: Standard 7-bit ASCII Representation

**PORTABILITY**

The 7-bit ASCII codes are portable. They conform to the ISO/IEC 646 standard.

**SEE ALSO**

**awk**(1), **sort**(1)

**3-2 Miscellaneous Information**

---

**NAME**

environ — standard environment variables

**SYNOPSIS**

**export** *NAME=value*

**echo** *\$NAME*

**DESCRIPTION**

When a process is executed, it inherits a set of strings called the *environment*. It is conventional for these strings to have the form:

*NAME=value*

The **export** command built into the MPE/iX Shell can be used to set the variable *NAME* into the environment of every child process. The **echo** command prints the value of environment variable *NAME* inside the MPE/iX Shell. Note that the shell maintains additional shell variables which are *not* exported to child processes; because these variables are not passed on, they are not environment variables.

The following environment variables are used throughout MPE/iX Shell and Utilities:

*COLUMNS*

If you set this variable to a numeric value, various commands use its value as the width of the output device in columns. This overrides the default.

*ENV* The value of this variable is the name of a file of MPE/iX Shell commands, or else be null. When the MPE/iX Shell is invoked, the file named by *ENV* is executed before the MPE/iX Shell does anything else. Thus your *ENV* file may contain definitions of aliases, shell functions, etc. that may be used by shell scripts. Note that your *ENV* file is executed, whether or not the MPE/iX Shell is invoked as a login shell.

*HOME* This variable is set when you start the MPE/iX Shell. It contains the name of your home directory, which is the default directory for **cd**(1).

*LINES* If you set this variable to a numeric value, various commands use its value as the number of lines available on the output device. This overrides the default.

*LOGNAME*

This variable is set by **login**. It holds the user name of the current user.

*MAILER*

For commands which send mail, this variable points at a mail delivery program. If this variable is not set, then the default mailer, **mailx** is invoked.

---

*PATH* This variable is set to a default value when you start the MPE/iX Shell. Normally, it is also set in your profile file. It lists the directories that are to be searched to find commands, as described in **sh**(1).

*SHELL* This variable contains the full path name of the shell being used.

*TERM* This variable contains the terminal type.

*TMPDIR*

By default, MPE/iX Shell and Utilities commands store temporary files under /tmp. To use a different directory for temporary files, set *TMPDIR* to the name of the directory you want to use.

*TZ* Commands that print times (and dates) use this variable to determine the time zone. The *TZ* variable is normally set in the /etc/profile file for system-wide use. See **timezone**(3) for details.

#### SEE ALSO

**cd**(1), **env**(1), **sh**(1), **timezone**(3)

**NAME**

iconv — Available code sets for conversion

**DESCRIPTION**

The `iconv(3)` function converts characters from any available single byte code set to any other available single byte code set. Table 3-2, *Available Code Sets*, contains a complete list of available single byte code sets. It also gives the code that you can use to identify a given code set when using the **pax** command, or the `iconv_open( )` function.

| Code Set  | Code           | Description                           |
|-----------|----------------|---------------------------------------|
| ISO8859-1 | IS8859         | Eight-bit coded graphic character set |
| ISO8859-1 | ISO8859-1:1987 | Eight-bit coded graphic character set |
| ISO8859-1 | iso8859_1      | Eight-bit coded graphic character set |
| ISO8859-1 | 8859           | Eight-bit coded graphic character set |
| ISO646    | IS646          | US ASCII character set                |
| ISO646    | 646            | US ASCII character set                |
| EBCDIC    | EBCDIC         | EBCDIC character set                  |
| CP1047    | CP1047         | IBM Code page 1047                    |
| C         | C              | C character set                       |

Table 3-2: Available Code Sets

**SEE ALSO**

**pax(1)**,

**NAME**

lex — functions used with **lex**

**SYNOPSIS**

```
#define YYLMAX 100
char yytext [YYLMAX];
int yyleng;
int yylineno;
FILE *yyin = stdin;
FILE *yyout = stdout;
#define yygetc() getc(yyin)
int input(void);
int unput(int c);
int yywrap(void);
void yyerror(const char *format, ...);
void yycomment(const char *delim);
int yymapch(int delim, int esc);
ECHO;
REJECT;
void yymore();
void yyless(int n);
```

**DESCRIPTION**

|          |                                                                                                                                                                                                                                                                                                                                                                  |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| YYLMAX   | defines the maximum length of tokens the LEX scanner can recognize. Its default value is 100 characters, and can be changed with the C preprocessor #undef and #define directives in the input declarations section.                                                                                                                                             |
| yytext   | is the current input token recognized by the LEX scanner, and is accessible both within a LEX action and on return of the <code>yylex()</code> function. It is terminated with a null (zero) byte. If <code>%pointer</code> is specified in the definitions section, <code>yytext</code> is defined as a pointer to a pre-allocated array of <code>char</code> . |
| yyleng   | is the length of the input token in <code>yytext</code> .                                                                                                                                                                                                                                                                                                        |
| yylineno | is the current input line number, maintained by <code>input</code> and <code>yycomment</code> .                                                                                                                                                                                                                                                                  |
| yyin     | determines the input stream for the <code>yylex()</code> and <code>input()</code> functions.                                                                                                                                                                                                                                                                     |
| yyout    | determines the output stream for the <code>output()</code> macro, which processes input that does not match any rules. The values of <code>yyin</code> and <code>yyout</code> can be changed by assignment.                                                                                                                                                      |

**3-6 Miscellaneous Information**

`yygetc` is a macro called by `yylex()` to obtain characters. Currently, this is defined as

```
#define yygetc() getc(yyin)
```

A new version can be defined for special purposes, by first using `#undef` to remove the current macro definition.

`input` is a function which returns the next character from the LEX input stream. (This means that LEX does not see it.) This function properly accounts for any look-ahead that LEX may require.

`unput` is a function which may be called to make the argument character *c* the next character to be read by `input()`, and hence by `yylex()`. The characters are placed in a push-back buffer.

`yywrap` is a function called by `yylex()` when it gets EOF from `yygetc()`. The default version of `yywrap()` returns 1, which indicates no more input is available. `yylex()` then returns 0 indicating end of file. If the user wishes to supply more input, a `yywrap()` should be provided that sets up the new input (possibly by assigning a new file stream to `yyin`), then returns 0 to indicate that more input is available.

`yyerror` is a function used by routines that generate diagnostics. A version of `yyerror()` is provided in the library; it simply passes its arguments to `fprintf()` with output to the error stream `stderr`. A newline is written following the message. A replacement may be provided by the user.

`yycomment` is a function that a translation may call when LEX recognizes the sequence of characters which mark the start of a comment in the given syntax. It takes a sequence of characters which mark the end of a comment, and skips over characters in the input stream until this sequence is found. Newlines found while skipping characters increment the external `yylineno`. An unexpected end-of-file produces a suitable diagnostic (using `yyerror()`.) The following **lex** rules match C and shell-style comments.

```
" /* " yycomment (" */ ");
. * \n ;
```

Note that a LEX pattern is more efficient at recognizing a newline-terminated comment, while the `yycomment` function can handle comments longer than `YYLMAX`.

`yymapch` is a function which may be used to process C-style character constants or strings. It returns the next string character from the input, or `-1` when the character *delim*, is reached. The usual C escapes are recognized; *esc* is the escape character to use: for C it would be backslash.

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|                     |                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ECHO                | is a statement that copies the matched input token <code>yytext</code> to the lex output stream <code>yyout</code> .                                         |
| REJECT              | is a statement that causes the current match to be discarded and the next possible match, if any, to be examined.                                            |
| <code>yymore</code> | is a function that causes the next token to be concatenated to the current token in <code>yytext</code> . The current token is not rescanned.                |
| <code>yyless</code> | is a function that shrinks the matched input in <code>yytext</code> to <i>n</i> characters. The remaining characters are rescanned by <code>yylex()</code> . |

## FILES

|                              |                  |
|------------------------------|------------------|
| <code>/usr/lib/libl.a</code> | UNIX LEX library |
|------------------------------|------------------|

## SEE ALSO

**lex(1), yacc(1)**

*LEX Programming Guide*



**NAME**

rcsedit — RCS editing facilities for descriptions and log messages

**DESCRIPTION**

Whenever RCS asks you to enter a description or log message, you may make use of editing commands to help you enter the message. Editing commands must be on a separate line and the first character of the line must be a tilde ~ character. Below we list the recognized commands.

- ~?    Displays a summary of editing commands.
- ~e    Writes the current message to a temporary file and invokes a text editor to edit that file. The name of the editor is taken from the *EDITOR* environment variable. If there is no such variable, **ed** is used. When you are finished editing the message, write it back out to the temporary file and quit the editor. You return to RCS.
- ~p    Displays the current text of the message.
- ~q    Discards the current message and lets you start again.
- ~r *filename*  
     Reads the contents of the given file and appends them to the current message.
- ~v    Similar to ~e, except that it invokes the visual editor identified by the *VISUAL* environment variable. The default is **vi**.
- ~w *filename*  
     Writes the current message to the specified file.
- ~! *command*  
     Executes the given system command.

If a line begins with a tilde, RCS assumes it is an editing command. If you want to enter a text line that begins with a tilde, type two, as in

~~ This line begins with a single tilde.

**EXAMPLES**

```
These are the changes I have made:
~r changes
```

reads in text from a file named *changes* and adds that text to the message being composed. The period (.) to mark the end of the message is still required.

**ENVIRONMENT VARIABLES**

The RCS editing facilities use the following environment variables:

*EDITOR*

contains the name of the editor invoked by the `~e` command.

*VISUAL*

contains the name of the editor invoked by the `~v` command.

**MESSAGES**

See **rcserror**(3) for a list of error messages that may occur while entering log messages.

**PORTABILITY**

These facilities are extensions to traditional implementations of RCS and are non-portable.

**SEE ALSO**

**ci**(1), **rcs**(1)

**NAME**

rcserror — RCS error messages

**DESCRIPTIONS**

The following error messages are common to all RCS utilities:

- Message:** Ancestor for *rev1* and *rev2* undefined  
**Cause:** When performing a join operation as specified by the **-j** option, **co** was unable to find a common ancestor for *rev1* and *rev2*. This can occur, for example, if both *rev1* and *rev2* are on the main branch.  
**Action:** Ensure that you have entered the revision numbers or symbolic names correctly.
- Message:** Bad date: *date*  
**Cause:** You specified a date that was not in a recognizable format.  
**Action:** Specify the date using the format described in the **co(1)** man page under **-d** in the *Options* section.
- Message:** Bad revision number  
**Cause:** You specified a revision number that contained a non-numeric character between periods (.). This is not valid.  
**Action:** Ensure that the revision number contains only digits and periods.
- Message:** Branch number *branch* not present.  
**Cause:** You specified a revision number that contains a branch component that does not exist.  
**Action:** Enter a correct revision number.
- Message:** Branch number *branch* too high.  
**Cause:** You tried to check in a file with a branched revision number; however, the branchpoint does not exist. For example, you tried to check in revision 1.4.1.1 when only revisions 1.1 and 1.2 exist.  
**Action:** Specify a branch number that has an existing branchpoint.
- Message:** Branch number *branch* too low.  
**Cause:** You specified a revision number whose first component was lower than the first component of the lowest revision. For example, you specified  

```
co -11.1 file
```

  
when the lowest revision of *file* was 2.1.  
**Action:** Specify a valid revision number.
- Message:** Can't build current directory path: *system error*  
**Cause:** See **syserror(3)**.  
**Action:** See **syserror(3)**.

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|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Can't create semaphore file for RCS file <i>filename</i> : <i>system error</i>                                                         |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                               |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                               |
| <b>Message:</b> | Can't find <i>char</i> to terminate string before end of file                                                                          |
| <b>Cause:</b>   | An RCS utility was unable to find the ending string terminator (usually ) for a string that was being read from a file.                |
| <b>Action:</b>  | Insert the ending string terminator at the appropriate place in the file.                                                              |
| <b>Message:</b> | Can't find delta for revision <i>rev</i>                                                                                               |
| <b>Cause:</b>   | An RCS utility was unable to find the delta information for the revision <i>rev</i> in the RCS file. The RCS file is probably corrupt. |
| <b>Action:</b>  | Retrieve an uncorrupted revision and rebuild from it.                                                                                  |
| <b>Message:</b> | Can't find RCS directory for <i>filename</i>                                                                                           |
| <b>Cause:</b>   | Using the value of <i>RCSPATH</i> , the directory containing the RCS file for <i>filename</i> could not be found.                      |
| <b>Action:</b>  | Either create an RCS directory as specified by <i>RCSPATH</i> , or change <i>RCSPATH</i> to point to an existing RCS directory.        |
| <b>Message:</b> | Can't find RCS file for <i>filename</i>                                                                                                |
| <b>Cause:</b>   | The RCS file associated with <i>filename</i> could not be found using the current value of <i>RCSPATH</i> .                            |
| <b>Action:</b>  | Set <i>RCSPATH</i> properly to find the RCS file.                                                                                      |
| <b>Message:</b> | Can find semaphore file <i>filename</i> : <i>system error</i>                                                                          |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                               |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                               |
| <b>Message:</b> | Can't generate full path name for RCS file                                                                                             |
| <b>Cause:</b>   | The RCS file for the given work file could not be found using the current value of <i>RCSPATH</i> .                                    |
| <b>Action:</b>  | Ensure that both <i>RCSPATH</i> and the path name given on the command line are correct.                                               |
| <b>Message:</b> | Can't open existing <i>filename</i> : <i>system error</i>                                                                              |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                               |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                               |
| <b>Message:</b> | Can't open <i>filename</i> : <i>system error</i>                                                                                       |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                               |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                               |

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| <b>Message:</b> | Can't open file <i>filename</i> : <i>system error</i>                                                                                                                                                                          |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Message:</b> | Can't open source file <i>filename</i> : <i>system error</i>                                                                                                                                                                   |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Message:</b> | Can't open working file <i>filename</i> : <i>system error</i>                                                                                                                                                                  |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Message:</b> | Can't reread redirected stdin for description; use<br>-t<file>                                                                                                                                                                 |
| <b>Cause:</b>   | When running an RCS utility non-interactively, you did not specify a file containing the description text with the <b>-t</b> option and did not use the <b>-I</b> option to read the description text from the standard input. |
| <b>Action:</b>  | When running an RCS utility non-interactively, specify the <b>-I</b> option to read the description text from standard input or use the <b>-t</b> option to specify a file containing the text.                                |
| <b>Message:</b> | Cannot find revision on branch <i>branch</i> with a date before <i>date</i> , author <i>author</i> , and state <i>state</i> .                                                                                                  |
| <b>Cause:</b>   | You asked an RCS utility to find a revision which matched the specified criteria, but it was unable to do so.                                                                                                                  |
| <b>Action:</b>  | Ensure that the specified criteria are correct. If not, correct them.                                                                                                                                                          |
| <b>Message:</b> | cannot open file <i>filename</i> : <i>system error</i>                                                                                                                                                                         |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Message:</b> | cannot open " <i>filename</i> ": <i>system error</i>                                                                                                                                                                           |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                                                                       |
| <b>Message:</b> | Closing \$ missing on keyword                                                                                                                                                                                                  |
| <b>Cause:</b>   | You specified an RCS keyword in your working file; however, you did not include the closing dollar sign (\$).                                                                                                                  |
| <b>Action:</b>  | Provide the missing dollar sign (\$).                                                                                                                                                                                          |

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| <b>Message:</b> | command too long to execute                                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | You specified a command string with the <code>~!</code> command that was longer than the editor was able to handle.                                                                                                                                                                    |
| <b>Action:</b>  | Use<br><br><code>~!sh</code><br><br>or<br><br><code>~!command</code><br><br>to get a command prompt, and perform the necessary action there.                                                                                                                                           |
| <b>Message:</b> | Could not generate temporary name                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | An RCS utility was unable to create a working file that it needed.                                                                                                                                                                                                                     |
| <b>Action:</b>  | Ensure that you either have a <code>/tmp</code> directory or that the environment contains a variable <code>TMPDIR</code> which names a directory where RCS can store temporary files. Also, ensure that you have sufficient permissions on this directory to create a temporary file. |
| <b>Message:</b> | could not open config. file specified with <code>-Y: system error</code>                                                                                                                                                                                                               |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Message:</b> | Current directory not writeable: <i>system error</i>                                                                                                                                                                                                                                   |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Message:</b> | "diff" command interrupted or failed                                                                                                                                                                                                                                                   |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Message:</b> | "diffb" command interrupted or failed                                                                                                                                                                                                                                                  |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Message:</b> | Directory <i>pathname</i> ignored                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | While attempting to locate the workfile associated with the specified RCS file, a directory with that name was found and ignored.                                                                                                                                                      |
| <b>Action:</b>  | None.                                                                                                                                                                                                                                                                                  |
| <b>Message:</b> | Directory <i>pathname</i> not writeable: <i>system error</i>                                                                                                                                                                                                                           |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                               |

