





Emacs support for Make Files

| Description | Keystroke | Function | Note |
|--|--|--|--|
| Make support | <ul style="list-style-type: none"> Emacs natively supports several Make dialect modes as listed below. PEL adds several commands and user-options that add control to the editing behaviour. See: <ul style="list-style-type: none"> pel-modes-activating-superword-mode : PEL automatically activates super-word-mode for make files. Use <f11> t <f2> to access the customization group. | | |
| Open this PDF file. See also: ⌘ Help/Info | <f11> SPC M <f1> <f12> <f1> | (pel-help-pdf &optional OPEN-WEB-PAGE) | Open the ⌘I - Make local PDF. If the prefix argument (like C-u or M--) is used, then it opens the remote GitHub hosted raw PDF instead. If the pel-flip-help-pdf-arg user-option is set it's the other way around. |
| ⌘ Customize PEL make support | <f11> SPC M <f2> <f12> <f2> | (pel-customize-pel &optional OTHER-WINDOW) | Customize PEL make support: pel-use-makefile <ul style="list-style-type: none"> pel-make-mode-alist to identify more file regexp and a make file major mode that must be used for those files. pel-makefile-activates-minor-modes lists minor modes to automatically activate in makefile major modes. If OTHER-WINDOW is non-nil (use C-u), display in another window. |
| ⌘I - Make | <f11> SPC M <f3> <f12> <f3> | (pel-customize-library &optional OTHER-WINDOW) | Customize Emacs makefile support: makefile. <ul style="list-style-type: none"> If OTHER-WINDOW is non-nil (use C-u), display in another window. |
| Select Make dialect mode See also: <ul style="list-style-type: none"> ⌘ Customize ⌘ File/Directory Variables | Emacs supports several dialects of make . It automatically selects the dialect when a file is visited using the mode and file specification association identified in the auto-mode-alist variable. The support associates the name and extensions of most make files with the corresponding dialect mode. The following make file dialect modes are supported: <ul style="list-style-type: none"> makefile-mode (the based mode upon which all following modes are derived): <ul style="list-style-type: none"> makefile-automake-mode : .am makefile-bsdmake-mode : [Mm]akefile, .mk, .make makefile-gmake-mode : GNUmakefile makefile-imake-mode : Imakefile makefile-makepp-mode :.makepp makefile-nmake-mode : .mak PEL implements the makefile-nmake-mode to support Microsoft NMAKE syntax. Some projects use the .mak extension for their makefile (the dmd project for example). <ul style="list-style-type: none"> With PEL, set up the association using the pel-auto-mode-alist user-option. <ul style="list-style-type: none"> You can access the relevant customization buffer for this user-option by using PEL <f11> <f2> p key sequence. See ⌘ Customize Its also possible to use file variables to explicitly identify the make dialect mode: write something like this on the first line: -*- mode: makefile-gmake; -*- You can also use the following commands to manually activate one of these modes when on of them is already active. | | |
| Activate automake mode | <ul style="list-style-type: none"> C-c RET C-a C-c C-m C-a | (makefile-automake-mode) | Activates the automake mode <ul style="list-style-type: none"> The mode-line lighter is : Makefile.am |
| Activate BSD make mode | <ul style="list-style-type: none"> C-c RET C-b C-c C-m C-b | (makefile-bsdmake-mode) | Activates the BSD make mode. <ul style="list-style-type: none"> BSD Make is the default make on macOS and BSD OS systems. The mode-line lighter is : BSDmakefile |
| Activate GNU make mode | <ul style="list-style-type: none"> C-c RET C-g C-c C-m C-g | (makefile-gmake-mode) | Activates the GNU make mode. <ul style="list-style-type: none"> The mode-line lighter is : GNUmakefile ⚠ Because this key sequence ends with C-g, type the Esc key 3 times to escape from the C-c C-m prefix. You can also use a key not in the list. |
| Activate imake mode | <ul style="list-style-type: none"> C-c RET <tab> C-c C-m C-i | (makefile-imake-mode) | Activate the imake mode <ul style="list-style-type: none"> The mode-line lighter is : Imakefile |
| Activate standard make mode | <ul style="list-style-type: none"> C-c RET RET C-c C-m C-m | (makefile-mode) | Activates the major mode for editing standard Makefiles. <ul style="list-style-type: none"> The mode-line lighter is : Makefile |
| Activate makepp mode | <ul style="list-style-type: none"> C-c RET C-p C-c C-m C-p | (makefile-makepp-mode) | Activates the makepp mode. Also called make++ <ul style="list-style-type: none"> makepp is written in Perl. It is mostly useful for writing C++ specific make files, as it expands GNU Make and removes the requirement of using recursive make. The mode-line lighter is : Makeppfile |
| Activate NMAKE mode | <ul style="list-style-type: none"> C-c RET C-n C-c C-m C-n | (makefile-nmake-mode) | Activates the nmake mode, supporting Microsoft's NMAKE makefile syntax. <ul style="list-style-type: none"> The mode-line lighter is: Nmake |
