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Red Hat Enterprise Linux Release 9.2 Manual Pages on 'ls.1p' command

\$ man ls.1p

LS(1P) POSIX Programmer's Manual LS(1P)

PROLOG

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NAME

ls ? list directory contents

SYNOPSIS

```
ls [-ikqrs] [-glnO] [-A|-a] [-C|-m|-x|-1] \
    [-F|-p] [-H|-L] [-R|-d] [-S|-f|-t] [-c|-u] [file...]
```

DESCRIPTION

For each operand that names a file of a type other than directory or symbolic link to a directory, ls shall write the name of the file as well as any requested, associated information. For each operand that names a file of type directory, ls shall write the names of files contained within the directory as well as any requested, associated information. Filenames beginning with a <period> ('.') and any associated information shall not be written out unless explicitly referenced, the -A or -a option is supplied, or an implementation-defined condition causes them to be written. If one or more of the -d, -F, or -l options are specified, and neither the -H nor the -L option is specified, for each operand that names a file of type symbolic link to a directory, ls

shall write the name of the file as well as any requested, associated information. If none of the -d, -F, or -l options are specified, or the -H or -L options are specified, for each operand that names a file of type symbolic link to a directory, ls shall write the names of files contained within the directory as well as any requested, associated information. In each case where the names of files contained within a directory are written, if the directory contains any symbolic links then ls shall evaluate the file information and file type to be those of the symbolic link itself, unless the -L option is specified.

If no operands are specified, ls shall behave as if a single operand of dot ('.') had been specified. If more than one operand is specified, ls shall write non-directory operands first; it shall sort directory and non-directory operands separately according to the collating sequence in the current locale.

Whenever ls sorts filenames or pathnames according to the collating sequence in the current locale, if this collating sequence does not have a total ordering of all characters (see the Base Definitions volume of POSIX.1?2017, Section 7.3.2, LC_COLLATE), then any filenames or pathnames that collate equally should be further compared byte-by-byte using the collating sequence for the POSIX locale.

The ls utility shall detect infinite loops; that is, entering a previously visited directory that is an ancestor of the last file encountered. When it detects an infinite loop, ls shall write a diagnostic message to standard error and shall either recover its position in the hierarchy or terminate.

OPTIONS

The ls utility shall conform to the Base Definitions volume of POSIX.1?2017, Section 12.2, Utility Syntax Guidelines.

The following options shall be supported:

- A Write out all directory entries, including those whose names begin with a <period> ('.') but excluding the entries dot and dot-dot (if they exist).
- C Write multi-text-column output with entries sorted down the

columns, according to the collating sequence. The number of text columns and the column separator characters are unspecified, but should be adapted to the nature of the output device. This option disables long format output.

-F Do not follow symbolic links named as operands unless the **-H** or **-L** options are specified. Write a `<slash>` (`/`) immediately after each pathname that is a directory, an `<asterisk>` (`*`) after each that is executable, a `<vertical-line>` (`|`) after each that is a FIFO, and an at-sign (`@`) after each that is a symbolic link. For other file types, other symbols may be written.

-H Evaluate the file information and file type for symbolic links specified on the command line to be those of the file referenced by the link, and not the link itself; however, `ls` shall write the name of the link itself and not the file referenced by the link.

-L Evaluate the file information and file type for all symbolic links (whether named on the command line or encountered in a file hierarchy) to be those of the file referenced by the link, and not the link itself; however, `ls` shall write the name of the link itself and not the file referenced by the link. When **-L** is used with **-l**, write the contents of symbolic links in the long format (see the `STDOUT` section).

-R Recursively list subdirectories encountered. When a symbolic link to a directory is encountered, the directory shall not be recursively listed unless the **-L** option is specified. The use of **-R** with **-d** or **-f** produces unspecified results.

-S Sort with the primary key being file size (in decreasing order) and the secondary key being filename in the collating sequence (in increasing order).

-a Write out all directory entries, including those whose names begin with a `<period>` (`.`).

-c Use time of last modification of the file status information

(see the Base Definitions volume of POSIX.1?2017, <sys_stat.h>) instead of last modification of the file itself for sorting (-t) or writing (-l).

