

# GNU Gnulib

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This manual is for GNU Gnulib (updated 2024-01-18 11:42:33), which is a library of common routines intended to be shared at the source level.

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# 1 Brief Overview

Gnulib is a source code library that provides basic functionality to programs and libraries. Many software packages make use of Gnulib to avoid reinventing the portability wheel.

Resources:

- Gnulib is hosted at Savannah: <https://savannah.gnu.org/projects/gnulib>. Get the sources through Git from there.
- The Gnulib home page: <https://www.gnu.org/software/gnulib/>.

## 1.1 Gnulib Basics

While portability across operating systems is not one of GNU’s primary goals, it has helped introduce many people to the GNU system, and is worthwhile when it can be achieved at a low cost. This collection helps lower that cost.

Gnulib is intended to be the canonical source for most of the important “portability” and/or common files for GNU projects. These are files intended to be shared at the source level; Gnulib is not a typical library meant to be installed and linked against. Thus, unlike most projects, Gnulib does not normally generate a source tarball distribution; instead, developers grab modules directly from the source repository.

The easiest, and recommended, way to do this is to use the `gnulib-tool` script. Since there is no installation procedure for Gnulib, `gnulib-tool` needs to be run directly in the directory that contains the Gnulib source code. You can do this either by specifying the absolute filename of `gnulib-tool`, or by using a symbolic link from a place inside your `PATH` to the `gnulib-tool` file of your preferred Gnulib checkout. For example:

```
$ ln -s $HOME/gnu/src/gnulib.git/gnulib-tool $HOME/bin/gnulib-tool
```

## 1.2 Git Checkout

Gnulib is available for anonymous checkout. In any Bourne-shell the following should work:

```
$ git clone https://git.savannah.gnu.org/git/gnulib.git
```

For a read-write checkout you need to have a login on ‘[savannah.gnu.org](https://savannah.gnu.org)’ and be a member of the Gnulib project at <https://savannah.gnu.org/projects/gnulib>. Then, instead of the URL <https://git.savannah.gnu.org/git/gnulib.git>, use the URL ‘`ssh://user@git.savannah.gnu.org/srv/git/gnulib`’ where `user` is your login name on [savannah.gnu.org](https://savannah.gnu.org).

git resources:

Overview: [https://en.wikipedia.org/wiki/Git\\_\(software\)](https://en.wikipedia.org/wiki/Git_(software))

Homepage:

<https://git-scm.com/>

When you use `git annotate` or `git blame` with Gnulib, it’s recommended that you use the `-w` option, in order to ignore massive whitespace changes that happened in 2009.

## 1.3 Keeping Up-to-date

The best way to work with Gnulib is to check it out of git. To synchronize, you can use `git pull`.

Subscribing to the `bug-gnulib@gnu.org` mailing list will help you to plan when to update your local copy of Gnulib (which you use to maintain your software) from git. You can review the archives, subscribe, etc., via <https://lists.gnu.org/mailman/listinfo/bug-gnulib>.

Sometimes, using an updated version of Gnulib will require you to use newer versions of GNU Automake or Autoconf. You may find it helpful to join the `autotools-announce` mailing list to be advised of such changes.

## 1.4 Contributing to Gnulib

All software here is copyrighted by the Free Software Foundation—you need to have filled out an assignment form for a project that uses the module for that contribution to be accepted here.

If you have a piece of code that you would like to contribute, please email `bug-gnulib@gnu.org`.

Generally we are looking for files that fulfill at least one of the following requirements:

- If your `.c` and `.h` files define functions that are broken or missing on some other system, we should be able to include it.
- If your functions remove arbitrary limits from existing functions (either under the same name, or as a slightly different name), we should be able to include it.

If your functions define completely new but rarely used functionality, you should probably consider packaging it as a separate library.

### 1.4.1 Gnulib licensing

Gnulib contains code both under GPL and LGPL. Because several packages that use Gnulib are GPL, the files state they are licensed under GPL. However, to support LGPL projects as well, you may use some of the files under LGPL. The “License:” information in the files under `modules/` clarifies the real license that applies to the module source.

Keep in mind that if you submit patches to files in Gnulib, you should license them under a compatible license, which means that sometimes the contribution will have to be LGPL, if the original file is available under LGPL via a “License: LGPL” information in the projects’ `modules/` file.

### 1.4.2 Indent with spaces not TABs

We use space-only indentation in nearly all files. This includes all `*.h`, `*.c`, `*.y` files, except for the `regex` module. Makefile and ChangeLog files are excluded, since TAB characters are part of their format.

In order to tell your editor to produce space-only indentation, you can use these instructions.

- For Emacs: Add these lines to your Emacs initialization file (`$HOME/.emacs` or similar):  

```
;; In Gnulib, indent with spaces everywhere (not TABs).
```

```
;; Exceptions: Makefile and ChangeLog modes.
(add-hook 'find-file-hook '(lambda ()
  (if (and buffer-file-name
          (string-match "/gnulib\\>" (buffer-file-name))
          (not (string-equal mode-name "Change Log"))
          (not (string-equal mode-name "Makefile"))))
      (setq indent-tabs-mode nil))))
```

- For vi (vim): Add these lines to your `$HOME/.vimrc` file:

```
" Don't use tabs for indentation. Spaces are nicer to work with.
set expandtab
```

For Makefile and ChangeLog files, compensate for this by adding this to your `$HOME/.vim/after/indent/make.vim` file, and similarly for your `$HOME/.vim/after/indent/changelog.vim` file:

```
" Use tabs for indentation, regardless of the global setting.
set noexpandtab
```

- For Eclipse: In the “Window|Preferences” dialog (or “Eclipse|Preferences” dialog on Mac OS),
  1. Under “General|Editors|Text Editors”, select the “Insert spaces for tabs” checkbox.
  2. Under “C/C++|Code Style”, select a code style profile that has the “Indentation|Tab policy” combobox set to “Spaces only”, such as the “GNU [built-in]” policy.

If you use the GNU indent program, pass it the option `--no-tabs`.

### 1.4.3 How to add a new module

- Add the header files and source files to `lib/`.
- If the module needs configure-time checks, write an Autoconf macro for it in `m4/module.m4`. See `m4/README` for details.
- Write a module description `modules/module`, based on `modules/TEMPLATE`.
- If the module contributes a section to the end-user documentation, put this documentation in `doc/module.texi` and add it to the “Files” section of `modules/module`. Most modules don’t do this; they have only documentation for the programmer (= Gnulib user). Such documentation usually goes into the `lib/` source files. It may also go into `doc/`; but don’t add it to the module description in this case.
- Add the module to the list in `MODULES.html.sh`.

You can test that a module builds correctly with:

```
$ ./gnulib-tool --create-testdir --dir=/tmp/testdir module1 ... moduleN
$ cd /tmp/testdir
$ ./configure && make
```

Other things:

- Check the license and copyright year of headers.
- Check that the source code follows the GNU coding standards; see <https://www.gnu.org/prep/standards>.



- Add source files to `config/srclist*` if they are identical to upstream and should be upgraded in Gnulib whenever the upstream source changes.
- Include header files in source files to verify the function prototypes.
- Make sure a replacement function doesn't cause warnings or clashes on systems that have the function.
- Autoconf functions can use 'gl\_\*' prefix. The 'AC\_\*' prefix is for autoconf internal functions.
- Build files only if they are needed on a platform. Look at the `alloca` and `fnmatch` modules for how to achieve this. If for some reason you cannot do this, and you have a `.c` file that leads to an empty `.o` file on some platforms (through some big `#if` around all the code), then ensure that the compilation unit is not empty after preprocessing. One way to do this is to `#include <stddef.h>` or `<stdio.h>` before the big `#if`.

## 1.5 Portability guidelines

Gnulib code is intended to be portable to a wide variety of platforms, not just GNU platforms. Gnulib typically attempts to support a platform as long as it is still supported by its provider, even if the platform is not the latest version. See Section 2.4 [Target Platforms], page 11.

Many Gnulib modules exist so that applications need not worry about undesirable variability in implementations. For example, an application that uses the `malloc` module need not worry about `malloc (0)` returning a null pointer on some Standard C platforms; and `glob` users need not worry about `glob` silently omitting symbolic links to nonexistent files on some platforms that do not conform to POSIX.

Gnulib code is intended to port without problem to new hosts, e.g., hosts conforming to recent C and POSIX standards. Hence Gnulib code should avoid using constructs that these newer standards no longer require, without first testing for the presence of these constructs. For example, because C11 made variable length arrays optional, Gnulib code should avoid them unless it first uses the `vararrays` module to check whether they are supported.

The following subsections discuss some exceptions and caveats to the general Gnulib portability guidelines.

### 1.5.1 C language versions

Currently Gnulib assumes at least a freestanding C99 compiler, possibly operating with a C library that predates C99; with time this assumption will likely be strengthened to later versions of the C standard. Old platforms currently supported include AIX 6.1, HP-UX 11i v1 and Solaris 10, though these platforms are rarely tested. Gnulib itself is so old that it contains many fixes for obsolete platforms, fixes that may be removed in the future.

Because of the freestanding C99 assumption, Gnulib code can include `<float.h>`, `<limits.h>`, `<stdarg.h>`, `<stddef.h>`, and `<stdint.h>` unconditionally; `<stdbool.h>` is also in the C99 freestanding list but is obsolescent as of C23. Gnulib code can also assume the existence of `<ctype.h>`, `<errno.h>`, `<fcntl.h>`, `<locale.h>`, `<signal.h>`, `<stdio.h>`, `<stdlib.h>`, `<string.h>`, and `<time.h>`. Similarly, many modules include `<sys/types.h>` even though it's not even in C11; that's OK since `<sys/types.h>` has been around nearly forever.

Even if the include files exist, they may not conform to the C standard. However, GCC has a `fixincludes` script that attempts to fix most conformance problems. Gnulib currently assumes include files largely conform to C99 or better. People still using ancient hosts should use `fixincludes` or fix their include files manually.

Even if the include files conform, the library itself may not. For example, `strtod` and `mktime` have some bugs on some platforms. You can work around some of these problems by requiring the relevant modules, e.g., the Gnulib `mktime` module supplies a working and conforming `mktime`.

### 1.5.2 C99 features assumed by Gnulib

Although the C99 standard specifies many features, Gnulib code is conservative about using them, partly because Gnulib predates the widespread adoption of C99, and partly because many C99 features are not well-supported in practice. C99 features that are reasonably portable nowadays include:

- A declaration after a statement, or as the first clause in a `for` statement.
- `long long int`.
- `<stdbool.h>`, although Gnulib code no longer uses it directly, preferring plain `bool` via the `stdbool` module instead. See Section 9.47 [`stdbool.h`], page 68.
- `<stdint.h>`, assuming the `stdint` module is used. See Section 9.50 [`stdint.h`], page 70.
- Compound literals and designated initializers.
- Variadic macros.  
Note: The handling of `__VA_ARGS__` in MSVC differs from the one in ISO C 99, see <https://stackoverflow.com/questions/5134523/>. But usually this matters only for macros that decompose `__VA_ARGS__`.
- `static inline` functions.
- `__func__`, assuming the `func` module is used. See Section 17.20 [`func`], page 812.
- The `restrict` qualifier, assuming `AC_REQUIRE([AC_C_RESTRICT])` is used. This qualifier is sometimes implemented via a macro, so C++ code that uses Gnulib should avoid using `restrict` as an identifier.
- Flexible array members (however, see the `flexmember` module).

### 1.5.3 C99 features avoided by Gnulib

Gnulib avoids some features even though they are standardized by C99, as they have portability problems in practice. Here is a partial list of avoided C99 features. Many other C99 features are portable only if their corresponding modules are used; Gnulib code that uses such a feature should require the corresponding module.

- Variable length arrays (VLAs) or variably modified types, without checking whether `__STDC_NO_VLA__` is defined. See the `vararrays` and `vla` modules.
- Block-scope variable length arrays, without checking whether either `GNULIB_NO_VLA` or `__STDC_NO_VLA__` is defined. This lets you define `GNULIB_NO_VLA` to pacify GCC when using its `-Wvla-larger-than warnings` option, and to avoid large stack usage that may have security implications. `GNULIB_NO_VLA` does not affect Gnulib's other uses of VLAs and variably modified types, such as array declarations in function prototype scope.

- Converting to pointers via integer types other than `intptr_t` or `uintptr_t`. Although the C standard says that values of these integer types, if they exist, should be convertible to and from `intmax_t` and `uintmax_t` without loss of information, on CHERI platforms such conversions result in integers that, if converted back to a pointer, cannot be dereferenced.
- `extern inline` functions, without checking whether they are supported. See Section 17.9 [extern inline], page 794.
- Type-generic math functions.
- Universal character names in source code.
- `<iso646.h>`, since GNU programs need not worry about deficient source-code encodings.
- Comments beginning with `///. This is mostly for style reasons.`

### 1.5.4 Other portability assumptions made by Gnulib

Gnulib code makes the following assumptions that go beyond what C and POSIX require:

- Standard internal types like `ptrdiff_t` and `size_t` are no wider than `long`. The GNU coding standards allow code to make this assumption, POSIX requires implementations to support at least one programming environment where this is true, and such environments are recommended for Gnulib-using applications. When it is easy to port to non-POSIX platforms like MinGW where these types are wider than `long`, new Gnulib code should do so, e.g., by using `ptrdiff_t` instead of `long`. However, it is not always that easy, and no effort has been made to check that all Gnulib modules work on MinGW-like environments.
- `int` and `unsigned int` are at least 32 bits wide. POSIX and the GNU coding standards both require this.
- Signed integer arithmetic is two’s complement.

Previously, Gnulib code sometimes also assumed that signed integer arithmetic wraps around, but modern compiler optimizations sometimes do not guarantee this, and Gnulib code with this assumption is now considered to be questionable. See Section 17.7 [Integer Properties], page 786.

Although some Gnulib modules contain explicit support for ones’ complement and signed magnitude integer representations, which are allowed by C17 and earlier, these modules are the exception rather than the rule. All practical Gnulib targets use two’s complement, which is required by C23.

- There are no “holes” in integer values: all the bits of an integer contribute to its value in the usual way. In particular, an unsigned type and its signed counterpart have the same number of bits when you count the latter’s sign bit. (As an exception, Gnulib code is portable to CHERI platforms even though this assumption is false for CHERI.)
- Objects with all bits zero are treated as zero or as null pointers. For example, `memset(A, 0, sizeof A)` initializes an array `A` of pointers to null pointers.
- The types `intptr_t` and `uintptr_t` exist, and pointers can be converted to and from these types without loss of information.
- Addresses and sizes behave as if objects reside in a flat address space. In particular:

- If two nonoverlapping objects have sizes  $S$  and  $T$  represented as `ptrdiff_t` or `size_t` values, then  $S + T$  cannot overflow.
- A pointer  $P$  points within an object  $O$  if and only if `(char *) &O <= (char *) P && (char *) P < (char *) (&O + 1)`.
- Arithmetic on a valid pointer is equivalent to the same arithmetic on the pointer converted to `uintptr_t`, except that offsets are multiplied by the size of the pointed-to objects. For example, if  $P + I$  is a valid expression involving a pointer  $P$  and an integer  $I$ , then `(uintptr_t) (P + I) == (uintptr_t) ((uintptr_t) P + I * sizeof *P)`. Similar arithmetic can be done with `intptr_t`, although more care must be taken in case of integer overflow or negative integers.
- A pointer  $P$  has alignment  $A$  if and only if `(uintptr_t) P % A` is zero, and similarly for `intptr_t`.
- If an existing object has size  $S$ , and if  $T$  is sufficiently small (e.g., 8 KiB), then  $S + T$  cannot overflow. Overflow in this case would mean that the rest of your program fits into  $T$  bytes, which can't happen in realistic flat-address-space hosts.
- Adding zero to a null pointer does not change the pointer. For example, `0 + (char *) NULL == (char *) NULL`.

Some system platforms violate these assumptions and are therefore not Gnulib porting targets. See Section 2.4.3 [Unsupported Platforms], page 12.

## 1.6 High Quality

We develop and maintain a testsuite for Gnulib. The goal is to have a 100% firm interface so that maintainers can feel free to update to the code in git at *any* time and know that their application will not break. This means that before any change can be committed to the repository, a test suite program must be produced that exposes the bug for regression testing.

### 1.6.1 Stable Branches

In Gnulib, we don't use topic branches for experimental work. Therefore, occasionally a broken commit may be pushed in Gnulib. It does not happen often, but it does happen.

To compensate for this, Gnulib offers “stable branches”. These are branches of the Gnulib code that are maintained over some longer period (a year, for example) and include

- bug fixes,
- portability enhancements (to existing as well as to new platforms),
- updates to `config.guess` and `config.sub`.

Not included in the stable branches are:

- new features, such as new modules,
- optimizations,
- refactorings,
- complex or risky changes in general,
- updates to `texinfo.tex`,
- documentation updates.

So far, we have five stable branches:

`stable-202401`

A stable branch that starts at the beginning of January 2024.

`stable-202307`

A stable branch that starts at the beginning of July 2023.

`stable-202301`

A stable branch that starts at the beginning of January 2023. It is no longer updated.

`stable-202207`

A stable branch that starts at the beginning of July 2022. It is no longer updated.

`stable-202201`

A stable branch that starts at the beginning of January 2022. It is no longer updated.

The two use-cases of stable branches are thus:

- You want to protect yourself from occasional breakage in GnuLib.
- When making a bug-fix release of your code, you can incorporate bug fixes in GnuLib, by pulling in the newest commits from the same stable branch that you were already using for the previous release.

## 1.6.2 Writing reliable code

When compiling and testing GnuLib and GnuLib-using programs, certain compiler options can help improve reliability. First of all, make it a habit to use `-Wall` in all compilation commands. Beyond that, the `manywarnings` module enables several forms of static checking in GCC and related compilers (see Section 19.6 [manywarnings], page 852).

For dynamic checking, you can run `configure` with `CFLAGS` options appropriate for your compiler. For example:

```
./configure \
  CPPFLAGS='-Wall'\
  CFLAGS='-g3 -O2'\
  ' -D_FORTIFY_SOURCE=2'\
  ' -fsanitize=undefined'\
  ' -fsanitize-undefined-trap-on-error'
```

Here:

- `-D_FORTIFY_SOURCE=2` enables extra security hardening checks in the GNU C library.
- `-fsanitize=undefined` enables GCC’s undefined behavior sanitizer (`ubsan`), and
- `-fsanitize-undefined-trap-on-error` causes `ubsan` to abort the program (through an “illegal instruction” signal). This measure stops exploit attempts and also allows you to debug the issue.

Without the `-fsanitize-undefined-trap-on-error` option, `-fsanitize=undefined` causes messages to be printed, and execution continues after an undefined behavior situation. The message printing causes GCC-like compilers to arrange for the program to dy-

namically link to libraries it might not otherwise need. With GCC, instead of `-fsanitize-undefined-trap-on-error` you can use the `-static-libubsan` option to arrange for two of the extra libraries (`libstdc++` and `libubsan`) to be linked statically rather than dynamically, though this typically bloats the executable and the remaining extra libraries are still linked dynamically.

It is also good to occasionally run the programs under `valgrind` (see Section 19.7 [Running self-tests under `valgrind`], page 855).

## 1.7 Join the GNU Project

GNU Gnuilib is part of the GNU Operating System, developed by the GNU Project.

If you are the author of an awesome program and want to join us in writing Free (libre) Software, please consider making it an official GNU program and become a GNU Maintainer. Instructions on how to do this are here (<https://www.gnu.org/help/evaluation>). We are looking forward to hacking with you!

Don't have a program to contribute? Look at all the other ways to help (<https://www.gnu.org/help/help.html>).

And to learn more about Free (libre) Software in general, please read and share this page (<https://gnu.org/philosophy/free-sw.html>).

## 2 Philosophy

Gnulib's design and development philosophy is organized around steady, collaborative, and open development of reusable modules that are suitable for a reasonably wide variety of platforms.

### 2.1 Benefits of using Gnulib

Gnulib is useful to enhance various aspects of a package:

- **Portability:** With Gnulib, a package maintainer can program against the POSIX and GNU libc APIs and nevertheless expect good portability to platforms that don't implement POSIX.
- **Maintainability:** When a package uses modules from Gnulib instead of code written specifically for that package, the maintainer has less code to maintain.
- **Security:** Gnulib provides functions that are immune against vulnerabilities that plague the uses of the corresponding commonplace functions. For example, `asprintf`, `canonicalize_file_name` are not affected by buffer sizing problems that affect `sprintf`, `realpath`. `openat` does not have the race conditions that `open` has. Etc.
- **Reliability:** Gnulib provides functions that combine a call to a system function with a check of the result. Examples are `xalloc`, `xprintf`, `xstrtod`, `xgetcwd`.
- **Structure:** Gnulib offers a way to structure code into modules, typically one include file, one source code file, and one autoconf macro for each functionality. Modularity helps maintainability.

### 2.2 Library vs. Reusable Code

Classical libraries are installed as binary object code. Gnulib is different: It is used as a source code library. Each package that uses Gnulib thus ships with part of the Gnulib source code. The used portion of Gnulib is tailored to the package: A build tool, called `gnulib-tool`, is provided that copies a tailored subset of Gnulib into the package.

### 2.3 Portability and Application Code

One of the goals of Gnulib is to make portable programming easy, on the basis of the standards relevant for GNU (and Unix). The objective behind that is to avoid a fragmentation of the user community into disjoint user communities according to the operating system, and instead allow synergies between users on different operating systems.

Another goal of Gnulib is to provide application code that can be shared between several applications. Some people wonder: "What? glibc doesn't have a function to copy a file?" Indeed, the scope of a system's libc is to implement the relevant standards (ISO C, POSIX) and to provide access functions to the kernel's system calls, and little more.

There is no clear borderline between both areas.

For example, Gnulib has a facility for generating the name of backup files. While this task is entirely at the application level—no standard specifies an API for it—the naïve code has some portability problems because on some platforms the length of file name components is limited to 30 characters or so. Gnulib handles that.

Similarly, Gnulib has a facility for executing a command in a subprocess. It is at the same time a portability enhancement (it works on GNU, Unix, and Windows, compared to the classical `fork/exec` idiom which is not portable to Windows), as well as an application aid: it takes care of redirecting `stdin` and/or `stdout` if desired, and emits an error message if the subprocess failed.

## 2.4 Target Platforms

Gnulib supports a number of platforms that we call the “reasonable portability targets”. This class consists of widespread operating systems, for three years after their last availability, or—for proprietary operating systems—as long as the vendor provides commercial support for it. Already existing Gnulib code for older operating systems is usually left in place for longer than these three years. So it comes that programs that use Gnulib run pretty well also on these older operating systems.

Some operating systems are not very widespread, but are Free Software and are actively developed. Such platforms are also supported by Gnulib, if that OS’s developers community keeps in touch with the Gnulib developers, by providing bug reports, analyses, or patches. For such platforms, Gnulib supports only the versions of the last year or the last few months, depending on the maturity of said OS project, the number of its users, and how often these users upgrade.

Niche operating systems are generally unsupported by Gnulib, unless some of their developers or users contribute support to Gnulib.

The degree of support Gnulib guarantees for a platform depends on the amount of testing it gets from volunteers. Platforms on which Gnulib is frequently tested are the best supported. Then come platforms with occasional testing, then platforms which are rarely tested. Usually, we fix bugs when they are reported. Except that some rarely tested platforms are also low priority; bug fixes for these platforms can take longer.

### 2.4.1 Supported Platforms

As of 2023, the list of supported platforms is the following:

- glibc systems. With glibc 2.19 or newer, they are frequently tested. About the kernels:
  - glibc on Linux is frequently tested.
  - glibc on kFreeBSD is rarely tested.
  - musl libc on Linux is occasionally tested.
- macOS. In versions 12.5, it’s occasionally tested. In version 10.5, it’s rarely tested.
- FreeBSD 13.0 or newer is occasionally tested.
- OpenBSD 7.0 or newer is occasionally tested.
- NetBSD 9.0 or newer is occasionally tested.
- AIX 7.1 and 7.2 are occasionally tested.
- Solaris 10 and 11.4 are occasionally tested. Solaris 9 is rarely tested and low priority.
- Android is occasionally tested, through the Termux app on Android 11.
- Cygwin 2.9 is occasionally tested. Cygwin 1.7.x is rarely tested.



- Native Windows:
  - mingw is occasionally tested. Only the latest version of mingw is tested; older versions are not supported.
  - MSVC 14 (Microsoft Visual Studio 2015 14.0) is occasionally tested. Only “release” builds (compiler option ‘-MD’) are supported, not “debug” builds (compiler option ‘-MDd’).

Note that some modules are currently unsupported on native Windows: `mgetgroups`, `getugroups`, `idcache`, `userspec`, `openpty`, `login_tty`, `forkpty`, `pt_chown`, `grantpt`, `pty`, `savedwd`, `mkancedirs`, `mkdir-p`, `euidaccess`, `faccessat`. The versions of Windows that are supported are Windows 10 and newer.

- GNU Hurd 0.9 is rarely tested.
- IRIX 6.5 is very rarely tested.
- Minix 3.3.0 is no longer tested.
- Haiku is no longer tested.
- uClibc on Linux is no longer tested.
- QNX is no longer tested.

### 2.4.2 Formerly Supported Platforms

The following platforms were supported in the past, but are no longer supported:

- glibc versions 2.1.x and older.
- Mac OS X 10.4 and older.
- AIX 6 and older.
- HP-UX 11.31.
- IRIX 6.4 and older.
- OSF/1 5.1.
- Solaris 8 and older.
- Interix.
- BeOS.

Gnulib supports these operating systems only in an unvirtualized environment. When you run an OS inside a virtual machine, you have to be aware that the virtual machine can bring in bugs of its own. For example, floating-point operations on Solaris can behave slightly differently in QEMU than on real hardware. And Haiku’s `bash` program misbehaves in VirtualBox 3, whereas it behaves fine in VirtualBox 4.

Similarly, running native Windows binaries on GNU/Linux under WINE is rarely tested and low priority: WINE has a set of behaviours and bugs that is slightly different from native Windows.

### 2.4.3 Unsupported Platforms

Some platforms with C compilers are not supported by Gnulib because the platforms violate Gnulib’s C portability assumptions. See Section 1.5.4 [Other portability assumptions], page 6.

These assumptions are not required by the C or POSIX standards but hold on almost all practical porting targets. If you need to port Gnulib code to a platform where these assumptions are not true, we would appreciate hearing of any fixes. We need fixes that do not increase runtime overhead on standard hosts and that are relatively easy to maintain.

These platforms are listed below to illustrate problems that Gnulib and Gnulib-using code would have if it were intended to be portable to all practical POSIX or C platforms.

- Clang’s `-fsanitize=undefined` option causes the program to crash if it adds zero to a null pointer – behavior that is undefined in strict C, but which yields a null pointer on all practical porting targets and which the Gnulib portability guidelines allow.

If you use Clang with `-fsanitize=undefined`, you can work around the problem by also using `-fno-sanitize=pointer-overflow`, although this may also disable some unrelated and useful pointer checks. Perhaps someday the Clang developers will fix the infelicity.

- The IBM i’s pointers are 128 bits wide and it lacks the two types `intptr_t` and `uintptr_t`, which are optional in the C and POSIX standards. However, these two types are required for the XSI extension to POSIX, and many Gnulib modules use them. To work around this compatibility problem, Gnulib-using applications can be run on the IBM i’s PASE emulation environment. The IBM i’s architecture descends from the System/38 (1978).
- The Unisys ClearPath Dorado’s machine word is 36 bits. Its signed integers use a ones’-complement representation. On these machines, `CHAR_BIT == 9` and `INT_MIN == -INT_MAX`. By default `UINT_MAX` is  $2^{36} - 2$ , which does not conform to the C requirement that it be one less than a power of two. Although compiler options can raise `UINT_MAX` to be  $2^{36} - 1$ , this can break system code that uses `-0` as a flag value. This platform’s architecture descends from the UNIVAC 1103 (1953).
- The Unisys ClearPath Libra’s machine word is 48 bits with a 4-bit tag and a 4-bit data extension. Its `unsigned int` uses the low-order 40 bits of the word, and `int` uses the low-order 41 bits of the word with a signed-magnitude representation. On these machines, `INT_MAX == UINT_MAX`, `INT_MIN == -INT_MAX`, and `sizeof (int) == 6`. This platform’s architecture descends from the Burroughs B5000 (1961).

The following platforms are not supported by Gnulib. The cost of supporting them would exceed the benefit because they are rarely used, or poorly documented, or have been supplanted by other platforms, or diverge too much from POSIX, or some combination of these and other factors. Please don’t bother sending us patches for them.

- Windows 95/98/ME.
- DJGPP and EMX (the 32-bit operating systems running in DOS).
- MSDOS (the 16-bit operating system).
- Windows Mobile, Symbian OS, iOS.

## 2.5 Modules

Gnulib is divided into modules. Every module implements a single facility. Modules can depend on other modules.

A module consists of a number of files and a module description. The files are copied by `gnulib-tool` into the package that will use it, usually verbatim, without changes. Source

code files (`.h`, `.c` files) reside in the `lib/` subdirectory. Autoconf macro files reside in the `m4/` subdirectory. Build scripts reside in the `build-aux/` subdirectory.

The module description contains the list of files; `gnulib-tool` copies these files. It contains the module's dependencies; `gnulib-tool` installs them as well. It also contains the autoconf macro invocation (usually a single line or nothing at all); `gnulib-tool` ensures this is invoked from the package's `configure.ac` file. And also a `Makefile.am` snippet; `gnulib-tool` collects these into a `Makefile.am` for the tailored Gnulib part. The module description and include file specification are for documentation purposes; they are combined into `MODULES.html`.

The module system serves two purposes:

1. It ensures consistency of the used autoconf macros and `Makefile.am` rules with the source code. For example, source code which uses the `getopt_long` function—this is a common way to implement parsing of command line options in a way that complies with the GNU standards—needs the source code (`lib/getopt.c` and others), the autoconf macro which detects whether the system's `libc` already has this function (in `m4/getopt.m4`), and a few `Makefile.am` lines that create the substitute `getopt.h` if not. These three pieces belong together. They cannot be used without each other. The module description and `gnulib-tool` ensure that they are copied altogether into the destination package.
2. It allows for scalability. It is well-known since the inception of the MODULA-2 language around 1978 that dissection into modules with dependencies allows for building large sets of code in a maintainable way. The maintainability comes from the facts that:
  - Every module has a single purpose; you don't worry about other parts of the program while creating, reading or modifying the code of a module.
  - The code you have to read in order to understand a module is limited to the source of the module and the `.h` files of the modules listed as dependencies. It is for this reason also that we recommend to put the comments describing the functions exported by a module into its `.h` file.

In other words, the module is the elementary unit of code in Gnulib, comparable to a class in object-oriented languages like Java or C#.

The module system is the basis of `gnulib-tool`. When `gnulib-tool` copies a part of Gnulib into a package, it first compiles a module list, starting with the requested modules and adding all the dependencies, and then collects the files, `configure.ac` snippets and `Makefile.am` snippets.

## 2.6 Various Kinds of Modules

There are modules of various kinds in Gnulib. For a complete list of the modules, see in `MODULES.html`.

### 2.6.1 Support for ISO C or POSIX functions.

When a function is not implemented by a system, the Gnulib module provides an implementation under the same name. Examples are the `'snprintf'` and `'readlink'` modules.

Similarly, when a function is not correctly implemented by a system, Gnulib provides a replacement. For functions, we use the pattern

```
#if !HAVE_WORKING_FOO
# define foo rpl_foo
#endif
```

and implement the `foo` function under the name `rpl_foo`. This renaming is needed to avoid conflicts at compile time (in case the system header files declare `foo`) and at link/run time (because the code making use of `foo` could end up residing in a shared library, and the executable program using this library could be defining `foo` itself).

For header files, such as `stdint.h`, we provide the substitute only if the system doesn't provide a correct one. The template of this replacement is distributed in a slightly different name, with `.in` inserted before the `.h` extension, so that on systems which do provide a correct header file the system's one is used.

The modules in this category are supported in C++ mode as well. This means, while the autoconfiguration uses the C compiler, the resulting header files and function substitutes can be used with a matching C++ compiler as well.

## 2.6.2 Enhancements of ISO C or POSIX functions

These are sometimes POSIX functions with GNU extensions also found in glibc—examples: `'getopt'`, `'fnmatch'`—and often new APIs—for example, for all functions that allocate memory in one way or the other, we have variants which also include the error checking against the out-of-memory condition.

## 2.6.3 Portable general use facilities

Examples are a module for copying a file—the portability problems relate to the copying of the file's modification time, access rights, and extended attributes—or a module for extracting the tail component of a file name—here the portability to native Windows requires a different API than the classical POSIX `basename` function.

## 2.6.4 Reusable application code

Examples are an error reporting function, a module that allows output of numbers with K/M/G suffixes, or cryptographic facilities.

## 2.6.5 Object oriented classes

Examples are data structures like `'list'`, or abstract output stream classes that work around the fact that an application cannot implement an stdio `FILE` with its logic. Here, while staying in C, we use implementation techniques like tables of function pointers, known from the C++ language or from the Linux kernel.

## 2.6.6 Interfaces to external libraries

Examples are the `'iconv'` module, which interfaces to the `iconv` facility, regardless whether it is contained in `libc` or in an external `libiconv`. Or the `'readline'` module, which interfaces to the GNU readline library.

## 2.6.7 Build / maintenance infrastructure

An example is the `'maintainer-makefile'` module, which provides extra Makefile tags for maintaining a package.

## 2.7 Collaborative Development

Gnulib is maintained collaboratively. The mailing list is <bug-gnulib at gnu dot org>. Be warned that some people on the list may be very active at some times and unresponsive at other times.

Every module has one or more maintainers. While issues are discussed collaboratively on the list, the maintainer of a module nevertheless has a veto right regarding changes in his module.

All patches should be posted to the list, regardless whether they are proposed patches or whether they are committed immediately by the maintainer of the particular module. The purpose is not only to inform the other users of the module, but mainly to allow peer review. It is not uncommon that several people contribute comments or spot bugs after a patch was proposed.

Conversely, if you are using Gnulib, and a patch is posted that affects one of the modules that your package uses, you have an interest in proofreading the patch.

## 2.8 Copyright

Most modules are under the GPL. Some, mostly modules which can reasonably be used in libraries, are under LGPL. Few modules are under other licenses, such as LGPLv2+, unlimited, or public domain.

If the module description file says "GPL", it means "GPLv3+" (GPLv3 or newer, at the licensee's choice); if it says "LGPL", it means "LGPLv3+" (LGPLv3 or newer, at the licensee's choice).

The source files, more precisely the files in `lib/` and `build-aux/`, are under a license compatible with the module's license. Most often, they are under the same license. But files can be shared among several modules, and in these cases it can happen that a source file is under a weaker license than noted in the module description – namely under the weakest license among the licenses of the modules that contain the file.

Different licenses apply to files in special directories:

`modules/` Module description files are under this copyright:

Copyright © 20XX–20YY Free Software Foundation, Inc.  
Copying and distribution of this file, with or without modification,  
in any medium, are permitted without royalty provided the copy-  
right notice and this notice are preserved.

`m4/` Autoconf macro files are under this copyright:

Copyright © 20XX–20YY Free Software Foundation, Inc.  
This file is free software; the Free Software Foundation gives un-  
limited permission to copy and/or distribute it, with or without  
modifications, as long as this notice is preserved.

`tests/` If a license statement is not present in a test module, the test files are under GPL. Even if the corresponding source module is under LGPL, this is not a problem, since compiled tests are not installed by “make install”.

`doc/` Documentation files are under this copyright:

Copyright © 2004–20YY Free Software Foundation, Inc.  
Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is at <https://www.gnu.org/licenses/fdl-1.3.en.html>.

If you want to use some Gnuilib modules under LGPL, you can do so by passing the option ‘`--lgpl`’ to `gnulib-tool`. This will ensure that all imported modules can be used under the LGPL license. Similarly, if you want some Gnuilib modules under LGPLv2+ (Lesser GPL version 2.1 or newer), you can do so by passing the option ‘`--lgpl=2`’ to `gnulib-tool`.

Keep in mind that when you submit patches to files in Gnuilib, you should license them under a compatible license. This means that sometimes the contribution will have to be LGPL, if the original file is available under LGPL. You can find out about it by looking at the license header of the file.

## 2.9 Steady Development

Gnuilib modules are continually adapted, to match new practices, to be consistent with newly added modules, or simply as a response to build failure reports.

If you are willing to report an occasional regression, we recommend to use the newest version from git always, except in periods of major changes. Most Gnuilib users do this.

## 2.10 Openness

Gnuilib is open in the sense that we gladly accept contributions if they are generally useful, well engineered, and if the contributors have signed the obligatory papers with the FSF.

The module system is open in the sense that a package using Gnuilib can

1. locally patch or override files in Gnuilib,
2. locally add modules that are treated like Gnuilib modules by `gnulib-tool`.

This is achieved by the ‘`--local-dir`’ option of `gnulib-tool` (see Chapter 5 [Extending Gnuilib], page 42).