| Navigate | The standard Emacs make-mode.el package provides the 2 commands to navigate across make target/dependency statements. PEL complements this with commands to navigate across the macro definition statements. | | |
| beginning of next token See also: ⌘ Navigation | C-<right> | (pel-forward-token-start &optional N) | Move to the beginning of next word/symbol. <ul style="list-style-type: none"> It handles characters that may be part of symbol in the current major mode, and jumps over them but stops at whitespace and operators. Supports numerical argument for repetition. Negative argument reverses the movement direction. The command support shift-marking. 👉 Useful when the superword-mode is not activated: allows jumping to next symbol while the word commands stop at each word separator character. |
| beginning of previous token See also: ⌘ Navigation | C-<left> | (pel-backward-token-start &optional N) | Move to the beginning of previous word/symbol. <ul style="list-style-type: none"> It handles characters that may be part of symbol in the current major mode (like ' _ ' in C), and jumps over them but stops at whitespace and operators. Supports numerical argument for repetition. Negative argument reverses the movement direction. The command support shift-marking. 👉 Useful when the superword-mode is not activated: allows jumping to previous symbol while the word commands stop at each word separator character. |
| Move point forward to next target/dependency | <ul style="list-style-type: none"> M-n <f12> <down> <M-f12> <down> <f11> SPC M <down> | (makefile-next-dependency) | Move point to the beginning of the next dependency line. <ul style="list-style-type: none"> Skips comments and macro definitions. |
| Move point backward to previous target/dependency | <ul style="list-style-type: none"> M-p <f12> <up> <M-f12> <up> <f11> SPC M <up> | (makefile-previous-dependency) | Move point to the beginning of the previous dependency line. <ul style="list-style-type: none"> Skips comments and macro definitions. |
| Move point forward to next macro definition statement | <ul style="list-style-type: none"> <f12> <M-down> <M-f12> <M-down> <f11> SPC M <M-down> | (pel-make-next-macro &optional N SILENT DONT-PUSH-MARK) | Move to the beginning of next N make file macro definition statement. <ul style="list-style-type: none"> The function skips over comments. If no valid form is found, don't move point, issue an error describing the failure unless SILENT is non-nil, in which case the function returns nil on error and non-nil on success. <ul style="list-style-type: none"> The error message states the number of instanced searched, the regexp used and the number of instances found. On success, the function push original position on the mark ring unless DONT-PUSH-MARK is non-nil. The command support shift-marking. |
| Move point backward to previous macro definition statement | <ul style="list-style-type: none"> <f12> <M-up> <M-f12> <M-up> <f11> SPC M <M-up> | (pel-make-previous-macro &optional N SILENT DONT-PUSH-MARK) | Move to the beginning of previous N make file macro definition statement. <ul style="list-style-type: none"> The function skips over comments. If no valid form is found, don't move point, issue an error describing the failure unless SILENT is non-nil, in which case the function returns nil on error and non-nil on success. <ul style="list-style-type: none"> The error message states the number of instanced searched, the regexp used and the number of instances found. On success, the function push original position on the mark ring unless DONT-PUSH-MARK is non-nil. The command support shift-marking. |
| • If statements | Use the <f6> key prefix followed by <right> , <left> , <up> and <down> to navigate across GNU Make if statements. The first 2 also accept prefix to move to else. | | |
| Move point forward to matching endif • or matching else | <f6> <right> | (pel-make-forward-conditional &optional TO-ELSE) | Move point forward to matching end of make conditional: if point is before a make conditional if statement it moves to the matching endif, or else when prefix arg is used. <ul style="list-style-type: none"> With C-u or numerical arg: move backward to matching else. On success, push the original position on the mark ring and return the new position. On error, issue user error on mismatch. Shift marking is available with C-M-<right> |
| Move point backward to matching if • or matching else | <f6> <left> | (pel-make-backward-conditional &optional TO-ELSE) | Move point backward to matching beginning of make conditional. <ul style="list-style-type: none"> With C-u or numerical arg: move backward to matching else. On success, push the original position on the mark ring and return the new position. On error, issue user error on mismatch. Shift marking is available with C-M-<left> |