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| <b>Message:</b> | end of file detected in interactive input                                                                                                                                                                                                                             |
| <b>Cause:</b>   | A line beginning with a dot was not found before the end of the input file when the <b>-I</b> option was specified.                                                                                                                                                   |
| <b>Action:</b>  | The file was properly checked in; no action is necessary.                                                                                                                                                                                                             |
| <b>Message:</b> | error in compression checking for <i>filename</i>                                                                                                                                                                                                                     |
| <b>Cause:</b>   | Something is wrong with the RCS file.                                                                                                                                                                                                                                 |
| <b>Action:</b>  | Recover a clean copy of the RCS file from your backups.                                                                                                                                                                                                               |
| <b>Message:</b> | Error closing input file <i>filename</i>                                                                                                                                                                                                                              |
| <b>Cause:</b>   | An error occurred while decompressing the RCS file <i>filename</i> .                                                                                                                                                                                                  |
| <b>Action:</b>  | The file is possibly corrupt. Try again with another copy of the file.                                                                                                                                                                                                |
| <b>Message:</b> | Error reading file <i>filename</i> : <i>system error</i>                                                                                                                                                                                                              |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                              |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                              |
| <b>Message:</b> | escape option ' <i>char</i> ' unknown                                                                                                                                                                                                                                 |
| <b>Cause:</b>   | You specified a <i>~</i> command that was not valid.                                                                                                                                                                                                                  |
| <b>Action:</b>  | Check the <i>DESCRIPTION</i> section of the <b>rcsedit(3)</b> man page for a list of valid <i>~</i> commands.                                                                                                                                                         |
| <b>Message:</b> | " <i>filename</i> " File exists                                                                                                                                                                                                                                       |
| <b>Cause:</b>   | You specified <i>filename</i> as the argument to a <i>~w</i> command, but <i>filename</i> already exists. RCS does not overwrite existing files.                                                                                                                      |
| <b>Action:</b>  | Pick another name.                                                                                                                                                                                                                                                    |
| <b>Message:</b> | <i>filename</i> too long to open with <i>~</i> command                                                                                                                                                                                                                |
| <b>Cause:</b>   | The path name specified as the argument of a <i>~r</i> or <i>~w</i> editing command (see <b>rcsedit(3)</b> ) was too long.                                                                                                                                            |
| <b>Action:</b>  | Shorten the path. For example, you might <b>cd</b> to the file's directory and specify a path name relative to that directory on the command line.                                                                                                                    |
| <b>Message:</b> | Files <i>workfile</i> and <i>rcsfile</i> are identical                                                                                                                                                                                                                |
| <b>Cause:</b>   | The indicated work file and RCS file are identical. This was probably caused by not setting <i>RCSPATH</i> correctly.                                                                                                                                                 |
| <b>Action:</b>  | Set the <i>RCSPATH</i> variable to point to the correct RCS directory.                                                                                                                                                                                                |
| <b>Message:</b> | incorrect range in edit script                                                                                                                                                                                                                                        |
| <b>Cause:</b>   | For each revision, the RCS file contains an edit script (similar to <b>diff</b> output) that describes how to build that revision from the base. One of these scripts contained a non-numeric character in the range of an <b>a</b> , <b>c</b> , or <b>d</b> command. |
| <b>Action:</b>  | The RCS file is corrupt. Edit it manually to correct the invalid range or retrieve a previous revision that does not involve this edit script and continue from that new base.                                                                                        |

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|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Insufficient memory for operation                                                                                                                 |
| <b>Cause:</b>   | There were not enough free system resources for the command to perform the requested operation.                                                   |
| <b>Action:</b>  | Try a less complex operation or free up more system resources.                                                                                    |
| <b>Message:</b> | Identifier <i>name</i> does not start with a letter                                                                                               |
| <b>Cause:</b>   | You specified an identifier (such as a login name or a state) that did not start with a letter.                                                   |
| <b>Action:</b>  | Correct the identifier.                                                                                                                           |
| <b>Message:</b> | Improper revision number: <i>rev</i>                                                                                                              |
| <b>Cause:</b>   | You specified a value for <i>rev</i> that is neither a valid revision number nor a valid symbolic name.                                           |
| <b>Action:</b>  | Specify a valid revision.                                                                                                                         |
| <b>Message:</b> | Invalid character ' <i>char</i> ' in identifier " <i>name</i> "                                                                                   |
| <b>Cause:</b>   | You specified an identifier (such as a login name or a state) that contained an invalid character. Spaces and control characters are not allowed. |
| <b>Action:</b>  | Correct the identifier.                                                                                                                           |
| <b>Message:</b> | Invalid character ' <i>char</i> ' in symbolic name " <i>sym_name</i> "                                                                            |
| <b>Cause:</b>   | You specified a symbolic name that contained a non-alphanumeric character.                                                                        |
| <b>Action:</b>  | Correct the symbolic name.                                                                                                                        |
| <b>Message:</b> | keyword value too long                                                                                                                            |
| <b>Cause:</b>   | The value assigned to an RCS keyword was too long.                                                                                                |
| <b>Action:</b>  | Shorten the value.                                                                                                                                |
| <b>Message:</b> | message buffer overflow                                                                                                                           |
| <b>Cause:</b>   | You entered a log message line that was too long.                                                                                                 |
| <b>Action:</b>  | Use shorter input lines.                                                                                                                          |
| <b>Message:</b> | message too long -- truncated                                                                                                                     |
| <b>Cause:</b>   | You specified a message to be read from a file that was longer than permitted.                                                                    |
| <b>Action:</b>  | Create a shorter message and try again.                                                                                                           |
| <b>Message:</b> | message too long. Maximum: <i>num</i>                                                                                                             |
| <b>Cause:</b>   | You entered a log message or description that was longer than <i>num</i> bytes.                                                                   |
| <b>Action:</b>  | Shorter your message or description to less than <i>num</i> bytes.                                                                                |
| <b>Message:</b> | Missing ':' in lock                                                                                                                               |
| <b>Cause:</b>   | The RCS file was missing the required colon (:) between the user name and the revision number in the list of locked revisions.                    |
| <b>Action:</b>  | Manually edit the RCS file to insert the required colon (:). See <b>rcsfile(3)</b> for the format of the RCS file.                                |



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- Message:** Missing ':' in symbolic name definition  
**Cause:** The RCS file was missing the required colon (:) between the symbolic name and its associated revision number in the list of symbolic names.  
**Action:** Manually edit the RCS file to insert the required colon (:). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after access list  
**Cause:** The RCS file contained the keyword **access** followed by a list of users who are allowed access to the file; however, this list was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after branch list  
**Cause:** The RCS file contained the keyword **branch** followed by the default branch; however, this line was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after branches  
**Cause:** The RCS file contained the keyword **branches** followed by a list of all branches for which a given revision is a branchpoint; however, this list was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after head  
**Cause:** The RCS file contained the keyword **head** followed by the number of the head revision of the file; however, this line was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after keyword *key*  
**Cause:** The RCS file contained a line which began with the given keyword; however, this line was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.
- Message:** Missing ';' after locks  
**Cause:** The RCS file contained the keyword **lock** followed by a list of locked revisions; however, this list was not terminated by the required semicolon (;).  
**Action:** Manually edit the RCS file to insert the required semicolon (;). See **rcsfile(3)** for the format of the RCS file.

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|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Missing ';' after next                                                                                                                                                        |
| <b>Cause:</b>   | The RCS file contained a line which began with the keyword <b>next</b> ; however, this line was not terminated by the required semicolon (;).                                 |
| <b>Action:</b>  | Manually edit the RCS file to insert the required semicolon (;). See <b>rcsfile(3)</b> for the format of the RCS file.                                                        |
| <b>Message:</b> | Missing ';' after symbolic names                                                                                                                                              |
| <b>Cause:</b>   | The RCS file contained the keyword <b>symbolic names</b> followed by a list of symbolic names; however, this list was not terminated by the required semicolon (;).           |
| <b>Action:</b>  | Manually edit the RCS file to insert the required semicolon (;). See <b>rcsfile(3)</b> for the format of the RCS file.                                                        |
| <b>Message:</b> | Missing access list                                                                                                                                                           |
| <b>Cause:</b>   | In the RCS file, the <b>access</b> keyword is not where it should be. The file is probably corrupt.                                                                           |
| <b>Action:</b>  | Manually edit the RCS file to correct the problem. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                            |
| <b>Message:</b> | Missing branches                                                                                                                                                              |
| <b>Cause:</b>   | In the RCS file, the <b>branches</b> keyword is not where it should be. The file is probably corrupt.                                                                         |
| <b>Action:</b>  | Manually edit the RCS file to correct the problem. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                            |
| <b>Message:</b> | Missing delta text                                                                                                                                                            |
| <b>Cause:</b>   | In the RCS file, the delta text (edit script) is not where it should be. The file is probably corrupt.                                                                        |
| <b>Action:</b>  | Retrieve an uncorrupted revision and rebuild from it.                                                                                                                         |
| <b>Message:</b> | Missing descriptive text                                                                                                                                                      |
| <b>Cause:</b>   | In the RCS file, the keyword <b>desc</b> and the descriptive text which follow its are not where they should be. The file is probably corrupt.                                |
| <b>Action:</b>  | Manually edit the RCS file to put the <b>desc</b> keyword and the descriptive text in their correct location. See <b>rcsfile(3)</b> for a description of the RCS file format. |
| <b>Message:</b> | Missing head                                                                                                                                                                  |
| <b>Cause:</b>   | In the RCS file, the keyword <b>head</b> does not appear in the proper place.                                                                                                 |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing keyword. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                     |
| <b>Message:</b> | Missing keyword                                                                                                                                                               |
| <b>Cause:</b>   | The given keyword did not appear where it should in the RCS file.                                                                                                             |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing keyword. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                     |

---

|                 |                                                                                                                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Missing keyword value                                                                                                                                                                                         |
| <b>Cause:</b>   | You attempted to check in a file using <b>ci -k</b> ; however, the working file contained an RCS keyword followed by a colon, but without a value following the colon.                                        |
| <b>Action:</b>  | Insert the missing value in the working file.                                                                                                                                                                 |
| <b>Message:</b> | Missing locks                                                                                                                                                                                                 |
| <b>Cause:</b>   | In the RCS file, the keyword <b>locks</b> does not appear in the proper place.                                                                                                                                |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing keyword. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                                                     |
| <b>Message:</b> | Missing log entry In the RCS file, the <b>log</b> entry does not appear in the appropriate place.                                                                                                             |
| <b>Action:</b>  | Manually edit the RCS file to correct the file's format. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                                                      |
| <b>Message:</b> | Missing next In the RCS file, the keyword <b>next</b> does not appear on the line following the <b>branches</b> keyword.                                                                                      |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing keyword. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                                                     |
| <b>Message:</b> | Missing number in lock                                                                                                                                                                                        |
| <b>Cause:</b>   | In the RCS file's header, the list of symbolic names following the keyword <b>lock</b> contained a symbolic name that was not associated with a revision number.                                              |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing revision number. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                                             |
| <b>Message:</b> | Missing number in symbolic name definition                                                                                                                                                                    |
| <b>Cause:</b>   | In the RCS file's header, the list of symbolic names following the keyword <b>symbols</b> contained a symbolic name that was not associated with a revision number.                                           |
| <b>Action:</b>  | Manually edit the RCS file to insert the missing revision number. See <b>rcsfile(3)</b> for a description of the RCS file format.                                                                             |
| <b>Message:</b> | Missing symbols                                                                                                                                                                                               |
| <b>Cause:</b>   | The keyword <b>symbols</b> does not appear in column 1 of the line following the access list in the RCS file's header.                                                                                        |
| <b>Action:</b>  | Manually edit the RCS file to insert the <b>symbols</b> keyword in the appropriate location, being sure to terminate it with a semicolon (;). See <b>rcsfile(3)</b> for a description of the RCS file format. |
| <b>Message:</b> | no filename specified                                                                                                                                                                                         |
| <b>Cause:</b>   | You specified a <b>~r</b> or <b>~w</b> command without providing a file name.                                                                                                                                 |
| <b>Action:</b>  | Provide the missing file name, and try again.                                                                                                                                                                 |

---

|                 |                                                                                                                                                                                                                                                                                                  |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | No side branches present for <i>rev</i>                                                                                                                                                                                                                                                          |
| <b>Cause:</b>   | You specified a revision number that should exist on a side branch from <i>rev</i> ; however, <i>rev</i> is not a branchpoint.                                                                                                                                                                   |
| <b>Action:</b>  | Specify a valid revision number.                                                                                                                                                                                                                                                                 |
| <b>Message:</b> | Option <i>-p</i> is set; ignoring output file <i>filename</i>                                                                                                                                                                                                                                    |
| <b>Cause:</b>   | Conflicting options on the command line specified both an output file and attempted to send the output to the standard output. The output was sent to the standard output and the output file is ignored.                                                                                        |
| <b>Action:</b>  | Either specify an output file or use the <i>-p</i> option to send the output to standard output, but do not do both.                                                                                                                                                                             |
| <b>Message:</b> | overflow in password prompt                                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | You specified a working file with a name that is too long to fit into a prompt being created by the command.                                                                                                                                                                                     |
| <b>Action:</b>  | Move deeper into the directory structure to get closer to the work file, thus shortening the path name.                                                                                                                                                                                          |
| <b>Message:</b> | Overwriting <i>filename</i> : <i>system error</i>                                                                                                                                                                                                                                                |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                                         |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                                                                                                                                                                                                         |
| <b>Message:</b> | Passwords don't match                                                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | You entered two passwords during the encryption process that did not match.                                                                                                                                                                                                                      |
| <b>Action:</b>  | Try again, paying closer attention to the passwords that you enter.                                                                                                                                                                                                                              |
| <b>Message:</b> | Path to RCS directory too long: <i>system error</i>                                                                                                                                                                                                                                              |
| <b>Cause:</b>   | See <b>syserror(3)</b>                                                                                                                                                                                                                                                                           |
| <b>Action:</b>  | See <b>syserror(3)</b>                                                                                                                                                                                                                                                                           |
| <b>Message:</b> | RCS file <i>filename</i> is not accessible                                                                                                                                                                                                                                                       |
| <b>Cause:</b>   | The RCS file was inaccessible. Another user may have it open for writing or you may not have appropriate permissions to access the file.                                                                                                                                                         |
| <b>Action:</b>  | Check the file permissions. If the file permissions allow you to write to the file, then another user must be accessing the file; wait a while and try again. If the file permissions do not allow you to write to the file, contact your system administrator about gaining access to the file. |
| <b>Message:</b> | RCS file name <i>filename</i> too long                                                                                                                                                                                                                                                           |
| <b>Cause:</b>   | You specified a path name that was too long to be properly handled by the file system.                                                                                                                                                                                                           |
| <b>Action:</b>  | Move deeper into the directory structure, to get closer to the file named, thus shortening the path name.                                                                                                                                                                                        |

---

**Message:** Revision number too long: *rev*  
**Cause:** The specified revision *rev* expands to a revision number that is long for RCS to handle. There are too many levels of branching.  
**Action:** Reorganize the revisions in the RCS file to require fewer levels of branching.

**Message:** Revision number *rev* too low  
**Cause:** A component of the revision number *rev* is too low. For example, you tried to check in a file with a lower revision number than what you checked it out with.  
**Action:** User a higher revision number.

**Message:** revision *rev* already locked by *username*  
**Cause:** You tried to lock a revision which was already locked by *username*.  
**Action:** Either ask *username* to unlock the required revision, or break the lock using the **-u** option of **rcs**.

**Message:** Revision *rev* not present  
**Cause:** You specified a revision of an RCS file that does not exist.  
**Action:** Specify a valid revision.

**Message:** Sorry  
**Cause:** The RCS utility was unable to read a password from standard input, probably because the utility was running in the background.  
**Action:** Run the RCS utility in the foreground.

**Message:** string buffer overflow -- truncating string  
**Cause:** You specified an input file that contained too many characters for RCS to handle. The input file was truncated.  
**Action:** Reduce the size of the input file.

**Message:** Stringtable overflow  
**Cause:** There were not enough free system resources to store all the strings required by the edit scripts needed to build a given revision.  
**Action:** Delete excess revisions with **rcs -o**.

**Message:** symbolic name *sym\_name* already bound to *rev*  
**Cause:** You attempted to assign a symbolic name to a revision, but that symbolic name was already assigned to another revision.  
**Action:** Either pick a different name, or remove the old symbolic assignment.  
**Cause:** You specified a symbolic name that did not begin with a letter.  
**Action:** Specify a symbolic name which begins with a letter.

**Message:** unable to create temporary file name for edit: *system error*  
**Cause:** See **syserror(3)**.  
**Action:** See **syserror(3)**.

---

|                 |                                                                                                                                                                                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | unable to edit message                                                                                                                                                           |
| <b>Cause:</b>   | A ~v command was read from the input, but the input is not a terminal.                                                                                                           |
| <b>Action:</b>  | You can only use the ~v command when the input is a terminal.                                                                                                                    |
| <b>Message:</b> | unable to open temporary file for decryption: <i>system error</i>                                                                                                                |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Message:</b> | unable to open temporary file for edit: <i>system error</i>                                                                                                                      |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Message:</b> | unable to reopen temporary file: <i>system error</i>                                                                                                                             |
| <b>Cause:</b>   | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Action:</b>  | See <b>syserror</b> (3).                                                                                                                                                         |
| <b>Message:</b> | unexpected end of file                                                                                                                                                           |
| <b>Cause:</b>   | While an RCS utility was building the requested revision, it encountered an end-of-file character in the edit script, where one should not be. The RCS file is probably corrupt. |
| <b>Action:</b>  | Retrieve an uncorrupted revision and rebuild from it.                                                                                                                            |
| <b>Message:</b> | Unterminated string                                                                                                                                                              |
| <b>Cause:</b>   | You specified a string which contained a large number of non-alphanumeric characters or was not terminated with a double quote (") character.                                    |
| <b>Action:</b>  | Reduce the number of non-alphanumeric characters in the string or provide the missing double quote (") character.                                                                |
| <b>Message:</b> | unterminated string                                                                                                                                                              |
| <b>Cause:</b>   | You specified a string which was not terminated with a double quote (") character.                                                                                               |
| <b>Action:</b>  | Provide the missing double quote (") character.                                                                                                                                  |
| <b>Message:</b> | User <i>username</i> not on the access list                                                                                                                                      |
| <b>Cause:</b>   | You attempted to access a RCS file but you are not on the list of users permitted to modify that file.                                                                           |
| <b>Action:</b>  | Have somebody on the RCS file's access list add you.                                                                                                                             |
| <b>Message:</b> | working file name <i>pathname</i> too long                                                                                                                                       |
| <b>Cause:</b>   | You specified a path name that was too long to be properly handled by the file system.                                                                                           |
| <b>Action:</b>  | Move deeper into the directory structure, to get closer to the file named, thus shortening the path name.                                                                        |

**Message:** write error: *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

**Message:** write failed on *filename*: *system error*

**Cause:** See **syserror**(3).

**Action:** See **syserror**(3).

**Message:** you already locked *rev*; only one lock allowed per person.

**Cause:** You attempted to lock the same file twice.

**Action:** Remove the existing lock using the **-u** option of **rcs**.

**NAME**

rcsfile — format of RCS file

**DESCRIPTION**

The content of an RCS file is described by the grammar given in this section. The text is free-format: spaces, tabs and newlines have no significance except in strings. Strings are enclosed by @. For a string to contain a @, it must be doubled.