- d Do not follow symbolic links named as operands unless the -H or -L options are specified. Do not treat directories differently than other types of files. The use of -d with -R or -f produces unspecified results.
- f List the entries in directory operands in the order they appear in the directory. The behavior for non-directory operands is unspecified. This option shall turn on -a. When -f is specified, any occurrences of the -r, -S, and -t options shall be ignored and any occurrences of the -A, -g, -l, -n, -o, and -s options may be ignored. The use of -f with -R or -d produces unspecified results.
- g Turn on the -l (ell) option, but disable writing the file's owner name or number. Disable the -C, -m, and -x options.
- i For each file, write the file's file serial number (see stat() in the System Interfaces volume of POSIX.1?2017).
- k Set the block size for the -s option and the per-directory block count written for the -l, -n, -s, -g, and -o options (see the STDOUT section) to 1024 bytes.
- l (The letter ell.) Do not follow symbolic links named as operands unless the -H or -L options are specified. Write out in long format (see the STDOUT section). Disable the -C, -m, and -x options.
- m Stream output format; list pathnames across the page, separated by a <comma> character followed by a <space> character. Use a <newline> character as the list terminator and after the separator sequence when there is not room on a line for the next list entry. This option disables long format output.
- n Turn on the -l (ell) option, but when writing the file's owner or group, write the file's numeric UID or GID rather than the user or group name, respectively. Disable the -C,

- m, and -x options.
- o Turn on the -l (ell) option, but disable writing the file's group name or number. Disable the -C, -m, and -x options.
- p Write a <slash> (/) after each filename if that file is a directory.
- q Force each instance of non-printable filename characters and <tab> characters to be written as the <question-mark> (?) character. Implementations may provide this option by default if the output is to a terminal device.
- r Reverse the order of the sort to get reverse collating sequence oldest first, or smallest file size first depending on the other options given.
- s Indicate the total number of file system blocks consumed by each file displayed. If the -k option is also specified, the block size shall be 1024 bytes; otherwise, the block size is implementation-defined.
- t Sort with the primary key being time modified (most recently modified first) and the secondary key being filename in the collating sequence. For a symbolic link, the time used as the sort key is that of the symbolic link itself, unless ls is evaluating its file information to be that of the file referenced by the link (see the -H and -L options).
- u Use time of last access (see the Base Definitions volume of POSIX.1?2017, <sys_stat.h>) instead of last modification of the file for sorting (-t) or writing (-l).
- x The same as -C, except that the multi-text-column output is produced with entries sorted across, rather than down, the columns. This option disables long format output.
- 1 (The numeric digit one.) Force output to be one entry per line. This option does not disable long format output. (Long format output is enabled by -g, -l (ell), -n, and -o; and disabled by -C, -m, and -x.)

If an option that enables long format output (-g, -l (ell), -n, and -o

is given with an option that disables long format output (-C, -m, and -x), this shall not be considered an error. The last of these options specified shall determine whether long format output is written.

If -R, -d, or -f are specified, the results of specifying these mutually-exclusive options are specified by the descriptions of these options above. If more than one of any of the other options shown in the SYNOPSIS section in mutually-exclusive sets are given, this shall not be considered an error; the last option specified in each set shall determine the output.

Note that if -t is specified, -c and -u are not only mutually-exclusive with each other, they are also mutually-exclusive with -S when determining sort order. But even if -S is specified after all occurrences of -c, -t, and -u, the last use of -c or -u determines the timestamp printed when producing long format output.

OPERANDS

The following operand shall be supported:

file A pathname of a file to be written. If the file specified is not found, a diagnostic message shall be output on standard error.

STDIN

Not used.

INPUT FILES

None.

ENVIRONMENT VARIABLES

The following environment variables shall affect the execution of ls:

COLUMNS Determine the user's preferred column position width for writing multiple text-column output. If this variable contains a string representing a decimal integer, the ls utility shall calculate how many pathname text columns to write (see -C) based on the width provided. If COLUMNS is not set or invalid, an implementation-defined number of column positions shall be assumed, based on the implementation's knowledge of the output device. The column width chosen to write the names

of files in any given directory shall be constant. Filenames shall not be truncated to fit into the multiple text-column output.

LANG Provide a default value for the internationalization variables that are unset or null. (See the Base Definitions volume of POSIX.1?2017, Section 8.2, Internationalization Variables for the precedence of internationalization variables used to determine the values of locale categories.)

LC_ALL If set to a non-empty string value, override the values of all the other internationalization variables.

LC_COLLATE

Determine the locale for character collation information in determining the pathname collation sequence.

LC_CTYPE Determine the locale for the interpretation of sequences of bytes of text data as characters (for example, single-byte as opposed to multi-byte characters in arguments) and which characters are defined as printable (character class print).

