

Essential Commands

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

Starting GDB

|                               |   |
|-------------------------------|---|
| <code>gdb</code>              | start GDB, with no debugging files                    |
| <code>gdb program</code>      | begin debugging <i>program</i>                        |
| <code>gdb program core</code> | debug coredump <i>core</i> produced by <i>program</i> |
| <code>gdb --help</code>       | describe command line options                         |

Stopping GDB

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

Getting Help

|                           |  |
|---------------------------|--|
| <code>help</code>         | list classes of commands                           |
| <code>help class</code>   | one-line descriptions for commands in <i>class</i> |
| <code>help command</code> | describe <i>command</i>                            |

Executing your Program

|                                       |  |
|---------------------------------------|--|
| <code>run arglist</code>              | start your program with <i>arglist</i>                 |
| <code>run</code>                      | start your program with current argument list          |
| <code>run ... &lt;inf &gt;outf</code> | start your program with input, output redirected       |
| <code>kill</code>                     | kill running program                                   |
| <code>tty dev</code>                  | use <i>dev</i> as stdin and stdout for next <b>run</b> |
| <code>set args arglist</code>         | specify <i>arglist</i> for next <b>run</b>             |
| <code>set args</code>                 | specify empty argument list                            |
| <code>show args</code>                | display argument list                                  |

|                                 |   |
|---------------------------------|---|
| <code>show env</code>           | show all environment variables                |
| <code>show env var</code>       | show value of environment variable <i>var</i> |
| <code>set env var string</code> | set environment variable <i>var</i>           |
| <code>unset env var</code>      | remove <i>var</i> from environment            |

Shell Commands

|                        |  |
|------------------------|--|
| <code>cd dir</code>    | change working directory to <i>dir</i> |
| <code>pwd</code>       | Print working directory                |
| <code>make ...</code>  | call “ <b>make</b> ”                   |
| <code>shell cmd</code> | execute arbitrary shell command string |

[ ] surround optional arguments ... show one or more arguments

Breakpoints and Watchpoints

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

Program Stack

|                                |  |
|--------------------------------|--|
| <code>backtrace [n]</code>     | print trace of all frames in stack; or of <i>n</i> frames—innermost if <i>n</i> >0, outermost if <i>n</i> <0 |
| <code>bt [n]</code>            |  |
| <code>frame [n]</code>         | select frame number <i>n</i> or frame at address <i>n</i> ; if no <i>n</i> , display current frame           |
| <code>up n</code>              | select frame <i>n</i> frames up  |
| <code>down n</code>            | select frame <i>n</i> frames down  |
| <code>info frame [addr]</code> | describe selected frame, or frame at <i>addr</i>   |
| <code>info args</code>         | arguments of selected frame  |
| <code>info locals</code>       | local variables of selected frame  |
| <code>info reg [rn]...</code>  | register values [for regs <i>rn</i> ] in selected frame; <b>all-reg</b> includes floating point              |
| <code>info all-reg [rn]</code> |  |

Execution Control

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

Display

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

Automatic Display

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

Expressions

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

Symbol Table

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

GDB Scripts

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

Signals

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

Debugging Targets

|                          |   |
|--------------------------|---|
| <i>target type param</i> | connect to target machine, process, or file |
| <i>help target</i>       | display available targets                   |
| <i>attach param</i>      | connect to another process                  |
| <i>detach</i>            | release target from GDB control             |

Controlling GDB

|   |  |
|---|--|
| <i>set param value</i>                                | set one of GDB's internal parameters   |
| <i>show param</i>                                     | display current setting of parameter   |
| Parameters understood by <b>set</b> and <b>show</b> : |  |
| <i>complaint limit</i>                                | number of messages on unusual symbols  |
| <i>confirm on/off</i>                                 | enable or disable cautionary queries   |
| <i>editing on/off</i>                                 | control <b>readline</b> command-line editing   |
| <i>height lpp</i>                                     | number of lines before pause in display  |
| <i>language lang</i>                                  | Language for GDB expressions ( <b>auto</b> , <b>c</b> or <b>modula-2</b> )                   |
|   |  |
| <i>listsize n</i>                                     | number of lines shown by <b>list</b>   |
| <i>prompt str</i>                                     | use <i>str</i> as GDB prompt   |
| <i>radix base</i>                                     | octal, decimal, or hex number representation   |
| <i>verbose on/off</i>                                 | control messages when loading symbols  |
| <i>width cpl</i>                                      | number of characters before line folded  |
| <i>write on/off</i>                                   | Allow or forbid patching binary, core files (when reopened with <b>exec</b> or <b>core</b> ) |
|   |  |
| <i>history ...</i>                                    | groups with the following options:   |
| <i>h ...</i>  |  |
| <i>h exp off/on</i>                                   | disable/enable <b>readline</b> history expansion   |
| <i>h file filename</i>                                | file for recording GDB command history   |
| <i>h size size</i>                                    | number of commands kept in history list  |
| <i>h save off/on</i>                                  | control use of external file for command history   |
|   |  |
| <i>print ...</i>                                      | groups with the following options:   |
| <i>p ...</i>  |  |
| <i>p address on/off</i>                               | print memory addresses in stacks, values   |
| <i>p array off/on</i>                                 | compact or attractive format for arrays  |
| <i>p demangl on/off</i>                               | source (demangled) or internal form for C++ symbols  |
| <i>p asm-dem on/off</i>                               | demangle C++ symbols in machine-instruction output   |
| <i>p elements limit</i>                               | number of array elements to display  |
| <i>p object on/off</i>                                | print C++ derived types for objects  |
| <i>p pretty off/on</i>                                | struct display: compact or indented  |
| <i>p union on/off</i>                                 | display of union members   |
| <i>p vtbl off/on</i>                                  | display of C++ virtual function tables   |
|   |  |
| <i>show commands</i>                                  | show last 10 commands  |
| <i>show commands n</i>                                | show 10 commands around number <i>n</i>  |
| <i>show commands +</i>                                | show next 10 commands  |

Working Files

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

Source Files

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

GDB under GNU Emacs

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

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|                      |   |
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