## 3 Invoking `gnulib-tool`

The `gnulib-tool` command is the recommended way to import Gnulib modules. It is possible to borrow Gnulib modules in a package without using `gnulib-tool`, relying only on the meta-information stored in the `modules/*` files, but with a growing number of modules this becomes tedious. `gnulib-tool` simplifies the management of source files, `Makefile.ams` and `configure.ac` in packages incorporating Gnulib modules.

`gnulib-tool` is not installed in a standard directory that is contained in the `PATH` variable. It needs to be run directly in the directory that contains the Gnulib source code. You can do this either by specifying the absolute filename of `gnulib-tool`, or you can also use a symbolic link from a place inside your `PATH` to the `gnulib-tool` file of your preferred and most up-to-date Gnulib checkout, like this:

```
$ ln -s $HOME/gnu/src/gnulib.git/gnulib-tool $HOME/bin/gnulib-tool
```

Run `'gnulib-tool --help'` for information. To get familiar with `gnulib-tool` without affecting your sources, you can also try some commands with the option `'--dry-run'`; then `gnulib-tool` will only report which actions it would perform in a real run without changing anything.

### 3.1 Finding modules

There are four ways of finding the names of Gnulib modules that you can use in your package:

- You have the complete module list, sorted according to categories, in <https://www.gnu.org/software/gnulib/MODULES.html>.
- If you are looking for POSIX function replacements that you don't know about yet, follow the procedure described in section Section 3.7 [Finding POSIX substitutes], page 24.
- If you are looking for a particular POSIX header or function replacement, look in the chapters Chapter 9 [Header File Substitutes], page 52, and Chapter 10 [Function Substitutes], page 85. For headers and functions that are provided by Glibc but not standardized by POSIX, look in the chapters Chapter 12 [Glibc Header File Substitutes], page 499, and Chapter 13 [Glibc Function Substitutes], page 512.
- If you have already found the source file in Gnulib and are looking for the module that contains this source file, you can use the command `'gnulib-tool --find filename'`.

### 3.2 Initial import

Gnulib assumes that your project uses Autoconf. When using Gnulib, you will need to have Autoconf among your build tools.

Gnulib also assumes that your project's `configure.ac` contains the line

```
AC_CONFIG_HEADERS([config.h])
```

The `config.h` file gets generated with platform dependent C macro definitions, and the source files include it (see Section 3.5 [Source changes], page 23).

Unless you use `gnulib-tool`'s `--gnu-make` option, Gnulib also assumes that your project uses Automake at least in a subdirectory of your project. While the use of Automake in

your project's top level directory is an easy way to fulfil the Makefile conventions of the GNU coding standards, Gnuilib does not require it.

Invoking 'gnuilib-tool --import' will copy source files, create a `Makefile.am` to build them, generate a file `gnuilib-comp.m4` with Autoconf M4 macro declarations used by `configure.ac`, and generate a file `gnuilib-cache.m4` containing the cached specification of how Gnuilib is used.

Our example will be a library that uses Autoconf, Automake and Libtool. It calls `strdup`, and you wish to use gnuilib to make the package portable to C99 and C11 (which don't have `strdup`).

```
~/src/libfoo$ gnuilib-tool --import strdup
Module list with included dependencies:
  absolute-header
  extensions
  strdup
  string
File list:
  lib/dummy.c
  lib/strdup.c
  lib/string.in.h
  m4/absolute-header.m4
  m4/extensions.m4
  m4/gnuilib-common.m4
  m4/strdup.m4
  m4/string_h.m4
Creating directory ./lib
Creating directory ./m4
Copying file lib/dummy.c
Copying file lib/strdup.c
Copying file lib/string.in.h
Copying file m4/absolute-header.m4
Copying file m4/extensions.m4
Copying file m4/gnuilib-common.m4
Copying file m4/gnuilib-tool.m4
Copying file m4/strdup.m4
Copying file m4/string_h.m4
Creating lib/Makefile.am
Creating m4/gnuilib-cache.m4
Creating m4/gnuilib-comp.m4
Finished.
```

You may need to add `#include` directives for the following `.h` files.

```
#include <string.h>
```

Don't forget to

- add "lib/Makefile" to `AC_CONFIG_FILES` in `./configure.ac`,
- mention "lib" in `SUBDIRS` in `Makefile.am`,



```

- mention "-I m4" in ACLOCAL_AMFLAGS in Makefile.am,
- invoke gl_EARLY in ./configure.ac, right after AC_PROG_CC,
- invoke gl_INIT in ./configure.ac.
~/src/libfoo$

```

By default, the source code is copied into `lib/` and the M4 macros in `m4/`. You can override these paths by using `--source-base=DIRECTORY` and `--m4-base=DIRECTORY`. Some modules also provide other files necessary for building. These files are copied into the directory specified by `'AC_CONFIG_AUX_DIR'` in `configure.ac` or by the `--aux-dir=DIRECTORY` option. If neither is specified, the current directory is assumed.

`gnuilib-tool` can make symbolic links instead of copying the source files. The option to specify for this is `'--symlink'`, or `'-s'` for short. This can be useful to save a few kilobytes of disk space. But it is likely to introduce bugs when `gnuilib` is updated; it is more reliable to use `'gnuilib-tool --update'` (see below) to update to newer versions of `gnuilib`. Furthermore it requires extra effort to create self-contained tarballs, and it may disturb some mechanism the maintainer applies to the sources. For these reasons, this option is generally discouraged.

`gnuilib-tool` will overwrite any preexisting files, in particular `Makefile.am`. It is also possible to separate the generated `Makefile.am` content (for building the `gnuilib` library) into a separate file, say `gnuilib.mk`, that can be included by your handwritten `Makefile.am`, but this is a more advanced use of `gnuilib-tool`.

Consequently, it is a good idea to choose directories that are not already used by your projects, to separate `gnuilib` imported files from your own files. This approach is also useful if you want to avoid conflicts between other tools (e.g., `gettextize` that also copy M4 files into your package. Simon Josefsson successfully uses a source base of `gl/`, and a M4 base of `gl/m4/`, in several packages.

After the `'--import'` option on the command line comes the list of Gnuilib modules that you want to incorporate in your package. The names of the modules coincide with the filenames in Gnuilib's `modules/` directory.

Some Gnuilib modules depend on other Gnuilib modules. `gnuilib-tool` will automatically add the needed modules as well; you need not list them explicitly. `gnuilib-tool` will also memorize which dependent modules it has added, so that when someday a dependency is dropped, the implicitly added module is dropped as well (unless you have explicitly requested that module).

If you want to cut a dependency, i.e., not add a module although one of your requested modules depends on it, you may use the option `'--avoid=module'` to do so. Multiple uses of this option are possible. Of course, you will then need to implement the same interface as the removed module.

A few manual steps are required to finish the initial import. `gnuilib-tool` printed a summary of these steps.

First, you must ensure Autoconf can find the macro definitions in `gnuilib-comp.m4`. Use the `ACLOCAL_AMFLAGS` specifier in your top-level `Makefile.am` file, as in:

```
ACLOCAL_AMFLAGS = -I m4
```

You are now ready to call the M4 macros in `gnuilib-comp.m4` from `configure.ac`. The macro `gl_EARLY` must be called as soon as possible after verifying that the C compiler is working. Typically, this is immediately after `AC_PROG_CC`, as in:

```

...
AC_PROG_CC
gl_EARLY
...

```

The core part of the gnuilib checks are done by the macro `gl_INIT`. Place it further down in the file, typically where you normally check for header files or functions. It must come after other checks which may affect the compiler invocation, such as `AC_MINIX`. For example:

```

...
# For gnuilib.
gl_INIT
...

```

`gl_INIT` will in turn call the macros related with the gnuilib functions, be it specific gnuilib macros, like `gl_FUNC_ALLOCA` or Autoconf or Automake macros like `AC_FUNC_ALLOCA` or `AM_FUNC_GETLINE`. So there is no need to call those macros yourself when you use the corresponding gnuilib modules.

You must also make sure that the gnuilib library is built. Add the `Makefile` in the gnuilib source base directory to `AC_CONFIG_FILES`, as in:

```
AC_CONFIG_FILES(... lib/Makefile ...)
```

You must also make sure that `make` will recurse into the gnuilib directory. To achieve this, add the gnuilib source base directory to a `SUBDIRS` `Makefile.am` statement, as in:

```
SUBDIRS = lib
```

or if you, more likely, already have a few entries in `SUBDIRS`, you can add something like:

```
SUBDIRS += lib
```

Finally, you have to add compiler and linker flags in the appropriate source directories, so that you can make use of the gnuilib library. Since some modules (`'getopt'`, for example) may copy files into the build directory, `top_builddir/lib` is needed as well as `top_srcdir/lib`. For example:

```

...
AM_CPPFLAGS = -I$(top_builddir)/lib -I$(top_srcdir)/lib
...
LDADD = lib/libgnu.a
...

```

Don't forget to `#include` the various header files. In this example, you would need to make sure that `'#include <string.h>'` is evaluated when compiling all source code files, that want to make use of `strdup`.

In the usual case where Autoconf is creating a `config.h` file, you should include `config.h` first, before any other include file. That way, for example, if `config.h` defines `'restrict'` to be the empty string on a non-C99 host, or a macro like `'_FILE_OFFSET_BITS'` that affects the layout of data structures, the definition is consistent for all include files. Also, on some platforms macros like `'_FILE_OFFSET_BITS'` and `'_GNU_SOURCE'` may be ineffective, or may have only a limited effect, if defined after the first system header file is included.

Finally, note that you cannot use `AC_LIBOBJ` or `AC_REPLACE_FUNCS` in your `configure.ac` and expect the resulting object files to be automatically added to

`lib/libgnu.a`. This is because your `AC_LIBOBJ` and `AC_REPLACE_FUNCS` invocations from `configure.ac` augment a variable `@LIBOBJ@` (and/or `@LTLIBOBJ@` if using Libtool), whereas `lib/libgnu.a` is built from the contents of a different variable, usually `@gl_LIBOBJ@` (or `@gl_LTLIBOBJ@` if using Libtool).

### 3.3 Modified imports

You can at any moment decide to use Gnuilib differently than the last time.

There are two ways to change how Gnuilib is used. Which one you'll use, depends on where you keep track of options and module names that you pass to `gnuilib-tool`.

- If you store the options and module names in a file under your own control, such as `autogen.sh`, `bootstrap`, `bootstrap.conf`, or similar, simply invoke `gnuilib-tool` again, with modified options and more or fewer module names.
- `gnuilib-tool` remembers which modules were used last time. If you want to rely on `gnuilib-tool`'s own memory of the last used options and module names, you can use the commands `gnuilib-tool --add-import` and `gnuilib-tool --remove-import`.

So, if you only want to use more Gnuilib modules, simply invoke `gnuilib-tool --add-import new-modules`. The list of modules that you pass after '`--add-import`' is *added* to the previous list of modules.

Similarly, if you want to use fewer Gnuilib modules, simply invoke `gnuilib-tool --remove-import unneeded-modules`. The list of modules that you pass after '`--remove-import`' is *removed* from the previous list of modules. Note that if a module is then still needed as dependency of other modules, it will be used nevertheless. If you want to *really* not use a module any more, regardless of whether other modules may need it, you need to use the '`--avoid`' option.

For other changes, such as different choices of '`--lib`', '`--source-base`' or '`--aux-dir`', the normal way is to modify manually the file `gnuilib-cache.m4` in the M4 macros directory, then launch '`gnuilib-tool --add-import`'.

The only change for which this doesn't work is a change of the '`--m4-base`' directory. Because, when you pass a different value of '`--m4-base`', `gnuilib-tool` will not find the previous `gnuilib-cache.m4` file any more. A possible solution is to manually copy the `gnuilib-cache.m4` into the new M4 macro directory.

In the `gnuilib-cache.m4` file, the macros have the following meaning:

#### `gl_MODULES`

The argument is a space separated list of the requested modules, not including dependencies.

#### `gl_AVOID`

The argument is a space separated list of modules that should not be used, even if they occur as dependencies. Corresponds to the '`--avoid`' command line argument.

#### `gl_SOURCE_BASE`

The argument is the relative file name of the directory containing the gnuilib source files (mostly `*.c` and `*.h` files). Corresponds to the '`--source-base`' command line argument.

- gl\_M4\_BASE**  
The argument is the relative file name of the directory containing the gnuilib M4 macros (\*.m4 files). Corresponds to the ‘`--m4-base`’ command line argument.
- gl\_TESTS\_BASE**  
The argument is the relative file name of the directory containing the gnuilib unit test files. Corresponds to the ‘`--tests-base`’ command line argument.
- gl\_LIB**  
The argument is the name of the library to be created. Corresponds to the ‘`--lib`’ command line argument.
- gl\_LGPL**  
The presence of this macro without arguments corresponds to the ‘`--lgpl`’ command line argument. The presence of this macro with an argument (whose value must be 2 or 3) corresponds to the ‘`--lgpl=arg`’ command line argument.
- gl\_LIBTOOL**  
The presence of this macro corresponds to the ‘`--libtool`’ command line argument and to the absence of the ‘`--no-libtool`’ command line argument. It takes no arguments.
- gl\_MACRO\_PREFIX**  
The argument is the prefix to use for macros in the `gnuilib-comp.m4` file. Corresponds to the ‘`--macro-prefix`’ command line argument.

### 3.4 Simple update

When you want to update to a more recent version of Gnuilib, without changing the list of modules or other parameters, a simple call does it:

```
$ gnuilib-tool --add-import
```

This will create, update or remove files, as needed.

Note: From time to time, changes are made in Gnuilib that are not backward compatible. When updating to a more recent Gnuilib, you should consult Gnuilib’s `NEWS` file to check whether the incompatible changes affect your project.

### 3.5 Changing your sources for use with Gnuilib

Gnuilib contains some header file overrides. This means that when building on systems with deficient header files in `/usr/include/`, it may create files named `string.h`, `stdlib.h`, `stdint.h` or similar in the build directory. In the other source directories of your package you will usually pass ‘`-I`’ options to the compiler, so that these Gnuilib substitutes are visible and take precedence over the files in `/usr/include/`.

These Gnuilib substitute header files rely on `<config.h>` being already included. Furthermore `<config.h>` must be the first include in every compilation unit. This means that to *all your source files* and likely also to *all your tests source files* you need to add an ‘`#include <config.h>`’ at the top. Which source files are affected? Exactly those whose compilation includes a ‘`-I`’ option that refers to the Gnuilib library directory.

This is annoying, but inevitable: On many systems, `<config.h>` is used to set system dependent flags (such as `_GNU_SOURCE` on GNU systems), and these flags have no effect after any system header file has been included.

### 3.6 Changing your link commands for use with Gnullib

When you use Gnullib, you need to augment the set of libraries against which your programs and libraries are linked. This is done by augmenting the Automake variable `LDADD` (for all programs) or `prog_LDADD` (for a single program `prog`) or `library_la_LIBADD` (for a single library `library.la`).

What do you need to add to this Automake variable?

1. The reference to the Gnullib library. In the example of section Section 3.2 [Initial import], page 18, this would be `lib/libgnu.a` for source in the top-level directory, or `../lib/libgnu.a` for source in a sibling directory of `lib/`.
2. References to additional libraries, brought in by some of the Gnullib modules that you use (directly or indirectly). The complete list of such libraries is printed when you invoke `gnullib-tool`. Alternatively, you can retrieve the set of additional libraries required by a specific Gnullib module by running

```
./gnullib-tool --extract-recursive-link-directive module
```

Beware: By looking into the module description file `modules/module` or by running

```
./gnullib-tool --extract-link-directive module
```

you would miss the link dependencies of indirectly used modules.

### 3.7 Finding recommended ISO C and POSIX function substitutes

Gnullib contains a wealth of portability workarounds for ISO C and POSIX functions. They are listed in detail in the chapter Chapter 10 [Function Substitutes], page 85. If you want to know which function substitutes are recommended for your package, you can search your source code for ISO C and POSIX functions that it uses and read the corresponding sections of said documentation chapter. But this is a tedious task. Here is an alternative approach that makes this task easier.

1. Add the Gnullib module `'posixcheck'` to the Gnullib imports of your package, as described earlier in this chapter.
2. Do a `make distclean` if you previously built in the top-level directory. Then regenerate the Autotools-generated parts of the package.
3. On a glibc system, build your package. Pay attention to the compiler warnings. Warnings are generated for uses of ISO C and POSIX functions that have portability problems or other important pitfalls and for which you have not yet imported the corresponding Gnullib module. If you get, say, a warning “warning: call to 'close' declared with attribute warning: close does not portably work on sockets - use gnullib module close for portability”, put `'close'` on your list of modules to import.
4. Add the modules you noted to the Gnullib imports of your package.
5. Optionally, you can do the same steps again, and make sure that there are no warnings left except those that you want to intentionally ignore.

6. Finally, remove the Gnuilib module ‘posixcheck’ from the Gnuilib imports, and run `make distclean`.

### 3.8 Modifying the build rules of a Gnuilib import directory

In some cases, you may want to set additional compiler options for use within the Gnuilib import directory. For example, the ‘relocatable’ module operates better if you define the C macros `ENABLE_COSTLY_RELOCATABLE` and `INSTALLDIR` during its compilation.

There are two ways to do so: Use of the `gnuilib-tool` option `--makefile-name`, and a kitchen-sink module.

With the `gnuilib-tool` option `--makefile-name`, you are telling `gnuilib-tool` to generate an includable `Makefile.am` portion, rather than a self-contained `Makefile.am`. For example, when you use `--makefile-name=Makefile.gnuilib`, `gnuilib-tool` will generate `Makefile.gnuilib`, and you will provide a hand-written `Makefile.am` that includes `Makefile.gnuilib` through a line such as

```
include Makefile.gnuilib
```

Before this include, you need to initialize this set of `Makefile.am` variables:

- `AUTOMAKE_OPTIONS`
- `SUBDIRS`
- `noinst_HEADERS`
- `noinst_LIBRARIES`
- `noinst_LTLIBRARIES`
- `pkgdata_DATA` (only with Automake  $\geq$  1.11.4)
- `EXTRA_DIST`
- `BUILT_SOURCES`
- `SUFFIXES`
- `MOSTLYCLEANFILES`
- `MOSTLYCLEANDIRS`
- `CLEANFILES`
- `DISTCLEANFILES`
- `MAINTAINERCLEANFILES`
- `AM_CPPFLAGS`
- `AM_CFLAGS`

`AUTOMAKE_OPTIONS` should be initialized as described in Section “Changing Automake’s Behavior” in *GNU Automake*. The other variables can be initialized to empty. However, you will most likely want to initialize some of them with non-empty values, in order to achieve the desired customization.

The other approach, the kitchen-sink module, is more advanced. See chapter Chapter 5 [Extending Gnuilib], page 42.

### 3.9 Building directly from the top-level directory

By default, the Gnuilib import directory will contain a generated `Makefile.am` file. After configuring, this produces a generated `Makefile` in this directory. As a consequence, the build from the top-level directory will use a recursive `make` invocation for this directory.

Some people prefer a build system where the `Makefile` in the top-level directory directly builds the artifacts in the subdirectories, without an intermediate `make` invocation. This is called “non-recursive make” and is supported by Automake. For more details, see <https://autotools.io/automake/nonrecursive.html>.

Gnuilib supports this flavour of build system too. To use it, pass two options to `gnuilib-tool`: `--makefile-name` and `--automake-subdir`.

With the `gnuilib-tool` option `--makefile-name`, you are telling `gnuilib-tool` to generate an includable `Makefile.am` portion in the Gnuilib import directory, rather than a self-contained `Makefile.am`. For example, when you use `--makefile-name=Makefile.gnuilib`, `gnuilib-tool` will generate `Makefile.gnuilib`.

With the option `--automake-subdir`, you are telling `gnuilib-tool` that you will include the generated file from the `Makefile.am` in the top-level directory, rather than from a `Makefile.am` in the same directory. For example, the top-level `Makefile.am` might contain this directive:

```
include lib/Makefile.gnuilib
```

The option `--automake-subdir` is also supported in combination with `--with-tests` (see Section 3.14 [Unit tests], page 31). Note that in this case, however, the generated unit tests directory will contain a `Makefile.am` and thus use a recursive `make` invocation. This is not a problem, since the built artifacts of your package have no dependencies towards the Gnuilib unit tests, nor vice versa.

### 3.10 Using Gnuilib for both a library and a program

Your project might build both a library and some accompanying programs in the same source tree. In that case you might want to use different modules for the library than for the programs. Typically the programs might want to make use of `getopt-posix` or `version-etc`, while the library wants to stay clear of these modules for technical or licensing reasons.

Let’s assume that your project contains a `lib` directory where the source of the library resides and a `src` directory for the sources of the programs as follows.

```
.
|-- configure.ac
|-- lib
|   |-- foo.c
|   `-- Makefile.am
|-- Makefile.am
`-- src
    |-- bar.c
    `-- Makefile.am
```

You can now add two instances of Gnuilib to your project in separate source trees:

```
~/src/libfoo$ gnuilib-tool --import --lib=libgnu --source-base=gnuilib \
--m4-base=gnuilib/m4 --macro-prefix=gl strndup
```

```
~/src/libfoo$ gnuilib-tool --import --lib=libgnutools \
               --source-base=src/gnuilib --m4-base=src/gnuilib/m4 \
               --macro-prefix=gl_tools getopt-gnu
```

The first one will import the module `strndup` in `gnuilib` and the second one will import `getopt-gnu` in `src/gnuilib` and you will end up with the following source tree (many files omitted in the interest of brevity):

```
.
|-- configure.ac
|-- gnuilib
|   |-- m4
|   |-- strndup.c
|-- lib
|   |-- foo.c
|   `-- Makefile.am
|-- Makefile.am
`-- src
    |-- bar.c
    |-- gnuilib
    |   |-- getopt.c
    |   |-- getopt.in.h
    |   |-- m4
    `-- Makefile.am
```

As discussed in Section 3.14 [Unit tests], page 31, you may not use ‘`--with-tests`’ for this project since the `configure.ac` is shared.

Integration with your code is basically the same as outlined in Section 3.2 [Initial import], page 18, with the one exception that you have to add both the macro `gl_EARLY` and the macro `gl_tools_EARLY` to your `configure.ac` (and of course also both macros `gl_INIT` and `gl_tools_INIT`). Obviously the name of the second macro is dependent on the value of the `--macro-prefix` option in your `gnuilib-tool` invocation.

```
...
AC_PROG_CC
gl_EARLY
gl_tools_EARLY
...
# For gnuilib.
gl_INIT
gl_tools_INIT
...
```

Also as outlined in Section 3.2 [Initial import], page 18, you will have to add compiler and linker flags. For the library you might have to add something along the line of the following to your `Makefile.am`:

```
...
AM_CPPFLAGS = -I$(top_srcdir)/gnuilib -I$(top_builddir)/gnuilib
...
libfoo_la_LIBADD = $(top_builddir)/gnuilib/libgnu.la
```



...

Correspondingly for the programs you will have to add something like this:

```
...
AM_CPPFLAGS = -I$(top_srcdir)/src/gnullib -I$(top_builddir)/src/gnullib
...
LDADD = $(top_builddir)/src/gnullib/libgnutools.la
...
```

The name of the library that you have pass in the linker option depends on the `--lib` option in `gnullib-tool` invocation.

### 3.11 Caveat: `gettextize` and `autopoint` users

The programs `gettextize` and `autopoint`, part of GNU `gettext`, import or update the internationalization infrastructure. Some of this infrastructure, namely ca. 20 Autoconf macro files and the `config.rpath` file, is also contained in Gnullib and may be imported by `gnullib-tool`. The use of `gettextize` or `autopoint` will therefore overwrite some of the files that `gnullib-tool` has imported, and vice versa.

Avoiding to use `gettextize` (manually, as package maintainer) or `autopoint` (as part of a script like `autoreconf` or `autogen.sh`) is not the solution: These programs also import the infrastructure in the `po/` and optionally in the `intl/` directory.

The copies of the conflicting files in Gnullib are more up-to-date than the copies brought in by `gettextize` and `autopoint`. When a new `gettext` release is made, the copies of the files in Gnullib will be updated immediately.

The choice of which version of `gettext` to require depends on the needs of your package. For a package that wants to comply to GNU Coding Standards, the steps are:

1. When you run `gettextize`, always use the `gettextize` from the matching GNU `gettext` release. For the most recent Gnullib checkout, this is the newest release found on <https://ftp.gnu.org/gnu/gettext/>. For an older Gnullib snapshot, it is the release that was the most recent release at the time the Gnullib snapshot was taken.
2. After running `gettextize`, invoke `gnullib-tool` and import the `gettext` module. Also, copy the latest version of gnullib's `build-aux/po/Makefile.in.in` to your `po/` directory (this is done for you if you use gnullib's `autogen.sh` script).
3. If you get an error message like `*** error: gettext infrastructure mismatch: using a Makefile.in.in from gettext version ... but the Autoconf macros are from gettext version ...`, it means that a new GNU `gettext` release was made, and its Autoconf macros were integrated into Gnullib and now mismatch the `po/` infrastructure. In this case, fetch and install the new GNU `gettext` release and run `gettextize` followed by `gnullib-tool`.

On the other hand, if your package is not as concerned with compliance to the latest standards, but instead favors development on stable environments, the steps are:

1. Determine the oldest version of `gettext` that you intend to support during development (at this time, gnullib recommends going no older than version 0.17). Run `autopoint` (not `gettextize`) to copy infrastructure into place (newer versions of `gettext` will install the older infrastructure that you requested).

2. Invoke `gnulib-tool`, and import the `gettext-h` module.

Regardless of which approach you used to get the infrastructure in place, the following steps must then be used to preserve that infrastructure (`gnulib`'s `autogen.sh` script follows these rules):

1. When a script of yours runs `autopoint`, invoke `gnulib-tool` afterwards.
2. When you invoke `autoreconf` after `gnulib-tool`, make sure to not invoke `autopoint` a second time, by setting the `AUTOPOINT` environment variable, like this:

```
$ env AUTOPOINT=true autoreconf --install
```

## 3.12 Handling Gnulib's own message translations

Gnulib provides some functions that emit translatable messages using GNU `gettext`. The '`gnulib`' domain at the Translation Project (<https://translationproject.org/>) collects translations of these messages, which you should incorporate into your own programs.

There are two basic ways to achieve this. The first, and older, method is to list all the source files you use from Gnulib in your own `po/POTFILES.in` file. This will cause all the relevant translatable strings to be included in your POT file. When you send this POT file to the Translation Project, translators will normally fill in the translations of the Gnulib strings from their "translation memory", and send you back updated PO files.

However, this process is error-prone: you might forget to list some source files, or the translator might not be using a translation memory and provide a different translation than another translator, or the translation might not be kept in sync between Gnulib and your package. It is also slow and causes substantial extra work, because a human translator must be in the loop for each language and you will need to incorporate their work on request.

For these reasons, a new method was designed and is now recommended. If you pass the `--po-base=directory` and `--po-domain=domain` options to `gnulib-tool`, then `gnulib-tool` will create a separate directory with its own `POTFILES.in`, and fetch current translations directly from the Translation Project (using `rsync` or `wget`, whichever is available). The POT file in this directory will be called `domain-gnulib.pot`, depending on the `domain` you gave to the `--po-domain` option (typically the same as the package name). This causes these translations to reside in a separate message domain, so that they do not clash either with the translations for the main part of your package nor with those of other packages on the system that use possibly different versions of Gnulib. When you use these options, the functions in Gnulib are built in such a way that they will always use this domain regardless of the default domain set by `textdomain`.

In order to use this method, you must—in each program that might use Gnulib code—add an extra line to the part of the program that initializes locale-dependent behavior. Where you would normally write something like:

```
setlocale (LC_ALL, "");
bindtextdomain (PACKAGE, LOCALEDIR);
textdomain (PACKAGE);
```

you should add an additional `bindtextdomain` call to inform `gettext` of where the MO files for the extra message domain may be found:

```
bindtextdomain (PACKAGE "-gnulib", LOCALEDIR);
```

(This example assumes that the *domain* that you specified to `gnulib-tool` is the same as the value of the `PACKAGE` preprocessor macro.)

Since you do not change the `textdomain` call, the default message domain for your program remains the same and your own use of `gettext` functions will not be affected.

### 3.13 Integration with Version Control Systems

If a project stores its source files in a version control system (VCS), such as CVS, Subversion, or Git, one needs to decide which files to commit.

In principle, all files created by `gnulib-tool`, except `gnulib-cache.m4`, can be treated like generated source files, like for example a `parser.c` file generated from `parser.y`. Alternatively, they can be considered source files and updated manually.

Here are the three different approaches in common use. Each has its place, and you should use whichever best suits your particular project and development methods.

1. In projects which commit all source files, whether generated or not, into their VCS, the `gnulib-tool` generated files should all be committed. In this case, you should pass the option ‘`--no-vc-files`’ to `gnulib-tool`, which avoids alteration of VCS-related files such as `.gitignore`.

Gnulib also contains files generated by `make` (and removed by `make clean`), using information determined by `configure`. For a Gnulib source file of the form `lib/foo.in.h`, the corresponding `lib/foo.h` is such a `make`-generated file. These should *not* be checked into the VCS, but instead added to `.gitignore` or equivalent.

2. In projects which customarily omit from their VCS all files that are generated from other source files, none of these files and directories are added into the VCS. As described in Section 3.3 [Modified imports], page 22, there are two ways to keep track of options and module names that are passed to `gnulib-tool`. The command for restoring the omitted files depends on it:
  - If they are stored in a file other than `gnulib-cache.m4`, such as `autogen.sh`, `bootstrap`, `bootstrap.conf`, or similar, the restoration command is the entire `gnulib-tool ... --import ...` invocation with all options and module names.
  - If the project relies on `gnulib-tool`’s memory of the last used options and module names, then the file `gnulib-cache.m4` in the M4 macros directory must be added to the VCS, and the restoration command is:

```
$ gnulib-tool --update
```

The ‘`--update`’ option operates much like the ‘`--add-import`’ option, but it does not offer the possibility to change the way Gnulib is used. Also it does not report in the `ChangeLogs` the files that it had to add because they were missing.

Most packages nowadays use the first among these two approaches. Over time, three ways of handling version control have evolved.

In the cases (A) and (B), a “git submodule” is used to reference the precise commit of the `gnulib` repository, so that each developer running ‘`./bootstrap --pull`’ or `autopull.sh` will get the same version of all `gnulib`-provided files.

The alternative is to always follow the newest Gnulib automatically. Note that this can cause breakages at unexpected moments, namely when a broken commit is pushed in Gnulib. It does not happen often, but it does happen.

- (A) In this approach, the developers use a git submodule manually.

The location of the submodule can be chosen to fit the package’s needs; here’s how to initially create the submodule in the directory `gnulib`:

```
$ git submodule add -- https://git.savannah.gnu.org/git/gnulib.git gnulib
```

Thereafter, the developer will run this command to update the submodule to the recorded checkout level:

```
$ git submodule update --init gnulib
```

Use this sequence to update to a newer version of gnulib:

```
$ git submodule update --remote gnulib
$ git add gnulib
$ ./bootstrap --bootstrap-sync
```

If multiple submodules are used, the following may be useful:

```
$ git config alias.syncsub "submodule foreach git pull origin master"
$ git syncsub
```

- (B) In this approach, the `build-aux/bootstrap` or `autopull.sh` program (see Section 20.3 [Developer tools], page 859) is used to aid a developer in using this setup. You copy this program (and if it’s `autopull.sh`, its companion files) into your package and place the copy or copies under version control. The program can be customized using `bootstrap.conf` which you also put under version control.
- (C) In this approach, you write the `autopull.sh` and `autogen.sh` files by hand. `autopull.sh` is most easily written as a script that invokes

```
./gitsub.sh pull || exit 1
```

where `gitsub.sh` is described in Section 20.3 [Developer tools], page 859.

`autogen.sh` typically contains an explicit `gnulib-tool` invocation, followed by

```
aclocal -I m4 \
  && autoconf \
  && autoheader && touch config.h.in \
  && automake --add-missing --copy \
  && rm -rf autom4te.cache \
  || exit $?
```

3. Some projects take a “middle road”: they do commit Gnulib source files as in the first approach, but they do not commit other derived files, such as a `Makefile.in` generated by Automake. This increases the size and complexity of the repository, but can help occasional contributors by not requiring them to have a full Gnulib checkout to do a build, and all developers by ensuring that all developers are working with the same version of Gnulib in the repository. It also supports multiple Gnulib instances within a project. It remains important not to commit the `make`-generated files, as described above.

### 3.14 Bundling the unit tests of the Gnulib modules

You can bundle the unit tests of the Gnulib modules together with your package, through the ‘`--with-tests`’ option. Together with ‘`--with-tests`’, you also specify the directory for these tests through the ‘`--tests-base`’ option. Of course, you need to add this directory to the `SUBDIRS` variable in the `Makefile.am` of the parent directory.

The advantage of having the unit tests bundled is that when your program has a problem on a particular platform, running the unit tests may help determine quickly if the problem

is on Gnuilib’s side or on your package’s side. Also, it helps verifying Gnuilib’s portability, of course.

The unit tests will be compiled and run when the user runs ‘`make check`’. When the user runs only ‘`make`’, the unit tests will not be compiled.

In the `SUBDIRS` variable, it is useful to put the Gnuilib tests directory after the directory containing the other tests, not before:

```
SUBDIRS = gnuilib-lib src man tests gnuilib-tests
```

This will ensure that on platforms where there are test failures in either directory, users will see and report the failures from the tests of your program.

Note: In packages which use more than one invocation of `gnuilib-tool` in the scope of the same `configure.ac`, you cannot use ‘`--with-tests`’. You will have to use a separate `configure.ac` in this case.

### 3.15 Avoiding unnecessary checks and compilations

In some cases, a module is needed by another module only on specific platforms. But when a module is present, its Autoconf checks are always executed, and its `Makefile.am` additions are always enabled. So it can happen that some Autoconf checks are executed and some source files are compiled, although no other module needs them on this particular platform, just *in case* some other module would need them.

The option ‘`--conditional-dependencies`’ enables an optimization of configure checks and `Makefile.am` snippets that avoids this. With this option, whether a module is considered “present” is no longer decided when `gnuilib-tool` is invoked, but later, when `configure` is run. This applies to modules that were added as dependencies while `gnuilib-tool` was run; modules that were passed on the command line explicitly are always “present”.

For example, the `timegm` module needs, on platforms where the system’s `timegm` function is missing or buggy, a replacement that is based on a function `mktime_internal`. The module `mktime-internal` that provides this function provides it on all platforms. So, by default, the file `mktime-internal.c` will be compiled on all platforms, even on `glibc` and `BSD` systems which have a working `timegm` function. When the option ‘`--conditional-dependencies`’ is given, on the other hand, and if `mktime-internal` was not explicitly required on the command line, the file `mktime-internal.c` will only be compiled on the platforms where the `timegm` needs them.

Conditional dependencies are specified in the module description by putting the condition on the same line as the dependent module, enclosed in brackets. The condition is a boolean shell expression that can assume that the `configure.ac` snippet from the module description has already been executed. In the example above, the dependency from `timegm` to `mktime-internal` is written like this:

```
Depends-on:
...
mktime-internal [test $HAVE_TIMEGM = 0 || test $REPLACE_TIMEGM = 1]
...
```

Note: The option ‘`--conditional-dependencies`’ cannot be used together with the option ‘`--with-tests`’. It also cannot be used when a package uses `gnuilib-tool` for

several subdirectories, with different values of `'--source-base'`, in the scope of a single `configure.ac` file.

## 4 Writing modules

This chapter explains how to write modules of your own, either to extend Gnulib for your own package (see Chapter 5 [Extending Gnulib], page 42), or for inclusion in gnulib proper.

The guidelines in this chapter do not necessarily need to be followed for using `gnulib-tool`. They merely represent a set of good practices. Following them will result in a good structure of your modules and in consistency with gnulib.

### 4.1 Source code files

Every API (C functions or variables) provided should be declared in a header file (`.h` file) and implemented in one or more implementation files (`.c` files). The separation has the effect that users of your module need to read only the contents of the `.h` file and the module description in order to understand what the module is about and how to use it—not the entire implementation. Furthermore, users of your module don't need to repeat the declarations of the functions in their code, and are likely to receive notification through compiler errors if you make incompatible changes to the API (like, adding a parameter or changing the return type of a function).

### 4.2 Header files

The `.h` file should declare the C functions and variables that the module provides.

The `.h` file should be stand-alone. That is, it does not require other `.h` files to be included before. Rather, it includes all necessary `.h` files by itself.

It is a tradition to use CPP tricks to avoid parsing the same header file more than once, which might cause warnings. The trick is to wrap the content of the header file (say, `foo.h`) in a block, as in:

```
#ifndef FOO_H
# define FOO_H
...
body of header file goes here
...
#endif /* FOO_H */
```

Whether to use `FOO_H` or `_FOO_H` is a matter of taste and style. The C99 and C11 standards reserve all identifiers that begin with an underscore and either an uppercase letter or another underscore, for any use. Thus, in theory, an application might not safely assume that `_FOO_H` has not already been defined by a library. On the other hand, using `FOO_H` will likely lead the higher risk of collisions with other symbols (e.g., `KEY_H`, `XK_H`, `BPF_H`, which are CPP macro constants, or `COFF_LONG_H`, which is a CPP macro function). Your preference may depend on whether you consider the header file under discussion as part of the application (which has its own namespace for CPP symbols) or a supporting library (that shouldn't interfere with the application's CPP symbol namespace).