| Description | Keystroke | Function | Note |
|---|--|--|---|
| Move outward forward to matching endif | <f6> <down> | (pel-make-outward-forward-conditional &optional NEST-COUNT) | Move point forward, outward to end of current if statement. <ul style="list-style-type: none"> By default move 1 nest level outward. A larger count can be specified with optional NEST-COUNT numeric argument. On success, push the original position on the mark ring and return the new position. On error, issue user error on mismatch. |
| Move outward backward to matching if | <f6> <up> | (pel-make-outward-backward-conditional &optional NEST-COUNT) | Move point backward, outward to beginning of current if statement. <ul style="list-style-type: none"> By default move 1 nest level outward. A larger count can be specified with optional NEST-COUNT numeric argument. On success, push the original position on the mark ring and return the new position. On error, issue user error on mismatch. |
| Show all Make conditional statements inside an occur buffer | <f6> o | (pel-make-conditionals-occur &optional NLINES) | Show make conditional statements inside an occur buffer. <ul style="list-style-type: none"> Each line is shown with NLINES before and after, or -NLINES before if NLINES is negative. NLINES defaults to 'list-matching-lines-default-context-lines'. If a region is defined the search is restricted to the region. |
| • by blocks | Move to the matching pair of character in the following sets: {},[],(),<,>,"", '. | | |
| block backward | <ul style="list-style-type: none"> C-M-b C-M-<left> C-[C-b Esc C-b Esc C-<left> | (backward-sexp &optional ARG) | Move backward across one balanced expression (sexp). <ul style="list-style-type: none"> With ARG, do it that many times. Negative arg -N means move forward across N balanced expressions. This command assumes point is not in a string or comment. C-M-b : ➡ Shift marking is available in graphics mode, not in terminal mode. C-M-<left> : ➡ Shift marking works with this command. |
| | <ul style="list-style-type: none"> ⚠ With PEL: if you want to use Esc C-<left> binding you must ensure that pel-windmove-on-esc-cursor user option is set to nil. ❖ C-M-<left> does not work on Windows, but H-<left> works. 🔊 Several Linux distros map C-M-<left> to desktop workspace operation. In that case you can either use another key binding or change Linux key binding in Systems->settings->keyboard->shortcuts to prevent it from using that key sequence. | | |
| block forward | <ul style="list-style-type: none"> C-M-f C-M-<right> C-[C-f Esc C-f Esc C-<right> | (forward-sexp &optional ARG) | Move forward across one balanced expression (sexp). <ul style="list-style-type: none"> With ARG, do it that many times. Negative arg -N means move backward across N balanced expressions. This command assumes point is not in a string or comment. C-M-f : ➡ Shift marking is available in graphics mode, not in terminal mode. C-M-<right> : ➡ Shift marking works with this command. |
| | <ul style="list-style-type: none"> ⚠ With PEL: if you want to use Esc C-<right> binding you must ensure that pel-windmove-on-esc-cursor user option is set to nil. ❖ C-M-<right> does not work on Windows, but H-<right> does. 🔊 Several Linux distros map C-M-<right> to desktop workspace operation. In that case you can either use another key binding or change Linux key binding in Systems->settings->keyboard->shortcuts to prevent it from using that key sequence. | | |
| iMenu/Speedbar | You can navigate through makefile macros and targets (identified as <i>dependencies</i>) using Emacs iMenu and Speedbar capabilities. <ul style="list-style-type: none"> Several commands are available to get a list of the various elements and move point to it. <ul style="list-style-type: none"> These commands include the following. More are listed in the Completion/Input. Several packages extend the completion and how entry is done. PEL allows dynamic selection of several methods and can display the current status with M-g ? You can also use the Speedbar to list all items on a vertical side-bar and navigate through them. | | |
| Find definitions using IMenu | <ul style="list-style-type: none"> <f11> <f10> i M-g i M-g M-i | (imenu INDEX-ITEM) | Lists imenu-detected items from the current buffer (according to its major mode). <ul style="list-style-type: none"> For example, in a elisp file, the entry points are the function definitions and may include the variables and other items depending what function does the parsing (it can be semantic which provides more information). Provides one of the following interfaces to let user select entry to jump to: <ul style="list-style-type: none"> The default: input completion, using the minibuffer window and tab completion. a pop-up window : available in Graphics mode selected by mouse or in both graphics and terminal (TTY) modes when the imenu-use-popup-menu user-option is turned on. <ul style="list-style-type: none"> with PEL you can use pel-imenu-toggle-popup (bound to M-g <f4> p) to toggle the user interface used by imenu. |