The meta syntax uses the following conventions:

- (a) | (or-bar) separates alternatives;
- (b) { and } enclose optional phrases;
- (c) { and }\* enclose phrases that may appear zero or more times;
- (d) { and }+ enclose phrases that must appear at least once and may be repeated;
- (e) < and > enclose non-terminal symbols.

```
<rcstext> ::= <admin> {<delta>}* <desc> {<deltatext>}*
```

```
<admin> ::= head {<num>};
 branch {<num>};
 access {<id>}*;
 symbols {<name> : <num>}*;
 locks {<id> : <num>}*; {strict}
 comment {<string>};
 {format {binary | text};}
```

```
<delta> ::= <num>
 date <num>;
 author <id>;
 state {<id>};
 branches {<num>}*;
 next {<num>;}
```

```
<desc> ::= desc <string>
```

```
<deltatext> ::= <num>
 log <string>
 text <string>
```

```
<num> ::= {<digit>{.}}+
```

```
<digit> ::= 0 | 1 | ... | 9
```

```
<id> ::= <letter>{<idchar>}*
```



---

```

<name> ::= <letter>{<digit> | <letter> | _}*
<letter> ::= A | B | ... | Z | a | b | ... | z
<idchar> ::= Any printing ASCII character except space,
 tab, carriage return, new line, and <special>.
<special> ::= ; | : | , | @
<string> ::= @ {any ASCII character, with @ doubled} * @

```

Identifiers are case-sensitive. Keywords are in lowercase only. The sets of keywords and identifiers may overlap.

Each <delta> node must have a corresponding <deltatext>, even if the <deltatext> is empty.

The <delta> nodes form a tree. All nodes with numbers that consist of a single pair (for example, 2.3, 2.1, and 1.3) are on the "trunk", and are linked through the **next** field in order of decreasing numbers. The **head** field in the <admin> node points to the head of that sequence (that is, contains the highest pair). The **branch** node in the <admin> node indicates the default branch (or revision) for most RCS operations. If empty, the default branch is the highest branch on the trunk.

All <delta> nodes with numbers that consist of 2n fields (n≥2) (for example, 3.1.1.1 and 2.1.2.2) are linked as follows. All nodes with identical first (2n)–1 number fields are linked through the **next** field in order of increasing numbers. For each such sequence, the <delta> node with a number that is identical to the first 2(n–1) number fields of the deltas on that sequence is called the branchpoint. The **branches** field of a node contains a list of the numbers of the first nodes of all sequences for which it is a branchpoint. This list is ordered in increasing numbers.

Example:

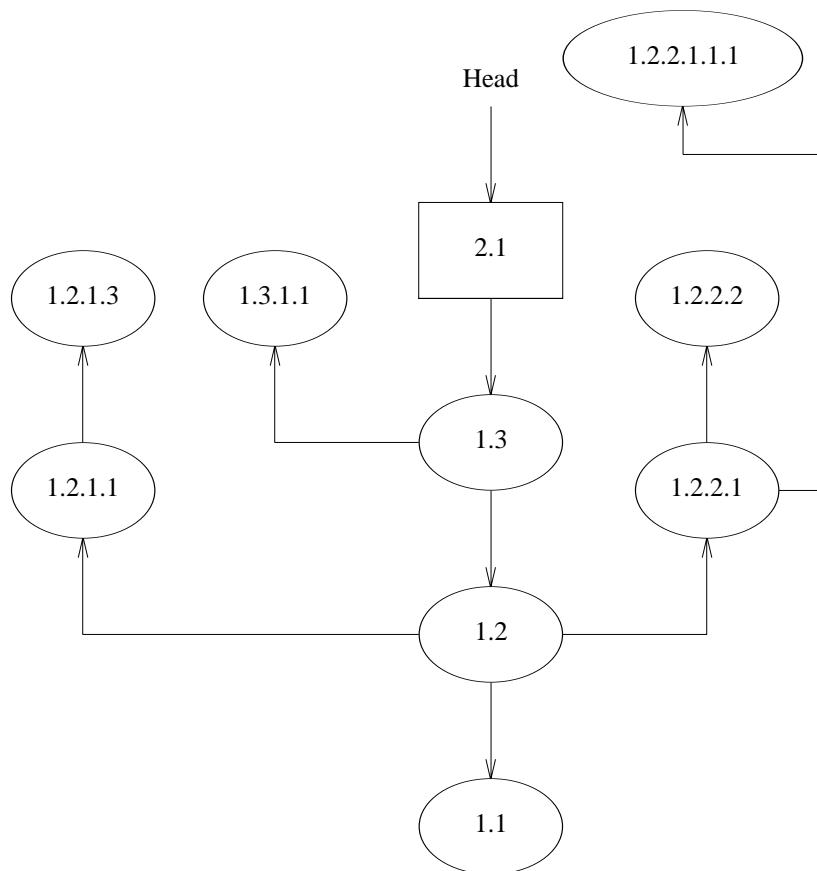


Figure 3-1: An RCS Revision Tree

**SEE ALSO**

**ci(1), co(1), ident(1), rcs(1), rcsclean(1), rcsdiff(1), rcsmerge(1), rlog(1)**

**NAME**

references — related books and articles

**DESCRIPTION**

The following is a selection of books and articles dealing with topics found in the reference manual for MPE/iX Shell and Utilities. Some entries contain comments, enclosed in square brackets [...], on the particular strengths of that reference. Please note that this list does *not* represent all good sources of information on these topics, but represents our particular favorites.

The first set of references covers MPE/iX Shell and Utilities in general:

IEEE P1003.2. *Information Technology — Portable Operating Systems Interfaces (POSIX)* — Part 2: Shell and Utilities Draft 12" . Institute of Electrical and Electronics Engineers: 1992. [Part of the POSIX series of standards for applications and user interfaces to open systems. It defines the applications interface to a shell command language, and a set of utility programs for complex data manipulation. When the User Portability Utilities Option is included, it also defines a common environment for general purpose time-sharing users on character-oriented display terminals.]

S. R. Bourne. *The UNIX System*. Addison-Wesley Publishing Company: 1983. [This book is a good overview of all of UNIX and thus MPE/iX Shell and Utilities. However, it predates such newer things as the KornShell.]

Brian W. Kernighan and Rob Pike. *The UNIX Programming Environment*. Prentice-Hall: 1984. [Good coverage of general concepts like the file system, pipes, and filters; excellent introduction to shell use and programming.]

Stephen G. Kochan and Patrick H. Wood. *Exploring the UNIX System*. Hayden Book Company: 1984. [This book provides a good grounding in the basic utilities from MPE/iX Shell and Utilities and includes a section on Vi. It is in the same series as the book on shell programming by the same authors.]

R. Pike and B. W. Kernighan "Program Design in the UNIX Environment" in *AT&T Bell Laboratories Technical Journal* Vol. 63, No. 8 (October 1984), pp. 1595-1605. [This article in particular, and also several others in this issue, provides some invaluable insights into the history and philosophy motivating UNIX and hence MPE/iX Shell and Utilities.]

**AWK**

These references deal with the **awk** programming language.

Alfred V. Aho, Peter J. Weinberger, and Brian W. Kernighan. *The AWK Programming Language*. Addison-Wesley Publishing Company: 1987. [An extensive introduction to the capabilities of **awk** by the designers of the language.]

Alfred V. Aho, Peter J. Weinberger, and Brian W. Kernighan. *AWK – A Pattern Scanning and Processing Language*. Computer Science Technical Report no. 118. AT&T Bell Laboratories: June 1985. [This is an excellent manual which describes the latest features in **awk** and contains a plethora of useful sample scripts.]

Jon Bentley, “Programming Pearls” in *Communications of the Association for Computing Machinery* Volume 28, 6-7 (June, July 1985), pp. 675-677. [An excellent overview of **awk** as a prototyping language. Contains a library of basic computing algorithms implemented in **awk**.]

## SHELL

The following references give more information on both the Bourne and Korn **sh** programs.

Stephen C. Kochan and Patrick H. Wood. *UNIX Shell Programming*. Hayden Book Company: 1985. [This book contains a very complete description of the UNIX System V.2 shell, as well as an excellent chapter on the KornShell Extensions.]

Morris I. Bolsky and David G. Korn, *The KornShell Command and Programming Language*. Prentice Hall, 1989. [This is the authoritative tutorial and reference for the KornShell; Korn himself is one of the authors.]

## VI

This set of references is specific to the Vi text editor.

Bill Joy. “An Introduction to Display Editing with Vi” and “Ex Reference Manual” in *UNIX Programmers Manual* Volume II, Berkeley Software Distribution. [These are the original Vi documents, by the first author of the program. They are authoritative.]

H. McGilton and R. Morgan. *Introducing the UNIX System*. McGraw-Hill: 1983. [This is a broadly based introductory UNIX text, with good coverage of Vi and many other topics.]

August Hansen. *Vi: The UNIX Screen Editor*. Prentice-Hall, 1986.

**NAME**

regerror — regular expression error messages

**DESCRIPTION**

MPE/iX Shell and Utilities generates the following regular expression error messages

- Message:** { } or \{ \} imbalance  
**Code:** REG\_EBRACE  
**Cause:** You specified a regular expression that contained a { } or \{ \} imbalance.  
**Action:** Make sure that all { and } characters and all \{ and \} characters appear in matched pairs in the regular expression.
- Message:** ( ) or \( \) imbalance  
**Code:** REG\_EPAREN  
**Cause:** You specified a regular expression that contained a ( ) or \( \) imbalance.  
**Action:** Make sure that all ( and ) characters and all \( and \) characters appear in matched pairs in the regular expression.
- Message:** [ ] imbalance or syntax error  
**Code:** REG\_EBRACK  
**Cause:** You specified a regular expression that contained a [ ] imbalance.  
**Action:** Make sure that all [ and ] characters appear in matched pairs in the regular expression.
- Message:** ?, \*, or + not preceded by valid regular expression  
**Code:** REG\_BADRPT  
**Cause:** You specified a regular expression that contained a ?, \*, or + which was not preceded by a valid regular expression.  
**Action:** Make sure that every unquoted /, \*, or + in the regular expression is preceded by a valid regular expression.
- Message:** contents of { } or \{ \} invalid  
**Code:** REG\_BADBR  
**Cause:** The contents of \{ \} or { } in the specified regular expression were invalid: not a number, too large a number, more than two numbers, first number larger than second.  
**Action:** Make sure that the contents of \{ \} or { } are valid.
- Message:** failed to match  
**Code:** REG\_ENOMATCH  
**Cause:** There was no match found for the specified regular expression.  
**Action:** Make sure that the regular expression was specified correctly.

---

|                 |                                                                                                                                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | internal error                                                                                                                   |
| <b>Code:</b>    | REG_EFATAL                                                                                                                       |
| <b>Cause:</b>   | An internal error occurred.                                                                                                      |
| <b>Action:</b>  | Contact your system manager.                                                                                                     |
| <b>Message:</b> | invalid character class type                                                                                                     |
| <b>Code:</b>    | REG_ECTYPE                                                                                                                       |
| <b>Cause:</b>   | You specified a regular expression that contained a reference to an invalid character class.                                     |
| <b>Action:</b>  | Make sure that all character classes referenced in the regular expression are valid in the locale indicated by <i>LC_CTYPE</i> . |
| <b>Message:</b> | invalid collation element                                                                                                        |
| <b>Code:</b>    | REG_ECOLLATE                                                                                                                     |
| <b>Cause:</b>   | You specified a regular expression that contains an invalid collating element.                                                   |
| <b>Action:</b>  | Make sure that all collating elements in the regular expression are valid in the locale indicated by <i>LC_COLLATE</i> .         |
| <b>Message:</b> | invalid endpoint in range                                                                                                        |
| <b>Code:</b>    | REG_ERANGE                                                                                                                       |
| <b>Cause:</b>   | You specified a regular expression that contained a range expression with an invalid endpoint.                                   |
| <b>Action:</b>  | Specify a valid endpoint.                                                                                                        |
| <b>Message:</b> | newline found before end of pattern                                                                                              |
| <b>Code:</b>    | REG_ENEWSLINE                                                                                                                    |
| <b>Cause:</b>   | You specified a regular expression that contained a newline before the end of the pattern.                                       |
| <b>Action:</b>  | Check the regular expression for a missing /.                                                                                    |
| <b>Message:</b> | number in \[0-9] invalid                                                                                                         |
| <b>Code:</b>    | REG_ESUBREG                                                                                                                      |
| <b>Cause:</b>   | You specified a number that was greater than the number of matching subexpressions.                                              |
| <b>Action:</b>  | Specify a number that is less than or equal to the number of matching subexpressions.                                            |
| <b>Message:</b> | out of memory                                                                                                                    |
| <b>Code:</b>    | REG_ESPACE                                                                                                                       |
| <b>Cause:</b>   | There were not enough free system resources for working with the specified regular expression.                                   |
| <b>Action:</b>  | Free up more resources or specify a less complex regular expression.                                                             |

---

|                 |                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------|
| <b>Message:</b> | success                                                                                       |
| <b>Code:</b>    | REG_OK                                                                                        |
| <b>Cause:</b>   | A match was found for the specified regular expression.                                       |
| <b>Action:</b>  | No action is required.                                                                        |
| <b>Message:</b> | syntax error                                                                                  |
| <b>Code:</b>    | REG_BADPAT                                                                                    |
| <b>Cause:</b>   | You specified an invalid regular expression.                                                  |
| <b>Action:</b>  | Correct the syntax of the regular expression                                                  |
| <b>Message:</b> | trailing \ in pattern                                                                         |
| <b>Code:</b>    | REG_EESCAPE                                                                                   |
| <b>Cause:</b>   | You specified a regular expression with a trailing \.                                         |
| <b>Action:</b>  | Remove the trailing \ or complete the escape sequence.                                        |
| <b>Message:</b> | unknown regex error                                                                           |
| <b>Cause:</b>   | The error code that was passed to regerror( ) is not a known error.                           |
| <b>Action:</b>  | Check your program to verify that <i>errcode</i> was retrieved from regexec( ) or regcomp( ). |

**SEE ALSO****regexec(3), regfree(3), regexp(3)**

## NAME

regexp — syntax of regular expression patterns

## DESCRIPTION

Many MPE/iX Shell and Utilities commands match strings of text in text files using a type of pattern known as a *regular expression*. Simply stated, a *regular expression* lets you find strings in text files not only by direct match, but also by extended matches, similar to, but much more powerful than the file name patterns described in **glob**(1) and **sh**(1).

The newline character at the end of each input line is never explicitly matched by any regular expression or part thereof.

**expr**, **ex**, **vi**, and **ed** take Basic regular expressions; all other MPE/iX Shell and Utilities commands accept Extended regular expressions. **grep** and **sed** accept Basic regular expressions, but will accept Extended regular expressions if the **-E** option is used.

Regular expressions may be made up of normal characters and/or special characters, sometimes called *metacharacters*. Basic and Extended regular expressions differ only in the metacharacters they can contain.

The Basic regular expression metacharacters are:

`^ $ . * \ ( \ ) [ \ { \ } \`

The Extended regular expression metacharacters are:

`| ^ $ . * + ? ( ) [ { } \`

These have the following meanings.

- `.` A dot character matches any single character of the input line.
- `^` The `^` character does not match any character but represents the beginning of the input line. For example, `^A` is a regular expression matching the letter A at the beginning of a line. The `^` character is only special at the beginning of a regular expression, or after a `(` or `|`.
- `$` This does not match any character but represents the end of the input line. For example, `A$` is a regular expression matching the letter A at the end of a line. The `$` character is only special at the end of a regular expression, or before a `)` or `|`.

[ *bracket-expression* ]

A bracket expression enclosed in square brackets is a regular expression that matches a single character, or collating element. Note that this bracket expression applies not only to regular expressions, but also to pattern matching as performed by the `fnmatch( )` function (used in file name expansion).



- a) If the initial character is a circumflex `^`, then this bracket expression is complemented. It shall match any character or collating-element except for the expressions specified in the bracket expression. For pattern matching, as performed by the `fnmatch()` function, this initial character is instead `!` (the exclamation mark).
- b) If the first character after any potential circumflex is either a dash (`-`), or a closing square bracket (`]`), then that character shall match exactly that character; that is a literal dash or closing square bracket.
- c) Collating sequences may be specified by enclosing their name inside square bracket period. For example, `[.ch.]` matches the multi-character collating sequence `ch` (if the current language supports that collating sequence). Any single character is itself. It is an error to give a collating sequence that isn't part of the current locale.
- d) Equivalence classes may be specified by enclosing a character or collating sequence inside square bracket equals. For example, `[=a=]` matches any character in the same equivalence class as `a`. This normally expands to all the variants of `a` in the current locale: for example, `a`, `\(a:`, `\(a'`, ... On some locales it might include both the uppercase and lowercase of a given character. In the POSIX locale, this always expands to only the character given.
- e) Within a character class expression (one made with square brackets), the following constructs may be used to represent sets of characters. These constructs are used for internationalization and handle the different collating sequences as required by POSIX.

|                          |                                                                  |
|--------------------------|------------------------------------------------------------------|
| <code>[ :alpha: ]</code> | Any alphabetic character.                                        |
| <code>[ :lower: ]</code> | Any lowercase alphabetic character.                              |
| <code>[ :upper: ]</code> | Any uppercase alphabetic character.                              |
| <code>[ :digit: ]</code> | Any digit character.                                             |
| <code>[ :alnum: ]</code> | Any alphanumeric character (alphabetic or digit).                |
| <code>[ :space: ]</code> | Any white space character (blank, horizontal tab, vertical tab). |
| <code>[ :graph: ]</code> | Any printable character, except the blank character.             |
| <code>[ :print: ]</code> | Any printable character, including the blank character.          |

`[ :punct: ]` Any printable character that is not white space or alphanumeric.

`[ :cntrl: ]` Any non-printable character.

For example, given the character class expression

`[ :alpha: ]`

you need to enclose the expression within another set of square brackets, as in:

`/[[:alpha:]]/`

- f) Character ranges are specified by a dash (–) between two characters, or collating sequences. This indicates all character or collating sequences which collate between two characters or collating sequences. The range does not refer to the native character set. For example, in the POSIX locale, `[a–z]` means all lowercase letters, even if they don't agree with the binary machine ordering. However, since many other locales do not collate in this manner, ranges should not be used in Strictly Conforming POSIX.2 Applications. A collating sequence may explicitly be an endpoint of a range; for example, `[.ch.]–[.ll.]` is valid; however equivalence classes or character classes may not: `[ [=a=]–z ]` is illegal.

`\` This character is used to turn off the special meaning of metacharacters. For example, `\.` only matches a dot character. Note that `\\` matches a literal `\` character. Also note the special case of `'\d'` described later.

`\d` For *d* representing any single decimal digit (from 1 to 9), this pattern is equivalent to the string matching the *d*th expression enclosed within the `( )` characters (or `\( \)` for some commands) found at an *earlier point* in the regular expression. Parenthesized expressions are numbered by counting `(` characters from the left.