Adapting C header files for use in C++ applications can use another CPP trick, as in:

```
# ifdef __cplusplus
extern "C"
```

```

{
# endif
...
body of header file goes here
...
# ifdef __cplusplus
}
# endif

```

The idea here is that `__cplusplus` is defined only by C++ implementations, which will wrap the header file in an `'extern "C"'` block. Again, whether to use this trick is a matter of taste and style. While the above can be seen as harmless, it could be argued that the header file is written in C, and any C++ application using it should explicitly use the `'extern "C"'` block itself. Your preference might depend on whether you consider the API exported by your header file as something available for C programs only, or for C and C++ programs alike.

Note that putting a `#include` in an `extern "C" { ... }` block yields a syntax error in C++ mode on some platforms (e.g., glibc systems with g++ v3.3 to v4.2, AIX, IRIX). For this reason, it is recommended to place the `#include` before the `extern "C"` block.

### 4.3 Implementation files

The `.c` file or files implement the functions and variables declared in the `.h` file.

#### Include ordering

Every implementation file must start with `'#include <config.h>'`. This is necessary for activating the preprocessor macros that are defined on behalf of the Autoconf macros. Some of these preprocessor macros, such as `_GNU_SOURCE`, would have no effect if defined after a system header file has already been included.

Then comes the `'#include "..."'` specifying the header file that is being implemented. Putting this right after `'#include <config.h>'` has the effect that it verifies that the header file is self-contained.

Then come the system and application headers. It is customary to put all the system headers before all application headers, so as to minimize the risk that a preprocessor macro defined in an application header confuses the system headers on some platforms.

In summary:

- First comes `#include <config.h>`.
- Second comes the `#include "..."` specifying the module being implemented.
- Then come all the `#include <...>` of system or system-replacement headers, in arbitrary order.
- Then come all the `#include "..."` of gnuilib and application headers, in arbitrary order.

### 4.4 Specification

The specification of a function should answer at least the following questions:

- What is the purpose of the function?



- What are the arguments?
- What is the return value?
- What happens in case of failure? (Exit? A specific return value? Errno set?)
- Memory allocation policy: If pointers to memory are returned, are they freshly allocated and supposed to be freed by the caller?

Where to put the specification describing exported functions? Three practices are used in gnuilib:

- The specification can be as comments in the header file, just above the function declaration.
- The specification can be as comments in the implementation file, just above the function definition.
- The specification can be in texinfo format, so that it gets included in the gnuilib manual.

In any case, the specification should appear in just one place, unless you can ensure that the multiple copies will always remain identical.

The advantage of putting it in the header file is that the user only has to read the include file normally never needs to peek into the implementation file(s).

The advantage of putting it in the implementation file is that when reviewing or changing the implementation, you have both elements side by side.

The advantage of texinfo formatted documentation is that it is easily published in HTML or Info format.

Currently (as of 2020), 70% of gnuilib uses the first practice, 25% of gnuilib uses the second practice, and a small minority uses the texinfo practice.

## 4.5 Module description

For the module description, you can start from an existing module's description, or from a blank one: `module/TEMPLATE` for a normal module, or `module/TEMPLATE-TESTS` for a unit test module. Some more fields are possible but rarely used. Use `module/TEMPLATE-EXTENDED` if you want to use one of them.

Module descriptions have the following fields. Absent fields are equivalent to fields with empty contents.

### Description

This field should contain a concise description of the module's functionality. One sentence is enough. For example, if it defines a single function `'frob'`, the description can be `'frob() function: frobnication.'` Gnuilib's documentation generator will automatically convert the first part to a hyperlink when it has this form.

### Status

This field is either empty/absent, or contains the word `'obsolete'`. In the latter case, `gnuilib-tool` will, unless the option `--with-obsolete` is given, omit it when it used as a dependency. It is good practice to also notify the user about an obsolete module. This is done by putting into the `'Notice'` section (see below) text like `'This module is obsolete.'`

**Notice** This field contains text that `gnulib-tool` will show to the user when the module is used. This can be a status indicator like ‘`This module is obsolete.`’ or additional advice. Do not abuse this field.

#### Applicability

This field is either empty/absent, or contains the word ‘`all`’. It describes to which `Makefile.am` the module is applied. By default, a normal module is applied to `source_base/Makefile.am` (normally `lib/Makefile.am`), whereas a module ending in `-tests` is applied to `tests_base/Makefile.am` (normally `tests/Makefile.am`). If this field is ‘`all`’, it is applied to both `Makefile.am`s. This is useful for modules which provide `Makefile.am` macros rather than compiled source code.

**Files** This field contains a newline separated list of the files that are part of the module. `gnulib-tool` copies these files into the package that uses the module. This list is typically ordered by importance: First comes the header file, then the implementation files, then other files.

It is possible to have the same file mentioned in multiple modules. That is, if the maintainers of that module agree on the purpose and future of said file.

#### Depends-on

This field contains a newline separated list of the modules that are required for the proper working of this module. `gnulib-tool` includes each required module automatically, unless it is specified with option `--avoid` or it is marked as obsolete and the option `--with-obsolete` is not given.

A test modules `foo-tests` implicitly depends on the corresponding non-test module `foo`. `foo` implicitly depends on `foo-tests` if the latter exists and if the option `--with-tests` has been given.

Tests modules can depend on non-tests modules. Non-tests modules should not depend on tests modules. (Recall that tests modules are built in a separate directory.)

Each listed required module may be declared a conditional dependency. This is indicated by placing the condition for the dependency on the same line, enclosed in brackets, after the name of the required module. The condition is a shell expression that is run after the module’s `configure.ac` statements. For example:

```
strtoull    [test $ac_cv_func_strtoumax = no]
```

Lines starting with `#` are recognized as comments and are ignored.

#### configure.ac-early

This field contains `configure.ac` stuff (Autoconf macro invocations and shell statements) that are logically placed early in the `configure.ac` file: right after the `AC_PROG_CC` invocation. This section is adequate for statements that modify `CPPFLAGS`, as these can affect the results of other Autoconf macros.

#### configure.ac

This field contains `configure.ac` stuff (Autoconf macro invocations and shell statements).

It is forbidden to add items to the `CPPFLAGS` variable here, other than temporarily, as these could affect the results of other Autoconf macros.

We avoid adding items to the `LIBS` variable, other than temporarily. Instead, the module can export an Autoconf-substituted variable that contains link options. The user of the module can then decide to which executables to apply which link options. Recall that a package can build executables of different kinds and purposes; having all executables link against all libraries is inappropriate.

If the statements in this section grow larger than a couple of lines, we recommend moving them to a `.m4` file of their own.

#### Makefile.am

This field contains `Makefile.am` statements. Variables like `lib_SOURCES` are transformed to match the name of the library being built in that directory. For example, `lib_SOURCES` may become `libgnu_a_SOURCES` (for a plain library) or `libgnu_la_SOURCES` (for a libtool library). Therefore, the normal way of having an implementation file `lib/foo.c` compiled unconditionally is to write

```
lib_SOURCES += foo.c
```

#### Include

This field contains the preprocessor statements that users of the module need to add to their source code files. Typically it's a single include statement. A shorthand is allowed: You don't need to write the word `"#include"`, just the name of the include file in the way it will appear in an include statement. Example:

```
"foo.h"
```

#### Link

This field contains the set of libraries that are needed when linking libraries or executables that use this module. Often this will be written as a reference to a Makefile variable. Please write them one per line, so that `gnulib-tool` can remove duplicates when presenting a summary to the user. Example:

```
$(POW_LIBM)
$(LTLIBICONV) when linking with libtool, $(LIBICONV) otherwise
```

When this field is omitted, it defaults to the union of the `Link` field of the dependencies.

#### License

This field specifies the license that governs the source code parts of this module. See Section 2.8 [Copyright], page 16, for details. Be sure to place, in every source code file, a copyright notice and the appropriate license notice, taken from the `etc/license-notices/` directory.

#### Maintainer

This field specifies the persons who have a definitive say about proposed changes to this module. You don't need to mention email addresses here: they can be inferred from the `ChangeLog` file.

Please put at least one person here. We don't like unmaintained modules.

## 4.6 Autoconf macros

For a module `foo`, an Autoconf macro file `m4/foo.m4` is typically created when the Autoconf macro invocations for the module are longer than one or two lines.

The name of the main entry point into this Autoconf macro file is typically `gl_FOO`. For modules outside GnuLib that are not likely to be moved into GnuLib, please use a prefix specific to your package: `gt_` for GNU gettext, `cu_` for GNU coreutils, etc.

For modules that define a function `foo`, the entry point is called `gl_FUNC_FOO` instead of `gl_FOO`. For modules that provide a header file with multiple functions, say `foo.h`, the entry point is called `gl_FOO_H` or `gl_HEADER_FOO_H`. This convention is useful because sometimes a header and a function name coincide (for example, `fcntl` and `fcntl.h`).

For modules that provide a replacement, it is useful to split the Autoconf macro into two macro definitions: one that detects whether the replacement is needed and requests the replacement by setting a `HAVE_FOO` variable to 0 or a `REPLACE_FOO` variable to 1 (this is the entry point, say `gl_FUNC_FOO`), and one that arranges for the macros needed by the replacement code `lib/foo.c` (typically called `gl_PREREQ_FOO`). The reason of this separation is

1. to make it easy to update the Autoconf macros when you have modified the source code file: after changing `lib/foo.c`, all you have to review is the `Depends-on` section of the module description and the `gl_PREREQ_FOO` macro in the Autoconf macro file.
2. The Autoconf macros are often large enough that splitting them eases maintenance.

## 4.7 Making proper use of AC\_LIBOBJ

Source files that provide a replacement should be only compiled on the platforms that need this replacement. While it is actually possible to compile a `.c` file whose contents is entirely `#ifdef`'ed out on the platforms that don't need the replacement, this practice is discouraged because

- It makes the build time longer than needed, by invoking the compiler for nothing.
- It produces a `.o` file that suggests that a replacement was needed.
- Empty object files produce a linker warning on some platforms: MSVC.

The typical idiom for invoking `AC_LIBOBJ` is thus the following, in the module description:

```
if test $HAVE_FOO = 0 || test $REPLACE_FOO = 1; then
  AC_LIBOBJ([foo])
  gl_PREREQ_FOO
fi
```

Important: Do not place `AC_LIBOBJ` invocations in the Autoconf macros in the `m4/` directory. The purpose of the Autoconf macros is to determine what features or bugs the platform has, and to make decisions about which replacements are needed. The purpose of the `configure.ac` and `Makefile.am` sections of the module descriptions is to arrange for the replacements to be compiled. **Source file names do not belong in the `m4/` directory.**

When an `AC_LIBOBJ` invocation is unconditional, it is simpler to just have the source file compiled through an Automake variable augmentation: In the `Makefile.am` section write

```
lib_SOURCES += foo.c
```

When a module description contains an `AC_LIBOBJ([foo])` invocation, you **must** list the source file `lib/foo.c` in the `Files` section. This is needed even if the module depends on another module that already lists `lib/foo.c` in its `Files` section – because your module might be used among the test modules (in the directory specified through `'--tests-base'`) and the other module among the main modules (in the directory specified

through ‘`--source-base`’), and in this situation, the `AC_LIBOBJ([foo])` of your module can only be satisfied by having `foo.c` be present in the tests source directory as well.

## 4.8 Unit test modules

A unit test that is a simple C program usually has a module description as simple as this:

```
Files:
tests/test-foo.c
tests/macros.h

Depends-on:

configure.ac:

Makefile.am:
TESTS += test-foo
check_PROGRAMS += test-foo
```

The test program `tests/test-foo.c` often has the following structure:

- First comes the obligatory ‘`#include <config.h>`’.
- Second comes the include of the header file that declares the API being tested. Including it here verifies that said header file is self-contained.
- Then come other includes. In particular, the file `macros.h` is often used here. It contains a convenient `ASSERT` macro.

The body of the test, then, contains many `ASSERT` invocations. When a test fails, the `ASSERT` macro prints the line number of the failing statement, thus giving you, the developer, an idea of which part of the test failed, even when you don’t have access to the machine where the test failed and the reporting user cannot run a debugger.

Sometimes it is convenient to write part of the test as a shell script. (For example, in areas related to process control or interprocess communication, or when different locales should be tried.) In these cases, the typical module description is like this:

```
Files:
tests/test-foo.sh
tests/test-foo.c
tests/macros.h

Depends-on:

configure.ac:

Makefile.am:
TESTS += test-foo.sh
TESTS_ENVIRONMENT += FOO_BAR='@FOO_BAR@'
check_PROGRAMS += test-foo
```

Here, the `TESTS_ENVIRONMENT` variable can be used to pass values determined by `configure` or by the `Makefile` to the shell script, as environment variables. The Autoconf values `EXEEXT` and `srcdir` are already provided as environment variables, through an initial value of `TESTS_ENVIRONMENT` that `gnulib-tool` puts in place.

Regardless of the specific form of the unit test, the following guidelines should be respected:

- A test indicates success by exiting with exit code 0. It should normally not produce output in this case. (Output to temporary files that are cleaned up at the end of the test are possible, of course.)
- A test indicates failure by exiting with an exit code different from 0 and 77, typically 1. It is useful to print a message about the failure in this case. The `ASSERT` macro already does so.
- A test indicates "skip", that is, that most of its interesting functionality could not be performed, through a return code of 77. A test should also print a message to stdout or stderr about the reason for skipping. For example:

```
    fputs ("Skipping test: multithreading not enabled\n", stderr);  
    return 77;
```

Such a message helps detecting bugs in the autoconf macros: A simple message `'SKIP: test-foo'` does not sufficiently catch the attention of the user.

## 4.9 Incompatible changes

Incompatible changes to Gnulib modules should be mentioned in Gnulib's `NEWS` file. Incompatible changes here mean that existing source code may not compile or work any more.

We don't mean changes in the binary interface (ABI), since

1. Gnulib code is used in source-code form.
2. The user who distributes libraries that contain Gnulib code is supposed to bump the version number in the way described in the Libtool documentation before every release.

## 5 Extending Gnulib

Gnulib modules are intended to be suitable for widespread use. Most problems with Gnulib can and should be fixed in a generic way, so that all of Gnulib’s users can benefit from the change. But occasionally a problem arises that is difficult or undesirable to fix generically, or a project that uses Gnulib may need to work around an issue before the Gnulib maintainers commit a final fix. Maintainers may also want to add their own pools of modules to projects as Gnulib “staging areas.”

The obvious way to make local changes to Gnulib modules is to use `gnulib-tool` to check out pristine modules, then to modify the results in-place. This works well enough for short-lived experiments. It is harder to keep modified versions of Gnulib modules for a long time, even though Git (or another distributed version control systems) can help out a lot with this during the development process.

Git, however, doesn’t address the distribution issue. When a package “foobar” needs a modified version of, say, `stdint.in.h`, it either has to put a comment into `foobar/autogen.sh` saying “Attention! This doesn’t work with a pristine Gnulib, you need this and that patch after checking out Gnulib,” or it has to use the `--avoid=stdint` option and provide the modified `stdint` module in a different directory.

The `--local-dir` option to `gnulib-tool` solves this problem. It allows the package to override or augment Gnulib. This means:

- You can store files that are to override Gnulib files or modules.
- You can store context diffs to be applied to Gnulib files.
- You can add modules of your own, that are not (yet) in Gnulib.
- You can also add unstructured amounts of code to the library, by grouping the non-Gnulib files of the library in a single kitchen-sink “module.” (This kind of kitchen-sink module is not needed when you use the `gnulib-tool` option `--makefile-name`.)

In a release tarball, you can distribute the contents of this `--local-dir` directory that will be combinable with newer versions of Gnulib, barring incompatible changes to Gnulib.

If the `--local-dir=directory` option is specified, then `gnulib-tool` looks in `directory` whenever it reads a file from the Gnulib directory. Suppose `gnulib-tool` is looking for `file`. Then:

- If `directory/file` exists, then `gnulib-tool` uses it instead of the file included in Gnulib.
- Otherwise, if `directory/file.diff` exists, then `gnulib-tool` uses the file from Gnulib after applying the diff using the `patch` program.
- Otherwise, `gnulib-tool` uses the file included in Gnulib.

You can specify the `--local-dir` multiple times. In this case, the first specified directory has the highest precedence. That is, a `file` found in one directory will shadow any `file` and `file.diff` in the later directories and in the Gnulib directory. And a file `file.diff` found in one directory will be applied on top of the combination of `file` and `file.diff` files found in the later directories and in the Gnulib directory.

Please make wise use of this option. It also allows you to easily hold back modifications you make to Gnulib macros in cases it may be better to share them.

## 6 Miscellaneous Notes

### 6.1 Out of memory handling

The glibc API does not have a standard error code for the out of memory error condition. Instead of adding a non-standard error code, glibc has chosen to adopt a different strategy. Out of memory handling happens in rare situations, but performing the out of memory error handling after almost all API function invocations pollute your source code and might make it harder to spot more serious problems. The strategy chosen improves code readability and robustness.

For most applications, aborting the application with an error message when the out of memory situation occurs is the best that can be wished for. This is how the library behaves by default (using the ‘`xalloc-die`’ module).

However, we realize that some applications may not want to abort execution in any situation. Glibc supports a hook to let the application regain control and perform its own cleanups when an out of memory situation has occurred. The application can define a function (having a `void` prototype, i.e., no return value and no parameters) and set the library variable `xalloc_die` to that function. The variable should be declared as follows.

```
extern void (*xalloc_die) (void);
```

Glibc will invoke this function if an out of memory error occurs. Note that the function should not return. Of course, care must be taken to not allocate more memory, as that will likely also fail.

### 6.2 Obsolete modules

Modules can be marked obsolete. This means that the problems they fix don’t occur any more on the platforms that are reasonable porting targets now. `glibc-tool` warns when obsolete modules are mentioned on the command line, and by default ignores dependencies from modules to obsolete modules. When you pass the option `--with-obsolete` to `glibc-tool`, dependencies to obsolete modules will be included, however, unless blocked through an `--avoid` option. This option is useful if your package should be portable even to very old platforms.

In order to mark a module obsolete, you need to add this to the module description:

```
Status:
obsolete
```

```
Notice:
This module is obsolete.
```

### 6.3 Extra tests modules

Test modules can be marked with some special status attributes. When a test module has such an attribute, `glibc-tool --import` will not include it by default.

The supported status attributes are:

```
c++-test Indicates that the test is testing C++ interoperability. Such a test is useful in a
C++ or mixed C/C++ package, but is useless in a C package.
```



**longrunning-test**

Indicates that the test takes a long time to compile or execute (more than five minutes or so). Such a test is better avoided in a release that is made for the general public.

**privileged-test**

Indicates that the test will request special privileges, for example, ask for the superuser password. Such a test may hang when run non-interactively and is therefore better avoided in a release that is made for the general public.

**unportable-test**

Indicates that the test is known to fail on some systems, and that there is no workaround about it. Such a test is better avoided in a release that is made for the general public.

`gnulib-tool --import --with-tests` will not include tests marked with these attributes by default. When `gnulib-tool` is invoked with one of the options `--with-c++-tests`, `--with-longrunning-tests`, `--with-privileged-tests`, `--with-unportable-tests`, it will include tests despite the corresponding special status attribute. When `gnulib-tool` receives the option `--with-all-tests`, it will include all tests regardless of their status attributes.

`gnulib-tool --create-testdir --with-tests` and `gnulib-tool --create-megatestdir --with-tests` by default include all tests of modules specified on the command line, regardless of their status attributes. Tests of modules occurring as dependencies are not included by default if they have one of these status attributes. The options `--with-c++-tests`, `--with-longrunning-tests`, `--with-privileged-tests`, `--with-unportable-tests` are recognized here as well. Additionally, `gnulib-tool` also understands the options `--without-c++-tests`, `--without-longrunning-tests`, `--without-privileged-tests`, `--without-unportable-tests`.

In order to mark a module with a status attribute, you need to add it to the module description, like this:

```
Status:
longrunning-test
```

If only a part of a test deserves a particular status attribute, you can split the module into a primary and a secondary test module, say `foo-tests` and `foo-extra-tests`. Then add a dependency from `foo-tests` to `foo-extra-tests`, and mark the `foo-extra-tests` with the particular status attribute.

## 6.4 Modules that modify the way other modules work

The normal way to design modules is that each module has its own code, and the module dependencies provide the facilities on which this code can rely. But sometimes it is necessary to use more advanced techniques. For example:

- You may want to have optional module dependencies: Let module A use facilities provided by module B, if module B is present, but without requiring that module B is present.
- A module can indicate support for particular behaviours. For example, Gnulib has a module `'sigpipe'` that requests POSIX compatible SIGPIPE behaviour from all other

modules – something that is not enabled by default. Or consider the ‘nonblocking’ module, that is an indicator that all I/O functions should handle non-blocking file descriptors – something that, equally, is not enabled by default.

- A module can indicate to other modules that they can rely on certain guarantees, and thus omit specific code. For example, when Gnulib’s ‘malloc-gnu’ module is present, you can omit code that test `n` against zero when you call `malloc (n)`.

Be aware that these advanced techniques likely cause breakage in the situation of multiple `gnulib-tool` invocations in the scope of a single `configure` file. This is because the question “is module B present?” does not have a unique answer in such situations. `gnulib-tool` has support for these techniques in the situation of `--create-testdir --single-configure`, which basically has two `gnulib-tool` invocations, one for a set of modules that end up in `gllib`, and one for the set of modules that end up in `gltests`. But you should be aware that this does not cover the general situation.

Which technique to use, depends on the answer to the question: “If my module occurs among the modules of `gltests`, should it have an effect on the modules in `gllib`?”

If the answer is “no”, your module description should invoke the Autoconf macro `gl_MODULE_INDICATOR`. This Autoconf macro takes one argument: the name of your module. The effect of `gl_MODULE_INDICATOR([my-module])` is to define, in `config.h`, a C macro `GNULIB_MY_MODULE` that indicates whether your macro is considered to be present. This works even when your macro is used in `gltests`: `GNULIB_MY_MODULE` will then evaluate to 1 in `gltests` but to 0 in `gllib`.

If the answer is “yes”, you have two techniques available. The first one is to invoke a similar Autoconf macro, named `gl_MODULE_INDICATOR_FOR_TESTS`. It works similarly. However, when your macro is used in `gltests`, `GNULIB_MY_MODULE` will evaluate to 1 both in `gltests` and in `gllib`.

The second one is to define a shell variable in the `configure` file that tells whether your module is present, through use of `m4_divert_text`. The Autoconf macros of a dependency module will initialize this shell variable, through ‘`m4_divert_text([DEFAULTS], [my_shell_var=no])`’. The Autoconf macros of your module will override this value, through ‘`m4_divert_text([INIT_PREPARE], [my_shell_var=yes])`’. Then you can use `my_shell_var` in the Autoconf macros of both modules. You can find more details about this technique in the Gnulib module `getopt-gnu`.

Reminder: These techniques are advanced. They have the potential to cause lots of headaches if you apply them incorrectly.

## 6.5 A C++ namespace for gnulib

The function definitions provided by Gnulib (`.c` code) are meant to be compiled by a C compiler. The header files (`.h` files), on the other hand, can be used in either C or C++.

By default, when used in a C++ compilation unit, the `.h` files declare the same symbols and overrides as in C mode, except that functions defined by Gnulib or by the system are declared as ‘`extern "C"`’.

It is also possible to indicate to Gnulib to provide many of its symbols in a dedicated C++ namespace. If you define the macro `GNULIB_NAMESPACE` to an identifier, many functions will

be defined in the namespace specified by the identifier instead of the global namespace. For example, after you have defined

```
#define GNULIB_NAMESPACE gnuilib
```

at the beginning of a compilation unit, Gnuilib’s `<fcntl.h>` header file will make available the `open` function as `gnuilib::open`. The symbol `open` will still refer to the system’s `open` function, with its platform specific bugs and limitations.

The symbols provided in the Gnuilib namespace are those for which the corresponding header file contains a `_GL_CXXALIAS_RPL` or `_GL_CXXALIAS_SYS` macro invocation.

The benefits of this namespace mode are:

- Gnuilib defines fewer symbols as preprocessor macros. For example, on a platform where `open` has to be overridden, Gnuilib normally does `#define open rpl_open`. If your package has a class with a member `open`, for example a class `foo` with a method `foo::open`, then if you define this member in a compilation unit that includes `<fcntl.h>` and use it in a compilation unit that does not include `<fcntl.h>`, or vice versa, you will get a link error. Worse: You will not notice this problem on the platform where the system’s `open` function works fine. This problem goes away in namespace mode.
- It provides a safety check whether the set of modules your package requests from Gnuilib is sufficient. For example, if you use the function `gnuilib::open` in your code, and you forgot to request the module ‘`open`’ from Gnuilib, you will get a compilation error (regardless of the platform).

The drawback of this namespace mode is that the system provided symbols in the global namespace are still present, even when they contain bugs that Gnuilib fixes. For example, if you call `open ( . . . )` in your code, it will invoke the possibly buggy system function, even if you have requested the module ‘`open`’ from `gnuilib-tool`.

You can turn on the namespace mode in some compilation units and keep it turned off in others. This can be useful if your package consists of an application layer that does not need to invoke POSIX functions and an operating system interface layer that contains all the OS function calls. In such a situation, you will want to turn on the namespace mode for the application layer—to avoid many preprocessor macro definitions—and turn it off for the OS interface layer—to avoid the drawback of the namespace mode, mentioned above.

## 6.6 License Texinfo sources

Gnuilib provides copies of the GNU GPL, GNU LGPL, GNU Affero GPL, and GNU FDL licenses in Texinfo form. (The master location is <https://www.gnu.org/licenses/>). These Texinfo documents do not have any node names and structures built into them; for your manual, you should `@include` them in an appropriate `@node`.

The conventional name for the GPL node is ‘`Copying`’ and for the FDL ‘`GNU Free Documentation License`’. The LGPL doesn’t seem to have a conventional node name.

Of course the license texts themselves should not be changed at all.

The recommended way to make use of these license files, consistently with current practice, is as follows:

- The code license (GNU GPL, GNU LGPL, or GNU Affero GPL) is usually present as a file in the top-level directory. This is true not only for the release tarballs,

but also in the VCS repository. The file is typically named ‘COPYING’ for the GNU GPL, or ‘COPYING.LIB’ or ‘COPYING.LESSER’ for the GNU LGPL. The presence of this file fulfills a legal obligation; see <https://www.gnu.org/licenses/gpl-faq.html#WhyMustIInclude>.

To make use of the code license in your documentation, you may request one of the modules `gpl-3.0`, `gpl-2.0`, `lgpl-3.0`, `lgpl-2.1`, `agpl-3.0`, through a `gnulib-tool` invocation. Or you may copy the relevant Texinfo file directly into your VCS repository. Both approaches are equally good. The Texinfo file changes very rarely.

- The documentation license file (GNU FDL) is usually not present as a file in the top-level directory, because that would be ambiguous: When you use the GNU FDL, you need to specify the Invariant Sections, the Front-Cover Texts, and the Back-Cover Texts.

To make use of this documentation license, copy the relevant Texinfo file (`doc/fdl-1.3.texi`) into your VCS repository. This makes sure that anyone who receives a copy of your VCS repository has also received a copy of the documentation license. In the documentation, also state what are the Invariant Sections, the Front-Cover Texts, and the Back-Cover Texts.

We recommend to place the licenses as appendices at the end of the manual, right before any indices. For the FDL, we suggest the following `@menu` entry:

```
* GNU Free Documentation License:: License for copying this manual
```

For any `@detailmenu` entries, we suggest the following:

```
Copying This Manual
```

```
* GNU Free Documentation License:: Copying and sharing this manual
```

And for actual inclusion of the FDL itself, we suggest the following:

```
@node GNU Free Documentation License
@appendix GNU Free Documentation License

@include fdl.texi
```

## 6.7 Building gnulib

If you wish to help the gnulib development effort with build logs for your favorite platform, you may perform these steps:

1. Prerequisites tools

Install the proper development tools. To build and test all of Gnulib, you will need development tools for the programming languages C, C++, Java, and Perl, along with standard POSIX utilities such as `awk`, `make` and `sh`. You will also need development tools that include Autoconf, Automake, Bison, Gettext, Git, GNU M4, Gperf, Libtool, and Texinfo. Some of these tools are needed only by some modules. More details can be found in Gnulib’s `DEPENDENCIES` file.

2. Obtain Gnulib

See <https://www.gnu.org/software/gnulib/> for how to get the current Gnulib sources via Git.

3. Create gnulib directory

On a machine with GNU development tools installed and with a gnulib git checkout, use

```
gnulib-tool --create-megatestdir --with-tests --dir=...
```

Note: The created directory uses ca. 512 MB on disk.

4. Transfer gnulib directory

Transfer this directory to a build machine (HP-UX, Cygwin, or whatever). Often it is easier to transfer one file, and this can be achieved by running, inside the directory the following commands:

```
./configure  
make dist
```

And then transferring the `dummy-0.tar.gz` file.

5. Build modules

On the build machine, run `./do-autobuild` (or `"nohup ./do-autobuild"`). It creates a directory `logs/` with a log file for each module.

## 7 Building the ISO C and POSIX Substitutes

This section shows a radically different way to use Gnulib.

You can extract the ISO C / POSIX substitutes part of gnulib by running the command

```
gnulib-tool --create-testdir --source-base=lib \  
            --dir=/tmp/posixlib `posix-modules`
```

The command ‘`posix-modules`’ is found in the same directory as `gnulib-tool`.

The resulting directory can be built on a particular platform, independently of the program being ported. Then you can configure and build any program, by setting `CPPFLAGS` and `LDFLAGS` at configure time accordingly: set `CPPFLAGS="-I../posixlib/lib"`, plus any essential type definitions and flags that you find in `../posixlib/config.h`, and set `LDFLAGS="../posixlib/lib/libgnu.a"`.

This way of using Gnulib is useful when you don’t want to modify the program’s source code, or when the program uses a mix between C and C++ sources (requiring separate builds of the `posixlib` for the C compiler and for the C++ compiler).

## 8 ISO C Keyword Substitutes

This chapter describes which keywords specified by ISO C are substituted by Gnulib.

### 8.1 alignof and alignas

Gnulib module: `alignasof`

The `alignasof` module arranges for `alignas` and `alignof` to be more like standard C.

Portability problems fixed by Gnulib:

- Pre-C11 platforms lack `alignas` and `alignof`.
- On pre-C23 platforms, `<stdalign.h>` must be included before using `alignas` or `alignof`. See Section 9.44 [`stdalign.h`], page 66.

Portability problems not fixed by Gnulib:

- On pre-C23 platforms, `alignas` and `alignof` are macros.

### 8.2 bool

Gnulib module: `stdbool`

Portability problems fixed by Gnulib:

- The keywords `bool`, `true`, and `false` are not available: gcc 12 and other compilers predating C23.

Portability problems not fixed by Gnulib:

- On pre-C23 platforms, the keyword substitutes are macros.
- On pre-C23 platforms, the keyword substitutes assume C99 or later.

### 8.3 nullptr

Gnulib module: `nullptr`

The `nullptr` module arranges for `nullptr` to act like standard C and C++.

The `nullptr` keyword yields a null pointer. It differs from the `NULL` macro, in that `NULL` might be an integer whereas `nullptr` is of a special `nullptr_t` type with only one value, namely `nullptr` itself. Using `nullptr` can help some compilers emit more sensible warnings, can avoid the need to cast a null pointer passed to a function prototyped with an ellipsis, and removes the need to include `<stddef.h>` merely to define `NULL`.

Portability problems fixed by Gnulib:

- Some platforms lack `nullptr`: For C: GCC 12, Clang 15, and other pre-2023 C compilers. For C++: pre-2011 C++ compilers.

Portability problems not fixed by Gnulib:

- On older platforms, `nullptr` is a macro instead of a keyword.
- On older platforms, `nullptr` does not have the type `nullptr_t`. In C, it has type `void *`; in C++ it has an integer type.
- On older platforms Gnulib cannot easily emulate `nullptr_t`, so null pointer type checking is more error prone. In C, `_Generic` expressions cannot reliably distinguish the type of `nullptr` from integer or `void *` types. C++ overloading has similar limitations.

## 8.4 `static_assert`

Gnulib module: `assert-h`

The `assert-h` module arranges for both `static_assert` and `<assert.h>` to be like standard C. See Section 9.3 [`assert.h`], page 52.

Portability problems fixed by Gnulib:

- Pre-C11 platforms lack `static_assert`.
- On pre-C23 platforms, `<assert.h>` must be included before using `static_assert`.

Portability problems not fixed by Gnulib:

- On pre-C23 platforms, `static_assert` is a macro.



## 9 ISO C and POSIX Header File Substitutes

This chapter describes which header files specified by ISO C or POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the header file. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this header file important enough to contribute a substitute for it. If you need this particular header file, you may write to <bug-gnulib at gnu dot org>.

### 9.1 aio.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/aio.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

### 9.2 arpa/inet.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/arpa\\_inet.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/arpa_inet.h.html)

Gnulib module: arpa\_inet

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 9.3 assert.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/assert.h.html>

Gnulib module: assert-h

See also the Gnulib modules `assert` and `verify`.

Portability problems fixed by Gnulib:

- On older C platforms <assert.h> must be included before using `static_assert`. For example, GCC versions before 13 do not support the `static_assert` keyword that was standardized by C23.
- On older platforms `static_assert` does not allow the second string-literal argument to be omitted. For example, GCC versions before 9.1 do not support the single-argument `static_assert` that was standardized by C23 and C++17.

- Even-older platforms do not support `static_assert` at all. For example, GCC versions before 4.6 and G++ versions before 4.3 do not support the two-argument form, which was standardized by C11 and C++11.
- Older C platforms might not support the obsolescent `_Static_assert` keyword or macro. This portability problem should not matter with code using this module, as such code should use `static_assert` instead.

Portability problems not fixed by Gnulib:

- A `static_assert` can also be used within a `struct` or `union` specifier, in place of an ordinary declaration of a member of the struct or union. The Gnulib substitute can be used only as an ordinary declaration in code intended to be portable to C99 or earlier.
- In C23 and C++11 and later, `static_assert` is a keyword. In C11 and C17 it is a macro. Any Gnulib substitute is also a macro.
- In C99 and later, `assert` can be applied to any scalar expression. In C89, the argument to `assert` is of type `int`.

## 9.4 `complex.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/complex.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.7, mingw, MSVC 9.

## 9.5 `cpio.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/cpio.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, Cygwin 2.4.x, mingw, MSVC 14.

## 9.6 `ctype.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ctype.h.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

## 9.7 dirent.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/dirent.h.html>

Gnulib module: dirent

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- The type `ino_t` is missing on some platforms: glibc 2.23 and others.

Portability problems not fixed by Gnulib:

- Although many systems define a `struct dirent` member named `d_type` and directory entry type macros like `DT_DIR` and `DT_LNK`, some do not: Minix 3.1.8, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw.
- On systems with `d_type`, not every filesystem supports `d_type`, and those lacking support will set it to `DT_UNKNOWN`.
- Some systems define a `struct dirent` member named `d_namlen` containing the string length of `d_name`, but others do not: glibc 2.23 on Linux, Minix 3.1.8, Solaris 11.4, Cygwin. All of these, except Cygwin, have a member `d_reclen` instead, that has a different semantics.
- Some systems define a `struct dirent` member named `d_off` containing a magic cookie suitable as an argument to `seekdir`, but others do not: glibc 2.23 on Hurd, macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, Cygwin, mingw.
- Some systems define a `struct dirent` member named `d_reclen` containing the number of bytes in the directory entry record, but others do not. This member has limited utility, as it is an implementation detail.

## 9.8 dlfcn.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/dlfcn.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

## 9.9 errno.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/errno.h.html>

Gnulib module: errno

Portability problems fixed by Gnulib:

- The macro `E_OVERFLOW` is not defined on some platforms: OpenBSD 4.0, mingw, MSVC 9.
- The macro `ENOLINK` is not defined on some platforms: OpenBSD 6.7, mingw, MSVC 9.

- The macro `EMULTIHOP` is not defined on some platforms: OpenBSD 6.7, mingw, MSVC 14.
- The macro `ECANCELED` is not defined on some platforms: OpenBSD 4.0, Cygwin, mingw, MSVC 9.
- The macros `ENOMSG`, `EIDRM`, `EPROTO`, `EBADMSG`, `ENOTSUP` are not defined on some platforms: OpenBSD 4.0, mingw, MSVC 9.
- The macro `ESTALE` is not defined on some platforms: mingw, MSVC 14.
- The macro `EDQUOT` is not defined on some platforms: NonStop Kernel, mingw, MSVC 14.
- The macros `ENETRESET`, `ECONNABORTED` are not defined on some platforms: Minix 3.1.8, mingw, MSVC 9.
- The macros `EWOULDBLOCK`, `ETXTBSY`, `ELOOP`, `ENOTSOCK`, `EDESTADDRREQ`, `EMSGSIZE`, `EPROTOTYPE`, `ENOPROTOOPT`, `EPROTONOSUPPORT`, `EOPNOTSUPP`, `EAFNOSUPPORT`, `EADDRINUSE`, `EADDRNOTAVAIL`, `ENETDOWN`, `ENETUNREACH`, `ECONNRESET`, `ENOBUFS`, `EISCONN`, `ENOTCONN`, `ETIMEDOUT`, `ECONNREFUSED`, `EHOSTUNREACH`, `EALREADY`, `EINPROGRESS` are not defined on some platforms: mingw, MSVC 9.
- The macros `EOWNERDEAD`, `ENOTRECOVERABLE` are not defined on some platforms: glibc/Linux 2.3.6, glibc/Hurd 2.15, glibc/kFreeBSD 2.15, Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin, mingw without pthreads-win32, MSVC 9.
- The macro `EILSEQ` is not defined on some platforms: LynxOS 178 2.2.2.