LC_MESSAGES

Determine the locale that should be used to affect the format and contents of diagnostic messages written to standard error.

LC_TIME Determine the format and contents for date and time strings written by ls.

NLSPATH Determine the location of message catalogs for the processing of LC_MESSAGES.

TZ Determine the timezone for date and time strings written by ls. If TZ is unset or null, an unspecified default timezone shall be used.

ASYNCHRONOUS EVENTS

Default.

STDOUT

The default format shall be to list one entry per line to standard output; the exceptions are to terminals or when one of the -C, -m, or -x

options is specified. If the output is to a terminal, the format is im?

plementation-defined.

When `-m` is specified, the format used for the last element of the list shall be:

```
"%s\n", <filename>
```

The format used for each other element of the list shall be:

```
"%s,%s", <filename>, <separator>
```

where, if there is not room for the next element of the list to fit within the current line length, `<separator>` is a string containing an optional `<space>` character and a mandatory `<newline>` character; otherwise it is a single `<space>` character.

If the `-i` option is specified, the file's file serial number (see the Base Definitions volume of POSIX.1?2017, `<sys_stat.h>`) shall be written in the following format before any other output for the corresponding entry:

```
%u ", <file serial number>
```

If the `-l` option is specified, the following information shall be written for files other than character special and block special files:

```
"%s %u %s %s %u %s %s\n", <file mode>, <number of links>,  
    <owner name>, <group name>, <size>, <date and time>,  
    <pathname>
```

If the `-l` option is specified, the following information shall be written for character special and block special files:

```
"%s %u %s %s %s %s %s\n", <file mode>, <number of links>,  
    <owner name>, <group name>, <device info>, <date and time>,  
    <pathname>
```

In both cases if the file is a symbolic link and the `-L` option is also specified, this information shall be for the file resolved from the symbolic link, except that the `<pathname>` field shall contain the path name of the symbolic link itself. If the file is a symbolic link and the `-L` option is not specified, this information shall be about the link itself and the `<pathname>` field shall be of the form:

```
"%s -> %s", <pathname of link>, <contents of link>
```

The `-n`, `-g`, and `-o` options use the same format as `-l`, but with omitted items and their associated `<blank>` characters. See the `OPTIONS` section. In both the preceding `-l` forms, if `<owner name>` or `<group name>` cannot be determined, or if `-n` is given, they shall be replaced with their associated numeric values using the format `%u`.

The `<size>` field shall contain the value that would be returned for the file in the `st_size` field of struct `stat` (see the Base Definitions volume of POSIX.1-2017, `<sys_stat.h>`). Note that for some file types this value is unspecified.

The `<device info>` field shall contain implementation-defined information associated with the device in question.

The `<date and time>` field shall contain the appropriate date and time stamp of when the file was last modified. In the POSIX locale, the field shall be the equivalent of the output of the following `date` command:

```
date "+%b %e %H:%M"
```

if the file has been modified in the last six months, or:

```
date "+%b %e %Y"
```

(where two `<space>` characters are used between `%e` and `%Y`) if the file has not been modified in the last six months or if the modification date is in the future, except that, in both cases, the final `<newline>` produced by `date` shall not be included and the output shall be as if the `date` command were executed at the time of the last modification date of the file rather than the current time. When the `LC_TIME` locale category is not set to the POSIX locale, a different format and order of presentation of this field may be used.

If the pathname was specified as a file operand, it shall be written as specified.

The file mode written under the `-l`, `-n`, `-g`, and `-o` options shall consist of the following format:

```
"%c%s%s%s%s", <entry type>, <owner permissions>,  
  <group permissions>, <other permissions>,  
  <optional alternate access method flag>
```

The <optional alternate access method flag> shall be the empty string if there is no alternate or additional access control method associated with the file; otherwise, it shall be a string containing a single printable character that is not a <blank>.

The <entry type> character shall describe the type of file, as follows:

- d Directory.
- b Block special file.
- c Character special file.
- l (ell) Symbolic link.
- p FIFO.
- Regular file.

Implementations may add other characters to this list to represent other implementation-defined file types.

The next three fields shall be three characters each:

<owner permissions>

Permissions for the file owner class (see the Base Definitions volume of POSIX.1?2017, Section 4.5, File Access Permissions).

<group permissions>

Permissions for the file group class.

<other permissions>

Permissions for the file other class.