Constructs of this form can be used in the replacement strings of substitution commands (for example, the `s` command in Ex, or the `sub` function of **awk**), to stand for constructs matched by parts of the regular expression. For example, in the following Ex command

`s/\(.*\):\(.*\)/\2:\1/`

the `\1` stands for everything matched by the first `\(.*\)` and the `\2` stands for everything matched by the second. The result of the command is to swap everything before the `:` with everything after.

*regex\**

A regular expression *regex* followed by \* matches a string of **zero** or more strings that would match *regex*. For example, A\* matches A, AA, AAA and so on. It also matches the null string (zero occurrences of A).

*regex+*

A regular expression *regex* followed by + matches a string of **one** or more strings that would match *regex*.

*regex?*

A regular expression *regex* followed by ? matches a string of one or zero occurrences of strings that would match *regex*.

*char{n}*

*char\{n\}*

In this expression (and the ones to follow), *char* is a regular expression that stands for a single character (for example, a literal character or a period (.)). Such a regular expression followed by a number in brace brackets stands for that number of repetitions of a character. For example, X\{3\} stands for XXX. In Basic regular expressions, in order to reduce the number of special characters, { and } must be escaped by the \ character to make them special, as shown in the second form (and the ones to follow).

*char{min,}*

*char\{min,\}*

When a number, *min*, followed by a comma appears in braces following a single-character regular expression, it stands for at least *min* repetitions of a character. For example, X\{3,\} stands for at least three repetitions of X.

*char{min,max}*

*char\{min,max\}*

When a single-character regular expression is followed by a pair of numbers in braces, it stands for at least *min* repetitions and no more than *max* repetitions of a character. For example, X\{3,7\} stands for three to seven repetitions of X.

*regex1 | regex2*

This expression matches either regular expression *regex1* or *regex2*.

*( regex )*

*\( regex \)*

This lets you group parts of regular expressions. Except where overridden by parentheses, concatenation has the highest precedence. In Basic regular expressions, in order to reduce the number of special characters, ( and ) must be escaped by the \ character to make them special, as shown in the second form.

Several regular expressions can be concatenated to form a larger regular expression.

Ex and Vi

The metacharacters available in the Ex and Vi editors are:

`^ $ . * \ ( \ ) [ \ \< \>`

The regular expressions accepted by Ex and Vi are similar to Basic regular expressions, except that the `\{` and `\}` characters are not special, and the `[ : : ]` character class expression are not available. The following two extra metacharacters are available:

- `\<` This matches the beginning of an identifier, defined as the boundary between non-alphanumerics and alphanumerics (including underscore). This matches no characters, only the context.
- `\>` This construct is analogous to the `\<` notation except that it matches the end of an identifier.

| Notation | awk | ed | egrep | expr | sed | vi |
|----------|-----|----|-------|------|-----|----|
| .        | •   | •  | •     | •    | •   | •  |
| ^        | •   | •  | •     |      | •   | •  |
| \$       | •   | •  | •     | •    | •   | •  |
| [...]    | •   | •  | •     | •    | •   | •  |
| [::]     | •   | •  | •     | •    | •   | •  |
| re*      | •   | •  | •     | •    | •   | •  |
| re+      | •   |    | •     |      |     |    |
| re?      | •   |    | •     |      |     |    |
| re re    | •   |    | •     |      |     |    |
| \d       | •   | •  | •     | •    | •   | •  |
| (...)    | •   |    | •     |      |     |    |
| \(...\)  |     | •  |       | •    | •   | •  |
| \<       |     |    |       |      |     | •  |
| \>       |     |    |       |      |     | •  |
| \{ \}    | •   |    | •     |      | •   |    |

Table 3-3: Regular Expression Features

Summary

The commands that use Basic and Extended regular expressions are as follows.

Basic

**csplit**, **ed**, **grep**, **expr**, **sed**, and **vi**.

Extended

**awk**, **egrep**, and **sed** with the **-E** option.

Table 3-4 summarizes which features apply to which MPE/iX Shell and Utilities commands.

## EXAMPLES

The following patterns are given as illustrations, along with plain language descriptions of what they match:

`abc` matches any line of text containing the three letters `abc` in that order.

`a.c` matches any string beginning with the letter `a`, followed by *any* character, followed by the letter `c`.

`^.$` matches any line containing exactly one character (the newline is not counted).

`a(b*|c*)d`  
matches any string beginning with a letter `a`, followed by either zero or more of the letter `b`, or zero or more of the letter `c`, followed by the letter `d`.

`.*[a-z]+.*`  
matches any line containing a *word*, consisting of lowercase alphabetic characters, delimited by at least one space on each side.

`(morty).*\1`

`morty.*morty`

These expressions both match lines containing at least two occurrences of the string `morty`.

`[[:space:]][[:alnum:]]`

Matches any character that is either a white space character or alphanumeric.

## PORTABILITY

The Basic regular expressions are available on most UNIX systems. Extended regular expressions may not be. POSIX-compliant systems support the Extended set.

## SEE ALSO

**awk(1)**, **ed(1)**, **grep(1)**, **expr(1)**, **sed(1)**, **vi(1)**, **fnmatch(3)**, **regcomp(3)**

**NAME**

shedit — interactive command and history editing in the shell

**SYNOPSIS**

**set** -o *editmode*

**EDITOR**=*editprog*

**VISUAL**=*editprog*

**DESCRIPTION**

POSIX uses a number of keys for such things as *erase* and *kill* processing. By default, the shell leaves command line editing to POSIX, using these familiar editing keys. However, these functions are not particularly powerful or friendly. As an alternative, the shell has built-in facilities for interactive command editing and file name generation that not only aid in composing new commands but also provide for convenient modification and re-execution of previous commands. This capability is distinct from that provided by the **fc**(1) command, which passes previous command lines to a separate program for editing. The built-in facilities mimic the **emacs**, **gmacs**, or **Vi** screen editors, and are enabled the following commands (see **set**(1) and **vi**(1) for details.)

```
set -o emacs
set -o gmacs
set -o vi
```

These facilities are also enabled (with the corresponding option set) by assigning a value ending in *emacs*, *gmacs*, or *vi* to the variable *EDITOR* or *VISUAL* (see **sh**(1)).

Unlike full-screen editors, shell editing uses a one-line window, extending from the end of the prompt to the second-last column. Multi-line history entries are displayed with newlines represented as ^J. The number of columns on the output device is obtained from the *COLUMNS* variable if defined; otherwise, it is assumed to be 80. A command line that extends into the rightmost column can be scrolled horizontally. If you try to move the cursor beyond the edge of the window, the line is scrolled to approximately centre the cursor in the window. The second last column displays a character marking a scrollable line: < indicates extra data off the left; > indicates extra data off the right; and \* indicates extra data off both sides.

**EMACS/GMACS EDITING MODE**

When this editing mode has been enabled, by any of the means noted earlier, ordinary printable characters from the keyboard are entered in the command line (and echoed). Various control characters introduce command sequences for such things as moving the cursor, scrolling through the command history, and modifying the current command. The only difference between **emacs** and **gmacs** mode is in the handling of **CTRL-T** (see the description of **CTRL-** in the *Text Change* subsection).

The command sequences recognized are listed in functional groups. The notation **s-2META-** represents **s-2ESC** followed by the letter. The terminology is historical. Many commands accept an optional preceding count which is entered in decimal as **s-2META-igits**, or as **CTRL-** which multiplies the current count (initially 1) by 4. The command is executed that number of times.

### Cursor Movement

**nCTRL-** Move the cursor back *n* characters.

**nCTRL-F** Move the cursor forward *n* characters.

**CTRL-A** Move the cursor to beginning of line.

**CTRL-E** Move the cursor to end of line.

**nMETA-b** Move the cursor back to *n*th previous beginning of word (string of alphanumeric).

**nMETA-f** Move the cursor forward to *n*th beginning of word.

**CTRL-]c** Move the cursor forward to next character *c* on current line.

**META-space**

**CTRL-@** Set mark at cursor position.

**CTRL-X CTRL-X**  
Exchange cursor position and mark.

### Line Search

These commands display a different history line.

**nCTRL-P** Select the *n*th previous command line from history.

**nCTRL-N** Select the *n*th next command line from history.

**META-<** Select the earliest command line from history.

**META->** Select the latest command line from history.

**nCTRL-RstringENTER**  
Select the *n*th previous command line matching *string*. If *n* is zero, then select the next matching command after the current line.

### Text Change

**n erase** (erase character)

**nBACKSPACE**

**nCTRL-H** Delete *n* characters to the left of the cursor.

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|                                          |                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>n</i>CTRL-D</b>                    | Delete <i>n</i> characters to the right of the cursor. If the current line is empty, then terminate the shell.                                                                                                                                                                                                                                   |
| <b><i>n</i>META-CTRL-H</b>               |                                                                                                                                                                                                                                                                                                                                                  |
| <b><i>n</i>META-h</b>                    | Delete to the <i>n</i> th beginning of word before the cursor.                                                                                                                                                                                                                                                                                   |
| <b><i>n</i>META-d</b>                    | Delete to the <i>n</i> th beginning of word after the cursor.                                                                                                                                                                                                                                                                                    |
| <b><i>n</i>CTRL-K</b>                    | Delete from the cursor to the end of line. If <i>n</i> is zero, then delete from the beginning of line to the cursor.                                                                                                                                                                                                                            |
| <b><i>kill</i></b> (line kill character) |                                                                                                                                                                                                                                                                                                                                                  |
| <b>CTRL-G</b>                            | Delete entire current line.                                                                                                                                                                                                                                                                                                                      |
| <b>CTRL-W</b>                            | Delete from cursor position to the mark (set with <b>META-space</b> or <b>CTRL-@</b> ).                                                                                                                                                                                                                                                          |
| <b>CTRL-T</b>                            | In <b>emacs</b> mode, transpose character under cursor with previous character. In <b>gmacs</b> mode, transpose two characters before cursor.                                                                                                                                                                                                    |
| <b>CTRL-Y</b>                            | Restore the last text deleted in <b>emacs</b> mode.                                                                                                                                                                                                                                                                                              |
| <b>CTRL-C</b>                            |                                                                                                                                                                                                                                                                                                                                                  |
| <b>CTRL-^</b>                            | Capitalize character under cursor.                                                                                                                                                                                                                                                                                                               |
| <b>META-c</b>                            | Capitalize word to right of cursor.                                                                                                                                                                                                                                                                                                              |
| <b>META-l</b>                            | Lowercase word to right of cursor.                                                                                                                                                                                                                                                                                                               |
| <b>META-u</b>                            | Uppercase word to right of cursor.                                                                                                                                                                                                                                                                                                               |
| <b><i>n</i>META-.</b>                    |                                                                                                                                                                                                                                                                                                                                                  |
| <b><i>n</i>META-_</b>                    | Insert the <i>n</i> th word of the previous command. If <i>n</i> is not given or it is zero, insert the last word of the previous command.                                                                                                                                                                                                       |
| <b>META-*</b>                            | Replace the current word with the list of files which would match that word with a * appended.                                                                                                                                                                                                                                                   |
| <b>META-ESC</b>                          | Used to complete a path name. If there is only one existing path name that matches as much as you've typed, the path name is completed and a space is added after the complete path name. If there are several matching path names, the shell expands what you've typed by adding all the characters that are common to all matching path names. |
| <b>META-=</b>                            | Lists all path names matching the current word.                                                                                                                                                                                                                                                                                                  |



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**Miscellaneous**

|                                    |                                                                                                                           |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>CTRL-J</b>                      |                                                                                                                           |
| <b>CTRL-M</b>                      |                                                                                                                           |
| <b>ENTER</b>                       | Execute current command line.                                                                                             |
| <b>CTRL-L</b>                      | Re-display current command line.                                                                                          |
| <b>CTRL-O</b>                      | Remember the next command line, execute the current command line, then select the remembered line.                        |
| <b>CTRL-U</b>                      | Multiply the count on the following command by 4 (for each <b>CTRL-U</b> ).                                               |
| <b>CTRL-V</b>                      | Display the version of the shell.                                                                                         |
| <b>\</b>                           | Take the next character literally. Thus command and control characters can be entered in a command line or search string. |
| <i>eof</i> (end-of-file character) |                                                                                                                           |
| <b>CTRL-D</b>                      | Terminate the shell.                                                                                                      |
| <b>META-n</b>                      | Enter a count for the following command.                                                                                  |

**Vi EDITING MODE**

When the Vi editing facilities have been enabled by any of the means discussed in the first paragraph, the shell is initially in *input mode* after each new prompt. Keyboard input is normally inserted at the current position in the current command line; the exceptions are the following *action keys*.

**Note:** In *input mode* the cursor arrow keys are ignored.

*erase* (erase character)

**BACKSPACE**

**CTRL-H** Delete the character to the left of the cursor.

*eof* (end-of-file character)

**CTRL-D** Terminate the shell.

**CTRL-W** Delete the word (white-space delimited string) to the left of the cursor.

*kill* (line kill character)

**CTRL-X** Delete the current line.

**CTRL-J**

**CTRL-M**

**ENTER** Execute the current line.

---

|               |                                                                                                                                                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ESC</b>    | Switch from <i>input mode</i> to <i>command mode</i> (see below).                                                                                                                                                                                                                                      |
| <b>CTRL-V</b> | Take the next character literally; useful for entering any of these <i>action keys</i> as text.                                                                                                                                                                                                        |
| <b>\</b>      | Escape the following <i>action key</i> . If the next character is any <i>action key</i> except <b>CTRL-J</b> , <b>CTRL-M</b> , or <b>ENTER</b> , the <b>\</b> is erased and the escaped character is entered literally; otherwise the <b>\</b> is entered, and the next character is treated normally. |

If the ESC key is pressed, the shell enters *command mode*, and keyboard input is interpreted as commands to reposition the cursor, scroll through the command history, delete or change text, or re-enter *input mode*. In *command mode* input is not echoed; it is acted upon. Many commands take an optional count, *n*, which is entered as a preceding decimal number (not echoed); the command is executed that number of times. Except where otherwise noted, *n* defaults to 1. Commands are discussed in functional groups.

### Cursor Movement

These commands reposition the cursor in the command line.

|            |                                                                                                                  |
|------------|------------------------------------------------------------------------------------------------------------------|
| <b>nh</b>  | Move back <i>n</i> characters.                                                                                   |
| <b>nl</b>  | Move forward <i>n</i> characters.                                                                                |
| <b>0</b>   | (zero) — Move to the first character on the line.                                                                |
| <b>^</b>   | Move to the first non-blank character on the line.                                                               |
| <b>\$</b>  | Move to the last character on the line.                                                                          |
| <b>nw</b>  | Move to the beginning of the <i>n</i> th next word (string of alphanumerics, or of non-blank non-alphanumerics). |
| <b>nW</b>  | Move to the beginning of the <i>n</i> th next full-word (string of non-blanks).                                  |
| <b>nb</b>  | Move to the <i>n</i> th previous beginning of word.                                                              |
| <b>nB</b>  | Move to the <i>n</i> th previous beginning of full-word.                                                         |
| <b>ne</b>  | Move to the <i>n</i> th next end of word.                                                                        |
| <b>nE</b>  | Move to the <i>n</i> th next end of full-word.                                                                   |
| <b>nc</b>  | Move to the <i>n</i> th next character <i>c</i> .                                                                |
| <b>nFc</b> | Move to the <i>n</i> th previous character <i>c</i> .                                                            |
| <b>ntc</b> | Move to the character before the <i>n</i> th next character <i>c</i> .                                           |

---

|                          |                                                                                                          |
|--------------------------|----------------------------------------------------------------------------------------------------------|
| <b><i>nT</i><i>c</i></b> | Move to the character after the <i>n</i> th previous character <i>c</i> .                                |
| <b><i>n</i>;</b>         | Repeat the previous <b>f</b> , <b>F</b> , <b>t</b> , or <b>T</b> command.                                |
| <b><i>n</i>,</b>         | Repeat the previous <b>f</b> , <b>F</b> , <b>t</b> , or <b>T</b> command, but in the opposite direction. |

### Line Search

The following change the current (displayed) command line.

|                             |                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>nj</i></b>            |                                                                                                                                                          |
| <b><i>n+</i></b>            | Select the <i>n</i> th next command line from history.                                                                                                   |
| <b><i>nk</i></b>            |                                                                                                                                                          |
| <b><i>n-</i></b>            | Select the <i>n</i> th previous command line from history.                                                                                               |
| <b><i>nG</i></b>            | Select the command with history number <i>n</i> , or the latest command if <i>n</i> is omitted.                                                          |
| <b><i>n/string</i>ENTER</b> | Select the <i>n</i> th command line, searching backwards, which matches <i>string</i> . If <i>string</i> is omitted, the previous search string is used. |
| <b><i>n?string</i>ENTER</b> | Select the <i>n</i> th command line, searching forwards, which matches <i>string</i> . If <i>string</i> is omitted, the previous search string is used.  |
| <b><i>nn</i></b>            | Repeat the last string search ('/' or '?') command.                                                                                                      |
| <b><i>nN</i></b>            | Repeat the last string search, but in the opposite direction.                                                                                            |

### Text Change

The following commands alter the text in the current command line. Some of these commands operate on a text block, defined by an immediately following cursor movement command. This is designated by *m* (for *movement*) in the text change command. The text block extends from the current cursor position to the new position determined by the movement command.

|                   |                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>i</i></b>   | Enter <i>input mode</i> , inserting text before the character under the cursor.                                                     |
| <b><i>I</i></b>   | Insert before first non-blank on line (^ <b>i</b> ).                                                                                |
| <b><i>a</i></b>   | Move the cursor forward one character and enter <i>input mode</i> , appending text after the character originally under the cursor. |
| <b><i>A</i></b>   | Append to end of line (\$ <b>a</b> ).                                                                                               |
| <b><i>ndm</i></b> | Delete text block. If <i>n</i> is given, it is applied to the <i>movement</i> .                                                     |

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|            |                                                                                                                                                                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>dd</b>  | Delete entire command line.                                                                                                                                                                                                                                                    |
| <b>D</b>   | Delete from cursor to end of line ( <b>d\$</b> ).                                                                                                                                                                                                                              |
| <b>nx</b>  | Delete <i>n</i> characters to right of cursor ( <b>ndl</b> ).                                                                                                                                                                                                                  |
| <b>nX</b>  | Delete <i>n</i> characters to left of cursor ( <b>ndh</b> ).                                                                                                                                                                                                                   |
| <b>ncm</b> | Change text block; deletes block of text and enters <i>input mode</i> . If <i>n</i> is given, it is applied to the <i>movement</i> .                                                                                                                                           |
| <b>cc</b>  |                                                                                                                                                                                                                                                                                |
| <b>S</b>   | Change entire command line.                                                                                                                                                                                                                                                    |
| <b>ns</b>  | Change next <i>n</i> characters from cursor.                                                                                                                                                                                                                                   |
| <b>np</b>  | Put back, after the character under the cursor, <i>n</i> copies of the last block deleted by a text change command.                                                                                                                                                            |
| <b>nP</b>  | Put back, before the character under the cursor, <i>n</i> copies of the last block deleted by a text change command.                                                                                                                                                           |
| <b>rc</b>  | Replace the single character under the cursor with the character <i>c</i> , and advance the cursor one position.                                                                                                                                                               |
| <b>R</b>   | Enter <i>replace mode</i> : a special case of <i>input mode</i> in which each character entered overwrites that under the cursor, and advances the cursor one position.                                                                                                        |
| <b>u</b>   | Undo the last text change to the current line. This is itself a text change command, and so acts as a toggle for the last change.                                                                                                                                              |
| <b>U</b>   | Undo all changes to the current line.                                                                                                                                                                                                                                          |
| <b>n~</b>  | Invert the case of the next <i>n</i> characters, advancing the cursor over them.                                                                                                                                                                                               |
| <b>n.</b>  | Repeat the last text change command. If <i>n</i> is given, it overrides the count originally given with the repeated command.                                                                                                                                                  |
| <b>n_</b>  | Append after the character under the cursor, the <i>n</i> th argument from the previous command line (default last), and enter <i>input mode</i> .                                                                                                                             |
| <b>*</b>   | Replace the current word with the list of file names that would match the word with a <i>*</i> appended. In the case of no match, the terminal beeps and the word is not changed; otherwise, the cursor is positioned at the end of the list and <i>input mode</i> is entered. |
| <b>\</b>   | Used to complete a path name. If there is only one existing path name that matches as much as you've typed, the path name is completed and a space is                                                                                                                          |

added after the complete path name. If there are several matching path names, the shell expands what you've typed by adding all the characters that are common to all matching path names.