Portability problems not fixed by GnuLib:

## 9.10 `fcntl.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fcntl.h.html>

GnuLib module: `fcntl-h`

Portability problems fixed by GnuLib:

- The type `pid_t` is not defined on some platforms: MSVC 14.
- The type `mode_t` is not defined on some platforms: MSVC 14.
- `'O_CLOEXEC'` is not defined on some platforms: Mac OS X 10.6, FreeBSD 8.4, NetBSD 5.1, OpenBSD 4.9, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14.
- `'O_DIRECTORY'`, `'O_DSYNC'`, `'O_NOCTTY'`, `'O_NOFOLLOW'`, `'O_RSYNC'`, `'O_SYNC'`, and `'O_TTY_INIT'` are not defined on some platforms. When not otherwise defined, GnuLib defines these macros to 0, which is generally safe.
- `'O_NONBLOCK'` is not defined on some platforms. If the `'nonblocking'` module is in use, gnuLib guarantees a working non-zero value; otherwise, the gnuLib replacement is 0.
- `'O_EXEC'` and `'O_SEARCH'` are not defined on some platforms. GnuLib defines these macros to `'O_RDONLY'`, which is typically 0. The `'O_PATH'` macro of GNU/Linux is not a suitable substitute, as `fchmod` fails with `'errno==EBADF'` when invoked on a file descriptor that was opened with `'O_PATH'`.

- ‘O\_ACCMODE’ is not defined on some platforms: MSVC 14.
- The ‘O\_ACCMODE’ mask mistakenly omits ‘O\_SEARCH’ and ‘O\_EXEC’ on some platforms: Cygwin.
- ‘O\_BINARY’, ‘O\_TEXT’ (not specified by POSIX, but essential for portability to native Windows platforms) are defined on some platforms but not on others. Gnulib defines these macros to 0 on GNU and other platforms that do not distinguish between text and binary I/O.
- ‘O\_CLOEXEC’, ‘O\_NOFOLLOW’, and ‘O\_TTY\_INIT’ are defined to values that are too large for an `int` on some platforms: AIX 7.1 with XL C 12.1.
- ‘O\_DIRECT’, ‘O\_IGNORE\_CTTY’, ‘O\_NDELAY’, ‘O\_NOATIME’, ‘O\_NOLINK’, ‘O\_NOLINKS’, and ‘O\_NOTRANS’ (not specified by POSIX) are defined on some platforms but not on others. When not otherwise defined, Gnulib defines these macros to 0, which is generally safe.
- ‘FD\_CLOEXEC’, ‘F\_DUPFD’, and ‘F\_GETFD’ are not defined on some platforms: mingw, MSVC 14.
- ‘F\_DUPFD\_CLOEXEC’ is not defined on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.7.1, mingw, MSVC 14.
- ‘AT\_FDCWD’, ‘AT\_EACCESS’, ‘AT\_SYMLINK\_NOFOLLOW’, ‘AT\_SYMLINK\_FOLLOW’, and ‘AT\_REMOVEDIR’ are not defined on many platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.
- ‘AT\_FDCWD’ is defined with a value too large for an `int` on some platforms: Solaris 11.3.

Portability problems not fixed by Gnulib:

- ‘O\_PATH’ is not defined on some platforms: glibc 2.13, macOS 13, FreeBSD 13.0, NetBSD 9.2, OpenBSD 7.1, Minix 3.3.0, AIX 7.3, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
- ‘F\_SETFD’, ‘F\_GETFL’, ‘F\_SETFL’, ‘F\_GETLK’, ‘F\_SETLK’, ‘F\_SETLKW’, ‘F\_GETOWN’, and ‘F\_SETOWN’ are not defined on some platforms: mingw, MSVC 14.
- ‘POSIX\_FADV\_DONTNEED’, ‘POSIX\_FADV\_NOREUSE’, ‘POSIX\_FADV\_NORMAL’, ‘POSIX\_FADV\_RANDOM’, ‘POSIX\_FADV\_SEQUENTIAL’, and ‘POSIX\_FADV\_WILLNEED’ are not defined on some platforms.

## 9.11 fenv.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fenv.h.html>

Gnulib module: `fenv`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Cygwin 1.7.7, MSVC 9.

Portability problems not fixed by Gnulib:

- On MSVC, the values of the rounding direction macros have changed: In MSVC 14, `FE_UPWARD` is 0x100 and `FE_DOWNWARD` is 0x200, whereas in MSVC 14.30, it’s the opposite.

## 9.12 float.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/float.h.html>

Gnulib module: float

Portability problems fixed by Gnulib:

- The conversion from `int` to `long double` is incorrect on some platforms: glibc 2.7 on Linux/SPARC64.
- The values of `LDBL_*` macros are incorrect on some platforms: On OpenBSD 4.0 and MirBSD 10, they are the same as the values of the `DBL_*` macros, although ‘`long double`’ is a larger type than ‘`double`’. On FreeBSD/x86 6.4, they represent the incorrect 53-bit precision assumptions in the compiler, not the real 64-bit precision at runtime. On Linux/PowerPC with GCC 4.4, on AIX 7.1 with GCC 4.2, and on IRIX 6.5, they don’t reflect the “double double” representation of `long double` correctly.

Portability problems not fixed by Gnulib:

- The macro `FLT_ROUNDS` is a constant expression and does not represent the current rounding mode on some platforms: glibc 2.11, HP-UX 11, mingw.

## 9.13 fmtmsg.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fmtmsg.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

## 9.14 fnmatch.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/fnmatch.h.html>

Gnulib module: `fnmatch-h`, `fnmatch-gnu`

Portability problems fixed by Gnulib module `fnmatch-h`:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `fnmatch-gnu`, together with module `fnmatch-h`:

- The macros `FNM_LEADING_DIR` and `FNM_CASEFOLD` are not defined on some platforms: AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 10.
- The macro `FNM_EXTMATCH` is not defined on all non-glibc platforms: musl libc, macOS 12.5, FreeBSD 14.0, NetBSD 9.3, OpenBSD 7.2, Minix 3.3, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 3.4.6, Android 13.
- The macro `FNM_FILE_NAME` is not defined on some platforms: NetBSD 9.3, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 10.

Portability problems not fixed by Gnulib:

### 9.15 `ftw.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ftw.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14.

### 9.16 `glob.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/glob.h.html>

Gnulib module: `glob-h`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 9.17 `grp.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/grp.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

### 9.18 `iconv.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/iconv.h.html>

Gnulib module: `iconv`

Portability problems fixed by Gnulib:

- The `<iconv.h>` from GNU libiconv is not found if installed in `$PREFIX/include`.

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, when GNU libiconv is not installed.

## 9.19 inttypes.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/inttypes.h.html>

Gnulib module: inttypes

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 9.
- This header file is very incomplete on some platforms.
- The declarations of `imaxabs` and `imaxdiv` are missing on some platforms: NetBSD 3.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5.
- The declarations of `strtoimax` and `strtoumax` are missing on some platforms: OpenBSD 6.7, AIX 5.1 (missing only `strtoumax`).
- On some hosts that predate C++11, when using C++ one must define `__STDC_FORMAT_MACROS` to make visible the declarations of format macros such as `PRIdMAX`.

Portability problems not fixed by Gnulib:

## 9.20 iso646.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/iso646.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin, mingw.

## 9.21 langinfo.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/langinfo.h.html>

Gnulib module: langinfo

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- The constant `CODESET` is not defined on some platforms: OpenBSD 6.7.
- The constants `ALTMON_1` to `ALTMON_12` are not defined on some platforms: glibc 2.26, musl libc, macOS 11.1, NetBSD 8.0, OpenBSD 6.5, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Haiku, Cygwin 2.9.
- The constants `ERA`, `ERA_D_FMT`, `ERA_D_T_FMT`, `ERA_T_FMT`, `ALT_DIGITS` are not defined on some platforms: OpenBSD 6.7.

Portability problems not fixed by Gnulib:



## 9.22 libgen.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/libgen.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

The Gnulib module `dirname` provides similar API, with functions `base_name` and `dir_name` that also work with Windows file names.

## 9.23 limits.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/limits.h.html>

Gnulib module: `limits-h` or `gethostname`

Portability problems fixed by Gnulib module `limits-h`:

- The macros `LLONG_MIN`, `LLONG_MAX`, `ULLONG_MAX` are not defined on some platforms: older glibc systems (e.g. Fedora 1), AIX 5.1, HP-UX 11, IRIX 6.5, OpenVMS.
- The macro `MB_LEN_MAX` is not defined on some platforms: pcc 1.2.0.DEVEL 20220331.
- The macros `WORD_BIT`, `LONG_BIT` are not defined on some platforms: glibc 2.11 without `-D_GNU_SOURCE`, Cygwin, mingw, MSVC 14.
- Macros like `CHAR_WIDTH` are not defined on some platforms: glibc 2.24, NetBSD 9.0, many others.
- The macros `BOOL_MAX` and `BOOL_WIDTH` are not defined on some platforms: glibc 2.32, many others.
- The macro `BOOL_MAX` is not defined with some compilers: clang 15.0.6.
- The macro `SSIZE_MAX` is not defined on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `gethostname`:

- The `HOST_NAME_MAX` macro is not defined on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The macro `SSIZE_MAX` has the wrong type, albeit with the correct value: 32-bit glibc 2.24 (on some architectures), Cygwin 2.5.2.

For `PATH_MAX`, Gnulib provides a module `pathmax` with a header file `"pathmax.h"`. It defines `PATH_MAX` to a constant on platforms with a file name length limit.

## 9.24 locale.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/locale.h.html>

Gnulib module: locale

Portability problems fixed by Gnulib:

- The definition of 'LC\_MESSAGES' is missing on some platforms: mingw, MSVC 14.
- The `locale_t` type is not defined on some platforms: glibc 2.11, macOS 11.1.
- The `struct lconv` type does not contain any members on some platforms: Android up to 2014.
- The `struct lconv` type does not contain the members `int_p_cs_precedes`, `int_p_sign_posn`, `int_p_sep_by_space`, `int_n_cs_precedes`, `int_n_sign_posn`, `int_n_sep_by_space` on some platforms: glibc, OpenBSD 4.9, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

## 9.25 math.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/math.h.html>

Gnulib module: math

Portability problems fixed by Gnulib:

- The conversion from `int` to `long double` is incorrect on some platforms: glibc 2.7 on Linux/SPARC64.
- The macro `NAN` is not defined on some platforms: OpenBSD 4.0, AIX 5.1, IRIX 6.5.
- The macro `NAN` is not exposed outside of C99 compilation on some platforms: glibc.
- The macros `NAN` and `HUGE_VAL` expand to a function address rather than a floating point constant on some platforms: Solaris 10.
- The macros `HUGE_VALF` and `HUGE_VALL` are not defined on some platforms: glibc/HPPA, glibc/SPARC, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
- The macros `FP_ILOGB0` and `FP_ILOGBNAN` are not defined on some platforms: NetBSD 5.1, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.
- The macros `FP_ILOGB0` and `FP_ILOGBNAN` have wrong values on some platforms: Haiku 2022.
- The macros `NAN`, `HUGE_VALL`, and `INFINITY` are not defined on some platforms: OpenVMS.

Portability problems not fixed by Gnulib:

- `NAN` is not a compile time constant with some compilers: OpenVMS.
- The macro or variable `math_errhandling` is not defined on some platforms: glibc 2.11, OpenBSD 4.9, NetBSD 5.1, UP-UX 11, IRIX 6.5, Cygwin 1.7.9, mingw, MSVC 9.

## 9.26 `monetary.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/monetary.h.html>

Gnulib module: `monetary`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.1, mingw, MSVC 14, Android 9.0.
- This header file has a syntax error in C++ mode on some platforms: NetBSD 8.0.

## 9.27 `mqueue.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/mqueue.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

## 9.28 `ndbm.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ndbm.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14, Android 9.0.

## 9.29 `net/if.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/net\\_if.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/net_if.h.html)

Gnulib module: `net_if`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms (needing `<sys/socket.h>` to be included first): Mac OS X 10.5, FreeBSD 8.2, OpenBSD 5.2.

Portability problems not fixed by Gnulib:

### 9.30 netdb.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netdb.h.html>

Gnulib module: netdb

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is incomplete on some platforms: Cygwin 1.5.x, Haiku.
- This header file does not define the type `socklen_t` on some platforms: IRIX 6.5.
- This header file does not define `AI_ALL`, `AI_V4MAPPED` on some platforms: NetBSD 9.0.
- This header file does not define `AI_ADDRCONFIG` on some platforms: NetBSD 5.0.

Portability problems not fixed by Gnulib:

### 9.31 netinet/in.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet\\_in.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet_in.h.html)

Gnulib module: netinet\_in

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms (it requires `<sys/types.h>` to be included first): OpenBSD 4.6.

Portability problems not fixed by Gnulib:

### 9.32 netinet/tcp.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet\\_tcp.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/netinet_tcp.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

### 9.33 nl\_types.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/nl\\_types.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/nl_types.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

### 9.34 poll.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/poll.h.html>

Gnulib module: poll-h

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 9.35 pthread.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pthread.h.html>

Gnulib module: pthread-h

Portability problems fixed by Gnulib:

- This header file is missing on some platforms. Minix 3.1.8, mingw 2.x, MSVC 14. But the provided replacement covers only the essential POSIX threads API. Furthermore it is just a dummy on some of these platforms: Minix 3.1.8.
- This header pollutes the namespace with some broken macro implementations for various functions such as `strtok_r` and `gmtime_r`: mingw 3.0.

Portability problems not fixed by Gnulib:

- This header file lacks the declaration of `pthread_atfork` on some platforms: IRIX 6.5.

### 9.36 pwd.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/pwd.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

### 9.37 regex.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/regex.h.html>

Gnulib module: regex

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This header file is not self-contained on some platforms: it requires `<sys/types.h>` to be included first.

### 9.38 sched.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sched.h.html>

Gnulib module: sched

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This header file does not define the type `pid_t` on some platforms: glibc 2.11, macOS 11.1.
- `struct sched_param` is not defined on some platforms: Haiku.
- `SCHED_FIFO`, `SCHED_RR`, `SCHED_OTHER` are not defined on some platforms: Haiku.

Portability problems not fixed by Gnulib:

### 9.39 search.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/search.h.html>

Gnulib module: search

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8.

### 9.40 semaphore.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/semaphore.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 9.41 setjmp.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/setjmp.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

## 9.42 `signal.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/signal.h.html>

Gnulib module: `signal-h`

Portability problems fixed by Gnulib:

- `volatile sig_atomic_t` is rejected by older compilers on some platforms: AIX.
- `sigset_t` is missing on some platforms: MSVC 14.
- `sigset_t` is only declared in `<sys/types.h>` on some platforms: mingw.
- `struct sigaction` and `siginfo_t` are missing on some platforms: mingw, MSVC 14.
- The type `pid_t` is not defined on some platforms: MSVC 14.
- The signal `SIGPIPE` is not defined on some platforms: mingw, MSVC 14.
- The macros `SA_RESETHAND` and `SA_RESTART` are not defined on some platforms: Non-Stop.
- The type `sighandler_t` (a GNU extension) is not defined on most non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Many signals are not defined on some platforms: mingw, MSVC 14.
- The macro `SIGBUS` is set to the same value as `SIGSEGV`, rather than being a distinct signal, on some platforms: Haiku.

## 9.43 `spawn.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/spawn.h.html>

Gnulib module: `spawn`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.25, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 9.44 `stdalign.h`

POSIX specification:

Not in POSIX yet, but we expect it will be, at least temporarily until it becomes obsolete due to its phasing out starting in C23. ISO C23 (latest free draft <http://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf>) sections 6.5.3.4, 6.7.5, 7.15. C++11 (latest free draft <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2011/n3242.pdf>) section 18.10.

Gnulib module: `alignasof`

Portability problems fixed by Gnulib:

- On older C platforms `<stdalign.h>` must be included before using `alignas` or `alignof`. For example, GCC versions before 13 do not support these keywords, which

were standardized by C23. On C23 and later platforms, `<stdalign.h>` has no effect and need not be included. (Gnulib-using code should not include `<stdalign.h>` without also employing Gnulib's now-deprecated `stdalign` module.)

- This header file is missing on many platforms: FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 9.0.
- Clang 3.0's `<stdalign.h>` does not define `alignof`.
- The `alignof` macro returns too large values for the types `double` and `long long` in GCC 4.7.0.
- Older C platforms might not support the obsolescent `_Alignas` and `_Alignof` keywords or macros. This portability problem should not matter with code using this module, as such code should use `alignas` and `alignof` instead.
- In C11 and C17, `<stdalign.h>` defines the macros `__alignas_is_defined` and `__alignof_is_defined` to 1. In C23, these macros are not defined. This portability problem should not matter with code using Gnulib's `alignasof` module, as such code should use `alignas` and `alignof` without checking these two macros. (Gnulib's now-deprecated `stdalign` module defines these two macros.)

Portability problems not fixed by Gnulib:

- In C11 and later, the operand of `alignof` must be a parenthesized type. Recent versions of GCC support an extension in which the operand can also be a unary expression, as with `sizeof`. The Gnulib substitute does not support this extension.
- On most pre-C11 platforms, the operand of `alignof` cannot be a structure type containing a flexible array member.
- The `alignas` keyword or macro is not always supported. Supported compilers include any compiler supporting C11 or later, which includes GCC, IBM C, Sun C 5.9 and later, and MSVC 7.0 and later.
- Some compilers do not support alignment via `alignas` of `auto` variables (i.e., variables on the stack). They diagnose and ignore the alignment: Sun C 5.11.
- Some linkers do not support operands of `alignas` that are greater than 8: mingw.
- Some compilers require the operand of `alignas` to be a single integer constant, not an expression: MSVC 7.0 through at least 10.0.
- The Sun C 5.13 (2014) compiler sometimes mishandles the alignment of multiple external variables that are declared close together with `alignas`. The bug is fixed in Sun C 5.15, also known as Oracle Developer Studio 12.6 (2017).
- You cannot assume that `alignas` and `alignof` are reserved words; they might be macros.

## 9.45 `stdarg.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdarg.h.html>

Gnulib module: `stdarg`

Portability problems fixed by Gnulib:



- Some compilers (e.g., AIX 5.3 cc) need to be in c99 mode for the builtin `va_copy` to work.

Portability problems not fixed by Gnulib:

## 9.46 `stdatomic.h`

POSIX specification:

Not in POSIX yet, but we expect it will be. ISO C11 (latest free draft <http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf>) section 7.17.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on many platforms: glibc with GCC 4.8.x or clang 2.8, FreeBSD 6.4, NetBSD 7.0, OpenBSD 6.5, OpenBSD 6.9 with gcc, Minix 3.3.0, AIX 7.2 with xlc or xlclang, HP-UX 11.31, IRIX 6.5, Solaris 11.3 with Oracle Studio 12.4 (Sun C 5.13), Cygwin 1.5.19, mingw, MSVC 14.
- Linus Torvalds believes that “no compiler writer will get the C/C++ memory model right”; see <https://lkml.org/lkml/2018/6/7/761>.

## 9.47 `stdbool.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdbool.h.html>

Gnulib module: `stdbool-c99`

The `stdbool-c99` module is present only for programs that formerly used the old `stdbool` module for C99 compatibility, and that for some reason cannot use the current `stdbool` module for C23 compatibility.

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5.
- This header file is not usable in C++ mode with the vendor compiler on Solaris 10.
- Some compilers have bugs relating to ‘`bool`’.
- This header file defines `true` incorrectly on some platforms: OpenBSD 4.7 with gcc 2.95.

Portability problems not fixed by Gnulib:

- ‘`_Bool`’ cannot be used before `<stdbool.h>` is included, or if the program is intended to be compiled by a C++ compiler. (With the advent of C23, ‘`_Bool`’ is obsolescent anyway.)
- You cannot assume that `_Bool` is a typedef; it might be a macro. For example, C23 allows `_Bool` to be a macro.
- Bit-fields of type ‘`bool`’ are not supported. Portable code should use ‘`unsigned int foo : 1;`’ rather than ‘`bool foo : 1;`’.
- Casts and automatic conversions to ‘`bool`’ don’t test against the zero value or the null pointer, as they should. Such casts should only be used if the value is known to be equal to 0 or 1.

- You cannot assume that casting a floating point literal to ‘bool’ will result in a constant expression.

## 9.48 stdckdint.h

POSIX specification:

Not in POSIX yet, but we expect it will be. ISO draft C23 (<https://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf>) section 7.20.

Gnulib module: stdckdint

Portability problems fixed by Gnulib:

- This header file is missing on many platforms: glibc 2.29, macOS 11.1, FreeBSD 13.2, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.3.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- In draft C23, arguments of `stdckdint.h` macros can have side effects.

## 9.49 stddef.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stddef.h.html>

Gnulib module: stddef

Portability problems fixed by Gnulib:

- Some platforms fail to provide `unreachable`, which was added in C23: GCC 13, clang 15, AIX with xlc 12.1, Solaris with Sun C 5.15, and others.
- Some platforms fail to provide `max_align_t`, which was added in C11: NetBSD 8.0, Solaris 11.0, and others.
- `max_align_t` does not have the expected alignment on some platforms: NetBSD 8.0/x86, AIX 7.2 with xlc in 64-bit mode.
- Some old platforms fail to provide `wchar_t`.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0
- Some platforms provide a `NULL` macro whose value does not have the size of a pointer: AIX 7.2 with xlc in 64-bit mode.
- When this header file is provided by TinyCC 0.9.27 on glibc or macOS systems, it does not fulfil the expectations of other system header files.

Portability problems not fixed by Gnulib:

- Some platforms fail to provide `nullptr_t`, which Gnulib cannot usefully emulate: GCC 12, Clang 15, and other pre-2023 C compilers.
- Some platforms provide an `offsetof` macro that cannot be used in arbitrary expressions: Solaris 11.4 This problem can be worked around by parenthesizing the `offsetof` expression in the unlikely case you use it with `sizeof` or ‘[]’.

## 9.50 `stdint.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdint.h.html>

Gnulib module: `stdint`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 3.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, MSVC 9.
- This header file is very incomplete on some platforms.
- The values of `SIG_ATOMIC_MIN` and `SIG_ATOMIC_MAX` are incorrect on some platforms: FreeBSD 6.2/ia64, FreeBSD 13.0/arm64.
- The value of `WINT_MAX` is incorrect on some platforms: mingw.
- The values of `INT8_MAX`, `UINT8_MAX` etc. are not usable in preprocessor expressions on some platforms: HP-UX 11.23.
- The values of `INTPTR_MAX` and `UINTPTR_MAX`, although correctly defined in `<stdint.h>`, are replaced by empty values when `<limits.h>` or `<inttypes.h>` gets included later on some platforms: Solaris 9 with GCC 4.5 or newer.
- The macros `WCHAR_MIN` and `WCHAR_MAX` are not defined in `<stdint.h>` (only in `<wchar.h>`) on some platforms: Dragonfly.
- On some hosts that predate C++11, when using C++ one must define `__STDC_CONSTANT_MACROS` to make visible the definitions of constant macros such as `INTMAX_C`, and one must define `__STDC_LIMIT_MACROS` to make visible the definitions of limit macros such as `INTMAX_MAX`.
- The macro `SIZE_MAX` has the wrong type, albeit with the correct value: 32-bit glibc 2.24 (on s390 architecture), Mac OS X 10.7.
- Macros like `INTMAX_WIDTH` are not defined on some platforms: glibc 2.24, NetBSD 9.0, many others.

Portability problems not fixed by Gnulib:

- `{uint,int}_fast{8,16,32,64}_t` may not correspond to the fastest types available on the system. Other `<stdint.h>` substitutes may define these types differently, so public header files should avoid these types.
- Macros are used instead of typedefs.
- Some C preprocessors mishandle constants that do not fit in `long int`. For example, as of 2007, Sun C mishandled `#if LLONG_MIN < 0` on a platform with 32-bit `long int` and 64-bit `long long int`; this bug was fixed on or before Oracle Developer Studio 12.6 (Sun C 5.15 SunOS\_sparc 2017/05/30). Some older preprocessors mishandle constants ending in `LL`. To work around these problems, compute the value of expressions like `LONG_MAX < LLONG_MAX` at `configure`-time rather than at `#if`-time.

The `stdint` module uses `#include_next`. If you wish to install the generated `stdint.h` file under another name, typically in order to be able to use some of the types defined by `stdint.h` in your public header file, you could use the following Makefile.am-snippet:

```
BUILT_SOURCES += idn-int.h
```

```

DISTCLEANFILES += idn-int.h
nodist_include_HEADERS += idn-int.h

idn-int.h:
if test -n "$(STDINT_H)"; then \
sed -e s/include_next/include/ gl/stdint.h > idn-int.h; \
else \
echo '#include <stdint.h>' > idn-int.h; \
fi

```

## 9.51 stdio.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdio.h.html>

Gnulib module: stdio

Portability problems fixed by Gnulib:

- The type `off_t` is missing on some platforms: glibc 2.8, eglibc 2.11.2 and others.
- The type `ssize_t` is missing on some platforms: glibc 2.8, Mac OS X 10.5, Solaris 10, MSVC 14, and others.
- The type `va_list` is missing on some platforms: glibc 2.8, OpenBSD 4.0, Solaris 11.4, and others.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

## 9.52 stdlib.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stdlib.h.html>

Gnulib module: stdlib, system-posix

Portability problems fixed by the Gnulib module `stdlib`:

- The macros `EXIT_SUCCESS` and `EXIT_FAILURE` are not defined on some platforms.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0
- The value of `MB_CUR_MAX` is too small (3 instead of 4) in UTF-8 locales on some platforms: Solaris 10.

Portability problems fixed by the Gnulib module `system-posix`:

- The macros `WIFSIGNALED`, `WIFEXITED`, `WIFSTOPPED`, `WTERMSIG`, `WEXITSTATUS`, `WNOHANG`, `WUNTRACED`, `WSTOPSIG` are not defined in this header file (only in `<sys/wait.h>`) on some platforms: MirBSD 10.

Portability problems not fixed by Gnulib:

- The definition of the type `once_flag`, of the macro `ONCE_FLAG_INIT`, and the declaration of the function `call_once`, that are required by ISO C 23, are not provided.

To get them, import Gnulib module `call_once` and include `<threads.h>` rather than `<stdlib.h>`.

- System status macros such as `WEXITSTATUS` require an lvalue argument on some platforms. macOS 11.1.

### 9.53 `stdnoreturn.h`

POSIX specification:

Not in POSIX yet, but we expect it will be. ISO C11 (latest free draft <http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf>) sections 7.23.

Gnulib module: `stdnoreturn`

Portability problems fixed by Gnulib:

- This header file is missing on many platforms: FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9.0, mingw, MSVC 14, Android 9.0.
- This file conflicts with some system header files, such as `<stdlib.h>` and `<process.h>`, on some platforms: MSVC/clang.

Portability problems not fixed by Gnulib:

- `<stdnoreturn.h>` and the `noreturn` macro are obsolescent in C23.
- `<stdnoreturn.h>` cannot be `#included` in C++ mode on some platforms: FreeBSD 13.1.
- `<stdnoreturn.h>` should be `#included` before `'_Noreturn'` is used.
- You cannot assume that `_Noreturn` is a reserved word; it might be a macro.
- When the macro `lint` is defined, standard headers define `_Noreturn` (and therefore `noreturn`) to be a macro that expands to the empty token sequence on some platforms: Cygwin 2.5.1, FreeBSD 10.3.
- On Cygwin 1.7.30 and MSVC 14, `noreturn` expands to the empty token sequence, to avoid problems with standard headers that use `noreturn` in combination with `__attribute__` or `__declspec`. Although the resulting code operates correctly, the compiler is not informed whether `noreturn` functions do not return, so it may generate incorrect warnings at compile-time, or code that is slightly less optimized. This problem does not occur with `_Noreturn`.
- Circa 2012 bleeding-edge GCC with `-Werror=old-style-declaration` requires `_Noreturn` or `noreturn` before the returned type in a declaration, and therefore rejects valid but unusually-worded declarations such as `void _Noreturn foo (void);`.

### 9.54 `string.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/string.h.html>

Gnulib module: `string`

Portability problems fixed by Gnulib:

- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

## 9.55 strings.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/strings.h.html>

Gnulib module: strings

Portability problems fixed by Gnulib:

- This header file is not self-contained on some platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- This header file defines symbols, such as ‘index’, often used for variables, making debugging harder.

## 9.56 stropts.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/stropts.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

## 9.57 sys/ipc.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_ipc.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_ipc.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 9.58 sys/mman.h

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_mman.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_mman.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 9.59 `sys/msg.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_msg.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_msg.h.html)

Gnulib module: `sys_msg`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

## 9.60 `sys/resource.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_resource.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_resource.h.html)

Gnulib module: `sys_resource`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- On some platforms, this header file requires that `<sys/types.h>` and `<sys/time.h>` already be included: FreeBSD 5.0.
- On some platforms, this header file does not define the `RUSAGE_SELF` and `RUSAGE_CHILDREN` constants: OpenVMS.

Portability problems not fixed by Gnulib:

- On some platforms, this header does not define some or all of the symbolic constants required by POSIX. For example, OpenVMS and Android do not define `RLIM_SAVED_CUR` or `RLIM_SAVED_MAX`.

## 9.61 `sys/select.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_select.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_select.h.html)

Gnulib module: `sys_select`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: HP-UX 11.11, NonStop Kernel, mingw, MSVC 14.
- This header file is not self-contained on some platforms: it requires `<sys/types.h>` to be included first.
- This header file is not self-contained—it requires `<string.h>` before `FD_ZERO` can be used—on some platforms: AIX 7.1, Solaris 11.4.

Portability problems not fixed by Gnulib:

## 9.62 `sys/sem.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_sem.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_sem.h.html)

Gnulib module: `sys_sem`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 9.63 `sys/shm.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_shm.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_shm.h.html)

Gnulib module: `sys_shm`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 9.64 `sys/socket.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_socket.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_socket.h.html)

Gnulib module: `sys_socket`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms: it requires `<sys/types.h>` to be included first.
- This header file does not define the type `socklen_t` on some platforms: IRIX 6.5.
- This header file does not define the type `struct iovec` on some platforms: OpenBSD 4.4.
- This header file is lacking the `SHUT_RD`, `SHUT_WR`, `SHUT_RDWR` macros on some platforms, despite having the `shutdown` functions: `emx+gcc`.
- The `struct sockaddr_storage` type does not have a member `ss_family` on some platforms: AIX 7.1.
- The `CMSG_SPACE` and `CMSG_LEN` macros are not provided on some platforms: OpenVMS.
- This header file does not define the `SO_REUSEPORT` macro on some platforms: Minix 3.1.8, Solaris 10, Cygwin, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This header file does not declare the `msg_control` and `msg_controllen` members of `struct msghdr` on some platforms. This can be detected by the absence of the `CMSG_FIRSTHDR` macro: gnulib replacement header, old BSD



## 9.65 `sys/stat.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_stat.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_stat.h.html)

Gnulib module: `sys_stat`

Portability problems fixed by Gnulib module `sys_stat`:

- The type `mode_t` is not defined on some platforms: MSVC 14.
- Some macros, such as `S_IFMT` or `S_IFIFO`, are missing on some platforms.
- The macros `S_ISBLK`, `S_ISCHR`, `S_ISDIR`, `S_ISFIFO`, `S_ISLNK`, `S_ISREG`, `S_ISSOCK` are broken on some platforms.
- Some platforms define macros, such as `S_ISDOOR`, that are not defined on other platforms.
- The functions `lstat` and `mkdir` are not declared on some platforms: mingw, MSVC 14.
- The macros `UTIME_NOW` and `UTIME_OMIT` are missing on some platforms.
- On some platforms, `struct stat` does not include `st_atim`, `st_mtim`, or `st_ctim` members. Use the gnulib module ‘`stat-time`’ for accessors to portably get at subsecond resolution.

Portability problems fixed by Gnulib module `sys_stat`, together with module `windows-stat-inodes`:

- On Windows platforms (excluding Cygwin), `st_ino` is always 0.

On platforms where `off_t` is a 32-bit type, `struct stat` cannot represent the size of files or block devices 2 GiB or larger and may not work correctly on directories 2 GiB or larger. Also, on platforms where `ino_t` is a 32-bit type, `struct stat` cannot represent larger inode numbers. See Section 14.2 [Large File Support], page 761, for how to address these problems.

See Section 14.5 [Avoiding the year 2038 problem], page 762, for portability issues with the `time_t` components of `struct stat`.

Portability problems not fixed by Gnulib:

- The macro `S_IFBLK` is missing on some platforms: MSVC 14.
- On OpenVMS, `st_ino` is an array of three `ino_t` values, not a single value. `b` are known to represent the same file.
- On some platforms, two different files may have the same `st_dev` and `st_ino` values, even when `st_ino` is nonzero:
  - GNU/Linux NFS servers that export all local file systems as a single NFS file system, if a local `st_dev` exceeds 255, or if a local `st_ino` exceeds 16777215.
  - Network Appliance NFS servers in snapshot directories; see Network Appliance bug #195.
  - ClearCase MVFS; see bug id ATRia04618.
- On some file systems, `st_size` contains bogus information for symlinks; use the Gnulib module `areadlink-with-size` for a better way to get symlink contents.

To partially work around porting problems with Microsoft Windows and OpenVMS, you can use the Gnulib `same-inode` module to test whether two `struct stat` objects are known to represent the same file. For example, `psame_inode (&a, &b)` is true if the `struct stat` objects `a` and `b` are known to represent the same file.

Another partial workaround is to compare other file metadata such as `st_mode` and `st_mtime` on platforms where `st_dev` and `st_ino` not uniquely identify a file. However, this does not work reliably on files whose metadata are being changed by other programs, or where the metadata happen to be equal.

## 9.66 `sys/statvfs.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_statvfs.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_statvfs.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14.

## 9.67 `sys/time.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_time.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_time.h.html)

Gnulib module: `sys_time`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- ‘`struct timeval`’ is not defined on some platforms.
- ‘`struct timeval`’ is defined with a `tv_sec` type that is narrower than `time_t` on some native Windows platforms: mingw64 in 64-bit mode, mingw64 in 32-bit mode when `__MINGW_USE_VC2005_COMPAT` is defined, MSVC 14 in 64-bit mode, MSVC 14 in 32-bit mode when `_USE_32BIT_TIME_T` is not defined.

See Section 14.5 [Avoiding the year 2038 problem], page 762, for portability issues with `time_t` and the `time_t` component of `struct timeval`.

Portability problems not fixed by Gnulib:

- ‘`struct timeval`’ is defined with a `tv_sec` type that is wider than `time_t`: OpenBSD 5.1 in 64-bit mode.

## 9.68 `sys/timeb.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/009695399/basedefs/sys\\_timeb.h.html](https://pubs.opengroup.org/onlinepubs/009695399/basedefs/sys_timeb.h.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This header file is missing on some platforms: OpenBSD 6.7, Android 9.0.

## 9.69 `sys/times.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_times.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_times.h.html)

GnuLib module: `sys_times`

Portability problems fixed by GnuLib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by GnuLib:

## 9.70 `sys/types.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_types.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_types.h.html)

GnuLib module: `sys_types`

Portability problems fixed by GnuLib:

- The type `pid_t` is not defined on some platforms: MSVC 14.
- The type `size_t` is not defined in this file on some platforms: MSVC 14.
- The type `ssize_t` is not defined on some platforms: MSVC 14.
- The type `mode_t` is not defined on some platforms: MSVC 14.
- Some systems leak definitions of `major`, `minor`, and `makedev` through this header; however, when `sys/sysmacros.h` exists, that file should also be included to avoid deprecation warnings from the versions in this header: glibc 2.25.

See Section 14.5 [Avoiding the year 2038 problem], page 762, for portability issues with `time_t`.

Portability problems not fixed by GnuLib:

- On some platforms the types `blksize_t` and `suseconds_t` are signed integer types that are wider than `long`: glibc x32

This module, together with the module `largefile`, also defines the type `off_t` to a 64-bit integer type on some platforms: mingw, MSVC 14.

## 9.71 `sys/uio.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_uio.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_uio.h.html)

GnuLib module: `sys_uio`

Portability problems fixed by GnuLib:

- This header file is missing on some platforms: mingw, MSVC 14.

- This header file is not self-contained (it requires `<sys/types.h>` to be included first) on some platforms: OpenBSD 4.4.

Portability problems not fixed by Gnulib:

## 9.72 `sys/un.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_un.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_un.h.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header requires `<code>sys/socket.h</code>` to be included first on some platforms: Cygwin 1.7.18.