| See also: | <ul style="list-style-type: none"> Completion/Input Menus | | |
| Move to imenu detected symbol definition in current buffer ★★ | <ul style="list-style-type: none"> M-g h M-g M-h | (pel-goto-symbol) | Prompt using for imenu symbol of the current buffer and move point to it. <ul style="list-style-type: none"> Refresh imenu and jump to a place in the buffer using the completion method selected. Modify user interface currently used with M-g <f4> h. The command sets a ref-marker before moving. Return to previous location with M-, |
| Display current setting of commands: | M-g ? | (pel-show-goto-symbol-settings) | Display current settings used by the goto symbol commands in the echo area. For example: |
| See also: | <ul style="list-style-type: none"> Completion/Input | | |
| | <pre> -UU-:----F1 makefile Top (1,0) (BSDmakefile WK Anzu F) pel-goto-symbol UI (M-g <f4> h) is: Ivy pel-goto-symbol-any-buffer UI (M-g <f4> y) is: Ido - iMenu UI is: pop-up menu - Ido requires: Ido Ubiquitous (M-g <f4> M-u) is: off - flx-ido (fuzzy matching) (M-g <f4> M-f) is: off - iMenu lists are hierarchical. - Ido uses: - Ido prompt geometry (<f11> M-c M-g): ido-grid - Ido Ubiquitous mode (<f11> M-c M-u): off - flx-ido mode (<f11> M-c M-f): off - iMenu+ support is: on, which impacts all Ido-based prompts - Semantic mode is: off </pre> | | |
| Insert & Edit | The following commands help the editing of the makefile contents. | | |
| Insert GNU make function statement | <ul style="list-style-type: none"> C-c Tab C-c C-i | (makefile-insert-gmake-function) | Insert a GNU make function call . <ul style="list-style-type: none"> Asks for the name of the function to use (with completion). Then prompts for all required parameters. |
| Insert target at point | C-c : | (makefile-insert-target-ref TARGET-NAME) | Complete on a list of known targets, then insert TARGET-NAME at point. |
| Add/remove line continuation trailing backslashes | C-c C-\ | (makefile-backslash-region FROM TO DELETE-FLAG) | Insert, align, or delete end-of-line backslashes on the lines in the region. <ul style="list-style-type: none"> With no argument, inserts backslashes and aligns existing backslashes. With an argument, deletes the backslashes. |
| | This function does not modify the last line of the region if the region ends right at the start of the following line; it does not modify blank lines at the start of the region. So you can put the region around an entire macro definition and conveniently use this command. | | |
| Perform completion at point | C-M-i <f12> . <f6> . | (completion-at-point) | Perform completion on the text around point. The completion method is determined by 'completion-at-point-functions'. ⚠🔊 The C-M-i is also often bound to flyspell command. Use <f12> . instead. |
| Electric Insert | When the makefile-mode makefile-electric-keys user-option is turned on (it is off by default), the characters \$: = and . have special behaviour, described below. | | |
| Insert macro reference | \$ | (makefile-insert-macro-ref MACRO-NAME) | Complete on a list of known macros, then insert complete ref at point. |
| Insert new target | : | (makefile-electric-colon ARG) | Prompt for name of new target. <ul style="list-style-type: none"> Only prompts if point is at beginning of line. Anywhere else just self-inserts. |
| Insert macro defintion | = | (makefile-electric-equal ARG) | Prompt for name of a macro to insert. <ul style="list-style-type: none"> Only prompts if point is at beginning of line. Anywhere else just self-inserts. |
| Insert special target | . | (makefile-electric-dot ARG) | Prompt for the name of a special target to insert. Supports tab completion. <ul style="list-style-type: none"> Only does electric insertion at beginning of line. Anywhere else just self-inserts. |
| Indenting | In make file editing, the tab character is important. The make program distinguish the tab character from multiple space characters. ⚠! The C-M-q key sequence is bound to prog-indent-sexp but it does not work well in makefile. Use the other 3 commands. | | |
| Insert a tab character | <tab> | (indent-for-tab-command &optional ARG) | Inserts a tab character in a makefile. |
| Indent line(s) rigidly | <ul style="list-style-type: none"> <f6> <tab> <f11> <tab> c | (pel-indent-lines &optional N) | Indent current or marked lines by N indentation levels. Each level uses a tab character. <ul style="list-style-type: none"> Works with point anywhere on the line. |
| | <ul style="list-style-type: none"> A special argument N can specify more than one indentation level. It defaults to 1. If a negative number is specified, 'pel-unindent-lines' is used. If a region is marked, the function does not deactivate it to allow repeated execution of the command. It also modifies the region to include all characters in all affected lines. Use C-g to de-activate the region. | | |

