

**NAME**

*rgbasm* — Game Boy assembler

**SYNOPSIS**

```
rgbasm [-EhVvw] [-b chars] [-D name[=value]] [-g chars] [-I path]
        [-M depend_file] [-MG] [-MC] [-MP] [-MT target_file] [-MQ target_file]
        [-o out_file] [-P include_file] [-p pad_value] [-Q fix_precision]
        [-r recursion_depth] [-s features:state_file] [-W warning]
        [-X max_errors] asmfile
```

**DESCRIPTION**

The **rgbasm** program creates an RGB object file from an assembly source file. The object file format is documented in *rgbds*(5).

The input *asmfile* can be a path to a file, or `-` to read from standard input.

Note that options can be abbreviated as long as the abbreviation is unambiguous: `--verb` is `--verbose`, but `--ver` is invalid because it could also be `--version`. The arguments are as follows:

- `-b chars`, `--binary-digits chars`  
 Allow two characters to be used for binary constants in addition to the default ‘0’ and ‘1’. Valid characters are numbers other than ‘0’ and ‘1’, letters, ‘.’, ‘#’, or ‘@’.
- `-D name[=value]`, `--define name[=value]`  
 Add a string symbol to the compiled source code. This is equivalent to *name* **EQU** “*value*” in code, or *name* **EQU** “1” if *value* is not specified.
- `-E`, `--export-all`  
 Export all labels, including unreferenced and local labels.
- `-g chars`, `--gfx-chars chars`  
 Allow four characters to be used for graphics constants in addition to the default ‘0’, ‘1’, ‘2’, and ‘3’. Valid characters are numbers other than ‘0’ to ‘3’, letters, ‘.’, ‘#’, or ‘@’. The defaults are 0123.
- `-h`, `--help`  
 Print help text for the program and exit.
- `-I path`, `--include path`  
 Add a new “include path”; *path* must point to a directory. When any **INCLUDE** (including the implicit one from `-P`), **INCBIN**, or **READFILE** is attempted, **rgbasm** first looks up the provided path from its working directory; if this fails, it tries again from each of the “include path” directories, in the order they were provided.
- `-M depend_file`, `--dependfile depend_file`  
 Write *make*(1) dependencies to *depend\_file*.
- `-MG`  
 To be used in conjunction with `-M`. This makes **rgbasm** assume that missing files are auto-generated: when any **INCLUDE** (including the implicit one from `-P`), **INCBIN**, or **READFILE** is attempted on a non-existent file, it is added as a dependency, then **rgbasm** exits normally or continues processing (depending on whether `-MC` was enabled) instead of erroring out. This feature is used in automatic updating of Makefiles.
- `-MC`  
 Implies `-MG`. This makes **rgbasm** continue processing after a non-existent dependency file, instead of exiting. Note that this *is not* recommended if any non-existent dependencies would have influenced subsequent processing, e.g. by causing an **IF** condition to take a different branch.
- `-MP`  
 When enabled, this adds a phony target to the rules emitted by `-M` for each dependency other than the main file. This prevents *make*(1) from erroring out when dependency files are deleted.

