# GDB QUICK REFERENCE

GDB Version 4

## Essential Commands

| | |
|---|---|
| `gdb` *program* [*core*] | debug *program* [using coredump *core*] |
| `b` [*file*`:`]*function* | set breakpoint at *function* [in *file*] |
| `run` [*arglist*] | start your program [with *arglist*] |
| `bt` | backtrace: display program stack |
| `p` *expr* | display the value of an expression |
| `c` | continue running your program |
| `n` | next line, stepping over function calls |
| `s` | next line, stepping into function calls |

## Starting GDB

| | |
|---|---|
| `gdb` | start GDB, with no debugging files |
| `gdb` *program* | begin debugging *program* |
| `gdb` *program core* | debug coredump *core* produced by *program* |
| `gdb --help` | describe command line options |

## Stopping GDB

| | |
|---|---|
| `quit` | exit GDB; also `q` or `EOF` (eg `C-d`) |
| `INTERRUPT` | (eg `C-c`) terminate current command, or send to running process |

## Getting Help

| | |
|---|---|
| `help` | list classes of commands |
| `help` *class* | one-line descriptions for commands in *class* |
| `help` *command* | describe *command* |

## Executing your Program

| | |
|---|---|
| `run` *arglist* | start your program with *arglist* |
| `run` | start your program with current argument list |
| `run ...` <*inf* >*outf* | start your program with input, output redirected |
| `kill` | kill running program |
| `tty` *dev* | use *dev* as stdin and stdout for next `run` |
| `set args` *arglist* | specify *arglist* for next `run` |
| `set args` | specify empty argument list |
| `show args` | display argument list |
| `show environment` | show all environment variables |
| `show env` *var* | show value of environment variable *var* |
| `set env` *var string* | set environment variable *var* |
| `unset env` *var* | remove *var* from environment |

## Shell Commands

| | |
|---|---|
| `cd` *dir* | change working directory to *dir* |
| `pwd` | Print working directory |
| `make ...` | call "`make`" |
| `shell` *cmd* | execute arbitrary shell command string |

[ ] surround optional arguments

. . . show one or more arguments

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## Breakpoints and Watchpoints

| | |
|---|---|
| `break` [*file*`:`]*line*<br>`b` [*file*`:`]*line* | set breakpoint at *line* number [in *file*]<br>eg: `break main.c:37` |
| `break` [*file*`:`]*function* | set breakpoint at *function* [in *file*] |
| `break +`*offset*<br>`break -`*offset* | set break at *offset* lines from current stop |
| `break *`*addr* | set breakpoint at address *addr* |
| `break` | set breakpoint at next instruction |
| `break ... if` *expr* | break conditionally on nonzero *expr* |
| `cond` *n* [*expr*] | new conditional expression on breakpoint *n*; make unconditional if no *expr* |
| `tbreak ...` | temporary break; disable when reached |
| `rbreak` *regex* | break on all functions matching *regex* |
| `watch` *expr* | set a watchpoint for expression *expr* |
| `catch` *x* | break at C++ handler for exception *x* |
| `info break` | show defined breakpoints |
| `info watch` | show defined watchpoints |
| `clear` | delete breakpoints at next instruction |
| `clear` [*file*`:`]*fun* | delete breakpoints at entry to *fun*() |
| `clear` [*file*`:`]*line* | delete breakpoints on source line |
| `delete` [*n*] | delete breakpoints [or breakpoint *n*] |
| `disable` [*n*] | disable breakpoints [or breakpoint *n*] |
| `enable` [*n*] | enable breakpoints [or breakpoint *n*] |
| `enable once` [*n*] | enable breakpoints [or breakpoint *n*]; disable again when reached |
| `enable del` [*n*] | enable breakpoints [or breakpoint *n*]; delete when reached |
| `ignore` *n count* | ignore breakpoint *n*, *count* times |
| `commands` *n*<br>[`silent`]<br>*command-list* | execute GDB *command-list* every time breakpoint *n* is reached. [`silent` suppresses default display] |
| `end` | end of *command-list* |

## Program Stack

| | |
|---|---|
| `backtrace` [*n*]<br>`bt` [*n*] | print trace of all frames in stack; or of *n* frames—innermost if *n*>0, outermost if *n*<0 |
| `frame` [*n*] | select frame number *n* or frame at address *n*; if no *n*, display current frame |
| `up` *n* | select frame *n* frames up |
| `down` *n* | select frame *n* frames down |
| `info frame` [*addr*] | describe selected frame, or frame at *addr* |
| `info args` | arguments of selected frame |
| `info locals` | local variables of selected frame |
| `info reg` [*rn*] | register values [for reg *rn*] in selected frame; `all-reg` includes floating point |
| `info all-reg` [*rn*] | |
| `info catch` | exception handlers active in selected frame |