| Description | Keystroke | Function | Note |
|---|---|---|---|
| Un-indent line(s) rigidly | <ul style="list-style-type: none"> <backtab> <f6> <backtab> <f11> <tab> C | (pel-unindent-lines &optional N) | <ul style="list-style-type: none"> Un-indent current line or marked lines by N indentation levels. Works with point is anywhere on the line. All lines touched by the region are un-indented. If region was marked, the function does not deactivate it to allow repeated execution of the command. If a region was marked, the function does not deactivate it to allow repeated execution of the command. It also modifies the region to include all characters in all affected lines Use C–g to de-activate the region. |
| Indent expression | C–M–g | (prog-indent-sexp &optional DEFUN) | Indent the expression after point. <ul style="list-style-type: none"> When interactively called with prefix, indent the enclosing defun instead.  This command does not work well in makefiles. |
| Comment control | Although the make file modes provide the comment-region command, it's best to use comment-dwim as it works much better: <ul style="list-style-type: none"> Insert a comment, comment or un-comment a region with M–; | | |
| Comment/un-comment See also: » Comments | M–; | (comment-dwim ARG) | Comment or un-comment line or region. |
| | <ul style="list-style-type: none"> Comment or un-comment line or region. <ul style="list-style-type: none"> When no marked region and no comment: <ul style="list-style-type: none"> On empty line: insert comment starter at the proper indentation level. Typed again: move it toward end of line. On line with code: insert comment starter after the code for an end-of-line comment With marked un-commented region: Comment region (each line is commented) With marked commented region: Removes the comment. Call the comment command you want (Do What I Mean). If the region is active and 'transient-mark-mode' is on, call 'comment-region' (unless it only consists of comments, in which case it calls 'uncomment-region'). Else, if the current line is empty, call 'comment-insert-comment-function' if it is defined, otherwise insert a comment and indent it. Else if a prefix ARG is specified, call 'comment-kill'. Else, call 'comment-indent'. | | |
| | C–c C–c | (comment-region BEG END &optional ARG) | Comment or uncomment each line in the region.  Prefer comment-dwim : it works better. |
| | Comment or uncomment each line in the region. <ul style="list-style-type: none"> With just C-u prefix arg, uncomment each line in region BEG .. END. Numeric prefix ARG means use ARG comment characters. If ARG is negative, delete that many comment characters instead. The strings used as comment starts are built from 'comment-start' and 'comment-padding'; the strings used as comment ends are built from 'comment-end' and 'comment-padding'. By default, the 'comment-start' markers are inserted at the current indentation of the region, and comments are terminated on each line (even for syntaxes in which newline does not end the comment and blank lines do not get comments). This can be changed with 'comment-style'. | | |
| Toggle display of comments in buffer or active region See also: » Comments | <f11> ; ; | (hide/show-comments-toggle &optional START END) | Toggle hiding/showing of comments in the active region or whole buffer. <ul style="list-style-type: none"> If the region is active then toggle in the region. Otherwise, in the whole buffer.  This requires the hide-comnt.el package (see » Comments).  PEL activates it when the pel-use-hide-comnt user option is t. |
| Analyze | The following commands analyze the content of the make file or the file system. | | |
| Scan current directory files, checking for targets | C–c C–f | (makefile-pickup-filenames-as-targets) | Scan the current directory for filenames to use as targets. <ul style="list-style-type: none"> Checks each filename against 'makefile-ignored-files-in-pickup-regex' and adds all qualifying names to the list of known targets. |
| Scan current buffer for makefile content | C–c C–p | (makefile-pickup-everything ARG) | Notice names of all macros and targets in Makefile. <ul style="list-style-type: none"> Prefix arg means force pickups to be redone. Use this to refresh the list of macros and targets located in the makefile before executing another action on those. |
| Update scan with latest makefile buffer content | C–c C–u | (makefile-create-up-to-date-overview) | Create a buffer containing an overview of the state of all known targets. <ul style="list-style-type: none"> Known targets are targets that are explicitly defined in that makefile; in other words, all targets that appear on the left hand side of a dependency in the makefile. |
| List macros and targets in dedicated buffer | C–c C–b | (makefile-switch-to-browser) | Open a "Macros and Target" buffer that only lists them. <ul style="list-style-type: none"> It operates in Fundamental mode and aside listing the macros and targets provides nothing more. |