- MT** *target\_file*  
 Add a target to the rules emitted by **-M**. The exact string provided will be written, including spaces and special characters.  
     **-MT** fileA **-MT** fileB  
 is equivalent to  
     **-MT** 'fileA fileB'.  
 If neither this nor **-MQ** is specified, the output file name is used.
- MQ** *target\_file*  
 Same as **-MT**, but additionally escapes any special *make*(1) characters, essentially '\$'.
- o** *out\_file*, **--output** *out\_file*  
 Write an object file to the given filename.
- P** *include\_file*, **--preinclude** *include\_file*  
 Pre-include a file. This acts as if a **INCLUDE** "*include\_file*" was read before the input *asmfile*. Multiple files can be pre-included in the order they were provided.
- p** *pad\_value*, **--pad-value** *pad\_value*  
 Use this as the value for **DS** directives in ROM sections, unless overridden. The default is 0x00.
- Q** *fix\_precision*, **--q-precision** *fix\_precision*  
 Use this as the precision of fixed-point numbers after the decimal point, unless they specify their own precision. The default is 16, so fixed-point numbers are Q16.16 (since they are 32-bit integers). The argument may start with a '.' to match the Q notation, for example, **-Q** .16.
- r** *recursion\_depth*, **--recursion-depth** *recursion\_depth*  
 Specifies the recursion depth past which **rgbasm** will assume being in an infinite loop. The default is 64.
- s** *features:state\_file*, **--state** *features:state\_file*  
 Write the specified *features* to *state\_file*, based on the final state of **rgbasm** at the end of its input. The expected *features* are a comma-separated subset of the following:
- equ** Write all numeric constants as **def** *name* **equ** *value*.
  - var** Write all variables as **def** *name* **=** *value*.
  - equis** Write all string constants as **def** *name* **equis** "*value*".
  - char** Write all characters as **charmap** *name*, *value*.
  - macro** Write all macros as **macro** *name* ... **endm**.
  - all** Acts like **equ**, **var**, **equis**, **char**, **macro**.
- This flag may be specified multiple times with different feature subsets to write them to different files (see "EXAMPLES" below).
- V**, **--version**  
 Print the version of the program and exit.
- v**, **--verbose**  
 Be verbose. The verbosity level is increased by one each time the flag is specified, with each level including the previous:
1. Print the **rgbasm** configuration before taking actions.
  2. Print a notice before significant actions.
  3. Print some of the actions' intermediate results.
  4. Print some internal debug information.
  5. Print detailed internal information.
- The verbosity level does not go past 6.

Note that verbose output is only intended to be consumed by humans, and may change without notice between RGBDS releases; relying on those for scripts is not advised.

- W *warning*, --warning *warning*  
Set warning flag *warning*. A warning message will be printed if *warning* is an unknown warning flag. See the “DIAGNOSTICS” section for a list of warnings.
- w     Disable all warning output, even when turned into errors.
- X *max\_errors*, --max-errors *max\_errors*  
If more than this number of errors (not warnings) occur, then abort the assembly process; -X 0 disables this behavior. The default is 100 if **rgbasm** is printing errors to a terminal, and 0 otherwise.

## DIAGNOSTICS

Warnings are diagnostic messages that indicate possibly erroneous behavior that does not necessarily compromise the assembling process. The following options alter the way warnings are processed.

- Werror  
Make all warnings into errors. This can be negated as -Wno-error to prevent turning all warnings into errors.
- Werror=  
Make the specified warning or meta warning into an error. A warning’s name is appended (example: -Werror=obsolete), and this warning is implicitly enabled and turned into an error. This can be negated as -Wno-error= to prevent turning a specified warning into an error, even if -Werror is in effect.

The following warnings are “meta” warnings, that enable a collection of other warnings. If a specific warning is toggled via a meta flag and a specific one, the more specific one takes priority. The position on the command-line acts as a tie breaker, the last one taking effect.

- Wall  
This enables warnings that are likely to indicate an error or undesired behavior, and that can easily be fixed.
- Wextra  
This enables extra warnings that are less likely to pose a problem, but that may still be wanted.
- Weverything  
Enables literally every warning.

The following warnings are actual warning flags; with each description, the corresponding warning flag is included. Note that each of these flags also has a negation (for example, -Wcharmap-redef enables the warning that -Wno-charmap-redef disables; and -Wall enables every warning that -Wno-all disables). Only the non-default flag is listed here. Ignoring the “no-” prefix, entries are listed alphabetically.

- Wno-assert  
Warn when **WARN**-type assertions fail. (See “Aborting the assembly process” in *rgbasm*(5) for **ASSERT**).
- Wbackwards-for  
Warn when **FOR** loops have their start and stop values switched according to the step value. This warning is enabled by -Wall.
- Wbuiltin-args  
Warn about incorrect arguments to built-in functions, such as **STRSLICE**() with indexes outside of the string’s bounds. This warning is enabled by -Wall.
- Wcharmap-redef  
Warn when re-defining a charmap mapping. This warning is enabled by -Wall.