## 9.73 `sys/utsname.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_utsname.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_utsname.h.html)

Gnulib module: `sys_utsname`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file is not self-contained on some platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

## 9.74 `sys/wait.h`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys\\_wait.h.html](https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/sys_wait.h.html)

Gnulib module: `sys_wait`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- System status macros such as `WEXITSTATUS` require an lvalue argument on some platforms. macOS 11.1.

## 9.75 `syslog.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/syslog.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 9.76 tar.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/tar.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

## 9.77 termios.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/termios.h.html>

Gnulib module: termios

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header does not declare `pid_t` on all platforms: glibc on some architectures, FreeBSD 6.4, OpenBSD 4.9, Cygwin 1.7.11.

Portability problems not fixed by Gnulib:

- The types `struct termios`, `cc_t`, `speed_t`, `tcflag_t` are not defined on some platforms: mingw, MSVC 14.

## 9.78 tgmth.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/tgmth.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Mac OS X 10.5, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

## 9.79 threads.h

Defines the multithreading facility of ISO C11.

Gnulib module: threads-h

Portability problems fixed by Gnulib:

- This header file is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.2.x, mingw, MSVC 14, Android 9.0.
- This header file defines `thrd_start_t` incorrectly on some platforms: AIX 7.2.
- This header file does not define `TSS_DTOR_ITERATIONS` on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- There is no way to define a working `thread_local` macro on some platforms:
  - Mac OS X 10.5,
  - OpenBSD 6.5,
  - AIX 7.1 with gcc (but it works with ‘`xlc -qthreaded -qtls`’),
  - HP-UX 11.31 with cc (but it works with gcc),
  - IRIX 6.5,
  - Android 4.3.

## 9.80 `time.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/time.h.html>

Gnulib module: `time-h`

Portability problems fixed by Gnulib:

- ‘`struct timespec`’ is not defined on some platforms.
- The macro `TIME_UTC` is not defined on many platforms: glibc 2.15, macOS 10.13, FreeBSD 11.0, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0.

Portability problems fixed by the Gnulib module `year2038`:

- On some platforms where `time_t` defaults to 32-bit but can be changed to 64-bit, functions like `stat` can fail with `errno == EOVERFLOW` when a 32-bit timestamp is out of range, such as with a file timestamp in the far future or past: glibc 2.34+ atop 32-bit x86 or ARM Linux. See Section 14.5 [Avoiding the year 2038 problem], page 762.

Portability problems not fixed by Gnulib:

- On platforms where `time_t` is always 32-bit, functions like `stat` can fail with `errno == EOVERFLOW` when a timestamp is out of range, such as with a file timestamp in the far future or past; on other such platforms, the functions silently return the low-order 32 bits of the correct timestamp. These platforms will be obsolete when 32-bit `time_t` rolls around, which will occur in 2038 for the typical case when `time_t` is signed. See Section 14.5 [Avoiding the year 2038 problem], page 762.
- On some platforms the `tv_nsec` member of `struct timespec` is not of type `long`, but is of type `long long` instead: glibc x32

## 9.81 `trace.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/trace.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

## 9.82 uchar.h

Defines the types `char16_t`, `char32_t` and declares the functions `mbrtoc16`, `c16rtomb`, `mbrtoc32`, `c32rtomb`.

Gnulib module: `uchar` or `uchar-c23`

Portability problems fixed by either Gnulib module `uchar` or `uchar-c23`:

- This header file is missing on many non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin, mingw, MSVC 9.
- This file is not self-contained on some platforms: Haiku.
- This file produces compilation errors in C++ mode on some platforms: AIX 7.2 with `xlclang++`.

Portability problems fixed by Gnulib module `uchar-c23`:

- `char32_t` values may not be Unicode code points. This is the case in ISO C 11 compliant but not ISO C 23 compliant implementations.

Portability problems not fixed by Gnulib:

## 9.83 ucontext.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/009695399/basedefs/ucontext.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.35, mingw, MSVC 14.

## 9.84 ulimit.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/ulimit.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin, mingw, MSVC 14, Android 9.0.

## 9.85 unistd.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/unistd.h.html>

Gnulib module: unistd

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.
- The `SEEK_*` macros are not defined in this file on some platforms: mingw.
- The `*_FILENO` macros are not defined in this file on some platforms: OS/2 EMX, mingw.
- The `_exit` function is not declared in this file on some platforms: mingw.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

## 9.86 utime.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/utime.h.html>

Gnulib module: utime-h

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 9.87 utmpx.h

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/utmpx.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 8.4, OpenBSD 7.2, Minix 3.1.8, mingw, MSVC 14, Android 13.0.
- While some platforms have the `struct utmpx` field `ut_user`, older platforms have the field `ut_name`.
- The `struct utmpx` field `ut_exit` does not exist on some platforms: macOS, FreeBSD, AIX, Cygwin.
- The `struct utmpx` field `ut_session` does not exist on some platforms: macOS, FreeBSD, AIX, HP-UX, Cygwin.
- The `struct utmpx` field `ut_addr` or `ut_addr_v6` or `ut_ss` does not exist on some platforms: macOS, FreeBSD, AIX, IRIX, Solaris.
- On some platforms, this API does not support timestamps past the year 2038: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits.



- On some platforms, this header misbehaves if the `year2038` or `year2038-recommended` modules are used and the program is configured without the `--disable-year2038` option. The `readutmp` module works around this problem: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits. See Section 14.5 [Avoiding the year 2038 problem], page 762.

## 9.88 `wchar.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wchar.h.html>

Gnulib module: `wchar`

Portability problems fixed by Gnulib:

- This header file cannot be included on some platforms: Linux uClibc built without wide character support.
- The type `wint_t` is incorrect on some platforms: mingw, MSVC 14.
- Some platforms provide a `NULL` macro that cannot be used in arbitrary expressions: NetBSD 5.0

Portability problems not fixed by Gnulib:

- This header file leads to link errors and endless recursions or endless loops on some platforms: glibc version 2.5 or older, together with gcc version 4.3 or newer and the option `'-std=c99'` or `'-std=gnu99'`.

## 9.89 `wctype.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wctype.h.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: HP-UX 11.00.
- The type `wint_t` is incorrect on some platforms: mingw, MSVC 14.
- The functions `isw*` are missing on some platforms: FreeBSD 4.11.
- The function `iswblank` is declared but not defined on some platforms: IRIX 6.5.30.

Portability problems not fixed by Gnulib:

## 9.90 `wordexp.h`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/basedefs/wordexp.h.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

## 10 ISO C and POSIX Function Substitutes

This chapter describes which functions and function-like macros specified by ISO C (including ISO TS 18661-1) or POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the function. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-gnulib at gnu dot org>.

### 10.1 FD\_CLR

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD\\_CLR.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_CLR.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.2 FD\_ISSET

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD\\_ISSET.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_ISSET.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.3 FD\_SET

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD\\_SET.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_SET.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.4 FD\_ZERO

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD\\_ZERO.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/FD_ZERO.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

## 10.5 `_Exit`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_Exit.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_Exit.html)

Gnulib module: `_Exit`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, Android 4.4.

Portability problems not fixed by Gnulib:

## 10.6 `_exit`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_exit.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_exit.html)

Gnulib module: `unistd`

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<stdlib.h>`) on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 10.7 `_longjmp`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_longjmp.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_longjmp.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x.

Note: Despite its being removed from POSIX, in 2023 on all systems which have `_setjmp`, it is the fastest way to save the registers but not the signal mask (up to 30 times faster than `setjmp` on some systems).

## 10.8 `_setjmp`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_setjmp.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_setjmp.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x.

Note: Despite its being removed from POSIX, in 2023 on all systems which have `_setjmp`, it is the fastest way to save the registers but not the signal mask (up to 30 times faster than `setjmp` on some systems).

## 10.9 `_tolower`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_tolower.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_tolower.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, Android 4.4.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `tolower` instead.

## 10.10 `_toupper`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/\\_toupper.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/_toupper.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, Android 4.4.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `toupper` instead.

## 10.11 `a64l`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/a64l.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- This function was not correctly implemented in glibc versions before 2.2.5.

## 10.12 `abort`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/abort.html>

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- Some platforms mistakenly close all stdio streams prior to raising SIGABRT: Cygwin 1.5.x.
- Some platforms always print a message to stderr, even if a SIGABRT handler uses longjmp to resume execution at a safe point: mingw, MSVC 14.

### 10.13 abs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/abs.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Android 4.3.

### 10.14 accept

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/accept.html>

GnuLib module: accept

Portability problems fixed by GnuLib:

- On Windows platforms (excluding Cygwin), the descriptors returned by the `accept` function cannot be used in calls to `read`, `write`, and `close`; you have to use `recv`, `send`, `closesocket` in these cases instead.
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.

Portability problems not fixed by GnuLib:

- Some platforms don't have a `socklen_t` type; in this case this function's third argument type is `'int *'`.
- On some platforms, this function's third argument type is `'void *'`, not `'socklen_t *'`: Solaris 10.

### 10.15 access

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/access.html>

GnuLib module: access

Portability problems fixed by GnuLib:

- This function does not support the `X_OK` mode on some platforms: MSVC 14.

- This function does not reject trailing slashes on symlinks to non-directories on some platforms: Mac OS X 10.5.

Portability problems not fixed by GnuLib:

- This function uses the effective id instead of the real id on some platforms: Cygwin 1.5.x.

Other problems of this function:

- There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.
- This function does not have an option for not following symbolic links (like `stat` versus `lstat`). If you need this option, use the GnuLib module `faccessat` with the `AT_EACCESS` flag.
- On native Windows, files whose basename does not contain a `.` cannot be executed through `execlp` or `execvp`. Nevertheless, this function may return true for such files.
- On Windows, different facilities for executing a program have different ways of finding an executable file, by trying various suffixes. For example, `execlp` and `execvp` search for files with the suffixes `.com`, `.exe`, `.bat`, `.cmd`, when the file with the given file name does not exist. Whereas `cmd.exe` searches according to the `PATHEXT` environment variable. This function does not perform any search; it merely looks at the file with the given file name.

## 10.16 `acos`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acos.html>

GnuLib module: `acos`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

## 10.17 `acosf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosf.html>

GnuLib module: `acosf`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by GnuLib:

## 10.18 acosh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

## 10.19 acoshf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acoshf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.

## 10.20 acoshl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acoshl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

## 10.21 acosl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/acosl.html>

Gnulib module: `acosl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.22 aio\_cancel

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_cancel.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_cancel.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.23 aio\_error

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_error.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_error.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.24 aio\_fsync

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_fsync.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_fsync.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.25 aio\_read

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_read.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_read.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.



Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.26 aio\_return

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_return.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_return.html)

GnuLib module: —

Portability problems fixed by GnuLib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.27 aio\_suspend

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_suspend.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_suspend.html)

GnuLib module: —

Portability problems fixed by GnuLib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.28 aio\_write

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio\\_write.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/aio_write.html)

GnuLib module: —

Portability problems fixed by GnuLib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.29 alarm

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/alarm.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function has no impact if `SIGALRM` is inherited as ignored; programs should use `signal (SIGALRM, SIG_DFL)` if it is important to ensure the alarm will fire.
- Use of this function in multi-threaded applications is not advised.
- This function is missing on some platforms: mingw (2011), MSVC 14.
- This function is conditionally declared in the non-standard `<io.h>` header on some platforms: mingw (2012 or newer).

## 10.30 aligned\_alloc

Documentation:

`man aligned_alloc`

Gnulib module: `aligned_alloc`

Portability problems fixed by Gnulib:

- This function fails if the alignment argument is smaller than `sizeof (void *)` on some platforms: macOS 11.1, AIX 7.3.1.

Portability problems not fixed by Gnulib:

- On some platforms, `aligned_alloc` crashes if the requested size is not a multiple of the alignment: AddressSanitizer (gcc 11.2 or clang 13).
- This function is missing on many older platforms: glibc 2.15, macOS 10.13, FreeBSD 6.4, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Gnulib has partial substitutes for `aligned_alloc` that do not crash even if the AddressSanitizer bug is present:

- The Gnulib module `alignalloc` provides a portable function `alignalloc` that is a near-substitute for glibc `aligned_alloc`, except that the result must be freed with `alignfree` rather than plain `free`.
- The Gnulib module `aligned-malloc` provides functions for allocating and freeing blocks of suitably aligned memory.
- The Gnulib module `pagealign_alloc` provides a similar API for allocating and freeing blocks of memory aligned on a system page boundary.

### 10.31 `alphasort`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/alphasort.html>

Gnulib module: `alphasort`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Solaris 9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The parameters of this function are declared as `const void *` on some platforms: glibc 2.3.6, macOS 10.7, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7.
- The parameters of this function are declared as `void *` on some platforms: AIX 5.1.

### 10.32 `asctime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is deprecated in C23. Likewise, POSIX says this function is obsolescent and it is planned to be removed in a future version. Portable applications can use `strftime` (or even `sprintf`) instead.
- This function may overflow its internal buffer if an invalid year is passed.

### 10.33 `asctime_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/asctime_r.html)

Future POSIX removal:

<https://www.austingroupbugs.net/view.php?id=1410>

Gnulib module: `extensions`

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in a future version. Use the function `strftime` (or even `sprintf`) instead.
- This function may put more than 26 bytes into the argument buffer if an invalid year is passed.

### 10.34 asin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asin.html>

Gnulib module: asin

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.35 asinf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinf.html>

Gnulib module: asinf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.36 asinh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

### 10.37 asinhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinhf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.

### 10.38 asinh1

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinh1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

### 10.39 asinl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/asinl.html>

Gnulib module: asinl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.40 assert

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/assert.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Extension: Gnulib offers a module ‘assert’ that allows the installer to disable assertions through a ‘configure’ option: ‘--disable-assert’.

### 10.41 atan

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan.html>

Gnulib module: atan

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

## 10.42 atan2

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2.html>

Gnulib module: atan2

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

## 10.43 atan2f

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2f.html>

Gnulib module: atan2f

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.44 atan2l

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atan2l.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

## 10.45 atanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanf.html>

Gnulib module: atanf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.46 atanh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

## 10.47 atanhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanhf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 9.

## 10.48 atanh1

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanh1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

## 10.49 atanl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atanl.html>

Gnulib module: atanl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.50 atexit

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atexit.html>

Gnulib module: atexit

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

## 10.51 atof

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atof.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.
- This function mis-parses strings with leading '+' on some old platforms: Old versions of Linux.
- This function returns a positive value for negative underflow on some platforms: glibc 2.4, Mingw, Cygwin.
- This function fails to do a valid parse of '-0x' on some platforms: glibc 2.4, Cygwin < 1.5.25-11.
- This function fails to parse Infinities and plain NaNs on some platforms: Mingw, OpenBSD 4.0.
- This function fails to parse NaN() on some platforms: Mingw, OpenBSD 4.0, Cygwin < 1.5.25-11.
- This function fails to parse NaN(n-char-sequence) on some platforms: Mingw, OpenBSD 4.0.
- This function fails to parse C99 hexadecimal floating point on some platforms: Mingw, OpenBSD 4.0.
- This function fails to correctly parse very long strings on some platforms: Mingw, Cygwin.

## 10.52 atoi

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atoi.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:



### 10.53 `atol`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atol.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.54 `atoll`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/atoll.html>

Gnulib module: `atoll`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.23, MSVC 9.

Portability problems not fixed by Gnulib:

### 10.55 `basename`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/basename.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-basename-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-basename-3.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.
- `glibc` and Android have two different functions `basename`: the POSIX version and the GNU version.
- `basename` assumes file names in POSIX syntax; it does not work with file names in Windows syntax.

The Gnulib module `basename-lgpl` provides similar API, with a function `last_component`, that also works with Windows file names.

### 10.56 `bind`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/bind.html>

Gnulib module: `bind`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by GnuLib:

## 10.57 `bsearch`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/bsearch.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

## 10.58 `btowc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/btowc.html>

GnuLib module: `btowc`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, mingw.
- This function returns `WEOF` for a `NUL` argument on some platforms: Cygwin 1.7.2.
- This function does not return `WEOF` for an `EOF` argument on some platforms: IRIX 6.5.
- In the `C` or `POSIX` locales, this function is not consistent with GnuLib's `mbrtowc` and can return `WEOF`: glibc 2.35, MirOS BSD #10.
- In the `C` or `POSIX` locales, this function is not consistent with `mbrtowc` on some platforms: mingw.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function `btoc32`, provided by GnuLib module `btoc32`, operates on 32-bit wide characters and therefore does not have this limitation.

## 10.59 `c8rtomb`

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on most platforms: glibc 2.29, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.60 c16rtomb

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.

## 10.61 c32rtomb

Gnulib module: c32rtomb

Portability problems fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
- This function returns 0 when the first argument is NULL in some locales on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Haiku 2020.

## 10.62 cabs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 9.

## 10.63 cabsf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabsf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, mingw, MSVC 9.

## 10.64 `cabs1`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cabs1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

## 10.65 `cacos`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacos.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.66 `cacosf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.67 `cacosh`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.68 `cacoshf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacoshf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.69 `cacoshl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacoshl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

## 10.70 `cacosl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cacosl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

## 10.71 `calloc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/calloc.html>

Gnulib module: `calloc-posix`

Portability problems fixed by Gnulib:

- Upon failure, the function does not set `errno` to `ENOMEM` on some platforms: mingw, MSVC 14.
- On some platforms, `calloc (n, s)` can succeed even if multiplying `n` by `s` would exceed `PTRDIFF_MAX` or `SIZE_MAX`. Although failing to check for exceeding `PTRDIFF_MAX` is arguably allowed by POSIX it can lead to undefined behavior later, so `calloc-posix` does not allow going over the limit.

Extension: Gnulib provides a module ‘`calloc-gnu`’ that substitutes a `calloc` implementation that behaves more like the glibc implementation. It fixes this portability problem:

- `calloc (0, s)` and `calloc (n, 0)` return NULL on success on some platforms: AIX 7.2.

## 10.72 `call_once`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Call-Once.html](https://www.gnu.org/software/libc/manual/html_node/Call-Once.html).

Gnulib module: `call_once`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- This function does not work on some platforms: Haiku.

## 10.73 `canonicalize`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.74 `canonicalizef`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.75 `canonicalizel`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.76 carg

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/carg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

## 10.77 cargf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cargf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

## 10.78 cargl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cargl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

## 10.79 casin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casin.html>

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.80 `casinf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinf.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.81 `casinh`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinh.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.82 `casinhf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinhf.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.



### 10.83 casinhl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casinh1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.84 casinl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/casin1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.85 catan

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catan.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

### 10.86 catanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.87 catanh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.88 catanhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanhf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 5.1.

## 10.89 catanhl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanhl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

## 10.90 catanl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catanl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.91 `catclose`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catclose.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 10.92 `catgets`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catgets.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 10.93 `catopen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/catopen.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 10.94 `cbirt`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbirt.html>

Gnulib module: `cbirt`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems not fixed by Gnulib:

### 10.95 `cbrtf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbrtf.html>

Gnulib module: `cbrtf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.
- This function returns a wrong value for a minus zero on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.96 `cbrtl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cbrtl.html>

Gnulib module: `cbrtl` or `cbrtl-ieee`

Portability problems fixed by either Gnulib module `cbrtl` or `cbrtl-ieee`

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.
- This function produces grossly wrong results on some platforms: OpenBSD 5.1/SPARC.

Portability problems fixed by Gnulib module `cbrtl-ieee`:

- This function returns a positive zero for a minus zero argument on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.97 `ccos`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccos.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.98 `ccosf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.99 `ccosh`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.100 `ccoshf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccoshf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.101 `ccoshl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccoshl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.102 `ccosl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ccosl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.103 `ceil`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceil.html>

Gnulib module: `ceil` or `ceil-ieee`

Portability problems fixed by either Gnulib module `ceil` or `ceil-ieee`:

Portability problems fixed by Gnulib module `ceil-ieee`:

- This function returns a positive zero for an argument between  $-1$  and  $0$  on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.104 `ceilf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceilf.html>

Gnulib module: `ceilf` or `ceilf-ieee`

Portability problems fixed by either Gnulib module `ceilf` or `ceilf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `ceilf-ieee`:

- This function returns a positive zero for an argument between  $-1$  and  $0$  on some platforms: macOS 10.13, AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.105 `ceil1`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ceil1.html>

Gnulib module: `ceil1` or `ceil1-ieee`

Portability problems fixed by either Gnulib module `ceil1` or `ceil1-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

- This function returns a wrong result for small arguments on some platforms: OpenBSD 5.6.

Portability problems fixed by Gnulib module `ceil1-ieee`:

Portability problems not fixed by Gnulib:

### 10.106 `cexp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.107 `cexpf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.108 `cexpl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cexpl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 13.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.109 `cfgetispeed`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfgetispeed.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.110 cfgetospeed

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfgetospeed.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.111 cfsetispeed

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfsetispeed.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.112 cfsetospeed

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cfsetospeed.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.113 chdir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/chdir.html>

Gnulib module: chdir

Portability problems fixed by Gnulib:

- This function is declared in different header files (namely, `<io.h>` or `<direct.h>`) on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.114 chmod

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/chmod.html>

Gnulib module: chmod

Portability problems fixed by Gnulib:

- This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2, IRIX 6.5.



- This function fails with a wrong error code (EINVAL instead of ENOTDIR) when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: mingw, MSVC.

Portability problems not fixed by Gnulib:

- This function sometimes fails with EACCES when the failure is due to lack of appropriate privileges (EPERM), not to search permission denied on the file name prefix (EACCES): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

### 10.115 chown

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/chown.html>

Gnulib module: chown

Portability problems fixed by Gnulib:

- Some platforms fail to detect trailing slash on non-directories, as in `chown("link-to-file/",uid,gid)`: macOS 12.5, FreeBSD 7.2, AIX 7.3.1, Solaris 9.
- Some platforms fail to update the change time when at least one argument was not `-1`, but no ownership changes resulted: OpenBSD 7.2.
- When passed an argument of `-1`, some implementations really set the owner user/group id of the file to this value, rather than leaving that id of the file alone: some very old platforms.
- When applied to a symbolic link, some implementations don't dereference the symlink, i.e. they behave like `lchown`: some very old platforms.
- This function is missing on some platforms; however, the replacement always fails with ENOSYS: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function sometimes fails with EACCES when the failure is due to lack of appropriate privileges (EPERM), not to search permission denied on the file name prefix (EACCES): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

### 10.116 cimag

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimag.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.117 `cimagf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimagf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.118 `cimagl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cimagl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

### 10.119 `clearerr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/clearerr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.120 `clock`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.121 `clock_getcpuclockid`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock\\_getcpuclockid.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_getcpuclockid.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

### 10.122 `clock_getres`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock\\_getres.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_getres.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, mingw, MSVC 14.
- On many platforms, this function returns a value other than the clock resolution of `clock_gettime`, i.e., the minimum distance between differing timestamps. For example, on AIX 7.2 it returns 10 milliseconds even though the clock resolution is 1 microsecond. Conversely, on GNU/Linux it typically returns 1 nanosecond even though the clock resolution may be greater.

The Gnulib module `gettime-res` is a partial substitute; it implements the `CLOCK_REALTIME` functionality of `clock_getres`, and fixes the too-high resolution bug of platforms like AIX 7.2.

### 10.123 `clock_gettime`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock\\_gettime.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_gettime.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, mingw, MSVC 14.
- This function leaves the upper 32 bits of the `tv_sec` field of the result uninitialized on some platforms: mingw in 32-bit mode.

The Gnulib modules `gettime` and `timespec_get` are partial substitutes; they implement the `CLOCK_REALTIME` functionality of `clock_gettime`.

### 10.124 `clock_nanosleep`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock\\_nanosleep.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_nanosleep.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 11.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

### 10.125 `clock_settime`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock\\_settime.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/clock_settime.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.

### 10.126 `clog`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/clog.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

### 10.127 `clogf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/clogf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

### 10.128 `clogl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/clogl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.129 `close`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/close.html>

Gnulib module: `close`

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
- On Windows platforms (excluding Cygwin), `socket` and `accept` do not return file descriptors that can be closed by `close`. Instead, `closesocket` must be used.

Portability problems not fixed by Gnulib:

### 10.130 `closedir`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/closedir.html>

Gnulib module: `closedir`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.131 `closelog`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/closelog.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.132 `cnd_broadcast`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.133 `cnd_destroy`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.134 `cnd_init`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.135 `cnd_signal`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.136 `cnd_timedwait`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.137 `cnd_wait`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Condition-Variables.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Condition-Variables.html).

Gnulib module: `cnd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.138 `confstr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/confstr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.139 conj

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/conj.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.140 conjf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/conjf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.141 conjl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/conjl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

### 10.142 connect

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/connect.html>

Gnulib module: connect

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:



### 10.143 copysign

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysign.html>

Gnulib module: copysign

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems not fixed by Gnulib:

### 10.144 copysignf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysignf.html>

Gnulib module: copysignf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.145 copysignl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/copysignl.html>

Gnulib module: copysignl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

Portability problems not fixed by Gnulib:

### 10.146 cos

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cos.html>

Gnulib module: cos

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.147 `cosf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosf.html>

Gnulib module: `cosf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.148 `cosh`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosh.html>

Gnulib module: `cosh`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.149 `coshf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/coshf.html>

Gnulib module: `coshf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.150 `coshl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/coshl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

### 10.151 `cosl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cosl.html>

Gnulib module: `cosl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.152 `cpow`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpow.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

### 10.153 `cpowf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpowf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9, Android 7.1.

### 10.154 `cpowl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cpowl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 11.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.155 cproj

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cproj.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
- The glibc implementation is or was broken.

### 10.156 cprojf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cprojf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.
- The glibc implementation is or was broken.

### 10.157 cprojl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/cprojl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.
- The glibc implementation is or was broken.

### 10.158 creal

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/creal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.159 `crealf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/crealf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.160 `creall`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/creall.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

### 10.161 `creat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/creat.html>

Gnulib module: `creat`

Portability problems fixed by Gnulib:

- This function does not support modes with execution bits (such as 0700) on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, `creat` may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file, on some platforms: FreeBSD 7.2, AIX 7.1, HP-UX 11.31, Solaris 9.

Portability problems not fixed by Gnulib:

- On Windows, this function returns a file handle in `O_TEXT` mode. If you need a file handle in `O_BINARY` mode, you need to use the function `open` instead.

### 10.162 crypt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/crypt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.34, FreeBSD 6.0, NetBSD 5.0, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in `<unistd.h>` (without `-D_GNU_SOURCE`) on some platforms: glibc (at least 2.11–2.13).

### 10.163 csin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csin.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.164 csinf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.165 csinh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.166 csinhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinhf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.167 csinhl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinhl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.168 csinl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csinl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.169 csqrt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.170 csqrtf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrtf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.171 csqrtl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/csqrtl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 5.1.

### 10.172 ctan

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctan.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.173 ctanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.



### 10.174 ctanh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanh.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.175 ctanhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanhf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, mingw, MSVC 9.

### 10.176 ctanh1

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanh1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.177 ctanl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctanl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 7.1.

### 10.178 `ctermid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctermid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.179 `ctime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctime.html>

Gnulib module: `ctime`

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by Gnulib:

- This function is deprecated in C23. Likewise, POSIX says this function is obsolescent and it is planned to be removed in a future version. Portable applications can use `localtime_r` and `strftime` (or even `sprintf`) instead.
- This function may overflow its internal buffer if an invalid year is passed.
- The `ctime` function need not be reentrant, and consequently is not required to be thread safe. Implementations of `ctime` typically write the timestamp into static buffer. If two threads call `ctime` at roughly the same time, you might end up with the wrong date in one of the threads, or some undefined string. There is a reentrant interface `ctime_r`.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 449.

A more flexible function is `strftime`. However, note that it is locale dependent.

### 10.180 `ctime_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctime\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/ctime_r.html)

Future POSIX removal:

<https://www.austingroupbugs.net/view.php?id=1410>

Gnulib module: `extensions`

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

- POSIX says this function is obsolescent and it is planned to be removed in a future version. Use the functions `localtime_r` and `strftime` (or even `sprintf`) instead.
- This function may put more than 26 bytes into the argument buffer if an invalid year is passed.

`ctime_r` takes a pre-allocated buffer and length of the buffer, and returns `NULL` on errors. The input buffer should be at least 26 bytes in size. The output string is locale-independent. However, years can have more than 4 digits if `time_t` is sufficiently wide, so the length of the required output buffer is not easy to determine. Increasing the buffer size when `ctime_r` returns `NULL` is not necessarily sufficient. The `NULL` return value could mean some other error condition, which will not go away by increasing the buffer size.

A more flexible function is `strftime`. However, note that it is locale dependent.

## 10.181 `daddl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.182 `daylight`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/daylight.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: FreeBSD 14.0, OpenBSD 3.8, IRIX 6.5.
- The address of this variable is not a compile-time constant on some platforms: Cygwin, mingw.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 449.

A more portable way of getting the UTC offset is to use `strftime` with the `%z` format. See Section 10.1082 [strftime], page 416.

### 10.183 dbm\_clearerr

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_clearerr.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_clearerr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.184 dbm\_close

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_close.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_close.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.185 dbm\_delete

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_delete.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_delete.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.186 dbm\_error

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_error.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_error.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.187 dbm\_fetch

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_fetch.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_fetch.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.188 dbm\_firstkey

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_firstkey.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_firstkey.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.189 dbm\_nextkey

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_nextkey.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_nextkey.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.190 dbm\_open

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.191 dbm\_store

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm\\_store.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/dbm_store.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.192 ddivl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.193 difftime

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/difftime.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.194 dirfd

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dirfd.html>

Gnulib module: dirfd

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 7.1, HP-UX 11, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function always fails on some platforms: mingw.
- There is a `dirfd` macro but no function, and the macro does not work with an argument of type `void *`, as a function would: NetBSD 9.2.

### 10.195 `dirname`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dirname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.
- `dirname` assumes file names in POSIX syntax; it does not work with file names in Windows syntax.

The Gnulib module `dirname` provides similar API, with functions `dir_name` and `mdir_name`, that also works with Windows file names.

### 10.196 `div`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/div.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.197 `dlclose`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlclose.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.198 `dLError`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dLError.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.199 dlopen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlopen.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlopen-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlopen-1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- If the file name argument is not absolute, the file is searched for. The search algorithm is system specific.

### 10.200 dlsym

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dlsym.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlsym-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlsym-1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- The visibility of symbols loaded in dependent shared libraries or present in the main executable is system dependent.

### 10.201 dmull

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



## 10.202 dprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dprintf.html>

Gnulib module: `dprintf` or `dprintf-posix` or `dprintf-gnu`

Portability problems fixed by either Gnulib module `dprintf` or `dprintf-posix` or `dprintf-gnu`:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems fixed by either Gnulib module `dprintf-posix` or `dprintf-gnu`:

- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.4.
- This function does not support the `'a'` and `'A'` directives on some platforms: glibc-2.3.6, Solaris 11.4.
- This function does not support the `'b'` directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the `'n'` directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1.
- This function does not support precisions in the `'ls'` directive correctly on some platforms: Solaris 11.4.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Solaris 11.4.
- `printf "%#.0x"` or `"%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1.
- This function produces wrong output for the `'lc'` directive with a NUL wide character argument on some platforms: musl libc 1.2.4.

Portability problems fixed by Gnulib module `dprintf-gnu`:

- This function does not support the `'B'` directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical `'long double'` numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86-64, IA-64 CPUs.

- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.203 `drand48`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/drand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.204 `dsubl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.205 `dup`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dup.html>

Gnulib module: `dup`

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.206 `dup2`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/dup2.html>

Gnulib module: `dup2`

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: MSVC 14.

- This function always returns 0 for success on some platforms: mingw, MSVC 14.
- This function can hang when duplicating an fd to itself on some platforms: mingw, MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: Cygwin 1.7.17, MSVC 14.
- This function crashes when invoked with valid arguments on some platforms: Cygwin 1.7.25.
- This function fails with `EINVAL` when duplicating an fd to itself: Android.
- This function resets the `FD_CLOEXEC` flag when duplicating an fd to itself on some platforms: Haiku.
- This function returns 0 for `dup2 (1, 1)` on some platforms: Cygwin 1.5.x.
- This function may return `-EBADF` instead of `-1` on some platforms: Linux releases between July 2008 and May 2009 (versions 2.6.27 to 2.6.29).
- This function returns `EMFILE` instead of `EBADF` for large targets, which interferes with using `dup2(fd,fd)==fd` as the minimal `EBADF` filter: AIX 7.1, FreeBSD 6.1, Cygwin 1.5.

Portability problems not fixed by Gnulib:

### 10.207 duplocale

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/duplocale.html>

Gnulib module: `duplocale`

Portability problems fixed by Gnulib:

- The argument `LC_GLOBAL_LOCALE` is not supported on some platforms: glibc 2.11, AIX 7.1.
- With the argument `LC_GLOBAL_LOCALE`, this function returns a wrong result on some platforms: NetBSD 7.1.

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
- This function is useless because the `locale_t` type is not defined on some platforms: z/OS.
- With the argument `LC_GLOBAL_LOCALE`, this function returns a wrong result on some platforms: Haiku.

### 10.208 encrypt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/encrypt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in `<unistd.h>` (without `-D_GNU_SOURCE`) on some platforms: glibc (at least 2.11–2.13).
- POSIX 202x says this function is obsolescent and it is planned to be removed in a future version.

### 10.209 `endgrent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endgrent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.210 `endhostent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endhostent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

### 10.211 `endnetent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endnetent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.

### 10.212 `endprotoent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endprotoent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

### 10.213 endpwent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endpwent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.214 endservent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endservent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.215 endutxent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/endutxent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.216 environ

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/environ.html>

Gnulib module: environ

Portability problems fixed by Gnulib:

- POSIX does not require this variable to be declared, and it is indeed not declared on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, IRIX 6.5, Solaris 11.4.
- On macOS, this variable is not declared. Up to Mac OS X 10.4, one can use

```
extern char **environ;
```

to get the variable declared. This does not work any more, however, in shared libraries on macOS 11.1. Here is a workaround: Instead, one can use

```
#include <crt_externs.h>
#define environ (*_NSGetEnviron())
```

This works at all versions of macOS.

- On Cygwin in 64-bit mode, references to this variable cause a link error when the option `-Wl,--disable-auto-import` is in use.

Portability problems not fixed by GnuLib:

- The address of this variable is not a compile-time constant on some platforms: mingw.
- Assigning NULL to `environ` to clear all variables is not portable; better is to assign `environ` to one-element array containing a NULL pointer. That said, an empty environment is not portable either, as some systems may require particular environment variables (such as `PATH`) to be present in order to operate consistently.

### 10.217 `erand48`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erand48.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.218 `erf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erf.html>

GnuLib module: `erf`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

### 10.219 `erfc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfc.html>

GnuLib module: `erfc`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

### 10.220 `erfcf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfcf.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.221 erfcl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfcl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

### 10.222 erff

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erff.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.223 erfl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/erfl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

### 10.224 errno

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/errno.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows, the socket functions don't set `errno`; their error code is available through `WSAGetLastError()` instead.

### 10.225 `execl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execl.html>

Gnulib module: `execl`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

### 10.226 `execle`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execle.html>

Gnulib module: `execle`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

### 10.227 `execlp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execlp.html>

Gnulib module: `execlp`



Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

## 10.228 `execv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execv.html>

Gnulib module: `execv`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The Gnulib replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Gnulib:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

## 10.229 `execve`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execve.html>

Gnulib module: `execve`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.

- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Note: The Glibc replacement for this function is not async-safe, that is, it must not be invoked from a signal handler.

Portability problems not fixed by Glibc:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

### 10.230 `execvp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/execvp.html>

Glibc module: `execvp`

Portability problems fixed by Glibc:

- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by Glibc:

- On some platforms, a script without executable permission is still run: Cygwin 1.5.x.

### 10.231 `exit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/exit.html>

Glibc module: `stdlib`

Portability problems fixed by Glibc:

- Some problems with the macros `EXIT_SUCCESS` and `EXIT_FAILURE`, see Section 9.52 [stdlib.h], page 71.

Portability problems not fixed by Glibc:

### 10.232 `exp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp.html>

Glibc module: `exp`

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

### 10.233 `exp2`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2.html>

Gnulib module: `exp2`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.
- This function returns grossly wrong results on some platforms: OpenBSD 4.9.

Portability problems not fixed by Gnulib:

### 10.234 `exp2f`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2f.html>

Gnulib module: `exp2f`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.235 `exp2l`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/exp2l.html>

Gnulib module: `exp2l` or `exp2l-ieee`

Portability problems fixed by either Gnulib module `exp2l` or `exp2l-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms: NetBSD 9.0.

Portability problems fixed by Gnulib module `exp2l-ieee`:

- This function returns a wrong value for a NaN argument on some platforms: OpenBSD 4.9.
- This function returns a wrong value for a negative infinity argument on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.236 expf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/expf.html>

Gnulib module: `expf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.237 expl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/expl.html>

Gnulib module: `expl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function returns 0.0 for all arguments on some platforms: Haiku 2017.
- This function returns NaN for small operands on some platforms: OpenBSD 5.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:

### 10.238 expm1

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1.html>

Gnulib module: `expm1` or `expm1-ieee`

Portability problems fixed by either Gnulib module `expm1` or `expm1-ieee`:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 9.