Emacs & Makefile— References

| Document | Notes |
|--|---|
| Make tools | See also: GNU Autotools @ Wikipedia , GNU Coding Standard, section 7 , Filesystem Hierarchy Standard (FHS 3.0) |
| GNU Make Manuals | <ul style="list-style-type: none"> GNU Make Top page <ul style="list-style-type: none"> How to run make GNU Make - Appendix A - Quick Reference Makefile Conventions Autoconf Portable Make Programming |
| Makepp home page | Makepp, also called make++ is a GNU Make replacement, written in Perl. It addresses the recursive make problem. |
| Make generic information | |
| Recursive Make Considered Harmful - Steve Miller | PDF paper (from the wayback machine archive) written by Steve Miller in 1997 describing the concept of recursive make technique showing why it causes several problems and what can be done to avoid them. |
| Non-Recursive Make Considered Harmful | A march 2016 PDF paper from Andrey Mokhov, Neil Mitchell, Simon Peyton Jones and Simon Marlow describe how even a non-recursive make based build system can be difficult to maintain and they propose something based on the Shake Haskell library. |

GNU Make Rules

| Including Other Makefiles | | | |
|---------------------------|---|---|---|
| Include makefiles | include filenames... | -include filenames... | Use the -include so that make ignores a makefile which does not exist or cannot be remade, with no error message. |
| GNU Make Rules | | | |
| Topic | Rule syntax format | | Description |
| Rule Syntax | targets : prerequisites recipe ... | <ul style="list-style-type: none">• Multiple line recipe, the on mostly used.• The recipe lines must start with a TAB character (or the string identified by the .RECIPEPREFIX pseudo-variable. | |
| | targets : prerequisites ; recipe recipe ... | <ul style="list-style-type: none">• It is also possible to to identify a recipe on the same line as the prerequisites, separated from them by a semicolon.• This allow writing a single-line rule. | |
| Wildcards | Wildcards can be used in targets and prerequisites. <ul style="list-style-type: none">• They are expanded in target and prerequisites• They are not expanded in variable definitions:<ul style="list-style-type: none">• See wildcard examples• But wildcard functions can be use to expand in variable definition as in: <code>objects := \$(wildcard *.o)</code> | * | All files, like '*.c' |
| | | ? | Expand to characters |
| | | [...] | |
| | | ~ | At beginning of path name, like ~/bin expands to your home bin directory |
| | | ~user | Expands the the home directory of specific user |

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|------------------------------------|--|---|--|-------------------------------|
| Functions that control Make | These functions control the way Make runs and are used to provide information to the user. | <code>\$(error text...)</code> | <code>\$(warning text...)</code> | <code>\$(info text...)</code> |
| The shell Function | <p>The shell function performs command expansion similar to what backquote does in the shell.</p> <ul style="list-style-type: none">After the <code>\$(shell ...)</code> execution, the exit status is placed inside the <code>.SHELLSTATUS</code> variable.See the following examples: | <p>To set the contents variable with a space separating each line:</p> <pre>contents := \$(shell cat foo)</pre> | <p>Set files to a space separated list of C file names:</p> <pre>files := \$(shell echo *.c)</pre> | |
| The guile Function | If GNU Make is built with Guile support the <code>.FEATURES</code> variable includes the word <i>guile</i> . The guile function is then available. Make expands its argument then it is passed to Guile for evaluation. See <u>GNU Guile Integration</u> . | | | |