- Wdiv  
Warn when dividing the smallest negative integer ( $-2^{31}$ ) by -1, which yields itself due to integer overflow.
- Wempty-macro-arg  
Warn when a macro argument is empty. This warning is enabled by -Wextra.
- Wempty-strrpl  
Warn when **STRRPL**() is called with an empty string as its second argument (the substring to replace). This warning is enabled by -Wall.
- Wlarge-constant  
Warn when a constant too large to fit in a signed 32-bit integer is encountered. This warning is enabled by -Wall.
- Wmacro-shift  
Warn when shifting macro arguments past their limits. This warning is enabled by -Wextra.
- Wno-nested-comment  
Warn when the block comment start sequence `/*` is found inside of a block comment. Block comments cannot be nested, so the first `*/` will end the whole comment.
- Wno-obsolete  
Warn when obsolete features are encountered, which have been deprecated and may later be removed.
- Wnumeric-string=  
Warn when a multi-character string is treated as a number. -Wnumeric-string=0 or -Wno-numeric-string disables this warning. -Wnumeric-string=1 or just -Wnumeric-string warns about strings longer than four characters, since four or fewer characters fit within a 32-bit integer. -Wnumeric-string=2 warns about any multi-character string.
- Wpurge=  
Warn when purging symbols which are likely to have been necessary. -Wpurge=0 or -Wno-purge disables this warning. -Wpurge=1 or just -Wpurge warns when purging any exported symbol (regardless of type). -Wpurge=2 also warns when purging any label (even if not exported).
- Wshift  
Warn when shifting right a negative value. Use a division by  $2^N$  instead.
- Wshift-amount  
Warn when a shift's operand is negative or greater than 32.
- Wtruncation=  
Warn when an implicit truncation (for example, **db** to an 8-bit value) loses some bits. -Wtruncation=0 or -Wno-truncation disables this warning. -Wtruncation=1 warns when an N-bit value is  $2^N$  or greater, or less than  $-2^N$ . -Wtruncation=2 or just -Wtruncation also warns when an N-bit value is less than  $-2^{(N-1)}$ , which will not fit in two's complement encoding.
- Wunmapped-char=  
Warn when a character goes through charmap conversion but has no defined mapping. -Wunmapped-char=0 or -Wno-unmapped-char disables this warning. -Wunmapped-char=1 or just -Wunmapped-char only warns if the active charmap is not empty. -Wunmapped-char=2 warns if the active charmap is empty, and/or is not the default charmap 'main'.

**-Wunmatched-directive**

Warn when a **PUSHC**, **PUSHO**, or **PUSHS** directive does not have a corresponding **POPC**, **POPO**, or **POPS**. This warning is enabled by **-Wextra**.

**-Wunterminated-load**

Warn when a **LOAD** block is not terminated by an **ENDL**. This warning is enabled by **-Wextra**.

**-Wno-user**

Warn when the **WARN** built-in is executed. (See “Aborting the assembly process” in *rgbasm(5)* for **WARN**).

**EXAMPLES**

You can assemble a source file in two ways.

Straightforward way:

```
$ rgbasm -o bar.o foo.asm
```

Pipes way:

```
$ cat foo.asm | rgbasm -o bar.o -
$ rgbasm -o bar.o - < foo.asm
```

The resulting object file is not yet a usable ROM image—it must first be run through *rgblink(1)* and then *rgbfix(1)*.

Writing the final assembler state to a file:

```
$ rgbasm -s all:state.dump.asm foo.asm
```

Or to multiple files:

```
$ rgbasm -s equ,var:numbers.dump.asm -s equ:strings.dump.asm
foo.asm
```

**BUGS**

Please report bugs on *GitHub*: <https://github.com/gbdev/rgbds/issues>.

**SEE ALSO**

*rgbasm(5)*, *rgblink(1)*, *rgbfix(1)*, *rgbgfx(1)*, *gbz80(7)*, *rgbasm-old(5)*, *rgbds(5)*, *rgbds(7)*

**HISTORY**

**rgbasm** was originally written by Carsten Sørensen as part of the ASMotor package, and was later repackaged in RGBDS by Justin Lloyd. It is now maintained by a number of contributors at <https://github.com/gbdev/rgbds>.