= Lists all path names matching the current word.

### Miscellaneous

***nym*** Yank text block into the delete buffer. Does not alter the command line or cursor position, but makes the text block available to subsequent **put** (**p** or **P**) commands. If *n* is given, it is applied to the *movement*.

***yy*** Yank entire command line.

***Y*** equivalent to **y\$** — yank rest of line.

***#*** Equivalent to **I#ENTER**.

***nv*** Execute **fc -e \${VISUAL:-\${EDITOR:-vi}}** *n*. If *n* is omitted, the history number of the current line is used.

**CTRL-L** Re-display the current line.

**CTRL-J**

**CTRL-M**

**ENTER** Execute the current line.

### LIMITATIONS

Editor macros (one-letter aliases) are not implemented.

Selecting a previous history line for editing while at a secondary prompt (that is, while entering a subsequent line of a new multi-line command) yields bizarre results.

### SEE ALSO

**fc(1)**, **set(1)**, **sh(1)**, **vi(1)**

---

**NAME**

syserror — system error messages

**DESCRIPTION**

Many error messages produced by commands in MPE/iX Shell and Utilities contain within them, an error message generated by the operating system, which gives more details on what actually caused the error.

Several of the MPE/iX system error messages have multiple causes and as a result, each of these causes requires a different action to correct the error. If an error has multiple causes listed, look down the list until you find the one that seems appropriate and try the corresponding action.

MPE/iX Shell and Utilities can generate the following system error messages:

- |                 |                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | Argument list too long                                                                                                                                                              |
| <b>Cause:</b>   | You attempted to create a new process with an argument list and environment list which have a combined length that exceeds the limit imposed by the ARG_MAX configuration variable. |
| <b>Action:</b>  | Reduce the size of the argument list and/or the environment list.                                                                                                                   |
| <b>Message:</b> | Bad address                                                                                                                                                                         |
| <b>Cause:</b>   | The system detected a NULL or bad address when it attempted to resolve an argument, or an argument was not terminated by a required NULL character.                                 |
| <b>Action:</b>  | Ensure that the argument is correctly specified.                                                                                                                                    |
| <b>Message:</b> | Bad file number                                                                                                                                                                     |
| <b>Cause:</b>   | You specified an invalid file descriptor as an argument to a command.                                                                                                               |
| <b>Action:</b>  | Specify a valid file descriptor.                                                                                                                                                    |
| <b>Message:</b> | Directory not empty                                                                                                                                                                 |
| <b>Cause:</b>   | You attempted to remove a directory that is not empty.                                                                                                                              |
| <b>Action:</b>  | Ensure that the directory is an empty directory.                                                                                                                                    |
| <b>Message:</b> | Exec() format error                                                                                                                                                                 |
| <b>Cause:</b>   | The file you attempted to execute is not an executable file of type NMPROG.                                                                                                         |
| <b>Action:</b>  | MPE/iX Shell and Utilities allows only files of type NMPROG to be executed.                                                                                                         |
| <b>Message:</b> | File already opened                                                                                                                                                                 |
| <b>Cause:</b>   | You attempted to open a file for exclusive access when it was already open, or you attempted to open a file when it was already open for exclusive access.                          |
| <b>Action:</b>  | Attempt the action later when the above conditions may no longer exist.                                                                                                             |
| <b>Message:</b> | File exists                                                                                                                                                                         |
| <b>Cause:</b>   | You attempted to create a file or directory that already exists.                                                                                                                    |
| <b>Action:</b>  | Specify a directory that does not already exist.                                                                                                                                    |

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|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | File too large                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Cause:</b>   | You attempted to write to a file or directory that would cause it to exceed its MPE/iX file limit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Action:</b>  | Contact your system administrator for assistance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Message:</b> | Filename too long                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | One of the following: <ol style="list-style-type: none"><li>1. You specified a path name with a length that exceeds the limit imposed by the PATH_MAX configuration variable.</li><li>2. You specified a component of the path name with a name that is longer than the limit imposed by the NAME_MAX configuration variable.</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Action:</b>  | Ensure that both the component's length and the full path name length do not exceed the limits imposed by NAME_MAX or PATH_MAX, respectively. The getconf utility can be used to obtain these values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Message:</b> | Illegal seek                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Cause:</b>   | You attempted to perform a seek operation on a file that does not support seeking.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Action:</b>  | Certain files or devices do not support seeking. Be sure the program is not attempting to perform seek operations on those files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Message:</b> | Implementation-defined error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Cause:</b>   | One of the following: <ol style="list-style-type: none"><li>1. You attempted to perform an action that is not allowed on the root directory, an account directory, a group directory, or the dot and dot-dot directories. For example, you may have attempted to modify the UID, GID, or access permissions of the directory, or you attempted to remove the directory.</li><li>2. You specified a path name that begins with two slash characters.</li><li>3. You attempted to obtain access permission information about a file or directory that you do not have MPE/iX ACD read ACD (RACD) access to.</li><li>4. You attempted to create a file or directory with a name that exceeds 16 characters in length in either the root directory or a group directory.</li><li>5. You attempted to write to a file or directory that would cause it to exceed its MPE/iX file limit.</li><li>6. You attempted to read more than {SSIZE_MAX} bytes in one read operation.</li><li>7. The stack and heap could not be copied to the new process or a file could not be inherited to the new process or a system data structure could not be copied to the new process.</li></ol> |

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|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Action:</b>  | One of the following: <ol style="list-style-type: none"> <li>1. Do not attempt to modify the UID, GID, or access permissions of the root directory, an account directory, or a group directory. Do not attempt to remove either these directories or the dot or dot-dot directories.</li> <li>2. Do not specify path names that begin with two slash characters.</li> <li>3. If you are the file owner, use the MPE/iX CI command <b>ALTSEC</b> to give yourself RACD access to the file. Otherwise, contact your system administrator for assistance.</li> <li>4. Do not attempt to create a file or directory with a name that exceeds 16 characters in length in either the root directory or a group directory.</li> <li>5. Contact your system administrator if you need to increase your disk space limits.</li> <li>6. Do not attempt to read more than <code>SSIZE_MAX</code> bytes in one read operation.</li> </ol> |
| <b>Message:</b> | Interrupted function call                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Cause:</b>   | A signal was caught by the process and control was returned from the signal handling function, or the function was interrupted by a signal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Action:</b>  | No action required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Message:</b> | Invalid argument                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Cause:</b>   | One of the following: <ol style="list-style-type: none"> <li>1. You passed an argument that specified an invalid or unsupported value.</li> <li>2. An attempt was made to handle a signal that cannot be handled or ignore a signal that cannot be ignored.</li> <li>3. An attempt was made to set the action to <code>SIGDFL</code> for a signal that cannot be handled and/or ignored.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Action:</b>  | Specify a valid and supported value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Message:</b> | Is a directory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Cause:</b>   | You attempted to perform an action on a directory that is only allowed for files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Action:</b>  | Use the appropriate commands to perform actions on directories.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Message:</b> | No child processes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | The calling process has no unwaited-for child processes, or the specified target process or process group does not exist or is not a child of the calling process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Action:</b>  | No action is necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Message:</b> | No space left on device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Cause:</b>   | You attempted to create or write to a file or directory that would have caused you to exceed the system limit for disk space imposed by the MPE/iX accounting facility, or there is not enough free disk space to create the file or directory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Action:</b>  | Contact your system administrator if you need to increase your disk space limits, or free up disk space by either removing or storing unnecessary files to tape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



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|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | No such file or directory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Cause:</b>   | You specified a file or directory that does not exist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Action:</b>  | Specify an existing file or directory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Message:</b> | No such process                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Cause:</b>   | The process ID associated with the action you attempted to perform does not match an existing process or process group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Action:</b>  | No action required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Message:</b> | Not a directory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Cause:</b>   | You specified a path name where a component is not a directory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Action:</b>  | Specify a valid path name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Message:</b> | Not enough memory space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | You attempted to execute a program that exceeded the memory requirements allowed by the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Action:</b>  | Contact your system administrator for assistance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Message:</b> | Operation not permitted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Cause:</b>   | One of the following: <ol style="list-style-type: none"><li>1. You do not have permission to modify the access permissions of the specified file or directory.</li><li>2. You cannot create child processes because the program you are currently executing was not linked with the MPE/iX process handling (PH) capability.</li><li>3. You attempted to remove a directory.</li><li>4. The program file being executed by the calling process is not a native mode program (NMPROG).</li><li>5. You do not have permission to send the specified signal to any receiving process.</li></ol> |
| <b>Action:</b>  | One of the following: <ol style="list-style-type: none"><li>1. To modify the access permissions of a file or directory, you must either be the file owner or have appropriate privileges.</li><li>2. Contact your system administrator for assistance.</li><li>3. Use <b>rmdir</b> to remove a directory.</li><li>4. You should only execute programs of type NMPROG.</li><li>5. Do not attempt to send the specified signal.</li></ol>                                                                                                                                                      |
| <b>Message:</b> | Permission denied                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Cause:</b>   | One of the following: <ol style="list-style-type: none"><li>1. You attempted to access a component of the specified path name in a manner not allowed by the component's access permissions.</li></ol>                                                                                                                                                                                                                                                                                                                                                                                       |

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|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | <ol style="list-style-type: none"><li>2. The file you attempted to execute is not an executable file of type NMPROG.</li><li>3. You attempted to access a file that has an MPE/iX lockword.</li></ol>                                                                                                                                                                                                                                                                           |
| <b>Action:</b>  | One of the following: <ol style="list-style-type: none"><li>1. Ensure that you have the proper access permissions to all components of the path name.</li><li>2. MPE/iX Shell and Utilities allows only files of type NMPROG to be executed.</li><li>3. You cannot access a file that has an MPE/iX lockword through MPE/iX Shell and Utilities. Lockwords can be removed only through MPE/iX CI commands by the file owner or by a user with appropriate privileges.</li></ol> |
| <b>Message:</b> | Resource temporary available                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Cause:</b>   | You attempted to execute a program that requires system resources that are not currently available.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Action:</b>  | Attempt to execute the program at a later time or decrease the number of processes associated with your program.                                                                                                                                                                                                                                                                                                                                                                |
| <b>Message:</b> | System call error                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Cause:</b>   | An MPE/iX operating system error has occurred that does not correspond to any other system errors defined in this section.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Action:</b>  | Contact your system administrator for assistance.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Message:</b> | Too many open files in process                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Cause:</b>   | You attempted to open a file or directory that would have exceeded the limit of currently open files and directories imposed by the OPEN_MAX configuration variable.                                                                                                                                                                                                                                                                                                            |
| <b>Action:</b>  | Close one or more files or directories before attempting the action again. The getconf utility can be used to obtain the value of OPEN_MAX.                                                                                                                                                                                                                                                                                                                                     |

**NAME**

timezone — setting local time zone

**SYNOPSIS**

*TZ=standardHH[:MM[:SS]][daylight[offset][,startdate[starttime],  
enddate[endtime]]]*

**DESCRIPTION**

The time kept by the local machine should be a universal standard representation such as Greenwich Mean Time (GMT) or Universal Time Coordinated (UTC) — hereafter referred to as the universal reference time. For personal computers that are not sharing data across time zones, the local time is an adequate standard. To support a universal standard, all MPE/iX utilities assume that times stored in the file system and returned by the operating system are stored in the universal reference time, then translated to local times. The mapping from the universal reference time to local time is specified by the *TZ* (time zone) environment variable.

The value of the *TZ* variable has the following five fields — two required and three optional:

*standard*

An alphabetic abbreviation for the local standard time zone (for example, GMT, EST, MSEZ).

*HH[:MM[:SS]]*

The time offset westwards from the universal reference time. A leading dash (–) means that the local time zone is east of the universal reference time. An optional colon (:) separates hours from optional minutes and seconds.

*[daylight]*

The abbreviation for your local daylight savings time zone. If the first and third fields are identical or third field is missing, Daylight Saving Time conversion is disabled.

*[offset]*

The number of hours, minutes, and seconds your local Daylight Savings Time is offset from UTC when Daylight Savings Time is in effect. If the Daylight Savings Time abbreviation is specified, and the offset omitted, the offset of one hour is assumed.

*[,startdate[/starttime],enddate[/endtime]]*

A rule which identifies the start and end of Daylight Savings Time — specifying when Daylight Savings Time should be in effect. Both the *startdate* and *enddate* must be present, and must either take the form *Jn*, *n*, or *Mm.n.d.*.

- *Jn* is the Julian day *n* ( $1 \leq n \leq 365$ ) and does not account for leap days.
- *n* is the zero-based Julian day ( $0 \leq n \leq 365$ ). Leap days are counted; therefore, you may refer to February 29th.

- For *Mm.n.d* the *d*th day ( $0 \leq d \leq 6$ ) of week *n* of month *m* of the year ( $1 \leq n \leq 5$ ,  $1 \leq m \leq 12$  where week 5 is the last *d* day in month *m*, which may occur in either the fourth or fifth week). In addition, week 1 is the first week in which the *d*th day occurs, and day zero is Sunday.

Neither *starttime* nor *endtime* are required, and when omitted, their values default to 02:00:00. If this Daylight Savings Time rule is omitted altogether, the values in the rule default to the standard American Daylight Savings Time rules — starting at 02:00:00 the first Sunday in April and ending at 02:00:00 the last Sunday in October.

When the *TZ* variable is not set, time conversions behave as if it were set to:

```
TZ=GMT0
```

## EXAMPLES

Here are some possible settings for the North American Eastern time zone:

```
TZ=EST5EDT
```

```
TZ=EST0EDT
```

```
TZ=EST0
```

In the first case, the reference time is GMT and thus stored time values are correct world wide. A simple change of the *TZ* variable prints local time correctly, anywhere. In the second case, the reference time is Eastern Standard Time and the only conversion performed is for Daylight Saving Time.

Other examples include:

```
TZ=NST3:30NDT2:00
```

```
TZ=MSEZ-1
```

The first applies to Newfoundland, while the second works in most of Western Europe.

Here are some time zone scenarios that involve Daylight Savings Time specification:

```
TZ=PST0PDT-1
```

```
TZ=ACST-09:30ACDT-10:30,M10.5.0/2:00,M3.5.0/2:00
```

The first scenario shows the *TZ* of a person in Seattle who stores local time on a PC, but does *not* adjust the clock to agree with Daylight Savings Time. The stated time zone precedes the machine clock time by one hour when Daylight Savings Time is in effect.

The second scenario shows the *TZ* set by a person in Australia who sets a PC clock to UTC and never adjusts it. The machine clock precedes UTC by 9.5 hours when Daylight Savings Time is not in effect, and by 10.5 hours when in effect. Daylight Savings Time will be in effect from 2:00 am on the last Sunday in October until 2:00 am on the last Sunday in March.

---

**PORTABILITY**

This interpretation of the *TZ* variable is a superset of that supported by UNIX System V.

**SEE ALSO**

**date(1)**

---

**NAME**

tmail — mail delivery program

**SYNOPSIS**

**tmail**

**DESCRIPTION**

**tmail** is a mail delivery program that delivers mail to all specified users on the local machine. It leaves each target mailbox in a state that allows the owner of that mailbox to read the mail inside. If **tmail** cannot deliver a mail message, it sends a mail message to the sender, stating that it could not deliver the message.

To work properly, **tmail** should be installed in the directory `/usr/lib` with an owner of `root` and permissions set to `4555` (that is, it is a `setuid root` program). The following line should also be added to file `/etc/mailx.rc` (if this file does not exist, it should be created with permissions of at least `444`):

```
set sendmail=/usr/lib/tmail
```

This informs **mailx** to use **tmail** as its mail delivery agent.

**MESSAGES**

|                 |                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------|
| <b>Message:</b> | cannot lock file " <i>filename</i> "                                                                         |
| <b>Cause:</b>   | The mailbox <i>filename</i> could not be locked, so the message could not be delivered.                      |
| <b>Action:</b>  | Wait a little while and try to send the message again.                                                       |
| <b>Message:</b> | chowning mailbox " <i>filename</i> "                                                                         |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                     |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                     |
| <b>Message:</b> | invalid user " <i>user</i> "                                                                                 |
| <b>Cause:</b>   | The name <i>user</i> , which was specified as a recipient of the message, is not a valid user on the system. |
| <b>Action:</b>  | Check the spelling of the recipient's name, and try to send your message again.                              |
| <b>Message:</b> | must run as <code>setuid root</code>                                                                         |
| <b>Cause:</b>   | You must be logged in with the user ID of <code>root</code> to run the specified command.                    |
| <b>Action:</b>  | Log in as <code>root</code> or contact your system manager to run this command.                              |
| <b>Message:</b> | re-opening temporary file " <i>filename</i> "                                                                |
| <b>Cause:</b>   | See <b>syserror(3)</b> .                                                                                     |
| <b>Action:</b>  | See <b>syserror(3)</b> .                                                                                     |

---

**Message:** temporary file "*filename*"  
**Cause:** See **syserror**(3).  
**Action:** See **syserror**(3).

**Message:** Unknown option "*-option*"  
**Cause:** You specified an option but **tmail** does not accept any options.  
**Action:** Do not specify an option for **tmail**.