| GNU Make Implicit Rules | | | | | |
|----------------------------------|--|---|--|---|--|
| Implicit Rule Topic | Description | | | | |
| Using Implicit Rules | <ul style="list-style-type: none">To use therm refrain from writing the recipe for a kind of target.Each implicit rule has a target and prerequisite patterns.Write a rule to identify extra prerequisites like header files prerequisites to an object file.There may be several implicit rules for the same target (for example a rule to generate object file from C files, another rule to generate object file from C++ files).See the catalogue of built-in-rules. It is possible to cancel an implicit rule.Make searches for implicit rules for:<ul style="list-style-type: none">each target that has no recipe,each double-colon rule that has no recipe,a file that is only mentioned as a prerequisite.The Implicit Rule Search Algorithm describes how the search for an implicit rule is done.A chain of implicit rules can be used to make the target from a prerequisite. But only one instance of an implicit rule can only be used in the chain.It's possible to define last-resort default rules to override part of another makefile.To prevent an implicit rule to apply to a specific target create an empty recipe for that target. | | | | |
| Special GNU Make Variables | | | | | |
| Make Goals | MAKECMDGOALS | This variable is set to the list of targets (goals) specified in the command line. If there were none, the variable is empty. | | | |
| Variables used in Implicit Rules | | | | | |
| Variable Name | Description | Default value | Flag Variable | | Description and default value (if any) |
| AR | Archive-maintaining program | ar | ARFLAGS | Flags to give the archive-maintaining program; default 'rv' | |
| AS | Program for compiling assembly files | as | ASFLAGS | Extra flags to give to the assembler (when explicitly invoked on a 's' or 'S' file) | |
| CC | Program for compiling C files | cc | CFLAGS | Extra flags to give to the C compiler. | |
| CXX | Program for compiling C++ files | g++ | CXXFLAGS | Extra flags to give to the C++ compiler. | |
| CPP | Program for running the C preprocessor, with results to standard output | \$(CC) -E | CPPFLAGS | Extra flags to give to the C preprocessor and programs that use it (the C and Fortran compilers). | |
| FC | Program for compiling or preprocessing Fortran and Ratfor files | f77 | FFLAGS | Extra flags to give to the Fortran compiler. | |
| | | | RFLAGS | Extra flags to give to the Fortran compiler for Ratfor files. | |
| M2C | Program to compile Modula-2 files | m2c | | | |
| PC | Program to compile Pascal files | pc | PFLAGS | Extra flags to give to the Pascal compiler. | |
| CO | Program for extracting a file from RCS | co | COFLAGS | Extra flags to give to the RCS co program. | |
| GET | Program for extracting a file from SCCS | get | GFLAGS | Extra flags to give to the SCCS get program. | |
| LEX | Program to use to turn Lex grammars into source code | lex | LFLAGS | Extra flags to give to Lex. | |
| YACC | Program to use to turn Yacc grammars into source code | yacc | YFLAGS | Extra flags to give to Yacc. | |
| LINT | Program to use to run lint on source code | lint | LINTFLAGS | Extra flags to give to lint. | |
| MAKEINFO | Program to convert a Texinfo source file into an Info file | makeinfo | | | |
| TEX | Program to make TeX DVI files from TeX source | tex | | | |
| TEXI2DVI | Program to make TeX DVI files from Texinfo source | texi2dvi | | | |
| WEAVE | Program to translate Web into TeX | weave | | | |
| CWEAVE | Program to translate C Web into TeX | weave | | | |
| TANGLE | Program to translate Web into Pascal | tangle | | | |
| CTANGLE | Program to translate C Web into C | tangle | | | |
| RM | Command to remove a file | rm -f | | | |
| | | | LDFLAGS | Extra flags to give to compilers when they are supposed to invoke the linker, 'ld', such as -L. Libraries (-lfoo) should be added to the LDLIBS variable instead. | |
| | | | LDLIBS | Library flags or names given to compilers when they are supposed to invoke the linker, 'ld'. Non-library linker flags, such as -L, should go in the LDFLAGS variable. | |
| | | | LOADLIBES | Deprecated (but still supported) alternative to LDLIBS. | |
| Automatic Variable | Expands to | | Notes and examples | | |
| \$@ | File name of the target . For archive(member): name or archive . | | | | |
| \$(@D) | The directory part of the target | | If the target is just a file name, then the value of \$(@D) is . | | |
| \$(@F) | The file name (with extension) of the target | | | | |
| \$(%) | File name of target archive member | | | | |
| \$(%D) | The directory part of the target archive member | | | | |
| \$(%F) | The file name (with extension) of the target archive member | | | | |
| \$< | Name of the first prerequisite | | | | |
| \$(<D) | The directory part of the prerequisite | | | | |
| \$(<F) | The file name (with extension) of the prerequisite | | | | |
| \$? | Names of all prerequisites newer than target with spaces between them. <ul style="list-style-type: none">For archive(member), only contain the member. | | Also useful in explicit rules when the receipt must operate on only the prerequisites that have changed. | | |
| \$(?D) | List of the directory part of all prerequisites newer than target | | | | |
| \$(?F) | List of the file name (with extension) of all prerequisites newer than target | | | | |
| ^ | The names of all prerequisites with spaces between them. <ul style="list-style-type: none">For archive(member), only contain the member.No duplicates in the list | | Does not contain order-only prerequisites. | | |
| ^(^D) | List of the directory part of all prerequisites (no duplicates) | | | | |
| ^(^F) | Lis of the file name (with extension) of all prerequisites (no duplicates) | | | | |
| \$(+) | The names of all prerequisites with spaces between them. <ul style="list-style-type: none">For archive(member), only contain the member.Duplicates are allowed in the list in the same order as received | | Useful when linking where it might be required to repeat the name of a library | | |
| \$(+D) | List of the directory part of all prerequisites (with duplicates) | | | | |