Portability problems fixed by Gnulib module `expm1-ieee`:

- This function has problems when the argument is minus zero on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.239 `expm1f`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1f.html>

Gnulib module: `expm1f` or `expm1f-ieee`

Portability problems fixed by either Gnulib module `expm1f` or `expm1f-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, mingw, MSVC 9.
- This function produces wrong results for arguments  $\leq -17.32868$  on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module `expm1f-ieee`:

- This function returns a positive zero for a minus zero argument on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

### 10.240 `expm1l`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/expm1l.html>

Gnulib module: `expm1l`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, Mac OS X 10.5, NetBSD 8.0.

Portability problems not fixed by Gnulib:

### 10.241 `fabs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabs.html>

Gnulib module: `fabs`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.242 `fabsf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabsf.html>

Gnulib module: `fabsf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, Solaris 9.

- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.243 `fabsl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fabsl.html>

Gnulib module: `fabsl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function returns a minus zero for a minus zero argument on some platforms: IRIX 6.5 with `gcc 4.2.4`.

Portability problems not fixed by Gnulib:

### 10.244 `faccessat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/faccessat.html>

Gnulib module: `faccessat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: `glibc 2.3.6`, macOS 10.12, FreeBSD 7.4, NetBSD 6.1.5, OpenBSD 4.9, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, `mingw`, MSVC 14, Android 4.0.4.
- On some platforms, `faccessat` (`dfd`, `"file/"`, `amode`, `flag`) succeeds instead of failing when `file` is not a directory. macOS 11.1.

Portability problems not fixed by Gnulib:

- The replacement does not always take ACLs into account.
- The replacement is not safe to be used in libraries.
- The replacement is not multithread-safe.
- The replacement does not support the `AT_SYMLINK_NOFOLLOW` flag, which is supported by GNU `faccessat`.
- On some platforms, `faccessat` can mishandle `AT_EACCESS` after a process starts as root and then becomes non-root: GNU/Linux with `glibc 2.32`.

Other problems of this function:

- There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.

### 10.245 fadd

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.246 faddl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.247 fattach

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fattach.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.248 fchdir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchdir.html>

Gnulib module: fchdir

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.

Portability problems not fixed by Gnulib:

## 10.249 fchmod

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchmod.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function sometimes fails with `EACCES` when the failure is due to lack of appropriate privileges (`EPERM`), not to search permission denied on the file name prefix (`EACCES`): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

## 10.250 fchmodat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchmodat.html>

Gnulib module: fchmodat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.
- When given the `AT_SYMLINK_NOFOLLOW` flag, this function fails with `errno` set to `ENOTSUP`, even when the file is not a symbolic link: GNU/Linux with glibc 2.31, Cygwin 2.9.

Portability problems not fixed by Gnulib:

- Some platforms do not allow changing the access bits on symbolic links.
- If the `AT_SYMLINK_NOFOLLOW` flag is specified, this function can fail with `errno` set to `EMFILE` or `ENFILE`, and it fails with `errno` set to `EOPNOTSUPP` if the `/proc` file system is not mounted: GNU/Linux with glibc 2.34.
- This function sometimes fails with `EACCES` when the failure is due to lack of appropriate privileges (`EPERM`), not to search permission denied on the file name prefix (`EACCES`): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

## 10.251 fchown

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchown.html>

Gnulib module: —



Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function sometimes fails with `EACCES` when the failure is due to lack of appropriate privileges (`EPERM`), not to search permission denied on the file name prefix (`EACCES`): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

## 10.252 `fchownat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fchownat.html>

Gnulib module: `fchownat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe. Also, the replacement may fail to change symlinks if `lchown` is unsupported, or fail altogether if `chown` is unsupported.
- This function is declared in `<sys/stat.h>`, not in `<unistd.h>`, on some platforms: Android 4.3.
- Some platforms fail to detect trailing slash on non-directories, as in `fchown(dir, "link-to-file/", uid, gid, flag)`: Solaris 9.
- Some platforms mistakenly dereference symlinks when using `AT_SYMLINK_NOFOLLOW`: Linux kernel 2.6.17.
- This function does not fail for an empty filename on some platforms: Linux with glibc < 2.11.

Portability problems not fixed by Gnulib:

- This function sometimes fails with `EACCES` when the failure is due to lack of appropriate privileges (`EPERM`), not to search permission denied on the file name prefix (`EACCES`): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

## 10.253 `fclose`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fclose.html>

Gnulib module: `fclose`

Portability problems fixed by Gnulib:

- On some platforms, this function fails to set the file position of a seekable input stream to the byte after the last one actually read: glibc 2.34, FreeBSD, AIX 7.2.
- This function crashes if the stream's file descriptor has already been closed on some platforms: MSVC 14.

- On Windows platforms (excluding Cygwin), `socket` and `accept` followed by `fdopen` do not return streams that can be closed by `fclose`.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

## 10.254 `fcntl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fcntl.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fcntl-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fcntl-3.html)

Gnulib module: `fcntl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function does not support `F_DUPFD_CLOEXEC` on some platforms: glibc with Linux kernels before 2.6.24, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.7.1. Note that the glibc replacement code is functional but not atomic.
- The `F_DUPFD_CLOEXEC` action of this function does not set the `FD_CLOEXEC` flag on some platforms: NetBSD 9.0.
- The `F_DUPFD_CLOEXEC` action of this function sets the `FD_CLOEXEC` flag on the wrong file descriptor on some platforms: Haiku.
- The `F_DUPFD` action of this function does not reject out-of-range targets properly on some platforms: AIX 7.1, Cygwin 1.5.x, Haiku.
- The `F_DUPFD` action of this function mistakenly clears `FD_CLOEXEC` on the source descriptor on some platforms: Haiku.

Portability problems not fixed by Gnulib:

- The replacement function does not support `F_SETFD`, `F_GETFL`, `F_SETFL`, `F_GETOWN`, `F_SETOWN`, `F_GETLK`, `F_SETLK`, and `F_SETLKW` on some platforms: mingw, MSVC 14.
- When a file does not support locking (such as on an NFS file system that does not support file locking), calls with `F_SETLK` and `F_SETLKW` fail with `errno` set to different values on different systems: `EINVAL` on OpenIndiana (as suggested by the POSIX 1003.1-2017 `fcntl` specification), `ENOLCK` on GNU/Linux, and `EOPNOTSUPP` on FreeBSD.

## 10.255 `fdatasync`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdatasync.html>

Gnulib module: `fdatasync`

Portability problems fixed by Gnulib:

- This function is present but not declared on some platforms: Mac OS X 10.7.

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 11.0, OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 2.2.

Portability problems not fixed by Gnulib:

### 10.256 `fdetach`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdetach.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.257 `fdim`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdim.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.258 `fdimf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdimf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.259 `fdiml`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdiml.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

## 10.260 fdiv

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.261 fdivl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.262 fdopen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdopen.html>

Gnulib module: fdopen

Portability problems fixed by Gnulib:

- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

Portability problems not fixed by Gnulib:

## 10.263 fdopendir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fdopendir.html>

Gnulib module: fdopendir

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe. Also, the replacement does not guarantee that

‘`dirfd(fdopendir(n))==n`’ (dirfd might fail, or return a different file descriptor than n).

- This function exists but is not declared on some platforms: FreeBSD 7.3.
- This function does not reject non-directory file descriptors on some platforms: GNU/Hurd.
- This function mistakenly closes non-directory file descriptors on some platforms: FreeBSD 8.1.

Portability problems not fixed by Gnulib:

### 10.264 `feclearexcept`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/feclearexcept.html>

Gnulib module: `fenv-exceptions-tracking-c99`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function is broken on some platforms: OpenBSD 7.4/mips64, Minix 3.3/i386.

Portability problems not fixed by Gnulib:

### 10.265 `fegetenv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetenv.html>

Gnulib module: `fenv-environment`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function clears all exception trap bits on some platforms: glibc 2.19/x86\_64, Mac OS X 10.5/i386, Mac OS X 10.5/x86\_64.
- This function does not save the exception trap bits on some platforms: AIX 7.3.

Portability problems not fixed by Gnulib:

### 10.266 `fegetexceptflag`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetexceptflag.html>

Gnulib module: `fenv-exceptions-state-c99`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

Portability problems not fixed by Gnulib:

## 10.267 fegetmode

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Control-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 10.268 fegetround

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fegetround.html>

Gnulib module: fenv-rounding

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.

Portability problems not fixed by Gnulib:

## 10.269 feholdexcept

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/feholdexcept.html>

Gnulib module: fenv-environment

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function does not work on some platforms: glibc 2.5, FreeBSD 12.2/arm64.
- This function does not save the exception trap bits on some platforms: AIX 7.3.
- This function does not clear the exception trap bits on some platforms: musl libc, mingw.
- This function may fail on some platforms: MSVC 14.
- 

Portability problems not fixed by Gnulib:

## 10.270 feof

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/feof.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.271 `feraiseexcept`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/feraiseexcept.html>

Gnulib module: `fenv-exceptions-tracking-c99`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function does not detect failures on `glibc 2.19/arm`.
- This function does not trigger traps on `Cygwin 3.4.9/x86_64`.

Portability problems not fixed by Gnulib:

### 10.272 `ferror`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ferror.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.273 `fesetenv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetenv.html>

Gnulib module: `fenv-environment`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function does not work on some platforms: `FreeBSD 12.2/arm64`.
- This function does not restore the floating-point exception trap bits on some platforms: `musl libc/i386`, `musl libc/x86_64`, AIX 7.3, Solaris 10 and 11, MSVC 14.
- The macro `FE_DFL_ENV` cannot be used because it leads to a link error on some platforms: `NetBSD 9.3/hppa`, `NetBSD 9.3/sparc`, `Cygwin 2.9.0`.
- This function, when called with `FE_DFL_ENV` argument, has no effect on the `x86 mxcsr` register and thus on floating-point operations performed in the SSE unit on some platforms: `mingw 10`.

Portability problems not fixed by Gnulib:

## 10.274 fesetexcept

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Status-bit-operations.html](https://www.gnu.org/software/libc/manual/html_node/Status-bit-operations.html).

Gnulib module: fenv-exceptions-tracking-c23

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function triggers floating-point exception traps although it shouldn't, on glibc 2.37/i386, glibc 2.37/powerpc.

Portability problems not fixed by Gnulib:

## 10.275 fesetexceptflag

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetexceptflag.html>

Gnulib module: fenv-exceptions-state-c99

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function triggers floating-point exception traps although it shouldn't, on glibc 2.37/i386, glibc 2.37/x86\_64, glibc 2.37/powerpc, musl libc, Mac OS X 10.5, Minix 3.3, mingw, Haiku.
- This function clears too many floating-point exception flags on glibc 2.37/alpha.
- This function is also buggy on AIX 7.3.1.

Portability problems not fixed by Gnulib:

## 10.276 fesetmode

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Control-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



## 10.277 fesetround

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fesetround.html>

Gnulib module: fenv-rounding

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function does not work on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

- The rounding mode has no effect on `long double` operations on some platforms: FreeBSD/arm64, NetBSD/sparc64, OpenBSD/mips64.

## 10.278 fetestexcept

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fetestexcept.html>

Gnulib module: fenv-exceptions-tracking-c99

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9, Android 4.4.
- This function clears the floating-point exception trap bits on some platforms: NetBSD 9.3/x86\_64.
- This function is broken on some platforms: Minix 3.3/i386.

Portability problems not fixed by Gnulib:

## 10.279 fetestexceptflag

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Status-bit-operations.html](https://www.gnu.org/software/libc/manual/html_node/Status-bit-operations.html).

Gnulib module: fenv-exceptions-state-c23

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

## 10.280 feupdateenv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/feupdateenv.html>

Gnulib module: fenv-environment

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 14, Android 4.4.
- This function crashes when given the argument `FE_DFL_ENV` on some platforms: glibc 2.37/riscv64.
- This function does not work on some platforms: glibc 2.5/ia64, FreeBSD 12.2/arm64.
- This function forgets about the currently set floating-point exception flags on some platforms: Mac OS X 10.5/i386, Mac OS X 10.5/x86\_64.
- This function does not restore the floating-point exception trap bits on some platforms: musl libc/i386, musl libc/x86\_64, AIX 7.3, Solaris 10 and 11, mingw 10.
- This function does not trigger traps on glibc 2.37/hppa, musl libc/s390x.
- This function may fail on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.281 fexecve

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fexecve.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x, mingw, MSVC 14, Android 8.1.

## 10.282 fflush

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fflush.html>

Gnulib module: fflush

Portability problems fixed by Gnulib:

- `fflush` followed by `fseek` or `fseeko`, applied to an input stream, should have the effect of positioning the underlying file descriptor. It doesn't do this on some platforms: glibc 2.34, FreeBSD 14.0, and others.
- `fflush` on an input stream changes the position of the stream to the end of the previous buffer, on some platforms: mingw, MSVC 14.
- `fflush` on an input stream right after `ungetc` does not discard the `ungetc` buffer, on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Cygwin 1.5.25-10.

Portability problems not fixed by Gnulib:

- `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.
- `fflush` on an input stream right after `ungetc` does not discard the `ungetc` buffer, on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14.

### 10.283 `ffs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ffs.html>

Gnulib module: `ffs`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 13.

### 10.284 `fgetc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetc.html>

Gnulib module: `stdio`, `nonblocking`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.

## 10.285 `fgetpos`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetpos.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.
- This function mistakenly succeeds on pipes on some platforms: mingw 10.

## 10.286 `fgets`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgets.html>

Gnulib module: `stdio`, `nonblocking`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

## 10.287 `fgetwc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetwc.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.288 fgetws

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fgetws.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.289 fileno

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fileno.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.290 flockfile

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/flockfile.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.291 floor

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/floor.html>

Gnulib module: `floor` or `floor-ieee`

Portability problems fixed by either Gnulib module `floor` or `floor-ieee`:

Portability problems fixed by Gnulib module `floor-ieee`:

Portability problems not fixed by Gnulib:

## 10.292 floorf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/floorf.html>

Gnulib module: floorf or floorf-ieee

Portability problems fixed by either Gnulib module `floorf` or `floorf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `floorf-ieee`:

Portability problems not fixed by Gnulib:

## 10.293 floorl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/floorl.html>

Gnulib module: floorl or floorl-ieee

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.294 fma

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fma.html>

Gnulib module: fma

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function produces wrong results on some platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 6.4/x86, NetBSD 8.0, Cygwin 1.5, mingw.

Portability problems not fixed by Gnulib:

## 10.295 fmaf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaf.html>

Gnulib module: fmaf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

- This function produces wrong results on some platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 6.4/x86, FreeBSD 12.2/arm, Cygwin 1.5, mingw.

Portability problems not fixed by GnuLib:

- This function produces wrong results on some platforms: musl libc/powerpc64le when emulated by QEMU 5.0.0.

### 10.296 `fmal`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmal.html>

GnuLib module: `fmal`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function produces wrong results on some platforms: glibc 2.17, macOS 10.13, FreeBSD 6.4/x86, mingw.

Portability problems not fixed by GnuLib:

### 10.297 `fmax`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmax.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.298 `fmaxf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaxf.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.299 `fmaxl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmaxl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

### 10.300 `fmaxmag`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.301 `fmaxmagf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.302 `fmaxmagl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 10.303 fmemopen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmemopen.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

### 10.304 fmin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmin.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.305 fminf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fminf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.306 fminl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fminl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

### 10.307 fminmag

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.308 fminmagf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.309 fminmagl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.310 fmod

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmod.html>

Gnulib module: fmod or fmod-ieee

Portability problems fixed by either Gnulib module fmod or fmod-ieee:

Portability problems fixed by Gnulib module fmod-ieee:

- This function has problems when the first argument is minus zero on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.311 fmodf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmodf.html>

Gnulib module: `fmodf` or `fmodf-ieee`

Portability problems fixed by either Gnulib module `fmodf` or `fmodf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `fmodf-ieee`:

- This function has problems when the first argument is minus zero on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.312 fmodl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmodl.html>

Gnulib module: `fmodl` or `fmodl-ieee`

Portability problems fixed by either Gnulib module `fmodl` or `fmodl-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function is not declared and does not work on some platforms: AIX 5.1.

Portability problems fixed by Gnulib module `fmodl-ieee`:

- This function has problems when the first argument is minus zero on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.313 fmtmsg

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fmtmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.314 `fmul`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.315 `fmull`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.316 `fnmatch`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fnmatch.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fnmatch-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fnmatch-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Wildcard-Matching.html](https://www.gnu.org/software/libc/manual/html_node/Wildcard-Matching.html),
- `man fnmatch`.

Gnulib module: `fnmatch` or `fnmatch-gnu`

Portability problems fixed by either Gnulib module `fnmatch` or `fnmatch-gnu`:

- This function is missing on some platforms: mingw, MSVC 14.
- The `"?"` pattern character fails to match characters outside the single-byte range on some platforms: NetBSD 9.3, Android 13.
- The `"?"` pattern character fails to match characters outside the Unicode BMP on some platforms: Solaris 10, Cygwin 3.4.6, MSVC, 32-bit AIX.
- In the pattern, negated character ranges (such as `[!a-z]`) are not supported on some platforms: Solaris 11.4.

- In the pattern, character classes (such as `[:alnum:]`) inside bracket expressions are not supported on some platforms: FreeBSD 13.2, NetBSD 9.3, Solaris 11 OpenIndiana, Cygwin 3.4.6.
- In the pattern, character classes (such as `[:alnum:]`) inside bracket expressions fail to match characters outside the single-byte range on some platforms: Android 13.
- The character class `[:cntrl:]` matches the empty string on some platforms: Solaris 11.4.
- Ranges that start or end with a backslash don't work right on some platforms: glibc 2.3.3.
- In the pattern, an opening bracket without closing bracket does not match a literal '[' on some platforms: glibc 2.12, macOS 12.5, NetBSD 9.3.

Portability problems fixed by Gnulib module `fnmatch-gnu`:

- This function does not support the flags `FNM_LEADING_DIR` and `FNM_CASEFOLD` on some platforms: AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 10.
- The flag `FNM_CASEFOLD` does not work in many situations on some platforms: NetBSD 9.3.
- The flag `FNM_CASEFOLD` does not work for multibyte characters consisting of more than one byte on some platforms: Android 13.
- This function does not support the flag `FNM_EXTMATCH` on all non-glibc platforms: musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.3, OpenBSD 7.2, Minix 3.3, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 3.4.6, Android 13.
- This function does not support the flag `FNM_FILE_NAME` as an alias of `FNM_PATHNAME` on some platforms: NetBSD 9.3, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 10.

Portability problems not fixed by Gnulib:

Note: Gnulib's replacement function has some limitations:

- It does not implement patterns with collating elements (such as `"[[.ch.]]"`) or equivalence classes (such as `"[[=a=]]"`).

## 10.317 `fopen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fopen.html>

Gnulib module: `fopen` or `fopen-gnu`

Portability problems fixed by either Gnulib module `fopen` or `fopen-gnu`:

- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: HP-UX 11.00, AIX 7.1, Solaris 9.
- On platforms where `off_t` is a 32-bit type, `fopen` may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- On Windows platforms (excluding Cygwin), this function does usually not recognize the `/dev/null` filename.

Portability problems fixed by Gnulib module `fopen-gnu`:

- This function does not support the mode character ‘x’ (corresponding to `O_EXCL`), introduced in ISO C11, on some platforms: FreeBSD 8.2, NetBSD 6.1, OpenBSD 5.6, Minix 3.2, AIX 6.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.16 (2012), mingw, MSVC 14.
- This function does not support the mode character ‘e’ (corresponding to `O_CLOEXEC`), introduced into a future POSIX revision through <https://www.austingroupbugs.net/view.php?id=411>, on some platforms: glibc 2.6, macOS 11.1, FreeBSD 9.0, NetBSD 5.1, OpenBSD 5.6, Minix 3.2, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.16 (2012), mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function returns a file stream in “text” mode by default; this means that it translates ‘\n’ to CR/LF by default. Use the “b” flag if you need reliable binary I/O.
- On Windows platforms (excluding Cygwin), this function fails to open directories for reading. Such streams have implementation-defined semantics on other platforms. To avoid directory streams with a consistent error message, use `fstat` after `open` and `fopen`, rather than `fopen` and `fileno`.

### 10.318 fork

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fork.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On some platforms, `fork` followed by a call of the `exec` family (`execl`, `execlp`, `execle`, `execv`, `execvp`, or `execve`) is less efficient than `vfork` followed by the same call. `vfork` is a variant of `fork` that has been introduced to optimize the `fork/exec` pattern.
- On Windows platforms (excluding Cygwin), this function is not implemented; use `_spawnvp` instead.

### 10.319 fpathconf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fpathconf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.320 `fpclassify`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fpclassify.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.321 `fprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fprintf.html>

Gnulib module: `fprintf-posix` or `fprintf-gnu` or `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by either Gnulib module `fprintf-posix` or `fprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf “%f”, “%e”, “%g” of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as “%2\$s”, on some platforms: NetBSD 3.0, mingw, MSVC 14.

- This function doesn't support the ' flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the 'a' directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- printf "%#.0x" or "%#.0X" with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.
- This function produces wrong output for the 'lc' directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `fprintf-gnu`:

- This function does not support the 'B' directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `fprintf-posix` or `fprintf-gnu`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio` or `fprintf-posix` or `fprintf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical 'long double' numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.



### 10.322 `fputc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputc.html>

Gnulib module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
- This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.

### 10.323 `fputs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputs.html>

Gnulib module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.324 `fputwc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputwc.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.325 `fputws`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fputws.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.326 `fread`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fread.html>

Gnulib module: `stdio`, `nonblocking`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.

### 10.327 `free`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/free.html>

Gnulib module: `free-posix`

Portability problems fixed by Gnulib:

- This function may clobber `errno` on many platforms: glibc 2.32, Mac OS X, FreeBSD, NetBSD, OpenBSD 4.4, Minix, AIX, HP-UX, IRIX, Cygwin, mingw, MSVC.

Portability problems not fixed by Gnulib:

### 10.328 `freeaddrinfo`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/freeaddrinfo.html>

Gnulib module: `getaddrinfo`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.
- On Windows, this function is declared in `<ws2tcpip.h>` rather than in `<netdb.h>`.
- On Windows, in 32-bit mode, this function is defined with a calling convention that is different from `cdecl`.

Portability problems not fixed by Gnulib:

### 10.329 `freelocale`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/freelocale.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
- This function is useless because the `locale_t` type is not defined on some platforms: z/OS.
- This function may cause crashes in subsequent `newlocale` invocations on some platforms: Haiku.

### 10.330 `freopen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/freopen.html>

Gnulib module: `freopen`

Portability problems fixed by Gnulib:

- On some platforms, if `stream` does not already have an open file descriptor, `freopen` returns the stream without opening the file: glibc 2.24.
- On platforms where `off_t` is a 32-bit type, `freopen` may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

- On Windows platforms (excluding Cygwin), this function does usually not recognize the `/dev/null` filename.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- This function does not support a `NULL` file name argument on some platforms: OpenBSD 4.9, AIX 7.1, HP-UX 11.23, IRIX 6.5, Solaris 10, mingw, MSVC 14.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: HP-UX 11.00, Solaris 9.
- Applications should not assume that `fileno(f)` will be the same before and after a call to `freopen(name,mode,f)`. However, the module `freopen-safer` can at least protect `stdin`, `stdout`, and `stderr`.

### 10.331 frexp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexp.html>

Gnulib module: `frexp`

Portability problems fixed by Gnulib:

- This function does not work on denormalized numbers on some platforms: NetBSD 3.0.
- This function does not work on negative zero on some platforms: NetBSD 4.99, MSVC 14.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.332 frexpf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexpf.html>

Gnulib module: `frexpf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function does not work on negative zero on some platforms: mingw.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:

### 10.333 frexpl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/frexpl.html>

Gnulib module: `frexpl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function does not work on finite numbers on some platforms: AIX 5.1, MSVC 14.
- This function does not work on denormalized numbers on some platforms: macOS 10.13/i386.
- This function does not work on infinite numbers on some platforms: IRIX 6.5, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.334 fromfp

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.335 fromfpf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.336 fromfpl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.337 fromfpx

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.338 fromfpxf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.339 fromfpxl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.340 fscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fscanf.html)

Gnulib module: `stdio`, `nonblocking`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function doesn't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

### 10.341 fseek

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fseek.html>

Gnulib module: `fseek`

Portability problems fixed by Gnulib:

- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On platforms where `long` is a 32-bit type, `fseek` does not work correctly with files 2 GiB and larger, even when the `AC_SYS_LARGEFILE` macro is used. The fix is to use `fseeko` instead.

### 10.342 fseeko

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fseeko.html>

Gnulib module: `fseeko`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- The declaration of `fseeko` in `<stdio.h>` is not enabled by default on some platforms: glibc 2.3.6.

- This function fails on seekable stdin, stdout, and stderr: cygwin <= 1.5.24.
- On platforms where `off_t` is a 32-bit type, `fseeko` does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.343 `fsetpos`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fsetpos.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.344 `fstat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstat.html>

Gnulib module: `fstat`

Portability problems fixed by Gnulib:

- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, `fstat` may not correctly report the size of files or block devices 2 GiB and larger.. See Section 14.2 [Large File Support], page 761.
- On Linux/x86 and Linux/x86\_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 761.
- On macOS 12.6, when this function yields a timestamp with a nonpositive `tv_sec` value, `tv_nsec` might be in the range `-999999999..-1`, representing a negative nanoseconds offset from `tv_sec`. Solaris 11.4 is similar, except that `tv_sec` might also be `-1000000000`.
- The `st_atime`, `st_ctime`, `st_mtime` fields are affected by the current time zone and by the DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the environment variable `TZ` is set).

Portability problems not fixed by Gnulib:

- See Section 9.65 [sys/stat.h], page 76, for general portability problems with `struct stat`.
- On Cygwin, `fstat` applied to the file descriptors 0 and 1, returns different `st_ino` values, even if standard input and standard output are not redirected and refer to the same terminal.



### 10.345 `fstatat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstatat.html>

Gnulib module: `fstatat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- On platforms where `off_t` is a 32-bit type, `fstatat` may not correctly report the size of files or block devices larger than 2 GB. See Section 14.2 [Large File Support], page 761.
- On some platforms, `fstatat(fd, "file/", buf, flag)` succeeds instead of failing with `ENOTDIR`. Solaris 9.
- For symlinks, when the argument ends in a slash, some platforms don't dereference the argument: Solaris 9.
- On macOS 12.6, when this function yields a timestamp with a nonpositive `tv_sec` value, `tv_nsec` might be in the range `-999999999..-1`, representing a negative nanoseconds offset from `tv_sec`. Solaris 11.4 is similar, except that `tv_sec` might also be `-1000000000`.

Portability problems not fixed by Gnulib:

- This function does not fail when the second argument is an empty string on some platforms, even when `AT_EMPTY_PATH` is not used: glibc 2.7, Linux 2.6.38.
- See Section 9.65 [sys/stat.h], page 76, for general portability problems with `struct stat`.

### 10.346 `fstatvfs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fstatvfs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `f_blocks` in `'struct statvfs'` is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. See Section 14.2 [Large File Support], page 761. This affects glibc/Hurd, HP-UX 11, Solaris.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14, Android 4.3.

### 10.347 `fsub`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.348 fsubl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Misc-FP-Arithmetic.html](https://www.gnu.org/software/libc/manual/html_node/Misc-FP-Arithmetic.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.349 fsync

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fsync.html>

Gnulib module: fsync

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- If the argument is a read-only file descriptor, this function fails with EBADF on some platforms: AIX 7.2, Cygwin 2.9.

### 10.350 ftell

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftell.html>

Gnulib module: ftell

Portability problems fixed by Gnulib:

- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.
- This function produces incorrect results after `putc` that followed a `getc` call that reached EOF on some platforms: Solaris 11 2010-11.
- This function, when invoked after `ungetc`, throws away the `ungetc` buffer, changes the stream's file position, and returns the wrong position on some platforms: macOS 10.15 and newer.
- This function mistakenly succeeds on pipes on some platforms: mingw 10.

Portability problems not fixed by Gnulib:

- This function produces incorrect results immediately after `fseek` on some platforms: HP-UX 11.

- `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.
- On platforms where `long` is a 32-bit type, `ftell` does not work correctly with files 2 GiB and larger, even when the `AC_SYS_LARGEFILE` macro is used. The fix is to use `ftello` instead.

### 10.351 `ftello`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftello.html>

Gnulib module: `ftello`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- The declaration of `ftello` in `<stdio.h>` is not enabled by default on some platforms: glibc 2.3.6.
- This function produces incorrect results after `putc` that followed a `getc` call that reached EOF on some platforms: Solaris 11 2010-11.
- This function, when invoked after `ungetc`, throws away the `ungetc` buffer, changes the stream's file position, and returns the wrong position on some platforms: macOS 10.15 and newer.
- This function fails on seekable stdin, stdout, and stderr: cygwin <= 1.5.24.
- This function mistakenly succeeds on pipes on some platforms: mingw 10.
- On platforms where `off_t` is a 32-bit type, `ftello` does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function produces incorrect results immediately after `fseek` on some platforms: HP-UX 11.
- `fflush`, `ftell`, `ftello`, `fgetpos` behave incorrectly on input streams that are opened in `O_TEXT` mode and whose contents contains Unix line terminators (LF), on some platforms: mingw, MSVC 14.

### 10.352 `ftok`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftok.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.353 ftruncate

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftruncate.html>

Gnulib module: ftruncate

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.354 ftrylockfile

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftrylockfile.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.355 ftw

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ftw.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 4.1.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the Gnulib module `fts` instead.

### 10.356 funlockfile

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/funlockfile.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.357 futimens

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/futimens.html>

Gnulib module: futimens

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.5, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.3. However, the replacement function may end up truncating timestamps to worse resolution than supported by the file system.
- This function returns a bogus value instead of failing with `ENOSYS` on some platforms: Linux kernel 2.6.21.
- When using `UTIME_OMIT` or `UTIME_NOW`, some systems require the `tv_sec` argument to be 0, and don't necessarily handle all file permissions in the manner required by POSIX: Linux kernel 2.6.25.
- When using `UTIME_OMIT` for the modification time, but specifying an access time, some systems fail to update the change time: Linux kernel 2.6.32, macOS 11.1, NetBSD 9.0, Solaris 11.1.
- Passing `AT_FDCWD` as the `fd` argument does not properly fail with `EBADF` on some systems: glibc 2.11, musl libc, Solaris 11.

Portability problems not fixed by Gnulib:

- Some platforms lack the ability to change the timestamps of a file descriptor, so the replacement can fail with `ENOSYS`; the gnulib module 'utimens' provides a more reliable interface `fdutimens`.
- The mere act of using `stat` modifies the access time of directories on some platforms, so `utimensat` can only effectively change directory modification time: Cygwin 1.5.x.

### 10.358 fwide

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwide.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, MSVC 14.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- `fwide` is not guaranteed to be able to change a file stream's mode to a different mode than the current one.

### 10.359 `fwprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.360 `fwrite`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwrite.html>

Gnulib module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.
- This function crashes if the stream's file descriptor has already been closed, if `MSVC_INVALID_PARAMETER_HANDLING` is `HAIRY_LIBRARY_HANDLING` or `SANE_LIBRARY_HANDLING`, on some platforms: MSVC 14.

### 10.361 `fwscanf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/fwscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fwscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fwscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.362 `gai_strerror`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/gai\\_strerror.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/gai_strerror.html)

Gnulib module: `getaddrinfo`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x.
- This function is only available in `<ws2tcpip.h>` on some platforms: mingw, MSVC 14.
- This function's return type is `char *` instead of `const char *` on some platforms: AIX 7.1, HP-UX 11, Solaris 9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.363 `getaddrinfo`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getaddrinfo.html>

Gnulib module: `getaddrinfo`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.
- On Windows, this function is declared in `<ws2tcpip.h>` rather than in `<netdb.h>`.

- On Windows, in 32-bit mode, this function is defined with a calling convention that is different from `cdecl`.

Portability problems not fixed by GnuLib:

- Unlike `glibc`'s implementation, `gnulib`'s replacement does not support internationalized domain names (IDN) encoding.

### 10.364 `getc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getc.html>

GnuLib module: `stdio`, `nonblocking`

Portability problems fixed by GnuLib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: `mingw`, `MSVC 14`.

Portability problems not fixed by GnuLib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include `glibc` and default `Solaris`.
- On Windows platforms (excluding `Cygwin`), this function does not set `errno` upon failure.

### 10.365 `getc_unlocked`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getc\\_unlocked.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getc_unlocked.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: `Minix 3.1.8`, `mingw`, `MSVC 14`.

### 10.366 `getchar`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getchar.html>

GnuLib module: `stdio`, `nonblocking`

Portability problems fixed by GnuLib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: `mingw`, `MSVC 14`.

Portability problems not fixed by GnuLib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on



some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

### 10.367 `getchar_unlocked`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getchar\\_unlocked.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getchar_unlocked.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.368 `getcwd`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getcwd.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getcwd.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getcwd.html)

Gnulib module: `getcwd` or `getcwd-lgpl`

Portability problems fixed by either Gnulib module `getcwd` or `getcwd-lgpl`:

- This function is declared in different header files (namely, `<io.h>` or `<direct.h>`) on some platforms: mingw, MSVC 14.
- On glibc and Solaris 11.4 platforms, `getcwd(NULL, n)` allocates memory for the result. On some other platforms, this call is not allowed.
- On some platforms, the prototype for `getcwd` uses `int` instead of `size_t` for the size argument when using non-standard headers, and the declaration is missing from `<unistd.h>`: mingw, MSVC 14.
- On some platforms, `getcwd(buf, 0)` crashes: MSVC 14.
- On some platforms, `getcwd(buf, 0)` fails with `ERANGE` instead of the required `EINVAL`: mingw.

Portability problems fixed by Gnulib module `getcwd`:

- This function does not handle long file names (greater than `PATH_MAX`) correctly on some platforms: glibc on Linux 2.4.20, musl libc 1.2.2/powerpc64le, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, AIX 7.1.

Portability problems not fixed by Gnulib:

- When using `getcwd(NULL, nonzero)`, some platforms, such as glibc or cygwin, allocate exactly `nonzero` bytes and fail with `ERANGE` if it was not big enough, while other platforms, such as FreeBSD, mingw, or MSVC 14, ignore the size argument and allocate whatever size is necessary. If this call succeeds, an application cannot portably access beyond the string length of the result.

### 10.369 `getdate`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdate.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Gnulib provides a module `parse-datetime` that contains a function `parse_datetime` that has similar functionality as the `getdate` function.

### 10.370 `getdate_err`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdate\\_err.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdate_err.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 10.13, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.371 `getdelim`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getdelim.html>

Gnulib module: `getdelim`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14, Android 4.2.
- This function makes out-of-bounds reads on some platforms: macOS 10.13.
- This function crashes when passed a pointer to a NULL buffer together with a pointer to a non-zero buffer size on some platforms: FreeBSD 8.0.

Portability problems not fixed by Gnulib:

- This function has quadratic running time for long lines on some platforms: uClibc 0.9.31.

### 10.372 getegid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getegid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.373 getenv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getenv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.374 geteuid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/geteuid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.375 getgid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.376 getgrent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.377 getgrgid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrgid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.378 getgrgid\_r

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrgid\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrgid_r.html)

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 6.0.

### 10.379 getgrnam

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrnam.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.380 getgrnam\_r

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrnam\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgrnam_r.html)

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 6.0.

### 10.381 `getgroups`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getgroups.html>

Gnulib module: `getgroups`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On some platforms, this function fails to reject a negative count, even though that is less than the size that would be returned: macOS 11.1, FreeBSD 13.0.
- On NeXTstep 3.2, `getgroups(0, NULL)` always fails. See macro `'AC_FUNC_GETGROUPS'`.
- On very old systems, this function operated on an array of `'int'`, even though that was a different size than an array of `'gid_t'`.

Portability problems not fixed by Gnulib:

- This function is unsafe to call between `fork` and `exec` if the parent process is multi-threaded.
- It is unspecified whether the effective group id will be included in the returned list, nor whether the list will be sorted in any particular order. For that matter, some platforms include the effective group id twice, if it is also a member of the current supplemental group ids.

The Gnulib module `mgetgroups` provides a similar API.

### 10.382 `gethostent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.

### 10.383 `gethostid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.384 gethostname

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gethostname.html>

Gnulib module: gethostname

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<winsock2.h>`) on some platforms: MSVC 14.
- On mingw and MSVC 14, this function has a prototype that differs from that specified by POSIX, and it is defined only in the `ws2_32` library.

Portability problems not fixed by Gnulib:

- This function's second argument type is `int` instead of `size_t` on some platforms: Solaris 10.
- If the given buffer is too small for the host name, some implementations fail with `EINVAL`, instead of returning a truncated host name.

### 10.385 getitimer

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getitimer.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `timer_gettime` instead.

### 10.386 getline

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getline.html>

Gnulib module: getline

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14, Android 4.2.
- This function is missing a declaration on some platforms: AIX 7.1.
- Some platforms provide a function by this name but with the wrong signature, for example in `-linet`.
- This function crashes when passed a pointer to a NULL buffer together with a pointer to a non-zero buffer size on some platforms: FreeBSD 8.0.