Each field shall have three character positions:

1. If 'r', the file is readable; if '-', the file is not readable.
2. If 'w', the file is writable; if '-', the file is not writable.
3. The first of the following that applies:
 - S If in <owner permissions>, the file is not executable and set-user-ID mode is set. If in <group permissions>, the file is not executable and set-group-ID mode is set.
 - s If in <owner permissions>, the file is executable and set-user-ID mode is set. If in <group permissions>, the file is executable and set-group-ID mode is set.
 - T If in <other permissions> and the file is a directory, search permission is not granted to others, and the restricted dele?

tion flag is set.

t If in <other permissions> and the file is a directory, search permission is granted to others, and the restricted deletion flag is set.

x The file is executable or the directory is searchable.

- None of the attributes of 'S', 's', 'T', 't', or 'x' applies.

Implementations may add other characters to this list for the third character position. Such additions shall, however, be written in lowercase if the file is executable or searchable, and in uppercase if it is not.

If any of the -l, -n, -s, -g, or -o options is specified, each list of files within the directory shall be preceded by a status line indicating the number of file system blocks occupied by files in the directory in 512-byte units if the -k option is not specified, or 1024-byte units if the -k option is specified, rounded up to the next integral number of units, if necessary. In the POSIX locale, the format shall be:

"total %u\n", <number of units in the directory>

If more than one directory, or a combination of non-directory files and directories are written, either as a result of specifying multiple operands, or the -R option, each list of files within a directory shall be preceded by:

"\n%s:\n", <directory name>

If this string is the first thing to be written, the first <newline> shall not be written. This output shall precede the number of units in the directory.

If the -s option is given, each file shall be written with the number of blocks used by the file. Along with -C, -1, -m, or -x, the number and a <space> shall precede the filename; with -l, -n, -g, or -o, they shall precede each line describing a file.

STDERR

The standard error shall be used only for diagnostic messages.

OUTPUT FILES

None.

EXTENDED DESCRIPTION

None.

EXIT STATUS

The following exit values shall be returned:

0 Successful completion.

>0 An error occurred.

CONSEQUENCES OF ERRORS

Default.

The following sections are informative.

APPLICATION USAGE

Many implementations use the `<equals-sign>` (`'='`) to denote sockets bound to the file system for the `-F` option. Similarly, many historical implementations use the `'s'` character to denote sockets as the entry type characters for the `-l` option.

It is difficult for an application to use every part of the file modes field of `ls -l` in a portable manner. Certain file types and executable bits are not guaranteed to be exactly as shown, as implementations may have extensions. Applications can use this field to pass directly to a user printout or prompt, but actions based on its contents should generally be deferred, instead, to the test utility.

The output of `ls` (with the `-l` and related options) contains information that logically could be used by utilities such as `chmod` and `touch` to restore files to a known state. However, this information is presented in a format that cannot be used directly by those utilities or be easily translated into a format that can be used. A character has been added to the end of the permissions string so that applications at least have an indication that they may be working in an area they do not understand instead of assuming that they can translate the permissions string into something that can be used. Future versions or related documents may define one or more specific characters to be used based on different standard additional or alternative access control mechanisms.

As with many of the utilities that deal with filenames, the output of

ls for multiple files or in one of the long listing formats must be used carefully on systems where filenames can contain embedded white space. Systems and system administrators should institute policies and user training to limit the use of such filenames.

The number of disk blocks occupied by the file that it reports varies depending on underlying file system type, block size units reported, and the method of calculating the number of blocks. On some file system types, the number is the actual number of blocks occupied by the file (counting indirect blocks and ignoring holes in the file); on others it is calculated based on the file size (usually making an allowance for indirect blocks, but ignoring holes).

EXAMPLES

An example of a small directory tree being fully listed with ls -laRF a in the POSIX locale:

```
total 11
drwxr-xr-x  3 fox  prog   64 Jul  4 12:07 ./
drwxrwxrwx  4 fox  prog  3264 Jul  4 12:09 ../
drwxr-xr-x  2 fox  prog   48 Jul  4 12:07 b/
-rwxr--r--  1 fox  prog  572 Jul  4 12:07 foo*
a/b:
total 4
drwxr-xr-x  2 fox  prog   48 Jul  4 12:07 ./
drwxr-xr-x  3 fox  prog   64 Jul  4 12:07 ../
-rw-r--r--  1 fox  prog  700 Jul  4 12:07 bar
```

RATIONALE

Some historical implementations of the ls utility show all entries in a directory except dot and dot-dot when a superuser invokes ls without specifying the -a option. When "normal" users invoke ls without specifying -a, they should not see information about any files with names beginning with a <period> unless they were named as file operands. Implementations are expected to traverse arbitrary depths when processing the -R option. The only limitation on depth should be based on running out of physical storage for keeping track of untraversed directories.

ries.