| | | |
|--------|---|---|
| \$(+F) | List of the file name (with extension) of all prerequisites (with duplicates) | |
| \$ | The names of all order-only prerequisites with spaces between them. | |
| \$* | <ul style="list-style-type: none"> For implicit rule: the stem which an implicit rule matches. For explicit rule, there is no <i>stem</i> : expands to the target name minus the suffix. | <ul style="list-style-type: none"> Implicit rule: if target is <i>dir/a.foo.b</i> and the target pattern is <i>a.%.b</i> then the stem is <i>dir/foo</i> Explicit rule: If target is <i>foo.c</i>, then <i>\$*</i> expands to <i>foo</i>. |
| \$(*D) | The directory part of the stem | |
| \$(*F) | The file name (with extension) of the stem | |

Suffix Rules - Obsolete Old-fashioned Suffix Rules

| Kinds of old-fashioned suffix rule | Example of suffix rule | Corresponding pattern rule | Description |
|------------------------------------|---|----------------------------|--|
| double-suffix | .c.o | <code>%.o : %.c</code> | Matches any file whose name ends with the target suffix. |
| single-suffix | .c | <code>% : %.c</code> | Matches any file name, and the corresponding implicit prerequisite name is made by appending the source suffix |
| | | | |
| | The old-fashioned suffix rules are obsolete because the pattern rules are more general and clearer. <ul style="list-style-type: none"> Suffix rules cannot have any prerequisites of their own. Suffix sure without recipe are meaningless. | | |

Assignment operators

| OP | Description | Example |
|-----|---|--|
| | Rules | |
| : | | non-terminal |
| :: | Makes the rule terminal: it's prerequisite may not be an intermediate file. | |
| | Variables | |
| = | Non-terminal recursively expanded variable assignment. See: <ul style="list-style-type: none"> The two-flavours of Variables Setting Variables | The following will echo Huh?: <pre>foo = \$(bar) bar = \$(ugh) ugh = Huh? all;echo \$(foo)</pre> |
| := | Simply expanded variables See: <ul style="list-style-type: none"> The two-flavours of Variables | The following: <pre>x := foo y := \$(x) bar x := later</pre> is equivalent to: <pre>y := foo bar x := later</pre> |
| ::= | Simply expanded variables - 2012 POSIX standard compliant. See: <ul style="list-style-type: none"> The two-flavours of Variables | The following: <pre>x ::= foo y ::= \$(x) bar x ::= later</pre> is equivalent to: <pre>y ::= foo bar x ::= later</pre> |
| ?= | Set variable if it is not already set. See: <ul style="list-style-type: none"> Setting Variables | The following: <pre>FOO ?= bar</pre> is equivalent to: <pre>ifeq (\$(origin FOO), undefined) FOO = bar endif</pre> |
| != | Shell assignment operator: used to execute a shell script and set a variable to its output. See: <ul style="list-style-type: none"> Setting Variables <p>Note that after the != execution, the exit status is placed inside the .SHELLSTATUS variable.</p> | For example, if you don't expect a \$ character to be part of the output string: <pre>hash != printf '\043' file_list != find . -name '*.c'</pre> If you expect \$ character(s) to be part of the output, then it's better to use another form: <pre>hash := \$(shell printf '\043') var := \$(shell find . -name "*.c")</pre> |
| += | Append text to a variable The text append operation is affected by the flavour of the original variable assignment (by = or := operators.) | The following: <pre>objects = main.o foo.o bar.o utils.o objects += another.o</pre> is equivalent to: <pre>objects = main.o foo.o bar.o utils.o objects := \$(objects) another.o</pre> |