## Execution Control

| | |
|---|---|
| `continue` [*count*]<br>`c` [*count*] | continue running; if *count* specified, ignore this breakpoint next *count* times |
| `step` [*count*]<br>`s` [*count*] | execute until another line reached; repeat *count* times if specified |
| `stepi` [*count*]<br>`si` [*count*] | step by machine instructions rather than source lines |
| `next` [*count*]<br>`n` [*count*] | execute next line, including any function calls |
| `nexti` [*count*]<br>`ni` [*count*] | next machine instruction rather than source line |
| `until` [*location*] | run until next instruction (or *location*) |
| `finish` | run until selected stack frame returns |
| `return` [*expr*] | pop selected stack frame without executing [setting return value] |
| `signal` *num* | resume execution with signal *s* (none if `0`) |
| `jump` *line*<br>`jump *`*address* | resume execution at specified *line* number or *address* |
| `set var=`*expr* | evaluate *expr* without displaying it; use for altering program variables |

## Display

| | |
|---|---|
| `print` [*/f*] [*expr*]<br>`p` [*/f*] [*expr*] | show value of *expr* [or last value `$`] according to format *f*: |
| `x` | hexadecimal |
| `d` | signed decimal |
| `u` | unsigned decimal |
| `o` | octal |
| `t` | binary |
| `a` | address, absolute and relative |
| `c` | character |
| `f` | floating point |
| `call` [*/f*] *expr* | like `print` but does not display `void` |
| `x` [*/Nuf*] *expr* | examine memory at address *expr*; optional format spec follows slash |
| *N* | count of how many units to display |
| *u* | unit size; one of |
| | `b` individual bytes |
| | `h` halfwords (two bytes) |
| | `w` words (four bytes) |
| | `g` giant words (eight bytes) |
| *f* | printing format. Any `print` format, or |
| | `s` null-terminated string |
| | `i` machine instructions |
| `disassem` [*addr*] | display memory as machine instructions |

## Automatic Display

| | |
|---|---|
| `display` [*/f*] *expr* | show value of *expr* each time program stops [according to format *f*] |
| `display` | display all enabled expressions on list |
| `undisplay` *n* | remove number(s) *n* from list of automatically displayed expressions |
| `disable disp` *n* | disable display for expression(s) number *n* |
| `enable disp` *n* | enable display for expression(s) number *n* |
| `info display` | numbered list of display expressions |

## Expressions

| | |
|---|---|
| *expr* | an expression in C, C++, or Modula-2 (including function calls), or: |
| *addr*`@`*len* | an array of *len* elements beginning at *addr* |
| *file*`::`*nm* | a variable or function *nm* defined in *file* |
| {*type*}*addr* | read memory at *addr* as specified *type* |
| `$` | most recent displayed value |
| `$`*n* | *n*th displayed value |
| `$$` | displayed value previous to $ |
| `$$`*n* | *n*th displayed value back from $ |
| `$_` | last address examined with `x` |
| `$__` | value at address `$_` |
| `$`*var* | convenience variable; assign any value |
| `show values` [*n*] | show last 10 values [or surrounding `$`*n*] |
| `show convenience` | display all convenience variables |

## Symbol Table

| | |
|---|---|
| `info address` *s* | show where symbol *s* is stored |
| `info func` [*regex*] | show names, types of defined functions (all, or matching *regex*) |
| `info var` [*regex*] | show names, types of global variables (all, or matching *regex*) |
| `whatis` [*expr*] | show data type of *expr* [or `$`] without evaluating; `ptype` gives more detail |
| `ptype` [*expr*] | |
| `ptype` *type* | describe type, struct, union, or enum |

## GDB Scripts

| | |
|---|---|
| `source` *script* | read, execute GDB commands from file *script* |
| `define` *cmd* | create new GDB command *cmd*; execute |
| *command-list* | script defined by *command-list* |
| `end` | end of *command-list* |
| `document` *cmd* | create online documentation for new GDB |
| *help-text* | command *cmd* |
| `end` | end of *help-text* |

## Signals

| | |
|---|---|
| `handle` *signal act* | specify GDB actions for *signal*: |
| `print` | announce signal |
| `noprint` | be silent for signal |
| `stop` | halt execution on signal |
| `nostop` | do not halt execution |
| `pass` | allow your program to handle signal |
| `nopass` | do not allow your program to see signal |
| `info signals` | show table of signals, GDB action for each |