The `-1` (one) option was historically found in BSD and BSD-derived implementations only. It is required in this volume of POSIX.1-2017 so that conforming applications might ensure that output is one entry per line, even if the output is to a terminal.

The `-S` option was added in Issue 7, but had been provided by several implementations for many years. The description given in the standard documents historic practice, but does not match much of the documentation that described its behavior. Historical documentation typically described it as something like:

`-S` Sort by size (largest size first) instead of by name. Special character devices (listed last) are sorted by name.

even though the file type was never considered when sorting the output.

Character special files do typically sort close to the end of the list because their file size on most implementations is zero. But they are sorted alphabetically with any other files that happen to have the same file size (zero), not sorted separately and added to the end.

This volume of POSIX.1-2017 is frequently silent about what happens when mutually-exclusive options are specified. Except for `-R`, `-d`, and `-f`, the `ls` utility is required to accept multiple options from each mutually-exclusive option set without treating them as errors and to use the behavior specified by the last option given in each mutually-exclusive set. Since `ls` is one of the most aliased commands, it is important that the implementation perform intuitively. For example, if the aliases were:

```
alias ls="ls -C"
```

and the user typed `ls -1` (one), single-text-column output should result, not an error.

The `-g`, `-l` (ell), `-n`, and `-o` options are not mutually-exclusive options. They all enable long format output. They work together to determine whether the file's owner is written (no if `-g` is present), file's group is written (no if `-o` is present), and if the file's group or owner is written whether it is written as the name (default) or a

string representation of the UID or GID number (if -n is present). The -C, -m, -x, and -1 (one) are mutually-exclusive options and the first three of these disable long format output. The -1 (one) option does not directly change whether or not long format output is enabled, but by overriding -C, -m, and -x, it can re-enable long format output that had been disabled by one of these options.

Earlier versions of this standard did not describe the BSD -A option (like -a, but dot and dot-dot are not written out). It has been added due to widespread implementation.

Implementations may make -q the default for terminals to prevent trojan horse attacks on terminals with special escape sequences. This is not required because:

- * Some control characters may be useful on some terminals; for example, a system might write them as "\001" or "^A".
- * Special behavior for terminals is not relevant to applications portability.

An early proposal specified that the <optional alternate access method flag> had to be '+' if there was an alternate access method used on the file or <space> if there was not. This was changed to be <space> if there is not and a single printable character if there is.

This was done for three reasons:

1. There are historical implementations using characters other than '+'.
'+'.
2. There are implementations that vary this character used in that position to distinguish between various alternate access methods in use.
3. The standard developers did not want to preclude future specifications that might need a way to specify more than one alternate access method.

Nonetheless, implementations providing a single alternate access method are encouraged to use '+'.

Earlier versions of this standard did not have the -k option, which meant that the -s option could not be used portably as its block size

was implementation-defined, and the units used to specify the number of blocks occupied by files in a directory in an `ls -l` listing were fixed as 512-byte units. The `-k` option has been added to provide a way for the `-s` option to be used portably, and for consistency it also changes the aforementioned units from 512-byte to 1024-byte.

The `<date and time>` field in the `-l` format is specified only for the POSIX locale. As noted, the format can be different in other locales. No mechanism for defining this is present in this volume of POSIX.1?2017, as the appropriate vehicle is a messaging system; that is, the format should be specified as a ```message''`.

FUTURE DIRECTIONS

Allowing `-f` to ignore the `-A`, `-g`, `-l`, `-n`, `-o`, and `-s` options may be re?moved in a future version.

A future version of this standard may require that if the collating se?quence for the current locale does not have a total ordering of all characters, any filenames or pathnames that collate equally are further compared byte-by-byte using the collating sequence for the POSIX lo?cale.

SEE ALSO

`chmod`, `find`

The Base Definitions volume of POSIX.1?2017, Section 7.3.2, `LC_COLLATE`, Section 4.5, File Access Permissions, Chapter 8, Environment Variables, Section 12.2, Utility Syntax Guidelines, `<sys_stat.h>`

The System Interfaces volume of POSIX.1?2017, `fstatat()`

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