Portability problems not fixed by Gnulib:

- This function has quadratic running time for long lines on some platforms: uClibc 0.9.31.

### 10.387 `getlogin`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getlogin.html>

Gnulib module: `getlogin`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: older mingw, MSVC 14.
- This function is not declared unless `_POSIX` is defined on some platforms: mingw.

Portability problems not fixed by Gnulib:

- This function returns an empty string even when standard input is a tty on some platforms: HP-UX 11.11.

### 10.388 `getlogin_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getlogin\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getlogin_r.html)

Gnulib module: `getlogin_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 8.1.
- This function is not declared unless `_REENTRANT` is defined, on some platforms: HP-UX 11.
- This function returns a truncated result, instead of failing with error code `ERANGE`, when the buffer is not large enough, on some platforms: macOS 11.1.

Portability problems not fixed by Gnulib:

- This function has an incompatible declaration on some platforms: FreeBSD 12.0, MidnightBSD 2.0, Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).
- This function fails even when standard input is a tty on some platforms: HP-UX 11.11.
- This function fails with error code `EINVAL` instead of `ERANGE` when the second argument is zero on some platforms: HP-UX 11.31.
- This function fails with error code `ENOMEM` instead of `ERANGE` on some platforms: Haiku.

### 10.389 `getmsg`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.390 getnameinfo

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnameinfo.html>

Gnulib module: getaddrinfo

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.391 getnetbyaddr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetbyaddr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14.

### 10.392 getnetbyname

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetbyname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14.

### 10.393 getnetent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getnetent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.



## 10.394 getopt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getopt.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/libutil-getopt-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/libutil-getopt-3.html)

Gnulib module: `getopt-posix` or `getopt-gnu`

The module `getopt-gnu` has support for “long options” and for “options that take optional arguments”. Compared to the API defined by POSIX, it adds a header file `<getopt.h>` and a function `getopt_long`.

Portability problems fixed by either Gnulib module `getopt-posix` or `getopt-gnu`:

- This function is missing on some platforms: MSVC 14.
- The value of `optind` after a missing required argument is wrong on some platforms: macOS 11.1, AIX 7.1, mingw.

Portability problems fixed by Gnulib module `getopt-gnu`:

- The function `getopt` does not support the ‘+’ flag in the options string on some platforms: macOS 11.1, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11 2010-11.
- The function `getopt` does not obey the combination of ‘+’ and ‘:’ flags in the options string on some platforms: glibc 2.11.
- The function `getopt` does not obey the ‘-’ flag in the options string when `POSIXLY_CORRECT` is set on some platforms: Cygwin 1.7.0.
- The function `getopt` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x.
- The function `getopt_long` is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 14.
- The function `getopt_long` does not support abbreviated long options where all disambiguations are equivalent on some platforms: OpenBSD 5.0.
- The function `getopt_long_only` is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- This function crashes if the option string includes `W`; on some platforms: glibc 2.14.

Portability problems not fixed by Gnulib:

- The default behavior of the glibc implementation of `getopt` allows mixing option and non-option arguments on the command line in any order. Other implementations, such as the one in Cygwin, enforce strict POSIX compliance: they require that the option arguments precede the non-option arguments. This is something to watch out in your program’s testsuite.
- The glibc implementation allows a complete reset of the environment, including re-checking for `POSIXLY_CORRECT`, by setting `optind` to 0. Several BSD implementations provide `optreset`, causing a reset by setting it non-zero, although it does not necessarily re-read `POSIXLY_CORRECT`. Solaris `getopt` does not support either reset method, but does not maintain state that needs the extra level of reset.

- On some platforms, this function does not set the stream error indicator on attempts to write to a read-only stream: glibc 2.13, Cygwin 1.7.9.

### 10.395 `getpayload`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.396 `getpayloadf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.397 `getpayloadl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.398 `getpeername`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpeername.html>

Gnulib module: `getpeername`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.

Portability problems not fixed by Gnulib:

- Some platforms don't have a `socklen_t` type; in this case this function's third argument type is `'int *'`.

### 10.399 `getpgid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpgid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.400 `getpgrp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpgrp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.401 `getpid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.402 `getpmsg`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.403 getppid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getppid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.404 getpriority

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpriority.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.405 getprotobyname

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotobyname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.406 getprotobynumber

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotobynumber.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.407 getprotoent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getprotoent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

### 10.408 getpwent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.409 getpwnam

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwnam.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.410 getpwnam\_r

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwnam\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwnam_r.html)

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 3.0.

### 10.411 `getpwuid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwuid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is unsafe to call between `fork` and `exec` if the parent process is multi-threaded. Instead, use `getpwuid_r` prior to forking.
- This function is missing on some platforms: mingw, MSVC 14.

### 10.412 `getpwuid_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwuid\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/getpwuid_r.html)

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.3 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is unsafe to call between `fork` and `exec` if the parent process is multi-threaded. Use it prior to forking.
- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 3.0.

### 10.413 `getrlimit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getrlimit.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getrlimit-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getrlimit-1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `rlim_t` is a 32-bit type, this function does not allow to retrieve limits larger than 4 GiB and larger, such as for `RLIMIT_FSIZE`. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.414 `getrusage`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getrusage.html>

Gnulib module: `getrusage`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Many platforms don't fill in all the fields of `struct rusage` with meaningful values.

### 10.415 `gets`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gets.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function should never be used, because it can overflow any given buffer.
- This function is missing on some platforms: OpenBSD 6.7, Solaris 11.4.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `fgets` instead.
- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

### 10.416 `getservbyname`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservbyname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.417 `getservbyport`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservbyport.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.418 getservernt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getservernt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.419 getsid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.1.

### 10.420 getsockname

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsockname.html>

Gnulib module: getsockname

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.

Portability problems not fixed by Gnulib:

- Some platforms don't have a `socklen_t` type; in this case this function's third argument type is `'int *'`.

### 10.421 getsockopt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsockopt.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getsockopt-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getsockopt-1.html)

Gnulib module: getsockopt



Portability problems fixed by GnuLib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.

Portability problems not fixed by GnuLib:

- Some platforms don't have a `socklen_t` type; in this case this function's fifth argument type is `'int *'`.
- Many socket options are not available on all platforms.

### 10.422 `getsubopt`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getsubopt.html>

GnuLib module: `getsubopt`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- This function is declared in `unistd.h` instead of `stdlib.h` on some platforms: Cygwin 1.7.1.

Portability problems not fixed by GnuLib:

### 10.423 `gettimeofday`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gettimeofday.html>

GnuLib module: `gettimeofday`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: MSVC 14.
- This function is declared with a nonstandard function prototype (only one argument, or `"..."` after the first argument) on some platforms.
- On some platforms, the second argument has type `struct timezone*` rather than `void *`, making it an error to redeclare the function with the POSIX signature: glibc. However, rather than penalize these systems with a replacement function, gnuLib defines `GETTIMEOFDAY_TIMEZONE` to the appropriate type for use in avoiding a compiler warning if assigning `gettimeofday` to a function pointer.
- This function has only a precision of 15.6 milliseconds on some platforms: mingw.

Portability problems not fixed by GnuLib:

- Behavior is non-portable if the second argument to `gettimeofday` is not `NULL`.

- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the Glibc module `gettime` or `timespec_get` instead. (POSIX recommends to use the function `clock_gettime`, but there is no corresponding Glibc module for it yet.)

### 10.424 `getuid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getuid.html>

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.425 `getutxent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxent.html>

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.426 `getutxid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxid.html>

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.427 `getutxline`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getutxline.html>

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.428 `getwc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getwc.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.429 `getwchar`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/getwchar.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.430 `glob`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/glob.html>

Gnulib module: `glob`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.
- This function does not list symbolic links to nonexistent files among the results, on some platforms: glibc 2.26, AIX 7.2, HP-UX 11, Solaris 11.4.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- Some platforms may store additional flags in the `gl_flags` field.

### 10.431 `globfree`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/globfree.html>

Gnulib module: `glob`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.432 `gmtime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/gmtime.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

### 10.433 `gmtime_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/gmtime\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/gmtime_r.html)

Gnulib module: `time_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is not declared unless `_REENTRANT` is defined, on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:

- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

### 10.434 `grantpt`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/grantpt.html>

Gnulib module: `grantpt`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

- This function reports success for invalid file descriptors on some platforms: OpenBSD, Cygwin 1.7.9, musl libc.

### 10.435 `hcreate`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hcreate.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.436 hdestroy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hdestroy.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.437 hsearch

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hsearch.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.438 htonl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/htonl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

### 10.439 htons

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/htons.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

### 10.440 hypot

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypot.html>

Gnulib module: `hypot` or `hypot-ieee`

Portability problems fixed by either Gnulib module `hypot` or `hypot-ieee`:

Portability problems fixed by Gnulib module `hypot-ieee`:

- When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.441 hypotf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypotf.html>

Gnulib module: `hypotf` or `hypotf-ieee`

Portability problems fixed by either Gnulib module `hypotf` or `hypotf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 14.
- This function produces wrong values on some platforms: NetBSD 5.1, OpenBSD 4.9.

Portability problems fixed by Gnulib module `hypot-ieee`:

- When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.442 hypotl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/hypotl.html>

Gnulib module: `hypotl` or `hypotl-ieee`

Portability problems fixed by either Gnulib module `hypotl` or `hypotl-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 14, Android 4.4.
- This function produces very imprecise results on some platforms: NetBSD 9.0, OpenBSD 5.1/SPARC.

Portability problems fixed by Gnulib module `hypotl-ieee`:

- When the arguments are mixed NaN and Infinity, this function returns a wrong value on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.443 iconv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv.html>

Gnulib module: iconv

Portability problems fixed by Gnulib:

- GNU libiconv is not found if installed in `$PREFIX/lib`.

Portability problems handled by Gnulib (in the sense that `HAVE_ICONV` does not get defined if the system's `iconv` function has this problem):

- Failures are not distinguishable from successful returns on some platforms: AIX 5.1..7.2, Solaris 10.
- A buffer overrun can occur on some platforms: AIX 6.1..7.1.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.
- This function was not correctly implemented in glibc versions before 2.2.
- When `iconv` encounters an input character that is valid but that cannot be converted to the output character set, glibc's and GNU libiconv's `iconv` stop the conversion. Some other implementations put an implementation-defined character into the output buffer. Gnulib provides higher-level facilities `striconv` and `striconveh` (wrappers around `iconv`) that deal with conversion errors in a platform independent way.
- This function returns a positive return value, instead of zero, when converting from ISO-8859-1 to UTF-8 on HP-UX 11.

### 10.444 iconv\_close

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv\\_close.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv_close.html)

Gnulib module: iconv

Portability problems fixed by Gnulib:

- GNU libiconv is not found if installed in `$PREFIX/lib`.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.

### 10.445 iconv\_open

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iconv_open.html)

Gnulib module: iconv, iconv\_open, iconv\_open-utf

Portability problems fixed by either Gnulib module `iconv` or `iconv_open`:

- GNU libiconv is not found if installed in `$PREFIX/lib`.

Portability problems handled by either Gnulib module `iconv` or `iconv_open` (in the sense that `HAVE_ICONV` does not get defined if the system's `iconv_open` function has this problem):

- No converter from EUC-JP to UTF-8 is provided on some platforms: HP-UX 11.

Portability problems fixed by Gnulib module `iconv_open`:

- This function recognizes only non-standard aliases for many encodings (not the IANA registered encoding names) on many platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11 2010-11, z/OS.

Portability problems fixed by Gnulib module `iconv_open-utf`:

- This function does not support the encodings UTF-16BE, UTF-16LE, UTF-32BE, UTF-32LE on many platforms: AIX 5.1, HP-UX 11, IRIX 6.5.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 8.1, when GNU libiconv is not installed.
- For some encodings A and B, this function cannot convert directly from A to B, although an indirect conversion from A through UTF-8 to B is possible. This occurs on some platforms: Solaris 11 2010-11. Gnulib provides a higher-level facility `striconveh` (a wrapper around `iconv`) that deals with this problem.
- The set of supported encodings and conversions is system dependent.

### 10.446 `if_freenameindex`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/if\\_freenameindex.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_freenameindex.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.
- This is available only as a macro, rather than a function, on some platforms: OpenBSD 4.6, MirBSD 10.

### 10.447 `if_indextoname`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/if\\_indextoname.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_indextoname.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.



### 10.448 `if_nameindex`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/if\\_nameindex.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_nameindex.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

### 10.449 `if_nametoindex`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/if\\_nametoindex.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/if_nametoindex.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14.

### 10.450 `ilogb`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogb.html>

Gnulib module: `ilogb`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.
- This function returns a wrong result for a zero argument on some platforms: OpenBSD 6.7, AIX 5.1.
- This function returns a wrong result for denormalized arguments on some platforms: Mac OS X 10.5 64-bit, AIX 7.1 64-bit.
- This function returns a wrong result for an infinite argument on some platforms: NetBSD 7.1, OpenBSD 6.7.
- This function returns a wrong result for a NaN argument on some platforms: NetBSD 7.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:

### 10.451 `ilogbf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogbf.html>

Gnulib module: `ilogbf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function returns a wrong result for a zero argument on some platforms: OpenBSD 6.7.
- This function returns a wrong result for an infinite argument on some platforms: NetBSD 7.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:

### 10.452 `ilogbl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ilogbl.html>

Gnulib module: `ilogbl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
- This function returns a wrong result for a zero argument on some platforms: Cygwin 2.9.
- This function returns a wrong result for a NaN argument on some platforms: Cygwin 3.4.6.
- This function returns a wrong result for denormalized arguments on some platforms: AIX 7.1 64-bit, Haiku 2017.

Portability problems not fixed by Gnulib:

### 10.453 `imaxabs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/imaxabs.html>

Gnulib module: `imaxabs`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, MSVC 9, Android 4.3.

Portability problems not fixed by Gnulib:

### 10.454 `imaxdiv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/imaxdiv.html>

Gnulib module: `imaxdiv`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, MSVC 9, Android 4.3.

Portability problems not fixed by Gnulib:

### 10.455 `inet_addr`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet\\_addr.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_addr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX 202x says this function is obsolescent and it is planned to be removed in a future version. Use the function `inet_pton` instead.
- On some old platforms, this function returns a `struct in_addr` rather than a scalar type such as `unsigned int` or `unsigned long`.

### 10.456 `inet_ntoa`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet\\_ntoa.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_ntoa.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX 202x says this function is obsolescent and it is planned to be removed in a future version. Use the function `inet_ntop` instead.
- The `inet_ntoa` function need not be reentrant, and consequently is not required to be thread safe. Implementations of `inet_ntoa` typically write the timestamp into static buffer. If two threads call `inet_ntoa` at roughly the same time, you might end up with the wrong date in one of the threads, or some undefined string.

Note: `inet_ntoa` is specific for IPv4 addresses. A protocol independent function is `inet_ntop`.

### 10.457 inet\_ntop

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet\\_ntop.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_ntop.html)

Gnulib module: inet\_ntop

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.00, mingw, MSVC 14.
- This function is declared in `<netdb.h>` instead of `<arpa/inet.h>` on some platforms: NonStop Kernel.
- This function is declared in `<ws2tcpip.h>`, with a POSIX incompatible declaration, on some platforms: MSVC 14 on Windows  $\geq$  Vista.

Portability problems not fixed by Gnulib:

- This function's fourth argument type is `size_t` instead of `socklen_t` on some platforms: Solaris 10.

### 10.458 inet\_pton

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet\\_pton.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/inet_pton.html)

Gnulib module: inet\_pton

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.00, mingw, MSVC 14.
- This function is declared in `<netdb.h>` instead of `<arpa/inet.h>` on some platforms: NonStop Kernel.
- This function is declared in `<ws2tcpip.h>`, with a POSIX incompatible declaration, on some platforms: MSVC 14 on Windows  $\geq$  Vista.

Portability problems not fixed by Gnulib:

### 10.459 initstate

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/initstate.html>

Gnulib module: random

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Cygwin 1.5.25.

Portability problems not fixed by Gnulib:

- This function crashes if the state buffer is unaligned on some platforms: glibc 2.36/sparc.
- The first parameter is `unsigned long` instead of `unsigned int` on some platforms: MidnightBSD 2.0.
- The third parameter is `long` instead of `size_t` on some platforms: MidnightBSD 2.0.
- This function makes out-of-bounds writes on some platforms: Haiku.

### 10.460 `insque`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/insque.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

### 10.461 `ioctl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ioctl.html>

LSB specification:

- [https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ioctl-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ioctl-2.html)
- [https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ttyio-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ttyio-2.html)
- [https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sockio-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sockio-2.html)

Gnulib module: `ioctl`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), `ioctl` is called `ioctlsocket`, and error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- The second parameter is of type `unsigned long` rather than `int` on some platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Haiku 2017.

Portability problems not fixed by Gnulib:

- Most `ioctl` requests are platform and hardware specific.

### 10.462 `isalnum`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalnum.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

**c\_isalnum**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

**iswalnum** This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module ‘wctype’.

**c32isalnum**

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module ‘c32isalnum’.

**mb\_isalnum**

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

**uc\_is\_alnum**

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-alnum’.

**10.463 isalnum\_l**

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalnum\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalnum_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

**10.464 isalpha**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha.html>

Gnulib module: ctype

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

**c\_isalpha**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.

**iswalpha** This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module ‘`wctype`’.

**c32isalpha** This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module ‘`c32isalpha`’.

**mb\_isalpha** This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘`mbchar`’.

**uc\_is\_alpha** This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘`unictype/ctype-alpha`’.

### 10.465 `isalpha_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isalpha_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.466 `isascii`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isascii.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x.

Note: This function’s behaviour depends on the locale, but requires special handling for the multibyte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are two alternative APIs:

**c\_isascii**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘`c-ctype`’.

**mb\_isascii**

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

**10.467 isastream**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isastream.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**10.468 isatty**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isatty.html>

Gnulib module: isatty

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, <io.h>) on some platforms: MSVC 14.
- On native Windows, this function also returns true for character devices such as NUL.
- On native Windows, this function returns false for Cygwin consoles.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

**10.469 isblank**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isblank.html>

Gnulib module: isblank

Portability problems fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5, Solaris 9, mingw, MSVC 9.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

**c\_isblank**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘c-ctype’.



**iswblank** This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module ‘`wctype`’.

**c32isblank**

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module ‘`c32isblank`’.

**mb\_isblank**

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘`mbchar`’.

**uc\_is\_blank**

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘`unictype/ctype-blank`’.

## 10.470 `isblank_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isblank\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isblank_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

## 10.471 `iscntrl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function’s behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

**c\_iscntrl**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module ‘`c-ctype`’.

**iswcntrl**

This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module ‘`wctype`’.

**c32iscntrl**

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `'c32iscntrl'`.

**mb\_iscntrl**

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module `'mbchar'`.

**uc\_is\_cntrl**

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `'unictype/ctype-cntrl'`.

**10.472 iscntrl\_l**

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iscntrl_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

**10.473 isdigit**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

**c\_isdigit**

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module `'c-ctype'`.

**iswdigit**

This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module `'wctype'`.

**c32isdigit**

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the GnuLib module `'c32isdigit'`.

**mb\_isdigit**

This function operates in a locale dependent way, on multibyte characters. It is provided by the GnuLib module `'mbchar'`.

**uc\_is\_digit**

This function operates in a locale independent way, on Unicode characters. It is provided by the GnuLib module `'unictype/ctype-digit'`.

**10.474 isdigit\_l**

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isdigit_l.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

**10.475 isfinite**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isfinite.html>

GnuLib module: `isfinite`

Portability problems fixed by GnuLib:

- This macro is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4.
- This macro incorrectly yields true for some `'double'` and for some `'long double'` arguments, on some platforms: Linux/ia64 (NaNs).

Portability problems not fixed by GnuLib:

- It is implementation-dependent whether `isfinite` raises an exception given a signaling NaN operand.
- This macro returns an unspecified result when given noncanonical values such as unnormalized numbers, pseudo-denormals, pseudo-NaNs, pseudo-Infinities, and pseudo-zeroes.

## 10.476 `isgraph`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgraph.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

`c_isgraph`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswgraph` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

`c32isgraph`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32isgraph`'.

`mb_isgraph`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module '`mbchar`'.

`uc_is_graph`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module '`unictype/ctype-graph`'.

## 10.477 `isgraph_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgraph\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgraph_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.478 `isgreater`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgreater.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.479 `isgreaterequal`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isgreaterequal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.480 `isinf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isinf.html>

Gnulib module: `isinf`

Portability problems fixed by Gnulib:

- This macro is missing on some platforms: AIX 5.1, IRIX 6.5, Solaris 11.4.

Portability problems not fixed by Gnulib:

- This macro returns an unspecified result when given noncanonical values such as unnormalized numbers, pseudo-denormals, pseudo-NaNs, pseudo-Infinities, and pseudo-zeroes.

### 10.481 `isless`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isless.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.482 `islessequal`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/islessequal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.483 `islessgreater`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/islessgreater.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

### 10.484 `islower`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/islower.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

`c_islower`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswlower` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

`c32islower`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32islower`'.

**mb\_islower**

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module ‘mbchar’.

**uc\_is\_lower**

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module ‘unictype/ctype-lower’.

**10.485 islower\_l**

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/islower\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/islower_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

**10.486 isnan**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isnan.html>

Gnulib module: isnan

Portability problems fixed by Gnulib:

- This macro is missing on some platforms: MSVC 9.
- `isnan` was introduced with C99 and is thus commonly not present on pre-C99 systems.
- `isnan` is not a macro on some platforms: IRIX 6.5, Solaris 11.4.
- This macro does not work on some platforms: MSVC 14.
- On IRIX 6.5 with `cc`, `isnan` does not recognize some NaNs.

Portability problems not fixed by Gnulib:

- This macro returns an unspecified result when given noncanonical values such as unnormalized numbers, pseudo-denormals, pseudo-NaN, pseudo-Infinities, and pseudo-zeroes.

**10.487 isnormal**

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isnormal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 4.4.

## 10.488 isprint

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isprint.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

### `c_isprint`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswprint` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

### `c32isprint`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32isprint`'.

### `mb_isprint`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module '`mbchar`'.

### `uc_is_print`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module '`unictype/ctype-print`'.

## 10.489 isprint\_l

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isprint\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isprint_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.



## 10.490 `ispunct`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ispunct.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

### `c_ispunct`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswpunct` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

### `c32ispunct`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32ispunct`'.

### `mb_ispunct`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module '`mbchar`'.

### `uc_is_punct`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module '`unictype/ctype-punct`'.

## 10.491 `ispunct_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/ispunct\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/ispunct_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

## 10.492 isspace

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isspace.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

### `c_isspace`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswspace` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

### `c32isspace`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32isspace`'.

### `mb_isspace`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module '`mbchar`'.

### `uc_is_space`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module '`unictype/ctype-space`'.

## 10.493 isspace\_1

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isspace\\_1.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isspace_1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

## 10.494 `isunordered`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isunordered.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.4, Android 9.0.

## 10.495 `isupper`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isupper.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

### `c_isupper`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module `'c-ctype'`.

`iswupper` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module `'wctype'`.

### `c32isupper`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `'c32isupper'`.

### `mb_isupper`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module `'mbchar'`.

### `uc_is_upper`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `'unictype/ctype-upper'`.

### 10.496 `isupper_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isupper\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isupper_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.497 `iswalnum`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalnum.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isalnum`, provided by Gnulib module `c32isalnum`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.498 `iswalnum_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalnum\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalnum_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.499 `iswalpha`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalpha.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isalpha`, provided by Gnulib module `c32isalpha`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.500 `iswalpha_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalpha\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswalpha_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.501 `iswblank`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswblank.html>

Gnulib module: `iswblank`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 9, mingw, MSVC 9, Android 4.4.
- This function is declared but not defined on some platforms: IRIX 6.5.30.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isblank`, provided by Gnulib module `c32isblank`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.502 `iswblank_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswblank\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswblank_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.503 `iswcntrl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswcntrl.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32iscntrl`, provided by Gnulib module `c32iscntrl`, operates on 32-bit wide characters and therefore does not have this limitation.
- This function returns 0 for U+2028 (LINE SEPARATOR) and U+2029 (PARAGRAPH SEPARATOR) on some platforms: macOS 11.1.

### 10.504 `iswcntrl_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswcntrl\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswcntrl_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.505 `iswctype`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswctype.html>

Gnulib module: `iswctype`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function is declared in `<wchar.h>`, not in `<wctype.h>`, on some platforms: HP-UX 11.00.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32_apply_type_test`, provided by Gnulib module `c32_apply_type_test`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.506 `iswctype_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswctype\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswctype_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.507 `iswdigit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit.html>

Gnulib module: `iswdigit`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function is not ISO C 99 compliant on some platforms: FreeBSD 14.0, NetBSD 9.0, Solaris 11.4, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isdigit`, provided by Gnulib module `c32isdigit`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.508 `iswdigit_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswdigit_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.509 `iswgraph`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isgraph`, provided by Gnulib module `c32isgraph`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.510 `iswgraph_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswgraph_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.



- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.511 `iswlower`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswlower.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32islower`, provided by Gnulib module `c32islower`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.512 `iswlower_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswlower\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswlower_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.513 `iswprint`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswprint.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function returns true for the tab (`'\t'`) character on some platforms: mingw.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isprint`, provided by Gnulib module `c32isprint`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.514 `iswprint_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswprint\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswprint_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.515 `iswpunct`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct.html>

Gnulib module: `iswpunct`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function is inconsistent with the `ispunct` function, because it returns false for the characters '\$', '+', '<', '=', '>', '^', `', '|', '~' on some platforms: Android 11.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32ispunct`, provided by Gnulib module `c32ispunct`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.516 `iswpunct_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswpunct_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.517 `iswspace`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswspace.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isspace`, provided by Gnulib module `c32isspace`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.518 `iswspace_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswspace\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswspace_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.519 `iswupper`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswupper.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isupper`, provided by Gnulib module `c32isupper`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.520 `iswupper_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswupper\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswupper_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.521 `iswxdigit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit.html>

Gnulib module: `iswxdigit`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.
- This function is not ISO C 99 compliant on some platforms: FreeBSD 14.0, NetBSD 9.0, Solaris 11.4, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32isxdigit`, provided by Gnulib module `c32isxdigit`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.522 `iswxdigit_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/iswxdigit_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.523 `isxdigit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/isxdigit.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are five alternative APIs:

`c_isxdigit`

This function operates in a locale independent way and returns true only for ASCII characters. It is provided by the Gnulib module '`c-ctype`'.

`iswxdigit`

This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module '`wctype`'.

`c32isxdigit`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module '`c32isxdigit`'.

`mb_isxdigit`

This function operates in a locale dependent way, on multibyte characters. It is provided by the Gnulib module '`mbchar`'.

`uc_is_xdigit`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module '`unictype/ctype-xdigit`'.

### 10.524 `isxdigit_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/isxdigit\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/isxdigit_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.525 `j0`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/j0.html>

Gnulib module: `j0`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

### 10.526 `j1`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/j1.html>

Gnulib module: `j1`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

### 10.527 `jn`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/jn.html>

Gnulib module: `jn`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

### 10.528 jrand48

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/jrand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.529 kill

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/kill.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-kill-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-kill-3.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.530 killpg

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/killpg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.531 164a

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/164a.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- This function was not correctly implemented in glibc versions before 2.2.5.

### 10.532 labs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/labs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 4.3.

### 10.533 lchown

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lchown.html>

Gnulib module: lchown

Portability problems fixed by Gnulib:

- This function is missing on some platforms; however, the replacement fails with `ENOSYS`: mingw, MSVC 14.
- This function is missing on some platforms; however, the replacement fails on symlinks: Minix 3.2.1.
- Some platforms fail to detect trailing slash on non-directories, as in `lchown("link-to-file/",uid,gid)`: FreeBSD 7.2, Solaris 9.
- Some platforms fail to update the change time when at least one argument was not `-1`, but no ownership changes resulted. However, without `lchmod`, the replacement only fixes this for non-symlinks: OpenBSD 4.0.

Portability problems not fixed by Gnulib:

- This function sometimes fails with `EACCES` when the failure is due to lack of appropriate privileges (`EPERM`), not to search permission denied on the file name prefix (`EACCES`): Linux kernel 5.15 with glibc 2.35 and a CIFS v1 file system (see <https://bugs.gnu.org/65599>).

### 10.534 lcong48

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lcong48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 5.1.



### 10.535 ldexp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexp.html>

Gnulib module: ldexp

Portability problems fixed by Gnulib:

- This function produces wrong results on some platforms: OpenBSD 7.3/mips64.

Portability problems not fixed by Gnulib:

### 10.536 ldexpf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexpf.html>

Gnulib module: ldexpf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.537 ldexpl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldexpl.html>

Gnulib module: ldexpl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function has no prototype in `<math.h>` on some platforms: Mac OS X.
- This function does not work on finite numbers on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:

### 10.538 ldiv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ldiv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.539 lfind

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lfind.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.

### 10.540 lgamma

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgamma.html>

Gnulib module: lgamma

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

### 10.541 lgammaf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgammaf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.542 lgammal

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lgammal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

### 10.543 link

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/link.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-link-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-link-1.html)

Gnulib module: link

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function fails to reject trailing slashes on non-directories on some platforms: FreeBSD 7.2, Solaris 11.3, Cygwin 1.5.x.
- When the second argument is a dangling symlink, some platforms follow that link and create the destination rather than failing: IRIX 6.5.

Portability problems not fixed by Gnulib:

- When the first argument is a symlink, some platforms create a hard-link to what the symlink referenced, rather than to the symlink itself. Use ‘linkat’ to force a particular behavior.

### 10.544 linkat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/linkat.html>

Gnulib module: linkat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.9, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function fails to directly hardlink symlinks on some platforms: Mac OS X 10.10.
- This function fails to reject trailing slashes on non-directories on some platforms: macOS 11.1, AIX 7.1, Solaris 11.3.
- This functions does not support AT\_SYMLINK\_FOLLOW on some platforms: Linux kernel 2.6.17.

Portability problems not fixed by Gnulib:

### 10.545 lio\_listio

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/lio\\_listio.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/lio_listio.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.546 listen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/listen.html>

Gnulib module: listen

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

### 10.547 llabs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llabs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, MSVC 9, Android 4.3.

### 10.548 lldiv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lldiv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11.23, MSVC 9.

### 10.549 llogb

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.550 `llogbf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.551 `llogbl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.552 `llrint`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrint.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9.

### 10.553 `llrintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9.

### 10.554 `llrintl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llrintl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.

### 10.555 `llround`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llround.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9.

### 10.556 `llroundf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llroundf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.7, MSVC 9.

### 10.557 `llroundl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/llroundl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

## 10.558 localeconv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/localeconv.html>

Gnulib module: localeconv

Portability problems fixed by Gnulib:

- The `struct lconv` type does not contain any members on some platforms: Android up to 2014.
- The `struct lconv` type does not contain the members `int_p_cs_precedes`, `int_p_sign_posn`, `int_p_sep_by_space`, `int_n_cs_precedes`, `int_n_sign_posn`, `int_n_sep_by_space` on some platforms: glibc, OpenBSD 4.9, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- The values of fields of `struct lconv` of type `char` are -1 instead of `CHAR_MAX` on some platforms: mingw.

Portability problems not fixed by Gnulib:

## 10.559 localtime

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/localtime.html>

Gnulib module: localtime

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by Gnulib:

- On some platforms, this function loops forever for values near extrema (such as the year  $-2 * 31$ ): Mac OS X 10.6. You can use the `time_rz` module to work around the problem.
- On some platforms, this function returns nonsense values for unsupported arguments (like  $2^56$ ), rather than failing: FreeBSD 10.
- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 449.

## 10.560 localtime\_r

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/localtime\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/localtime_r.html)

Gnulib module: time\_r

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is not declared unless `_REENTRANT` is defined, on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:

- On some platforms, this function loops forever for values near extrema (such as the year  $-2 * 31$ ): Mac OS X 10.6. You can use the `time_rz` module to work around the problem.
- On some platforms, this function returns nonsense values for unsupported arguments (like  $2^56$ ), rather than failing: FreeBSD 10.
- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.

### 10.561 lockf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lockf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

### 10.562 log

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log.html>

Gnulib module: `log` or `log-ieee`

Portability problems fixed by either Gnulib module `log` or `log-ieee`:

Portability problems fixed by Gnulib module `log-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 11.4.

Portability problems not fixed by Gnulib:

### 10.563 log10

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10.html>

Gnulib module: `log10` or `log10-ieee`

Portability problems fixed by either Gnulib module `log10` or `log10-ieee`:

Portability problems fixed by Gnulib module `log10-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 11.4.

Portability problems not fixed by Gnulib:



### 10.564 `log10f`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10f.html>

Gnulib module: `log10f` or `log10f-ieee`

Portability problems fixed by either Gnulib module `log10f` or `log10f-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `log10f-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1.

Portability problems not fixed by Gnulib:

### 10.565 `log10l`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log10l.html>

Gnulib module: `log10l`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function is not declared and does not work on some platforms: AIX 5.1.
- This function returns an unnormalized negative infinity for a minus zero argument on some platforms: IRIX 6.5.
- This function returns an unnormalized positive infinity for a positive infinite argument on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:

### 10.566 `log1p`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1p.html>

Gnulib module: `log1p` or `log1p-ieee`

Portability problems fixed by either Gnulib module `log1p` or `log1p-ieee`:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

Portability problems fixed by Gnulib module `log1p-ieee`:

- This function has problems when the argument is minus zero on some platforms: AIX 7.1, HP-UX 11.

Portability problems not fixed by Gnulib:

## 10.567 log1pf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1pf.html>

Gnulib module: `log1pf` or `log1pf-ieee`

Portability problems fixed by either Gnulib module `log1pf` or `log1pf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 9.
- This function returns a wrong value for the argument `-1.0f` on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module `log1pf-ieee`:

- This function has problems when the argument is minus zero on some platforms: OpenBSD 4.9, AIX 7.1.

Portability problems not fixed by Gnulib:

## 10.568 log1pl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log1pl.html>

Gnulib module: `log1pl` or `log1pl-ieee`

Portability problems fixed by either Gnulib module `log1pl` or `log1pl-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems fixed by Gnulib module `log1pl-ieee`:

- This function has problems when the argument is minus zero on some platforms: AIX 7.1, IRIX 6.5.

Portability problems not fixed by Gnulib:

## 10.569 log2

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2.html>

Gnulib module: `log2` or `log2-ieee`

Portability problems fixed by either Gnulib module `log2` or `log2-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9, Android 4.2.
- This function is not declared on some platforms: IRIX 6.5.
- This function is only provided as a macro on some platforms: Cygwin 1.5.x.
- This function returns slightly wrong values for exact powers of 2 on some platforms: Cygwin 1.7.9.

Portability problems fixed by Gnulib module `log2-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 10/x86\_64.

Portability problems not fixed by Gnulib:

## 10.570 `log2f`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2f.html>

Gnulib module: `log2f` or `log2f-ieee`

Portability problems fixed by either Gnulib module `log2f` or `log2f-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9, Android 4.2.
- This function is not declared on some platforms: IRIX 6.5.
- This function is only provided as a macro on some platforms: Cygwin 1.5.x.
- This function returns slightly wrong values for exact powers of 2 on some platforms: Cygwin 1.7.9.

Portability problems fixed by Gnulib module `log2f-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1, Solaris 10/x86\_64.

Portability problems not fixed by Gnulib:

## 10.571 `log2l`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/log2l.html>

Gnulib module: `log2l`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.2.
- This function is not declared on some platforms: IRIX 6.5.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.
- This function returns Infinity for some large finite arguments on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems not fixed by Gnulib:

### 10.572 logb

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/logb.html>

Gnulib module: logb

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.
- This function is missing a declaration on some platforms: Cygwin 1.5.x.
- This function produces wrong results for subnormal numbers on some platforms: glibc 2.17/ppc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4, Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

### 10.573 logbf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/logbf.html>

Gnulib module: logbf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.
- This function produces wrong results for subnormal numbers on some platforms: glibc 2.11/ppc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4.

Portability problems not fixed by Gnulib:

### 10.574 logbl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/logbl.html>

Gnulib module: logbl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.2.
- This function goes into an endless loop for arguments such as 1.6810515715560467531313389086608763014932L on some platforms: OpenBSD 7.3/mips64.
- This function produces wrong results for subnormal numbers on some platforms: glibc 2.11/powerpc, glibc 2.7/sparc, glibc 2.7/hppa, Solaris 11.4, glibc 2.23/powerpc64le.

Portability problems not fixed by Gnulib:

## 10.575 `logf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/logf.html>

Gnulib module: `logf` or `logf-ieee`

Portability problems fixed by either Gnulib module `logf` or `logf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `logf-ieee`:

- This function returns a wrong value for a negative argument on some platforms: NetBSD 5.1.

Portability problems not fixed by Gnulib:

## 10.576 `logl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/logl.html>

Gnulib module: `logl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function returns wrong results on some platforms: glibc 2.7 on Linux/SPARC64.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x, NetBSD 9.0.