**Message:** writing mailbox "*filename*"  
**Cause:** See **syserror**(3).  
**Action:** See **syserror**(3).

**Message:** writing temporary file "*filename*"  
**Cause:** See **syserror**(3).  
**Action:** See **syserror**(3).

**SEE ALSO**

mailx(1)





# A

## **MPE/iX Implementation Considerations**

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This appendix describes important MPE/iX implementation details you should understand when using MPE/iX Shell and Utilities. It divides implementation details into these subjects:

- Invoking the MPE/iX Shell from the CI Prompt
- Path Name Syntax Rules
- Access Control
- Files
- Directories
- Signals
- Process Management
- TTY and Device Limitations

## Invoking the MPE/iX Shell from the CI Prompt

MPE/iX does not currently implement MPE/iX Shell as a system login shell. As a result, you must specify the **-L** option when invoking the MPE/iX Shell from the system prompt. This ensures that the shell reads and executes the required configuration information files.

At startup time, the MPE/iX Shell searches for a `.profile` file in the directory specified by the `HOME` environment variable. When you invoke the MPE/iX Shell with the **-L** option, the `HOME` variable is set to your current working directory. If your current directory is not your home group, your current shell session does not load your `.profile` file and may instead load somebody else's `.profile` file.

In addition, when you invoke the MPE/iX Shell, it tries to open the file `.sh_history` which contains the command history. Any other shell executing from the same directory shares your history file.

For these reasons, it is important to make sure that you start the MPE/iX Shell from your home group so that you do not interfere with other users.

Typically, your system administrator assigns you a home group when your user identity is first established on the system. To determine your home group, enter the following at the MPE/iX CI prompt:

```
LISTUSER
```

Contact your system administrator if you do not already have a home group.

## Path Name Syntax Rules

When you specify a path name to an actual system object, the operating system resolves it using either the hierarchical (HFS) name syntax or the MPE name syntax. The syntax used depends upon the interface you are using or name the object. A name syntax is a set of rules that define the structure of valid names for that syntax.

The hierarchical (HFS) name syntax used by MPE/iX Shell and Utilities conforms to object name syntax rules defined by the POSIX.1 standard.

The following rules apply when naming files and directories using MPE/iX HFS name syntax:

- File and directory names can contain alphanumeric characters (A–Z, a–z, 0–9) as well as the dot (.), underscore (\_), and dash (–) characters.
- File and directory names can be up to 255 characters in length; however, certain restrictions apply to file and directory names which reside directly beneath account directories or group directories. For more information about name restrictions, refer to the sections entitled *Files* and *Directories* in this Appendix.

MPE/iX Shell and Utilities uses the MPE/iX HFS syntax exclusively, when resolving a path name to a system object. You can successfully name any file or directory on the system using HFS syntax.

**Note:** By default, MPE/iX CI commands adhere to the MPE name syntax; however, MPE/iX CI commands can use HFS syntax if you begin a path name specification with either a dot (.) or a slash (/). This is important to remember when you use the shell commands **callci**, **tobyte**, and **frombyte**. For more information about MPE syntax and HFS syntax, refer to *New Features of MPE/iX: Using the Hierarchical File System* (32650-90351).

## Access Control

This section provides an overview of implementation considerations you should understand when using access control features as implemented by MPE/iX Shell and Utilities.

MPE/iX Shell and Utilities fully supports the access permission features defined by the POSIX.1 standard. MPE/iX supports additional access security features, but in most cases they remain transparent through MPE/iX Shell and Utilities.

You may, however, need to understand these underlying access security features if you access files or directories that were not created through MPE/iX Shell and Utilities, or if the security of those files or directories was modified by MPE/iX CI commands or system intrinsics.

## MPE/iX Access Control Definitions

MPE/iX Shell and Utilities fully supports the POSIX.1 access permissions through the use of the MPE/iX access control definition (ACD) facility. Except in cases described below, ACD access control remains transparent when used through MPE/iX Shell and Utilities. MPE/iX Shell and Utilities automatically translates between the POSIX.1 view of access permission and the MPE/iX view of access permission.

For more information about MPE/iX ACDs, refer to *New Features of MPE/iX: Using the Hierarchical File System* (32650-90351).

## Mapping Between POSIX.1 and ACD Access Permissions

Table A-1 shows how POSIX.1 file permissions correspond to MPE/iX ACD access permissions.

| POSIX.1 | ACD Access Permissions |
|---------|------------------------|
| Read    | ACD read (R) access    |
| Write   | ACD write (W) access   |
| Execute | ACD execute (X) access |

Table A-1: Mapping Between POSIX.1 and ACD File Access Permissions

Table A-2 shows how POSIX.1 directory permissions correspond to MPE/iX ACD access permissions.

| POSIX.1 | ACD Access Permissions                                                          |
|---------|---------------------------------------------------------------------------------|
| Read    | ACD read directory entry (RD) access                                            |
| Write   | Both ACD create directory entry (CD) and ACD delete directory entry (DD) access |
| Execute | ACD traverse directory entries (TD) access                                      |

Table A-2: Mapping Between POSIX.1 and ACD Directory Access Permissions

### A-4 MPE/iX Implementation Considerations

Table A-3 shows how POSIX.1 file user classes correspond to MPE/iX ACD user specifications.

| POSIX.1 File Classes | ACD User Specifications  |
|----------------------|--------------------------|
| File owner           | \$OWNER                  |
| File group           | \$GROUP and \$GROUP_MASK |
| File other           | @. @                     |

Table A-3: Mapping Between POSIX.1 and ACD User Classes

If you are accessing files that were not created through MPE/iX Shell and Utilities or whose security was modified by MPE/iX commands or system intrinsics, the ACDs may be missing any or all of the four POSIX.1 ACD user specification entries (\$OWNER, \$GROUP, \$GROUP\_MASK, and @. @). ACDs missing any of these four ACD user specification entries are still POSIX.1-compliant since they can be regarded as containing default values for the missing ACD entries.

MPE/iX ACD evaluation is consistent with default access values of all for missing \$OWNER and \$GROUP\_MASK entries and no for missing \$GROUP and @. @ entries. If an ACD contains an @. @ entry and lacks a \$GROUP entry, members of the file group class are mapped to the @. @ entry.

For example, the ACD entries R, W, X: \$OWNER and R, W, X: JOE. FINANCE are equivalent if the user ID located in the file label of the file is JOE. FINANCE. Likewise, the ACD entries R, W, X: \$GROUP and R, W, X: @. FINANCE are equivalent if the group ID (GID) associated with the MPE/iX FINANCE account is the same as the GID associated with the file.

## \$GROUP\_MASK

The MPE/iX ACD user specification, \$GROUP\_MASK, allows the less expressive 9-bit security in MPE/iX Shell and Utilities to provide greater control over the more expressive security provided by MPE/iX ACDs. Access modes specified by \$GROUP\_MASK serve to restrict access permissions specified by \$GROUP.

When the ACD contains only the four POSIX.1 ACD user specifications (the default condition for all files and directories created through MPE/iX Shell and Utilities), modifications made to access permissions associated with the \$GROUP entry are also made to the access permissions associated with the \$GROUP\_MASK. This ensures that the two entries remain synchronized.

The behavior of \$GROUP and \$GROUP\_MASK is different when an ACD contains user specification entries beyond \$OWNER, \$GROUP, \$GROUP\_MASK, and @. @ that are not \$OWNER or @. @ are considered to be members of the POSIX.1 file group class. The \$GROUP\_MASK entry restricts all members of the file group class to the access permissions associated with \$GROUP\_MASK.

**Note:** When an ACD contains entries other than the four POSIX.1 ACD user specification entries (\$OWNER, \$GROUP, \$GROUP\_MASK, and @. @), modifications made to the file group class using the shell **chmod** command modify only the ACD \$GROUP\_MASK user specification (instead of both \$GROUP and \$GROUP\_MASK). This conforms to rules specified in the current draft of the POSIX.6 standard.

For more information about `$GROUP_MASK`, refer to *New Features of MPE/iX: Using the Hierarchical File System* (32650-90351).

## Returning Information About Access Permissions

An additional MPE/iX ACD access permission, read ACD (RACD) access, is used to restrict a user from reading access permissions of a directory or file. MPE/iX Shell and Utilities does not allow manipulation of the RACD access permission. By default, all users have RACD access to all objects created through the MPE/iX Shell and Utilities. In addition, all directories on MPE/iX allow, by default, RACD access to all users. This default allows queries of directory and file access permissions to occur without error.

MPE/iX provides facilities outside MPE/iX Shell and Utilities to manipulate the RACD access permission of a directory or file. If a user invoking an MPE/iX Shell command or utility attempts to obtain security information on a file or directory that does not allow RACD access to that user, a system error results (see **syserror**(3)).

To determine if a user has RACD access to a file or directory, enter the following at the shell prompt:

```
callci listfile absolute_pathname -2
```

where *absolute\_pathname* is the absolute path name of the file or directory.

You can modify RACD access to a file or directory using the MPE/iX CI command **ALTSEC**, described in the *MPE/iX Reference Supplement* (32650-90353).

## MPE/iX Save Files (SF) Capability

When using MPE/iX Shell and Utilities, you must have MPE/iX Save Files (SF) capability to create an entry in a directory. The MPE/iX SF capability acts as an additional access control mechanism. SF capability is an MPE/iX capability assigned to a system user through the MPE/iX CI commands **NEWUSER** or **ALTUSER**, described in the *MPE/iX Reference Supplement* (32650-90353).

To determine if a user has SF capability, enter the following at the shell prompt:

```
callci listuser username.accountname
```

where *username.accountname* is a user ID string.

## MPE/iX Lockwords

MPE/iX provides an additional access control mechanism, file lockwords, that is not accessible through MPE/iX Shell and Utilities. Attempts to open an existing file that has a MPE/iX lockword result in a system error (see **syserror**(3)).

## A-6 MPE/iX Implementation Considerations

## Files

This section provides an overview of implementation considerations you should understand when creating, accessing, and managing files through MPE/iX Shell and Utilities.

### POSIX File Types

The following table lists the five file types defined in the POSIX.1 standard with their equivalent implementations on MPE/iX:

| POSIX File Type           | MPE/iX File Type                                                                                          |
|---------------------------|-----------------------------------------------------------------------------------------------------------|
| Regular file              | Byte stream file, used to refer to a MPE/iX standard ASCII disk file with a record format of byte stream. |
| Directory special file    | Directory file, used to refer to an MPE/iX directory file.                                                |
| Block device special file | Not implemented on MPE/iX                                                                                 |

Table A-4: MPE/iX Implementations of POSIX File Types

MPE/iX supports a special file type that has a record format of byte stream to reproduce the file behavior defined in the POSIX.1 standard.

You can find additional information about MPE/iX byte stream files in *New Features of MPE/iX: Using the Hierarchical File System* (32650-90351).

Refer to the section *Directories* for implementation details of MPE/iX directory files.

### Creating and Opening Files

The user ID (UID) of a newly created file is set to the UID of the creator of the file. The group ID (GID) of a newly created file is set to the GID of the directory (the parent directory) in which the file is created.

### Directory Restrictions

A file created directly under the root directory, under an MPE/iX account, or under an MPE/iX group cannot have a file name that exceeds 16 characters in length. Attempts to create a file with a name exceeding 16 characters in length directly under the root directory, a group, or an account results in a system error (see **syserror(3)**).

### Input/Output Considerations

The following sections describe implementation details associated with data transfer through MPE/iX Shell and Utilities.

The POSIX.1 standard does not recognize a file limit with a regular file. The size is defined by the user. MPE/iX, however, provides two facilities for limiting the amount of disk space a user can have for files:

- File limit
- MPE/iX accounting limits on disk space

## File Limits

MPE/iX supports file limits on all objects created on the system to allow users to control the maximum size a file can attain. Files created through MPE/iX Shell and Utilities have file limits. The default file limit for a byte stream file is two gigabytes when created through MPE/iX Shell and Utilities. A file's file limit cannot be manipulated through MPE/iX Shell and Utilities.

Attempts to write data to a file that would result in that file's size exceeding the file limit result in a system error (see **syserror**(3)).

Normally, the file limit of two gigabytes should rarely, if ever, be reached; however, a user can use MPE/iX CI commands or system intrinsics to set a file limit to a much lower value. If you open a byte stream file with a file limit that has been set to a lower value, the chance of a write error is increased.

## MPE/iX Accounting Limits on Disk Space

MPE/iX allows a system administrator to limit the amount of disk space a user may allocate. MPE/iX disk space limitations can only be placed on MPE/iX account directories and group directories; however, a limit placed on an account or group directory is also imposed on all hierarchical directories and files created at all levels beneath that account or group directory.

No such accounting limits exist for hierarchical directories and files created at all levels under the root directory that are not under MPE/iX account and group directories.

Attempts to write data to a file that would result in the disk allocation exceeding MPE/iX disk space limitations result in a system error (see **syserror**(3)).

## Additional Implementation Considerations

The MPE/iX Shell and Utilities utilities which allow you to specify a path name return a system error (see **syserror**(3)) if you attempt to specify a path name beginning with two slash characters (//).

The current release of MPE/iX does not provide facilities that allow programs to modify their effective user or group identities. As a result, a process's real and effective user IDs and group IDs are always the same.

If you use **chmod** to change the access permission bits of an file, the change does not affect access through open file descriptors that are already associated with the file.

MPE/iX implements the **DIR** structure associated with both C streams and directory streams using a file descriptor. You encounter one effect of this implementation when you attempt to execute a file.

Because MPE/iX uses file descriptors to implement streams, the file descriptors associated with the parent's streams remain open for the new process image and count towards the new process image's limit of open file descriptors; however, these file descriptors are inaccessible to the new process image.

## A-8 MPE/iX Implementation Considerations



MPE/iX does not allow multiple hard links to files or directories. Each file has a maximum link count of 1. A file is considered removed if its link count is zero. Note, however, that processes that are accessing a file when its link count becomes zero can continue to access the file; upon closing the file, the process cannot again open the file.

## Directories

This section provides an overview of implementation considerations you must understand when creating and managing MPE/iX directories through MPE/iX Shell and Utilities.

You can find additional information about MPE/iX directories in *New Features of MPE/iX: Using the Hierarchical File System* (32650-90351).

### MPE/iX Directories

MPE/iX hierarchical directory services present an integrated view of the file system. You can create files and hierarchical directories anywhere in the file system.

MPE/iX accounts and groups are special directories that serve as hierarchical directories while continuing to serve as *classic* MPE accounts and groups.

MPE/iX Shell and Utilities can access any file in the file system hierarchy using hierarchical file name syntax. This includes files in the *classic* MPE directory structure. For example, both of the following fully qualified file name specifications refer to the same file.

```
/MYACCT/MYGROUP/MYFILE
MYFILE.MYGROUP.MYACCT
```

### MPE/iX Directory Features

The following sections describe special features of the MPE/iX root directory, MPE/iX account and group directories, hierarchical directories, and the dot and dot-dot directories. You need to understand these special features to create and manage directories through MPE/iX Shell and Utilities.

#### Root Directory Features

- You cannot rename, copy, or remove the MPE/iX root directory (/).
- Only users with SM capability can create objects directly under the root directory.
- Access permissions for the root directory are `read` and `execute` access for all users and `write` access for none. Attempts to use `chmod` to remove or change access permissions of the root directory result in a system error (see `syserror(3)`).
- Names of files and hierarchical directories created directly under the root directory cannot exceed 16 characters in length.
- The root directory, MPE/iX account directories, and hierarchical directories and files at all levels under the root directory are restricted to the MPE/iX system volume set.
- The root directory does not contain explicit dot (.) and dot-dot (..) directories; however, dot and dot-dot directory behavior is supported. You can open the dot and dot-dot directories just like any

#### A-10 MPE/iX Implementation Considerations

other hierarchical directory. You can use file information routines to return information about these directories.

- You cannot modify the user ID (UID) and group ID (GID) associated through MPE/iX Shell and Utilities.

## Account Directory Features

- You cannot rename, copy, or remove account directories through MPE/iX Shell and Utilities. You can only create account directories directly under the root directory if you are a user SM capability using the MPE/iX CI command **NEWACCT**.
- Access permissions for an account directory are `read` and `execute` access for all users and `write` access for none. Attempts to use **chmod** to remove or change access permissions of an account directory result in a system error (see **syserror(3)**).
- When an account directory name is a component in a path name, you must specify it in uppercase.
- MPE/iX account directories are restricted to the MPE/iX system volume set.
- An account directory does not contain explicit dot (.) and dot-dot (..) directories; however, dot and dot-dot directory behavior is supported. You can open the dot and dot-dot directories just like any other hierarchical directory. You can use file information routines to return information about these directories.
- You cannot modify the user ID (UID) and group ID (GID) associated with an account directory through MPE/iX Shell and Utilities.

## Group Directory Features

- You cannot rename, copy, or remove group directories through MPE/iX Shell and Utilities. You can only use the MPE/iX CI command **NEWACCT** to create group directories directly under account directories or to modify them if you are a user with system manager (SM) or account manager (AM) capability who is a member of that account (your GID matches the GID of the account).
- Default access permissions for group directories are `read` and `execute` access for all users and `write` access for none. You can only modify access permissions for a group directory with the MPE/iX CI command **ALTGROUP**. Attempts to use **chmod** to remove or change access permissions of a group directory result in a system error (see **syserror(3)**).
- When a group directory name is a component in a path name, you must specify it in uppercase.
- You can create files and hierarchical directories at any level beneath group directories.
- Names of files and hierarchical directories created directly under groups and accounts cannot exceed 16 characters in length.
- You can optionally assign MPE/iX group directories (and all files and hierarchical directories at all levels under them) to a user volume set when created.