## Debugging Targets

| | |
|---|---|
| `target` *type param* | connect to target machine, process, or file |
| `help target` | display available targets |
| `attach` *param* | connect to another process |
| `detach` | release target from GDB control |

## Controlling GDB

| | |
|---|---|
| `set` *param value* | set one of GDB's internal parameters |
| `show` *param* | display current setting of parameter |

Parameters understood by `set` and `show`:

| | |
|---|---|
| `complaints` *limit* | number of messages on unusual symbols |
| `confirm` *on/off* | enable or disable cautionary queries |
| `editing` *on/off* | control `readline` command-line editing |
| `height` *lpp* | number of lines before pause in display |
| `language` *lang* | Language for GDB expressions (`auto`, `c` or `modula-2`) |
| `listsize` *n* | number of lines shown by `list` |
| `prompt` *str* | use *str* as GDB prompt |
| `radix` *base* | octal, decimal, or hex number representation |
| `verbose` *on/off* | control messages when loading symbols |
| `width` *cpl* | number of characters before line folded |
| `write` *on/off* | Allow or forbid patching binary, core files (when reopened with `exec` or `core`) |
| `history` ... | groups with the following options: |
| `h` ... | |
| `h exp` *off/on* | disable/enable `readline` history expansion |
| `h file` *filename* | file for recording GDB command history |
| `h size` *size* | number of commands kept in history list |
| `h save` *off/on* | control use of external file for command history |
| `print` ... | groups with the following options: |
| `p` ... | |
| `p address` *on/off* | print memory addresses in stacks, values |
| `p array` *off/on* | compact or attractive format for arrays |
| `p demangl` *on/off* | source (demangled) or internal form for C++ symbols |
| `p asm-dem` *on/off* | demangle C++ symbols in machine-instruction output |
| `p elements` *limit* | number of array elements to display |
| `p object` *on/off* | print C++ derived types for objects |
| `p pretty` *off/on* | struct display: compact or indented |
| `p union` *on/off* | display of union members |
| `p vtbl` *off/on* | display of C++ virtual function tables |

| | |
|---|---|
| `show commands` | show last 10 commands |
| `show commands` *n* | show 10 commands around number *n* |
| `show commands +` | show next 10 commands |

## Working Files

| | |
|---|---|
| `file` [*file*] | use *file* for both symbols and executable; with no arg, discard both |
| `core` [*file*] | read *file* as coredump; or discard |
| `exec` [*file*] | use *file* as executable only; or discard |
| `symbol` [*file*] | use symbol table from *file*; or discard |
| `load` *file* | dynamically link *file* and add its symbols |
| `add-sym` *file addr* | read additional symbols from *file*, dynamically loaded at *addr* |
| `info files` | display working files and targets in use |
| `path` *dirs* | add *dirs* to front of path searched for executable and symbol files |
| `show path` | display executable and symbol file path |
| `info share` | list names of shared libraries currently loaded |

## Source Files

| | |
|---|---|
| `dir` *names* | add directory *names* to front of source path |
| `dir` | clear source path |
| `show dir` | show current source path |
| `list` | show next ten lines of source |
| `list -` | show previous ten lines |
| `list` *lines* | display source centered around *lines*, specified as one of: |
| [*file*`:`]*num* | line number [in named file] |
| [*file*`:`]*function* | beginning of function [in named file] |
| `+`*off* | *off* lines after last printed |
| `-`*off* | *off* lines previous to last printed |
| `*`*address* | line containing *address* |
| `list` *f*`,`*l* | from line *f* to line *l* |
| `info line` *num* | show starting, ending addresses of compiled code for source line *num* |
| `info source` | show name of current source file |
| `info sources` | list all source files in use |
| `forw` *regex* | search following source lines for *regex* |
| `rev` *regex* | search preceding source lines for *regex* |

## GDB under GNU Emacs

| | |
|---|---|
| `M-x gdb` | run GDB under Emacs |
| `C-h m` | describe GDB mode |
| `M-s` | step one line (`step`) |
| `M-n` | next line (`next`) |
| `M-i` | step one instruction (`stepi`) |
| `C-c C-f` | finish current stack frame (`finish`) |
| `M-c` | continue (`cont`) |
| `M-u` | up *arg* frames (`up`) |
| `M-d` | down *arg* frames (`down`) |
| `C-x &` | copy number from point, insert at end |
| `C-x SPC` | (in source file) set break at point |

## GDB License

| | |
|---|---|
| `show copying` | Display GNU General Public License |
| `show warranty` | There is NO WARRANTY for GDB. Display full no-warranty statement. |

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