- A group directory does not contain explicit dot (.) and dot-dot (..) directories; however, dot and dot-dot directory behavior is supported. You can open the dot and dot-dot directories just like any other hierarchical directory. You can use file information routines to return information about these directories.
- You cannot modify the user ID (UID) and group ID (GID) associated with a group directory through MPE/iX Shell and Utilities.
- The ability to create files under a group directory (including hierarchical directories and files at all levels under a group directory) is also determined by the MPE/iX save files (SF) capability, which must be assigned to the MPE/iX user attempting to create an object at any level under a group directory.
- A group directory must have MPE/iX save access assigned to it before you can create files or directories under it. For more information about MPE/iX save access, refer to the manual *Controlling System Activity* (32650-90155).

## Hierarchical Directory Features

- You cannot rename hierarchical directories through MPE/iX Shell and Utilities. You can only remove hierarchical directories when they are empty (containing only the dot (.) and dot-dot (..) directory entries).
- Users can define and modify access permissions for hierarchical directories through MPE/iX Shell and Utilities.
- A hierarchical directory inherits its group ID (GID) from its parent directory and its user ID (UID) from the user who created it. You can use **chown** to modify the UID and GID of a hierarchical directory.
- Hierarchical directories (and all objects under them) that are not under MPE/iX account and group directories are restricted to the MPE/iX system volume set.
- Names of hierarchical directories and files located directly under the root directory, an account, or a group cannot exceed 16 characters in length.
- Names of hierarchical directories that are not directly under either the root directory or group directories cannot exceed 255 characters in length.
- MPE/iX accounting limits for disk space apply to both hierarchical directories and files located at all levels under group directories.
- Hierarchical directories contain explicit dot (.) and dot-dot (..) directory entries.

## Dot (.) and Dot-Dot (..) Directory Features

When **mkdir** first creates a hierarchical directory, it places two special directory entries in the hierarchical directory: dot (.) and dot-dot (..).

- You can use the dot directory to specify the current directory without using a formal directory name.
- You can use the dot-dot directory to specify the current directory's parent directory without using a formal directory name.

You can open the dot and dot-dot directories just like any other hierarchical directory. You can use file information routines to return information about these directories.

You cannot explicitly remove these two directories from their parent directory except by removing the parent directory.

**Note:** The dot and dot-dot directories are not found explicitly under the root directory or under MPE/iX account and group directories; however, you can use both dot and dot-dot with these directories during path name resolution.

## Additional Implementation Considerations

Two MPE/iX ACD access modes, create directory entry (CD) and delete directory entry (DD), implement write access to a directory. Setting or modifying write access permission to a directory using MPE/iX Shell and Utilities always modifies both ACD access modes. Both CD and DD access modes must be specified in the ACD for a MPE/iX Shell and Utilities routine to have write access to a hierarchical directory.

MPE/iX CI commands and system intrinsics allow you to remove either the CD or DD access mode. When this occurs, write access permission is not visible to the user through the `ls -l` command; however, if only DD access is specified in the ACD, a user can delete directory entries but cannot create directory entries. Likewise, if only CD access is specified in the ACD, a user can create directory entries but cannot delete directory entries.

The MPE/iX Shell and Utilities routines which allow you to specify a path name return a system error (see `syserror(3)`) if you attempt to specify a path name beginning with two slash characters (`//`).

If you use `chmod` to change the access permission bits of a file or directory, the change does not affect access through open file descriptors already associated with the file or directory.

Because MPE/iX uses file descriptors to implement directory streams, the file descriptors associated with the parent's directory streams remain open for the new process image and count towards the new process image's limit of open file descriptors. These file descriptors, however, are inaccessible to the new process image.

If you add an entry to or remove an entry from a directory, subsequent queries of the directory accurately reflect its current state.

Each directory has a maximum link count of 1. MPE/iX considers a directory removed if its link count is zero. MPE/iX Shell and Utilities routines that are accessing a directory file when its link count becomes zero can continue to access the directory; however, upon closing the directory, the routine cannot again open the directory.

## Signals

This section provides an overview of implementation considerations you must understand when using signals as they are implemented in MPE/iX Shell and Utilities.

### Supported Signal Functions

The MPE/iX Shell and Utilities library implements all signal functions defined by the POSIX.1 standard.

### Signal Descriptions

Table A-5 describes the signal constants, declared in the `<signal.h>` header, that processes use to refer to the signals that occur on the system. It also notes the default action taken by the system when the signal is delivered, whether the signal is required for POSIX.1 conformance, and any MPE/iX implementation details.

| Constant | Default Action       | Description and Implementation Details                                                                                                                                                                                                                                                                                                                                                         |
|----------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIGABRT  | Abnormal termination | Abnormal termination signal (initiated by the <code>abort()</code> function). Required for POSIX.1 conformance.                                                                                                                                                                                                                                                                                |
| SIGALRM  | Abnormal termination | Timeout signal (initiated by the <code>alarm()</code> function). Required for POSIX.1 conformance.                                                                                                                                                                                                                                                                                             |
| SIGBUS   | Abnormal termination | Address violation. SIGBUS is not required for POSIX.1 conformance, but is a signal commonly used on UNIX-based systems. A POSIX.1-conforming application should not rely upon the generation of this signal by the system. The results are undefined if the system generates this signal while the signal is either blocked, ignored, or has a signal-handling function that returns normally. |
| SIGFPE   | Abnormal termination | Erroneous arithmetic operation, such as division by zero or a floating point exception. The results are undefined if the system generates this signal while the signal is either blocked, ignored, or has a signal-handling function that returns normally. Required for POSIX.1 conformance.                                                                                                  |

Table A-5: Signals Required by POSIX.1

| Constant | Default Action       | Description and Implementation Details                                                                                                                                                                                                                   |
|----------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIGHUP   | Abnormal termination | Hangup detected on a controlling terminal or death of a controlling process. Required for POSIX.1 conformance.                                                                                                                                           |
| SIGILL   | Abnormal termination | Detection of an invalid or illegal hardware instruction (not reset when caught). Required for POSIX.1 conformance.                                                                                                                                       |
| SIGINT   | Abnormal termination | Interactive interrupt signal. Required for POSIX.1 conformance.                                                                                                                                                                                          |
| SIGKILL  | Abnormal termination | Termination signal (cannot be caught or ignored). If an application attempts to change the default action associated with SIGKILL, the attempt is ignored without error. Required for POSIX.1 conformance.                                               |
| SIGPIPE  | Abnormal termination | Write on a pipe with no readers. Required for POSIX.1 conformance.                                                                                                                                                                                       |
| SIGQUIT  | Abnormal termination | Interactive termination signal. Required for POSIX.1 conformance.                                                                                                                                                                                        |
| SIGSEGV  | Abnormal termination | Detection of an invalid or illegal memory reference. The results are undefined if the system generates this signal while the signal is either blocked, ignored, or has a signal-handling function that returns normally. Required for POSIX conformance. |
| SIGTERM  | Abnormal termination | Software termination signal (initiated by the <code>kill()</code> function). Required for POSIX.1 conformance.                                                                                                                                           |
| SIGUSR1  | Abnormal termination | Reserved as application-defined signal #1. Required for POSIX.1 conformance.                                                                                                                                                                             |
| SIGUSR2  | Abnormal termination | Reserved as application-defined signal #2. Required for POSIX.1 conformance.                                                                                                                                                                             |

Table A-5: Signals Required by POSIX.1 (continued)

| Constant                   | Default Action                         | Description and Implementation Details                                                                                                                                                                                                               |
|----------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Job Control Signals</b> |                                        |                                                                                                                                                                                                                                                      |
| SIGCHLD                    | Ignore the signal                      | Child process stopped or terminated. Required for POSIX.1 conformance.                                                                                                                                                                               |
| SIGCONT                    | Continue if stopped; otherwise, ignore | Continue if stopped. This signal is never generated by the system. Required for POSIX.1 conformance.                                                                                                                                                 |
| SIGSTOP                    | Stop the process                       | Stop signal (cannot be caught or ignored). If an application attempts to change the default action associated with SIGSTOP, the attempt is ignored without error. This signal is never generated by the system. Required for POSIX.1 conformance.    |
| SIGTSTP                    | Stop the process                       | Interactive stop signal. Because job control is not implemented, your application should not rely upon the generation of this signal by the system. Required for POSIX.1 conformance.                                                                |
| SIGTTIN                    | Stop the process                       | Read from the controlling terminal attempted by a member of a background process group. Because job control is not implemented, your application should not rely upon the generation of this signal by the system. Required for POSIX.1 conformance. |
| SIGTTOU                    | Stop the process                       | Write to the controlling terminal attempted by a member of a background process group. Because job control is not implemented, your application should not rely upon the generation of this signal by the system. Required for POSIX.1 conformance.  |

Table A-5: Signals Required by POSIX.1 (continued)

## Additional Implementation Considerations

On MPE/iX, signals cannot be delivered to a process while that process is executing system code. The signal remains pending until control returns to the calling process. A sending process cannot rely on timely delivery of a signal if the target process is executing system code.

For example, if a signal is generated for a process when the process is reading from or writing to a file, the signal remains pending until after a successful transfer of data or until an error is encountered.

When using the **kill** command, the value -1 is not valid when specifying a target process. If you specify -1 as a target process, **kill** returns a system error (see **syserr(3)**).

### A-16 MPE/iX Implementation Considerations



## Process Management

This section provides an overview of implementation considerations you must understand when creating and managing processes as they are implemented in MPE/iX Shell and Utilities.

The implementation and behavior of processes created through MPE/iX Shell and Utilities conform in most respects to the POSIX.1 standard. In most cases, underlying MPE/iX process features are transparent to MPE/iX Shell and Utilities; however, there are some MPE/iX features outside the scope of the POSIX.1 standard that cannot be hidden from your application. You must take these additional implementation features into account when creating and managing processes through MPE/iX Shell and Utilities.

### Creating a New Process

When using MPE/iX Shell and Utilities to create and execute processes, the executable file must have an MPE/iX file code of NMPRG. Any attempt to execute a file with a name that does not conform to this rule results in a system error (see **syserror**(3)).

An executable file that is compiled and linked using the **c89** command (available through MPE/iX Shell and Utilities) always creates an executable file with an MPE/iX file code of NMPRG.

To determine whether a file has an MPE/iX file code of NMPRG, you must use the MPE/iX CI command **LISTFILE**. For more information about using the **LISTFILE** command, refer to the *MPE/iX Reference Supplement* (32650-90353).

### MPE/iX Process Handling Capability

By default, MPE/iX restricts the user's ability to spawn multiple processes under the MPE/iX Command Interpreter (CI). The MPE/iX process handling (PH) capability allows the creation of multiple processes.

The executable file must be linked with PH capability. The **c89** command available through the MPE/iX Shell automatically assigns PH capability to files at link time.

### Inherited Process Attributes

Because processes created through MPE/iX Shell and Utilities reside in an MPE/iX process environment, certain MPE/iX process attributes are inherited by the new process. These MPE/iX process attributes remain transparent in a POSIX environment.

For example, a new process inherits the following MPE/iX process attributes:

- Process priority
- Capabilities
- Stack size
- Heap size

Also, the child process does not inherit some MPE/iX process attributes (those not defined by the POSIX.1 standard). These MPE/iX process attributes remain transparent in a POSIX environment.

## Process Environment

Applications invoked directly from the MPE/iX CI inherit an empty environment list from the CI. MPE/iX does not provide CI commands or system intrinsics to add environment variables to this list.

MPE/iX Shell and Utilities provides facilities to create and modify its environment list. When you invoke the MPE/iX Shell using the **-L** option, the shell executes the commands in the system profile (`/etc/profile`). These commands set up the default environment. The shell then executes commands in your customized `.profile` file located in your home directory. Applications that rely upon a meaningful environment list being inherited by a parent process should be invoked through MPE/iX Shell and Utilities.

## Process Termination

On MPE/iX, if a parent process terminates without waiting for all of its child processes to terminate, the resulting *orphaned* child processes are terminated immediately prior to termination of the parent process. The implementation does not allow orphaned child processes to be adopted by a system process. Your application should not rely upon orphaned child processes being adopted by a system process.

## Additional Implementation Considerations

A user process cannot be a controlling process. Only system processes, such as the MPE/iX Command Interpreter (CI) can be controlling processes.

The controlling terminal is not disassociated from the session of the calling process when the process terminates. The controlling terminal is associated with the MPE/iX CI session that invokes MPE/iX Shell and Utilities. The controlling terminal is only disassociated when the MPE/iX session ends (when the user logs off the system using the **BYE** command). CPU time accounting information accrued by the calling process is not made available to the parent process.

On MPE/iX, a process's real user ID, effective user ID, and saved set-user-ID are always identical. In addition, `{SAVED_SET_IDS}` is always defined.

## TTY and Device Limitations

The current implementation of MPE/iX does not support a General Terminal Interface as defined in POSIX.1. This has a number of consequences which affect how MPE/iX Shell and Utilities operates. The affected areas are:

- Interrupting Processes
- End-of-File
- Direct Device Input/Output
- Configuring TTYs
- Reopening TTYs

### A-18 MPE/iX Implementation Considerations

## Interrupting Processes

POSIX requires that the TTY driver recognize a special interrupt character and send a signal to the foreground process when it receives this character. This facility is not implemented in the current release. Instead, it uses an alternative mechanism based on the existing MPE/iX sub-system break facility to emulate it. In most cases, typing CTRL-Y interrupts the foreground process. Note that this is a limited emulation and may not work in all cases.

There is presently no emulation provided for the *quit* facility.

Refer to the **stty**(1) and **sh**(1) man pages for more information.

## End-of-File

POSIX normally defines a character to represent the end-of-file. When a program which is reading input from a file encounters this character, it means that the file is complete. The current release of MPE/iX does not use a single character for this purpose. Instead, it uses the text string :eod. No mechanism to alter this behavior is currently implemented.

## Direct Device Input/Output

MPE/iX supports device link files. As a result, you can use utilities like **tar** and **pax** to read and write tapes directly. Use the **mknod** command to create a device link to the desired device destination. For example,

```
:MKNOD "/dev/TAPE7 c 0 7"
```

creates the device link file /dev/TAPE7. Now you can use the command

```
tar -xvf /dev/TAPE7
```

in the shell.

## Configuring TTY's

The current release of MPE/iX does not support all of the configurable options specified in the POSIX standard. Refer to the **stty**(1) man page for a list of features that are not currently implemented.

## Reopening TTY's

The current release of MPE/iX does not allow you to directly reopen a tty through MPE/iX Shell and Utilities. The **tty** utility is primarily provided for informational purposes. A command like

```
ls > $(tty)
```

does not work properly because the shell cannot use the string returned by **tty** to reopen the terminal.



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|                                   | exit — exit from the shell .....          | exit(1)     |
|                                   | exit from loop in shell script.....       | break(1)    |
|                                   | exit from the shell.....                  | exit(1)     |
|                                   | expand — expand tabs to spaces .....      | expand(1)   |
|                                   | expand tabs to spaces .....               | expand(1)   |

|                                |                                        |             |
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| display brief command          | explanations .....                     | help(1)     |
|                                | export — mark names for export.....    | export(1)   |
| mark names for                 | export.....                            | export(1)   |
|                                | expr — evaluate expression.....        | expr(1)     |
| regular                        | expression error messages.....         | regerror(3) |
| evaluate                       | expression.....                        | expr(1)     |
| syntax of regular              | expression patterns .....              | regex(3)    |
| evaluate arithmetic            | expressions .....                      | let(1)      |
| file options/                  | external command to parse shell .....  | getopt(1)   |
| log messages/RCS editing       | facilities for descriptions and .....  | rcsedit(3)  |
|                                | fail, quietly .....                    | false(1)    |
|                                | false — fail, quietly .....            | false(1)    |
| re-enter previous commands/    | fc — display, fix, edit and .....      | fc(1)       |
|                                | fgrep — match patterns in a file ..... | grep(1)     |
| lines/selectively display      | fields or characters from input .....  | cut(1)      |
| create a                       | FIFO special file .....                | mkfifo(1)   |
|                                | file — determine file type .....       | file(1)     |
| split a text                   | file, according to criteria .....      | csplit(1)   |
| attributes/list                | file and directory names and .....     | ls(1)       |
| change RCS                     | file attributes .....                  | rcs(1)      |
| for data interchange and       | file backup/archiver .....             | pax(1)      |
| build a special                | file .....                             | mknod(1)    |
| change access permissions of a | file .....                             | chmod(1)    |
| create a FIFO special          | file .....                             | mkfifo(1)   |
| create a link to an existing   | file .....                             | ln(1)       |
| decode transmitted binary      | file .....                             | uudecode(1) |
| display first part of          | file .....                             | head(1)     |
| display last lines of          | file .....                             | tail(1)     |
| display unique lines of sorted | file .....                             | uniq(1)     |
| formatted                      | file dump.....                         | od(1)       |
| egrep — match patterns in a    | file .....                             | grep(1)     |
| fgrep — match patterns in a    | file .....                             | grep(1)     |
| produce tags                   | file for ex, more, and vi .....        | ctags(1)    |
| encode a                       | file for safe transmission .....       | uuencode(1) |
| format of tags                 | file .....                             | tags(2)     |
| format of RCS                  | file .....                             | rcsfile(3)  |
| format of the /etc/magic       | file .....                             | magic(2)    |
| . (dot) — execute shell        | file in current environment.....       | dot(1)      |
| split a                        | file into manageable pieces.....       | split(1)    |
| Lempel-Ziv compression of a    | file .....                             | compress(1) |
| look for keywords in a         | file .....                             | ident(1)    |
| match patterns in a            | file .....                             | grep(1)     |
| three-way                      | file merge.....                        | merge(1)    |
| get or set the                 | file mode creation mask .....          | umask(1)    |
| change                         | file modification date .....           | touch(1)    |

|                               |                                          |               |
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| display                       | file name component of path name .....   | basename(1)   |
| command to parse shell        | file options/external .....              | getopt(1)     |
| summarize                     | file space usage .....                   | du(1)         |
| list                          | file system elements in categories ..... | lc(1)         |
| find files within             | file tree .....                          | find(1)       |
| determine                     | file type .....                          | file(1)       |
| check in a                    | file under RCS .....                     | ci(1)         |
| check out a                   | file under RCS .....                     | co(1)         |
| change                        | file using diff output .....             | patch(1)      |
| checksum and block count for  | file/compute .....                       | sum(1)        |
| checksum and byte count for   | file/compute .....                       | cksum(1)      |
| rename and move               | files and directories .....              | mv(1)         |
| bdiff — compare two text      | files and show differences .....         | diff(1)       |
| compare binary                | files and show differences .....         | diffb(1)      |
| compare sorted                | files and show differences .....         | comm(1)       |
| compare two text              | files and show differences .....         | diff(1)       |
| diffh — compare two text      | files and show differences .....         | diff(1)       |
| change the group ownership of | files and/or directories .....           | chgrp(1)      |
| change the ownership of       | files and/or directories .....           | chown(1)      |
| archiver to copy and back up  | files .....                              | cpio(1)       |
| compress                      | files by Huffman encoding .....          | pack(1)       |
| clean up working              | files .....                              | rcsclean(1)   |
| compare three text            | files .....                              | diff3(1)      |
| compare two                   | files .....                              | cmp(1)        |
| concatenate and display text  | files .....                              | cat(1)        |
| copy                          | files .....                              | cp(1)         |
| decode Huffman packed         | files .....                              | unpack(1)     |
| display and format            | files .....                              | pr(1)         |
| display info about RCS        | files .....                              | rlog(1)       |
| display                       | files on a page-by-page basis .....      | more(1)       |
| display Huffman packed        | files on standard output .....           | pcat(1)       |
| remove                        | files .....                              | rm(1)         |
| convert MPE record            | files to byte stream files .....         | tobyte(1)     |
| convert a byte stream         | files to MPE record files .....          | frombyte(1)   |
| find                          | files within file tree .....             | find(1)       |
| stream files to MPE record    | files/convert a byte .....               | frombyte(1)   |
| record files to byte stream   | files/convert MPE .....                  | tobyte(1)     |
| printable strings in binary   | files/display .....                      | strings(1)    |
| and interdependent            | files/maintain program-generated .....   | make(1)       |
| and interdependent            | files/maintain program-generated .....   | make(1)       |
| information from executable   | files/remove debug .....                 | strip(1)      |
| archiver to copy and back up  | files/USTAR-compatible tape .....        | tar(1)        |
| Lempel-Ziv compression of a   | file/Undo .....                          | uncompress(1) |
| translation                   | filter .....                             | tr(1)         |
| tree/                         | find — find files within file .....      | find(1)       |

|                             |                                         |              |
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|                             | find files within file tree .....       | find(1)      |
| display                     | first part of file.....                 | head(1)      |
| commands/display,           | fix, edit and re-enter previous .....   | fc(1)        |
| set shell                   | flags and positional parameters .....   | set(1)       |
|                             | fmt — simple text formatter .....       | fmt(1)       |
| lines/                      | fold — break lines into shorter.....    | fold(1)      |
| display text in large       | font.....                               | banner(1)    |
| display and                 | format files .....                      | pr(1)        |
|                             | format of cpio archives .....           | cpio(2)      |
|                             | format of tags file.....                | tags(2)      |
|                             | format of pax archives.....             | pax(2)       |
|                             | format of RCS file.....                 | rcsfile(3)   |
|                             | format of tar archives .....            | tar(2)       |
|                             | format of the /etc/magic file.....      | magic(2)     |
|                             | formatted file dump .....               | od(1)        |
| display a                   | formatted string.....                   | printf(1)    |
| simple text                 | formatter .....                         | fmt(1)       |
| files to MPE record files/  | frombyte — convert a byte stream.....   | frombyte(1)  |
| return from shell           | function or . (dot) script .....        | return(1)    |
| remove shell variable or    | function .....                          | unset(1)     |
| shell functions/            | functions — display or modify.....      | functions(1) |
| display or modify shell     | functions .....                         | functions(1) |
|                             | functions used with lex .....           | lex(3)       |
| data transformation, report | generation language .....               | awk(1)       |
| parser                      | generator language .....                | yacc(1)      |
| lexical analyzer            | generator.....                          | lex(1)       |
|                             | generic C compiler interface .....      | c89(1)       |
| mask/                       | get or set the file mode creation.....  | umask(1)     |
| configuration information/  | getconf — display POSIX.....            | getconf(1)   |
| parse shell file options/   | getopt — external command to .....      | getopt(1)    |
| shell script command line/  | getopts — parse options from.....       | getopts(1)   |
|                             | grep — match patterns in a file.....    | grep(1)      |
| display user and            | group names .....                       | id(1)        |
| directories/change the      | group ownership of files and/or .....   | chgrp(1)     |
|                             | hash — create a tracked alias .....     | hash(1)      |
|                             | head — display first part of file ..... | head(1)      |
| explanations/               | help — display brief command .....      | help(1)      |
|                             | history — display command history ..... | history(1)   |
| display command             | history .....                           | history(1)   |
| interactive command and     | history editing in the shell.....       | shedit(3)    |
|                             | horizontally concatenate lines .....    | paste(1)     |
| tell                        | how shell interprets command name.....  | whence(1)    |
| tell                        | how shell interprets name .....         | type(1)      |
| compress files by           | Huffman encoding .....                  | pack(1)      |
| decode                      | Huffman packed files .....              | unpack(1)    |

|                                   |                                         |             |
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| output/display                    | Huffman packed files on standard .....  | pcat(1)     |
| conversion/                       | iconv — Available code sets for .....   | iconv(3)    |
|                                   | id — display user and group names ..... | id(1)       |
| file/                             | ident — look for keywords in a .....    | ident(1)    |
| display                           | info about RCS files .....              | rlog(1)     |
| display                           | information about current users .....   | who(1)      |
| display POSIX configuration       | information .....                       | getconf(1)  |
| display system name               | information .....                       | uname(1)    |
| remove debug                      | information from executable files ..... | strip(1)    |
|                                   | input a line to the shell .....         | read(1)     |
| copy and convert                  | input blocks .....                      | dd(1)       |
| copy one line of standard         | input .....                             | line(1)     |
| reverse character order of        | input lines .....                       | rev(1)      |
| fields or characters from         | input lines/selectively display .....   | cut(1)      |
| variable/                         | integer — declare an integer .....      | integer(1)  |
| declare an                        | integer variable .....                  | integer(1)  |
| editing in the shell/             | interactive command and history .....   | shedit(3)   |
| display-oriented                  | interactive text editor .....           | vi(1)       |
| interrupts/                       | intercept abnormal conditions and ..... | trap(1)     |
| archiver for data                 | interchange and file backup .....       | pax(1)      |
| maintain program-generated and    | interdependent files .....              | make(1)     |
| generic C compiler                | interface .....                         | c89(1)      |
| control/                          | interpret ASA/FORTRAN carriage .....    | asa(1)      |
| (Korn) shell and command          | interpreter/POSIX-compliant .....       | sh(1)       |
| (Korn) shell and command          | interpreter/rsh — POSIX-compliant ..... | sh(1)       |
| tell how shell                    | interprets command name .....           | whence(1)   |
| tell how shell                    | interprets name .....                   | type(1)     |
| abnormal conditions and           | interrupts/intercept .....              | trap(1)     |
|                                   | intro — introduction to man pages ..... | intro(1)    |
|                                   | introduction to man pages .....         | intro(1)    |
| skip to next                      | iteration of loop in shell script ..... | continue(1) |
| current session/                  | jobs — display status of jobs in .....  | jobs(1)     |
| display status of                 | jobs in current session .....           | jobs(1)     |
| relational databases/             | join — join two sorted, textual .....   | join(1)     |
| relational databases/             | join two sorted, textual .....          | join(1)     |
| look for                          | keywords in a file .....                | ident(1)    |
|                                   | kill — terminate process .....          | kill(1)     |
| interpreter/POSIX-compliant       | (Korn) shell and command .....          | sh(1)       |
| interpreter/rsh — POSIX-compliant | (Korn) shell and command .....          | sh(1)       |
| parser generator                  | language .....                          | yacc(1)     |
| arithmetic calculation            | language/arbitrary-precision .....      | bc(1)       |
| report generation                 | language/data transformation, .....     | awk(1)      |
| display text in                   | large font .....                        | banner(1)   |
| display                           | last lines of file .....                | tail(1)     |
| in categories/                    | lc — list file system elements .....    | lc(1)       |

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|                               | Lempel-Ziv compression of a file.....     | compress(1)   |
| Undo                          | Lempel-Ziv compression of a file.....     | uncompress(1) |
| expressions/                  | let — evaluate arithmetic .....           | let(1)        |
|                               | lex — functions used with lex .....       | lex(3)        |
|                               | lex — lexical analyzer generator .....    | lex(1)        |
| functions used with           | lex .....                                 | lex(3)        |
|                               | lexical analyzer generator .....          | lex(1)        |
| create and maintain           | library archives .....                    | ar(1)         |
| input/                        | line — copy one line of standard .....    | line(1)       |
| copy one                      | line of standard input.....               | line(1)       |
| input a                       | line to the shell.....                    | read(1)       |
|                               | line-oriented text editor.....            | ed(1)         |
| from shell script command     | line/parse options.....                   | getopts(1)    |
| break lines into shorter      | lines.....                                | fold(1)       |
| construct and execute command | lines.....                                | xargs(1)      |
| horizontally concatenate      | lines.....                                | paste(1)      |
| break                         | lines into shorter lines .....            | fold(1)       |
| number                        | lines.....                                | nl(1)         |
| display last                  | lines of file.....                        | tail(1)       |
| display unique                | lines of sorted file .....                | uniq(1)       |
| character order of input      | lines/reverse .....                       | rev(1)        |
| or characters from input      | lines/selectively display fields.....     | cut(1)        |
| create a                      | link to an existing file.....             | ln(1)         |
| attributes/                   | list file and directory names and.....    | ls(1)         |
| categories/                   | list file system elements in .....        | lc(1)         |
| existing file/                | ln — create a link to an .....            | ln(1)         |
| setting                       | local time zone .....                     | timezone(3)   |
| for descriptions and          | log messages/RCS editing facilities ..... | rcsedit(3)    |
| write to all                  | logged in users .....                     | wall(1)       |
|                               | logname — display user name.....          | logname(1)    |
|                               | look for keywords in a file .....         | ident(1)      |
| exit from                     | loop in shell script .....                | break(1)      |
| skip to next iteration of     | loop in shell script .....                | continue(1)   |
| names and attributes/         | ls — list file and directory .....        | ls(1)         |
| file/                         | magic — format of the /etc/magic .....    | magic(2)      |
|                               | mail delivery program .....               | tsmail(3)     |
| read electronic               | mail .....                                | mailx(1)      |
|                               | mailx — read electronic mail .....        | mailx(1)      |
| create and                    | maintain library archives .....           | ar(1)         |
| interdependent files/         | maintain program-generated and.....       | make(1)       |
| online reference manual/      | man — print sections of the .....         | man(1)        |
| introduction to               | man pages.....                            | intro(1)      |
| split a file into             | manageable pieces .....                   | split(1)      |
| of the online reference       | manual/print sections .....               | man(1)        |
|                               | mark names for export.....                | export(1)     |



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|                                | mark variable as readonly .....         | readonly(1)  |
| or set the file mode creation  | mask/get .....                          | umask(1)     |
|                                | match patterns in a file .....          | grep(1)      |
|                                | merge — three-way file merge .....      | merge(1)     |
|                                | merge RCS revisions .....               | rcsmerge(1)  |
| three-way file                 | merge .....                             | merge(1)     |
|                                | mesg — allow or refuse messages .....   | mesg(1)      |
| allow or refuse                | messages .....                          | mesg(1)      |
| RCS error                      | messages .....                          | rcserror(3)  |
| regular expression error       | messages .....                          | regerror(3)  |
| system error                   | messages .....                          | syserror(3)  |
| for descriptions and log       | messages/RCS editing facilities .....   | rcsedit(3)   |
|                                | mkdir — create a new directory .....    | mkdir(1)     |
| file/                          | mkfifo — create a FIFO special .....    | mkfifo(1)    |
|                                | mknod — build a special file .....      | mknod(1)     |
| get or set the file            | mode creation mask .....                | umask(1)     |
| change file                    | modification date .....                 | touch(1)     |
| display or                     | modify shell functions .....            | functions(1) |
| page-by-page basis /           | more — display files on a .....         | more(1)      |
| produce tags file for ex,      | more, and vi .....                      | ctags(1)     |
| rename and                     | move files and directories .....        | mv(1)        |
| convert a byte stream files to | MPE record files .....                  | frombyte(1)  |
| files/convert                  | MPE record files to byte stream .....   | tobyte(1)    |
| Shell/run a                    | MPE/iX CI command from the MPE/iX ..... | callci(1)    |
| a MPE/iX CI command from the   | MPE/iX Shell/run .....                  | callci(1)    |
| produce                        | multi-column output .....               | c(1)         |
| directories/                   | mv — rename and move files and .....    | mv(1)        |
| display file                   | name component of path name .....       | basename(1)  |
| display terminal               | name .....                              | tty(1)       |
| display user                   | name .....                              | logname(1)   |
| display path                   | name for executable command .....       | which(1)     |
| display system                 | name information .....                  | uname(1)     |
| tell how shell interprets      | name .....                              | type(1)      |
| directory components of path   | name/display .....                      | dirname(1)   |
| file name component of path    | name/display .....                      | basename(1)  |
| list file and directory        | names and attributes .....              | ls(1)        |
| check path                     | names .....                             | pathchk(1)   |
| display user and group         | names .....                             | id(1)        |
| mark                           | names for export .....                  | export(1)    |
| how shell interprets command   | name/tell .....                         | whence(1)    |
| create a                       | new directory .....                     | mkdir(1)     |
| characters/count of            | newlines, words, bytes, and .....       | wc(1)        |
| script/skip to                 | next iteration of loop in shell .....   | continue(1)  |
| different priority/            | nice — run a command at a .....         | nice(1)      |
|                                | nl — number lines .....                 | nl(1)        |

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| stream editor (non-interactive) .....                         | sed(1)      |
| : (colon) — do nothing, successfully .....                    | colon(1)    |
| do nothing, successfully .....                                | true(1)     |
| number lines .....                                            | nl(1)       |
| od — formatted file dump .....                                | od(1)       |
| print sections of the online reference manual .....           | man(1)      |
| line/parse options from shell script command .....            | getopts(1)  |
| set or display terminal options .....                         | stty(1)     |
| command to parse shell file options/external .....            | getopt(1)   |
| reverse character order of input lines .....                  | rev(1)      |
| check out a file under RCS .....                              | co(1)       |
| change file using diff output .....                           | patch(1)    |
| produce multi-column output .....                             | c(1)        |
| clone output stream .....                                     | tee(1)      |
| packed files on standard output/display Huffman .....         | pcat(1)     |
| directories/change the ownership of files and/or .....        | chown(1)    |
| directories/change the group ownership of files and/or .....  | chgrp(1)    |
| encoding/ pack — compress files by Huffman .....              | pack(1)     |
| decode Huffman packed files .....                             | unpack(1)   |
| display Huffman packed files on standard output .....         | pcat(1)     |
| display files on a page-by-page basis .....                   | more(1)     |
| introduction to man pages .....                               | intro(1)    |
| set shell flags and positional parameters .....               | set(1)      |
| shift positional parameters .....                             | shift(1)    |
| command line/ parse options from shell script .....           | getopts(1)  |
| external command to parse shell file options .....            | getopt(1)   |
| parser generator language .....                               | yacc(1)     |
| display first part of file .....                              | head(1)     |
| lines/ paste — horizontally concatenate .....                 | paste(1)    |
| output/ patch — change file using diff .....                  | patch(1)    |
| display file name component of path name .....                | basename(1) |
| display path name for executable command .....                | which(1)    |
| directory components of path name/display .....               | dirname(1)  |
| check path names .....                                        | pathchk(1)  |
| pathchk — check path names .....                              | pathchk(1)  |
| egrep — match patterns in a file .....                        | grep(1)     |
| fgrep — match patterns in a file .....                        | grep(1)     |
| match patterns in a file .....                                | grep(1)     |
| syntax of regular expression patterns .....                   | regex(3)    |
| interchange and file backup/ pax — archiver for data .....    | pax(1)      |
| pax — format of pax archives .....                            | pax(2)      |
| format of pax archives .....                                  | pax(2)      |
| files on standard output/ pcat — display Huffman packed ..... | pcat(1)     |
| change access permissions of a file .....                     | chmod(1)    |
| split a file into manageable pieces .....                     | split(1)    |

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| execute a command in               | place of the current shell .....        | exec(1)     |
| set shell flags and                | positional parameters .....             | set(1)      |
| shift                              | positional parameters .....             | shift(1)    |
|                                    | pr — display and format files .....     | pr(1)       |
| arbitrary                          | precision desk calculator .....         | dc(1)       |
| edit and re-execute                | previous command .....                  | r(1)        |
| fix, edit and re-enter             | previous commands/display .....         | fc(1)       |
| the shell/                         | print — display arguments from .....    | print(1)    |
| reference manual/                  | print sections of the online .....      | man(1)      |
| display                            | printable strings in binary files ..... | strings(1)  |
| string/                            | printf — display a formatted .....      | printf(1)   |
| set                                | priorities of running processes .....   | renice(1)   |
| run a command at a different       | priority .....                          | nice(1)     |
| display                            | process status .....                    | ps(1)       |
| terminate                          | process .....                           | kill(1)     |
| wait for                           | process to complete .....               | wait(1)     |
| set environment for                | process/display environment, .....      | env(1)      |
| set priorities of running          | processes .....                         | renice(1)   |
|                                    | produce multi-column output .....       | c(1)        |
| and vi/                            | produce tags file for ex, more, .....   | ctags(1)    |
| mail delivery                      | program .....                           | tsmail(3)   |
| interdependent files/maintain      | program-generated and .....             | make(1)     |
|                                    | ps — display process status .....       | ps(1)       |
|                                    | pwd — display working directory .....   | pwd(1)      |
| display                            | POSIX configuration information .....   | getconf(1)  |
| command interpreter/               | POSIX-compliant (Korn) shell and .....  | sh(1)       |
| fail,                              | quietly .....                           | false(1)    |
| command/                           | r — edit and re-execute previous .....  | r(1)        |
|                                    | rcs — change RCS file attributes .....  | r(1)        |
| check in a file under              | RCS .....                               | ci(1)       |
| check out a file under             | RCS .....                               | co(1)       |
| SCCS to                            | RCS conversion utility .....            | scs2rcs(1)  |
| descriptions and log messages/     | RCS editing facilities for .....        | rcsedit(3)  |
|                                    | RCS error messages .....                | rcserror(3) |
| change                             | RCS file attributes .....               | rcs(1)      |
| format of                          | RCS file .....                          | rcsfile(3)  |
| display info about                 | RCS files .....                         | rlog(1)     |
| compare                            | RCS revisions .....                     | rcsdiff(1)  |
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