Portability problems not fixed by Gnulib:

## 10.577 `longjmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/longjmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- The effects of this call are system and compiler optimization dependent, since it restores the contents of register-allocated variables but not the contents of stack-allocated variables.
- When longjumping out of a signal handler that was being executed on an alternate stack (installed through `sigaltstack`), on FreeBSD, NetBSD, OpenBSD, you need to clear the `SS_ONSTACK` flag in the `stack_t` structure managed by the kernel.

### 10.578 `lrand48`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.579 `lrint`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrint.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.580 `lrintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.581 `lrintl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lrintl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.

### 10.582 `lround`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lround.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.583 `lroundf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lroundf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.584 `lroundl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lroundl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

### 10.585 `lsearch`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lsearch.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.

## 10.586 lseek

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lseek.html>

Gnulib module: lseek

Portability problems fixed by Gnulib:

- On some platforms, `lseek (fd, offset, SEEK_DATA)` returns a value greater than `offset` even when `offset` addresses data: macOS 12
- This function is declared in a different header file (namely, `<io.h>`) on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, `lseek` does not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function mistakenly succeeds on pipes on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- POSIX does not specify which file descriptors support seeking and which don't. In practice, regular files and block devices support seeking, and ttys, pipes, and most character devices don't support it.
- When the third argument is invalid, POSIX says that `lseek` should set `errno` to `EINVAL` and return `-1`, but in this situation a `SIGSYS` signal is raised on some platforms: IRIX 6.5.
- Some systems do not support `SEEK_DATA` and `SEEK_HOLE`: AIX, HP-UX, Microsoft Windows, NetBSD, OpenBSD.
- Some systems have a buggy `SEEK_DATA` and `SEEK_HOLE`, and Gnulib works around the problem via `#undef SEEK_DATA` and `#undef SEEK_HOLE`: FreeBSD 13, macOS 12.

## 10.587 lstat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/lstat.html>

Gnulib module: lstat

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, `lstat` may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- On Linux/x86 and Linux/x86\_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 761.
- For symlinks, when the argument ends in a slash, some platforms don't dereference the argument: Solaris 9.
- On some platforms, `lstat("file/",buf)` succeeds instead of failing with `ENOTDIR`. macOS 11.1, Solaris 9.
- On macOS 12.6, when this function yields a timestamp with a nonpositive `tv_sec` value, `tv_nsec` might be in the range `-999999999..-1`, representing a negative nanoseconds offset from `tv_sec`. Solaris 11.4 is similar, except that `tv_sec` might also be `-1000000000`.



- On Windows platforms (excluding Cygwin), symlinks are not supported, so `lstat` does not exist.

Portability problems not fixed by GnuLib:

- See Section 9.65 [`sys/stat.h`], page 76, for general portability problems with `struct stat`.

## 10.588 `malloc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/malloc.html>

GnuLib module: `malloc-posix`

Portability problems fixed by GnuLib:

- Upon failure, the function does not set `errno` to `ENOMEM` on some platforms: mingw, MSVC 14.
- On some platforms, `malloc (n)` can succeed even if `n` exceeds `PTRDIFF_MAX`. Although this behavior is arguably allowed by POSIX it can lead to behavior not defined by POSIX later, so `malloc-posix` does not allow going over the limit.

Extension: GnuLib provides a module ‘`malloc-gnu`’ that substitutes a `malloc` implementation that behaves more like the glibc implementation, by fixing this portability problem:

- `malloc (0)` returns `NULL` on success on some platforms: AIX 7.2.

## 10.589 `mblen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mblen.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Android 7.1.

## 10.590 `mbrlen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbrlen.html>

GnuLib module: `mbrlen`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.
- This function returns 0 instead of `(size_t) -2` when the input is empty: glibc 2.19.
- This function returns `(size_t) -1` instead of `(size_t) -2` when the input is empty: AIX 5.1.

- This function does not put the state into non-initial state when parsing an incomplete multibyte character on some platforms: AIX 5.1.
- This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: HP-UX 11.11, Solaris 11 2010-11.
- This function may not return 0 when parsing the NUL character on some platforms: Solaris 9.

Portability problems not fixed by GnuLib:

### 10.591 `mbrtoc8`

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on most platforms: glibc 2.29, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.592 `mbrtoc16`

GnuLib module: `mbrtoc16`

Portability problems fixed by GnuLib:

- This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
- This function may crash when the first argument is NULL on some platforms: glibc 2.36.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.36.
- This function returns 0 instead of `(size_t) -2` when the input is empty: glibc 2.19, Android 11.
- This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: mingw.
- This function returns `(size_t) -3` instead of a byte count when it has stored a high surrogate, and returns a byte count instead of `(size_t) -3` when it has stored a low surrogate, on some platforms: Android.
- This function does not recognize multibyte sequences that `mbrtowc` recognizes on some platforms: FreeBSD 13.2, Solaris 11.4, MSVC 14.

Portability problems not fixed by GnuLib:

- After `mbrtoc16` returns a `char16_t` value, `mbsinit` cannot be used to determine whether the function is ready to return another `char16_t` value. To do so, instead call `mbrtoc16` again, with an appropriately incremented `const char *` argument and an appropriately decremented `size_t` argument.

### 10.593 `mbrtoc32`

Gnulib module: `mbrtoc32` or `mbrtoc32-regular`

Portability problems fixed by either Gnulib module `mbrtoc32` or `mbrtoc32-regular`:

- This function is missing on most non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 9, Android 4.4.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.
- This function returns 0 instead of `(size_t) -2` when the input is empty: glibc 2.19, mingw, Android 11, Haiku.
- This function does not recognize multibyte sequences that `mbrtowc` recognizes on some platforms: FreeBSD 13.2, Solaris 11.4, mingw, MSVC 14.

Portability problems fixed by Gnulib module `mbrtoc32-regular`:

- This function can map some multibyte characters to a sequence of two or more Unicode characters, and may thus return `(size_t) -3`. No known implementation currently (2023) behaves that way, but it may theoretically happen. With the `mbrtoc32-regular` module, you have the guarantee that the Gnulib-provided `mbrtoc32` function maps each multibyte character to exactly one Unicode character and thus never returns `(size_t) -3`.
- This function behaves incorrectly when converting precomposed characters from the BIG5-HKSCS encoding: glibc 2.36.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Haiku 2020.

Note: If you want the guarantee that the `char32_t` values returned by this function are Unicode code points, you also need to request the `uchar-c23` module.

### 10.594 `mbrtowc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbrtowc.html>

Gnulib module: `mbrtowc`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.
- This function returns 0 instead of `(size_t) -2` when the input is empty: glibc 2.19, MSVC 14, Android 11.
- This function returns `(size_t) -1` instead of `(size_t) -2` when the input is empty: AIX 7.2.
- This function does not put the state into non-initial state when parsing an incomplete multibyte character on some platforms: AIX 7.2.

- This function stores a wide character when parsing an incomplete multibyte character on some platforms: MSVC 14.
- This function returns the total number of bytes that make up the multibyte character, not the number of bytes that were needed to complete the multibyte character, on some platforms: HP-UX 11.11, Solaris 11 2010-11, mingw, MSVC 14.
- This function may not return 0 when parsing the NUL character on some platforms: Solaris 9.

Portability problems not fixed by GnuLib:

- In UTF-8 locales, this function may return wide characters up to 0x7FFFFFFF (that is, beyond 0x0010FFFF) on some platforms: glibc 2.34.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the ISO C11 function `mbrtoc32`, provided by GnuLib module `mbrtoc32`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.595 `mbsinit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsinit.html>

GnuLib module: `mbsinit`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, MSVC 14.
- This function always returns 1, even in multibyte locales, on some platforms: mingw.

Portability problems not fixed by GnuLib:

- This function is not useful after calls to `mbrtoc16` or `mbrtoc8`.

### 10.596 `mbsnrtowcs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsnrtowcs.html>

GnuLib module: `mbsnrtowcs`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function produces invalid wide characters on some platforms: Solaris 11.4.
- In the C or POSIX locales, this function can return `(size_t) -1` and set `errno` to `EILSEQ`: glibc 2.35.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function `mbsnrtoc32s`, provided by GnuLib module `mbsnrtoc32s`, operates on 32-bit wide characters and therefore does not have this limitation.

- The specification is not clear about whether this function should update the conversion state when the first argument (the destination pointer) is NULL. The glibc, Mac OS X, FreeBSD implementations do update the state in this case. For portability, when passing a NULL destination argument, it is best to pass a pointer to a temporary copy of the conversion state.

### 10.597 mbsrtowcs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbsrtowcs.html>

Gnulib module: mbsrtowcs

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function does not work on some platforms: HP-UX 11, Solaris 11 2010-11.
- In the C or POSIX locales, this function can return (`size_t`) -1 and set `errno` to `EILSEQ`: glibc 2.35.
- This function does not work when the first argument is NULL on some platforms: mingw.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `mbsrtoc32s`, provided by Gnulib module `mbsrtoc32s`, operates on 32-bit wide characters and therefore does not have this limitation.
- The specification is not clear about whether this function should update the conversion state when the first argument (the destination pointer) is NULL. The glibc implementation does not update the state in this case; the macOS and FreeBSD implementations do. For portability, when passing a NULL destination argument, it is best to pass a pointer to a temporary copy of the conversion state.

### 10.598 mbstowcs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbstowcs.html>

Gnulib module: mbstowcs

Portability problems fixed by Gnulib:

- In the C or POSIX locales, this function can return (`size_t`) -1 and set `errno` to `EILSEQ`: glibc 2.35.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `mbstoc32s`, provided by Gnulib module `mbstoc32s`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.599 mbtowc

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mbtowc.html>

Gnulib module: mbtowc

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.

Portability problems not fixed by Gnulib:

- In UTF-8 locales, this function may return wide characters up to 0x7FFFFFFF (that is, beyond 0x0010FFFF) on some platforms: glibc 2.34.
- This function accumulates hidden state on some platforms: glibc 2.8 (see [https://sourceware.org/bugzilla/show\\_bug.cgi?id=9674](https://sourceware.org/bugzilla/show_bug.cgi?id=9674)).
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.600 memccpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memccpy.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.601 memchr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memchr.html>

Gnulib module: memchr

Portability problems fixed by Gnulib:

- This function dereferences too much memory on some platforms: glibc 2.10 on x86\_64, IA-64; glibc 2.11 on Alpha, AIX 7.2.
- This function returns NULL if the character argument is not in the range of an `unsigned char` on some platforms: Android 5.0.

Portability problems not fixed by Gnulib:

### 10.602 memcmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memcmp.html>

Gnulib module: memcmp

Portability problems fixed by Gnulib:

- This function fails when comparing 16 bytes or more and with at least one buffer not starting on a 4-byte boundary on some older platforms: NeXTstep/x86.

Portability problems not fixed by GnuLib:

- This function produces wrong results when the arguments are constant strings and the compiler is clang 6.0.1.

### 10.603 memcpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memcpy.html>

GnuLib module: memcpy

Portability problems fixed by GnuLib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by GnuLib:

### 10.604 memmove

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memmove.html>

GnuLib module: memmove

Portability problems fixed by GnuLib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by GnuLib:

### 10.605 memset

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/memset.html>

GnuLib module: memset

Portability problems fixed by GnuLib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by GnuLib:

### 10.606 memset\_explicit

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Erasing-Sensitive-Data.html](https://www.gnu.org/software/libc/manual/html_node/Erasing-Sensitive-Data.html),

GnuLib module: memset\_explicit

The `memset_explicit` function is an approximation to what is needed, and does not suffice in general to erase information. Although calling `memset_explicit` should clear the memory in question, the information that was in memory may still be available elsewhere

on the machine. Proper implementation of information erasure requires support from levels below C code.

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.36, FreeBSD 13.1, NetBSD 9.3, OpenBSD 7.2, macOS 13, Solaris 11.4, Android 13, and many other systems.

Portability problems not fixed by Gnulib:

- Although the module's implementation should set the memory on platforms compatible with GCC and on platforms using traditional linkers, it may not set the memory on non-GCC platforms that use whole-program optimization.

## 10.607 mkdir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdir.html>

Gnulib module: `sys_stat` or `mkdir`

Portability problems fixed by either Gnulib module `sys_stat` or `mkdir`:

- This function is declared in different header files (namely, `<io.h>` or `<direct.h>`) on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function is called `_mkdir` and takes only one argument. The fix (without Gnulib) is to define a macro like this:

```
#define mkdir ((int (*)( )) _mkdir)
```

or

```
#define mkdir(path,mode) _mkdir (path)
```

Portability problems fixed by Gnulib module `mkdir`:

- When the argument ends in a slash, the function call fails on some platforms.
- This function mistakenly succeeds on `'mkdir("d/./",mode)'` on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 10.608 mkdirat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdirat.html>

Gnulib module: `mkdirat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.

Portability problems not fixed by Gnulib:



### 10.609 mkdtemp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkdtemp.html>

Gnulib module: mkdtemp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.610 mkfifo

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkfifo.html>

Gnulib module: mkfifo

Portability problems fixed by Gnulib:

- This function mishandles trailing slash on some platforms: FreeBSD 7.2, Solaris 9.
- This function is missing on some platforms; however, the replacement always fails with ENOSYS: mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

- If the argument exists and is a directory, this function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

### 10.611 mkfifoat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkfifoat.html>

Gnulib module: mkfifoat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- The gnulib replacement function always fails with 'ENOSYS' on some platforms: mingw, MSVC 14.
- If the argument exists and is a directory, the gnulib replacement function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

### 10.612 mknod

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mknod.html>

Gnulib module: mknod

Portability problems fixed by Gnulib:

- This function requires super-user privileges to create a fifo: FreeBSD 7.2, NetBSD 8.0, OpenBSD 6.7.
- This function mishandles trailing slash on some platforms: FreeBSD 7.2, Solaris 9.
- This function is missing on some platforms; however, the replacement always fails with ENOSYS: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Use of this function for anything except fifos is not portable, generally requiring super-user privileges and knowledge of supported device numbers.
- If the argument exists and is a directory, this function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

### 10.613 mknodat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mknodat.html>

Gnulib module: mkfifoat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- The gnulib replacement function always fails with 'ENOSYS' on some platforms: mingw, MSVC 14.
- If the argument exists and is a directory, the gnulib replacement function fails with EISDIR instead of the correct EEXIST: HP-UX 11.11.

### 10.614 mkstemp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mkstemp.html>

Gnulib module: mkstemp

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- On platforms where `off_t` is a 32-bit type, `mkstemp` may not work correctly to create files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

- On some older platforms, `mkstemp` can create a world or group writable or readable file, if you haven't set the process umask to 077. This is a security risk.

Portability problems not fixed by Gnulib:

The gnulib module `clean-temp` can create temporary files that will not be left behind after signals such as SIGINT.

### 10.615 `mktime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mktime.html>

Gnulib module: `mktime`

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.
- `mktime` may go into an endless loop on some platforms.
- `mktime` may occasionally return wrong results on some platforms.

Portability problems not fixed by Gnulib:

- On some platforms, this function yields incorrect values for timestamps before the year 1: MacOS X 10.5, Solaris 11.3.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [`tzset`], page 449.

### 10.616 `mlock`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mlock.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.617 `mlockall`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mlockall.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.1.

## 10.618 mmap

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mmap.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- To get anonymous memory, on some platforms, you can use the flags `MAP_ANONYMOUS` | `MAP_PRIVATE` and `-1` instead of a file descriptor; on others you have to use a read-only file descriptor of `/dev/zero`.
- On HP-UX, passing a non-NULL first argument, as a hint for the address (even without `MAP_FIXED`), often causes `mmap` to fail. Better pass `NULL` in this case.
- On HP-UX, `MAP_FIXED` basically never works. On other platforms, it depends on the circumstances whether memory can be returned at a given address.

## 10.619 modf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/modf.html>

Gnulib module: `modf` or `modf-ieee`

Portability problems fixed by either Gnulib module `modf` or `modf-ieee`:

Portability problems fixed by Gnulib module `modf-ieee`:

- This function has problems with a NaN argument on some platforms: NetBSD 5.1, Cygwin.
- This function has problems with infinite arguments on some platforms: FreeBSD 6.4, OpenBSD 6.7, IRIX 6.5.

Portability problems not fixed by Gnulib:

## 10.620 modff

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/modff.html>

Gnulib module: `modff` or `modff-ieee`

Portability problems fixed by either Gnulib module `modff` or `modff-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.
- This function is only defined as a buggy macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `modff-ieee`:

- This function has problems with a NaN argument on some platforms: NetBSD 5.1, OpenBSD 6.7, Solaris 9, Cygwin.

- This function has problems with infinite arguments on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:

### 10.621 `modfl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/modfl.html>

Gnulib module: `modfl` or `modfl-ieee`

Portability problems fixed by either Gnulib module `modfl` or `modfl-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `modfl-ieee`:

- This function has problems with infinite arguments on some platforms: IRIX 6.5, mingw.

Portability problems not fixed by Gnulib:

### 10.622 `mprotect`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mprotect.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function does not set `errno` on some platforms: mingw.
- On AIX, it is not possible to use `mprotect` on memory regions allocated with `malloc`.

### 10.623 `mq_close`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_close.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_close.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.624 mq\_getattr

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_getattr.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_getattr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.625 mq\_notify

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_notify.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_notify.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.626 mq\_open

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.627 mq\_receive

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_receive.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_receive.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.628 mq\_send

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_send.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_send.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.629 mq\_setattr

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_setattr.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_setattr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.630 mq\_timedreceive

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_timedreceive.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_timedreceive.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.631 mq\_timedsend

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_timedsend.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_timedsend.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.632 mq\_unlink

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq\\_unlink.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/mq_unlink.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.633 mrand48

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/mrand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.634 msgctl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgctl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

### 10.635 msgget

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgget.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.



### 10.636 msgrcv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgrcv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

### 10.637 msgsnd

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/msgsnd.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

### 10.638 msync

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/msync.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On NetBSD, `msync` takes only two arguments.

### 10.639 mtx\_destroy

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.640 `mtx_init`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.641 `mtx_lock`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.642 `mtx_timedlock`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.643 `mtx_trylock`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.644 `mtx_unlock`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Mutexes.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Mutexes.html).

Gnulib module: `mtx`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.645 `munlock`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/munlock.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.646 `munlockall`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/munlockall.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.1.

### 10.647 `munmap`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/munmap.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.648 nan

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nan.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.649 nanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.650 nanl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 3.1.

### 10.651 nanosleep

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nanosleep.html>

Gnulib module: nanosleep

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function mishandles large arguments when interrupted by a signal on some platforms: Linux 64-bit, Solaris 64-bit.
- This function cannot sleep longer than 49.7 days on some platforms: Cygwin 1.5.x.
- This function does not fail when passed a negative nanosecond value on some platforms: newer 32-bit mingw.

Portability problems not fixed by Gnulib:

### 10.652 nearbyint

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyint.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.653 nearbyintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.654 nearbyintl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nearbyintl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

### 10.655 newlocale

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/newlocale.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 9.0, NetBSD 5.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
- This function is useless because the `locale_t` type is not defined on some platforms: z/OS.
- This function is useless because the `locale_t` type contains basically no information on some platforms: OpenBSD 6.3.

### 10.656 nextafter

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafter.html>

Gnulib module: nextafter

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.

### 10.657 nextafterf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafterf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.658 nextafterl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nextafterl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

### 10.659 nextdown

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextdown`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.660 nextdownf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextdownf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.661 nextdownl

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextdownl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.662 nexttoward

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttoward.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.2.

### 10.663 nexttowardf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttowardf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9.

### 10.664 nexttowardl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nexttowardl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 8.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 9, Android 4.2.

### 10.665 nextup

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextup`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.666 nextupf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextupf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 10.667 nextupl

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html),
- `man nextupl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.23, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.668 nftw

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nftw.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14, Android 4.1.

### 10.669 nice

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/nice.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- In glibc before glibc 2.2.4, `nice` returned 0 upon success.

### 10.670 nl\_langinfo

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl\\_langinfo.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl_langinfo.html)

Gnulib module: `nl_langinfo`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.

- The constant `CODESET` is not supported on some platforms: OpenBSD 3.8.
- The constants `ALTMON_1` to `ALTMON_12` are not defined on some platforms: glibc 2.26, musl libc, macOS 11.1, NetBSD 8.0, OpenBSD 6.7, AIX 7.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Haiku, Cygwin 2.9.
- The constants `ERA`, `ERA_D_FMT`, `ERA_D_T_FMT`, `ERA_T_FMT`, `ALT_DIGITS` are not supported on some platforms: OpenBSD 6.7.
- The constants `YESEXPR` and `NOEXPR` do not return a valid string on some platforms: IRIX 6.5.
- This function is not multithread-safe on some platforms: Solaris 11.3.

Portability problems not fixed by Gnulib:

- On Cygwin 1.5.x, which doesn't have locales, `nl_langinfo(CODESET)` always returns `"US-ASCII"`.
- On Cygwin 1.7.0, only the charset portion of a locale designation is honored.
- On NetBSD 5.0, in some locales, `nl_langinfo(CRNCYSTR)` returns the empty string, although the local currency symbol, as returned by `localeconv()->currency_symbol`, is non-empty.
- On NetBSD 5.1, in the "C" locale, the results of `nl_langinfo(ABMON_1) ... nl_langinfo(ABMON_12)` are full month names, not abbreviated month names.

## 10.671 `nl_langinfo_1`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl\\_langinfo\\_1.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/nl_langinfo_1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

## 10.672 `rand48`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.673 ntohl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ntohl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

### 10.674 ntohs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ntohs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, mingw, MSVC 14, Android 4.4.

### 10.675 open

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/open.html>

Gnulib module: `open`, `fchdir`

Portability problems fixed by the Gnulib module `open`:

- Some platforms do not support `O_CLOEXEC`: Mac OS X 10.6, FreeBSD 8.4, NetBSD 5.1, OpenBSD 4.9, Minix 3.1.8, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14.
- On platforms where `off_t` is a 32-bit type, `open` may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: macOS 11.1, FreeBSD 7.2, AIX 7.1, HP-UX 11.00, Solaris 9.
- This function does not support the `O_NONBLOCK` flag when it is defined by the gnulib module `nonblocking` on some platforms: mingw, MSVC 14.
- On Windows platforms (excluding Cygwin), this function does usually not recognize the `/dev/null` filename.

Portability problems fixed by the Gnulib module `fchdir`:

- On Windows platforms (excluding Cygwin), this function fails to open a read-only descriptor for directories.

Portability problems not fixed by Gnulib:

- The Gnulib replacement for `O_CLOEXEC` is not atomic, and so is not safe in the presence of multiple threads or signal handlers.

- `open ("symlink", O_CREAT ...)` fails when the argument points to a nonexistent file in an existing directory on some platforms: Haiku.
- `open ("symlink", O_NOFOLLOW ...)` fails with `errno` set to `EMLINK` instead of the POSIX-required `ELOOP` on some platforms: FreeBSD 10.1.
- `open ("symlink", O_NOFOLLOW ...)` fails with `errno` set to `EFTYPE` instead of the POSIX-required `ELOOP` on some platforms: NetBSD 6.1.
- On Windows, this function returns a file handle in `O_TEXT` mode by default; this means that it translates `'\n'` to CR/LF by default. Use the `O_BINARY` flag if you need reliable binary I/O.

### 10.676 `openat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/openat.html>

Gnulib module: `openat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- Some platforms do not support `O_CLOEXEC`: AIX 7.1, Solaris 10.
- On platforms where `off_t` is a 32-bit type, `open` may not work correctly with files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a nonexistent file or a file that is not a directory, on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

- The Gnulib replacement for `O_CLOEXEC` is not atomic, and so is not safe in the presence of multiple threads or signal handlers.
- `openat (fd, "symlink", O_NOFOLLOW ...)` fails with `errno` set to `EMLINK` instead of the POSIX-required `ELOOP` on some platforms: FreeBSD 10.1.
- `openat (fd, "symlink", O_NOFOLLOW ...)` fails with `errno` set to `EFTYPE` instead of the POSIX-required `ELOOP` on some platforms: NetBSD 6.1.

### 10.677 `opendir`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/opendir.html>

Gnulib module: `opendir`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this

function may report inode numbers incorrectly. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.678 `openlog`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/openlog.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.679 `open_memstream`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/open\\_memstream.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/open_memstream.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

An alternative to the `open_memstream` function is the Gnulib module `string-buffer`.

### 10.680 `open_wmemstream`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/open\\_wmemstream.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/open_wmemstream.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.681 `optarg`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/optarg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Mac OS X 10.5, IRIX 6.5, MSVC 14.

### 10.682 `opterr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/opterr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: IRIX 6.5, MSVC 14.

### 10.683 `optind`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/optind.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: IRIX 6.5, MSVC 14.

### 10.684 `optopt`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/optopt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Mac OS X 10.5, IRIX 6.5, MSVC 14.

### 10.685 `pathconf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pathconf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

## 10.686 pause

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pause.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

## 10.687 pclose

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pclose.html>

Gnulib module: pclose

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.688 perror

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/perror.html>

Gnulib module: perror

Portability problems fixed by Gnulib:

- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, Cygwin 1.5.x, mingw, MSVC 14.
- This function treats `errno` of 0 like failure, although POSIX requires that the message declare it as a success, on some platforms: FreeBSD 8.2, OpenBSD 4.7, macOS 11.1.
- This function clobbers the `strerror` buffer on some platforms: Cygwin 1.7.9, Android 11.
- This function fails to print a useful a string for out-of-range integers on some platforms: HP-UX 11, IRIX 6.5.

Portability problems not fixed by Gnulib:

- POSIX requires that this function set the stream error bit (detected by `ferror`) on write failure, but not all platforms do this: glibc 2.13, cygwin 1.7.9.
- POSIX requires that this function not alter stream orientation, but the gnulib replacement locks in byte orientation and fails on wide character streams.

## 10.689 pipe

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pipe.html>

Gnulib module: pipe-posix

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function crashes rather than failing with `EMFILE` if no resources are left on some platforms: Cygwin 1.7.9.

## 10.690 poll

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/poll.html>

Gnulib module: poll

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, HP NonStop.
- This function doesn't work on special files like `/dev/null` and ttys like `/dev/tty` on some platforms: macOS 10.15, AIX 5.3.

Portability problems not fixed by Gnulib:

- Under Windows, when passing a pipe, Gnulib's `poll` replacement might return 0 even before the timeout has passed. Programs using it with pipes can thus busy wait.
- On some platforms, file descriptors other than sockets do not support `POLLHUP`; they will return a "readable" or "writable" status instead: AIX 7.2, HP NonStop, mingw, MSVC.

## 10.691 popen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/popen.html>

Gnulib module: popen

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- Some platforms start the child with closed `stdin` or `stdout` if the standard descriptors were closed in the parent: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

- On native Windows platforms, this functions terminates the current process with exit code 127 if the environment variable `COMSPEC` is not set.
- Some platforms mistakenly set the close-on-exec bit, then if it is cleared by the application, the platform then leaks file descriptors from earlier `popen` calls into subsequent `popen` children: Cygwin 1.5.x.



### 10.692 `posix_fadvise`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_fadvise.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fadvise.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

### 10.693 `posix_fallocate`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_fallocate.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_fallocate.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- POSIX specifies that `EINVAL` should be returned when the file system doesn't support the allocation operation directly. glibc however emulates the file system allocation with writes where unsupported, and apps have depended on that long term implementation. This is both inefficient, and as of glibc 2.21 at least, buggy on certain NFS setups.

### 10.694 `posix_madvise`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_madvise.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_madvise.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 5.1.

### 10.695 `posix_mem_offset`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_mem\\_offset.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_mem_offset.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.696 `posix_memalign`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_memalign.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_memalign.html)

Gnulib module: `posix_memalign`

Portability problems fixed by Gnulib:

- This function produces misaligned results on some platforms: OpenBSD 6.1.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.1.

The Gnulib module `aligned-malloc` provides functions for allocating and freeing blocks of suitably aligned memory.

The Gnulib module `pagealign_alloc` provides a similar API for allocating and freeing blocks of memory aligned on a system page boundary.

### 10.697 `posix_openpt`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_openpt.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_openpt.html)

Gnulib module: `posix_openpt`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. However, the replacement may fail with `ENOSYS` or `ENOENT` on some platforms.

Portability problems not fixed by Gnulib:

Note that when using this function to open the master side of a pseudo-terminal, you still need platform dependent code to open the corresponding slave side. The Gnulib module `openpty` provides an easy-to-use API that does both at once.

## 10.698 `posix_spawn`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn.html)

Gnulib module: `posix_spawn`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.3, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- When this function fails, it causes the `stdio` buffer contents to be output twice on some platforms: AIX 6.1.
- When the program to be invoked is an executable script without a `#!` marker in the first line, this function executes the script as if it were a shell script, on some platforms: GNU/Hurd.

Portability problems not fixed by Gnulib:

- This function does not work on some platforms: AIX 6.1 (under particular circumstances).

The Gnulib modules `posix_spawn_file_actions_addchdir` and `posix_spawn_file_actions_addfchdir` provide additional actions, that consist in changing the current directory of the child process before starting the specified program.

## 10.699 `posix_spawn_file_actions_addclose`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn\\_file\\_actions\\_addclose.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn_file_actions_addclose.html)

Gnulib module: `posix_spawn_file_actions_addclose`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function does not reject a negative file descriptor on some platforms: musl libc.

Portability problems not fixed by Gnulib:

## 10.700 `posix_spawn_file_actions_adddup2`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn\\_file\\_actions\\_adddup2.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn_file_actions_adddup2.html)

Gnulib module: `posix_spawn_file_actions_adddup2`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

- This function does not reject a too large file descriptor on some platforms: musl libc, Solaris 11.4.

Portability problems not fixed by Gnulib:

### 10.701 `posix_spawn_file_actions_addopen`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn\\_file\\_actions\\_addopen.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn_file_actions_addopen.html)

Gnulib module: `posix_spawn_file_actions_addopen`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function does not reject a too large file descriptor on some platforms: musl libc, Solaris 11.4.

Portability problems not fixed by Gnulib:

### 10.702 `posix_spawn_file_actions_destroy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn\\_file\\_actions\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn_file_actions_destroy.html)

Gnulib module: `posix_spawn_file_actions_destroy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.703 `posix_spawn_file_actions_init`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawn\\_file\\_actions\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawn_file_actions_init.html)

Gnulib module: `posix_spawn_file_actions_init`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.704 `posix_spawnattr_destroy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_destroy.html)

Gnulib module: `posix_spawnattr_destroy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.705 `posix_spawnattr_getflags`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getflags.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getflags.html)

Gnulib module: `posix_spawnattr_getflags`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.706 `posix_spawnattr_getpgroup`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getpgroup.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getpgroup.html)

Gnulib module: `posix_spawnattr_getpgroup`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.707 `posix_spawnattr_getschedparam`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getschedparam.html)

Gnulib module: `posix_spawnattr_getschedparam`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.708 `posix_spawnattr_getschedpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getschedpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getschedpolicy.html)

Gnulib module: `posix_spawnattr_getschedpolicy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.709 `posix_spawnattr_getsigdefault`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getsigdefault.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getsigdefault.html)

Gnulib module: `posix_spawnattr_getsigdefault`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.710 `posix_spawnattr_getsigmask`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_getsigmask.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_getsigmask.html)

Gnulib module: `posix_spawnattr_getsigmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.711 `posix_spawnattr_init`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_init.html)

Gnulib module: `posix_spawnattr_init`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.712 `posix_spawnattr_setflags`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setflags.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setflags.html)

Gnulib module: `posix_spawnattr_setflags`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.713 `posix_spawnattr_setpgroup`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setpgroup.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setpgroup.html)

Gnulib module: `posix_spawnattr_setpgroup`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.714 `posix_spawnattr_setschedparam`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setschedparam.html)

Gnulib module: `posix_spawnattr_setschedparam`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.715 `posix_spawnattr_setschedpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setschedpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setschedpolicy.html)

Gnulib module: `posix_spawnattr_setschedpolicy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.716 `posix_spawnattr_setsigdefault`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setsigdefault.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setsigdefault.html)

Gnulib module: `posix_spawnattr_setsigdefault`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.717 `posix_spawnattr_setsigmask`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnattr\\_setsigmask.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnattr_setsigmask.html)

Gnulib module: `posix_spawnattr_setsigmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

Portability problems not fixed by Gnulib:

### 10.718 `posix_spawnp`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_spawnp.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_spawnp.html)

Gnulib module: `posix_spawnp`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.3, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.



- When this function fails, it causes the stdio buffer contents to be output twice on some platforms: AIX 6.1.
- When the program to be invoked is an executable script without a ‘#!’ marker in the first line, this function executes the script as if it were a shell script, on some platforms: glibc 2.14/Linux, glibc 2.32/Hurd, macOS 12.5, FreeBSD 14.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 3.4.x.

Portability problems not fixed by GnuLib:

- This function does not work on some platforms: AIX 6.1 (under particular circumstances).

The GnuLib modules `posix_spawn_file_actions_addchdir` and `posix_spawn_file_actions_addfchdir` provide additional actions, that consist in changing the current directory of the child process before starting the specified program.

### 10.719 `posix_trace_attr_destroy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_destroy.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.720 `posix_trace_attr_getclockres`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getclockres.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getclockres.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.721 `posix_trace_attr_getcreatetime`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getcreatetime.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getcreatetime.html)

GnuLib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.722 `posix_trace_attr_getgenversion`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getgenversion.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getgenversion.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.723 `posix_trace_attr_getinherited`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getinherited.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getinherited.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.724 `posix_trace_attr_getlogfullpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getlogfullpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getlogfullpolicy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.725 `posix_trace_attr_getlogsize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getlogsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getlogsize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.726 `posix_trace_attr_getmaxdatasize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getmaxdatasize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getmaxdatasize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.727 `posix_trace_attr_getmaxsystemeventsz`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getmaxsystemeventsz.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getmaxsystemeventsz.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.728 `posix_trace_attr_getmaxusereventsiz`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getmaxusereventsiz.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getmaxusereventsiz.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.729 `posix_trace_attr_getname`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getname.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getname.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.730 `posix_trace_attr_getstreamfullpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getstreamfullpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getstreamfullpolicy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.731 `posix_trace_attr_getstreamsize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_getstreamsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_getstreamsize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.732 `posix_trace_attr_init`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_init.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.733 `posix_trace_attr_setinherited`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setinherited.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setinherited.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.734 `posix_trace_attr_setlogfullpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setlogfullpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setlogfullpolicy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.735 `posix_trace_attr_setlogsize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setlogsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setlogsize.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.736 `posix_trace_attr_setmaxdatasize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setmaxdatasize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setmaxdatasize.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.737 `posix_trace_attr_setname`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setname.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setname.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.738 `posix_trace_attr_setstreamfullpolicy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setstreamfullpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setstreamfullpolicy.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.739 `posix_trace_attr_setstreamsize`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_attr\\_setstreamsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_attr_setstreamsize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.740 `posix_trace_clear`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_clear.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_clear.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.741 `posix_trace_close`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_close.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_close.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.742 `posix_trace_create`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_create.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_create.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.743 `posix_trace_create_withlog`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_create\\_withlog.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_create_withlog.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.744 `posix_trace_event`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_event.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_event.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.745 `posix_trace_eventid_equal`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventid\\_equal.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventid_equal.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 10.746 `posix_trace_eventid_get_name`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventid\\_get\\_name.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventid_get_name.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.747 `posix_trace_eventid_open`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventid\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventid_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.748 `posix_trace_eventset_add`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventset\\_add.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_add.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.749 `posix_trace_eventset_del`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventset\\_del.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_del.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.750 `posix_trace_eventset_empty`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventset\\_empty.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_empty.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.751 `posix_trace_eventset_fill`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventset\\_fill.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_fill.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.752 `posix_trace_eventset_ismember`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventset\\_ismember.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventset_ismember.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.753 `posix_trace_eventtypelist_getnext_id`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventtypelist\\_getnext\\_id.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventtypelist_getnext_id.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.754 `posix_trace_eventtypelist_rewind`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_eventtypelist\\_rewind.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_eventtypelist_rewind.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.755 `posix_trace_flush`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_flush.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_flush.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.756 `posix_trace_get_attr`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_get\\_attr.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_get_attr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.757 `posix_trace_get_filter`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_get\\_filter.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_get_filter.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.758 `posix_trace_get_status`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_get\\_status.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_get_status.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.759 `posix_trace_getnext_event`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_getnext\\_event.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_getnext_event.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.760 `posix_trace_open`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.761 `posix_trace_rewind`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_rewind.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_rewind.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.762 `posix_trace_set_filter`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_set\\_filter.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_set_filter.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.763 `posix_trace_shutdown`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_shutdown.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_shutdown.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.764 `posix_trace_start`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_start.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_start.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.765 `posix_trace_stop`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_stop.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_stop.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.766 `posix_trace_timedgetnext_event`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_timedgetnext\\_event.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_timedgetnext_event.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.767 `posix_trace_trid_eventid_open`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_trid\\_eventid\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_trid_eventid_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.768 `posix_trace_trygetnext_event`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_trace\\_trygetnext\\_event.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_trace_trygetnext_event.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.769 `posix_typed_mem_get_info`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_typed\\_mem\\_get\\_info.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_typed_mem_get_info.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.770 `posix_typed_mem_open`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix\\_typed\\_mem\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/posix_typed_mem_open.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.771 pow

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pow.html>

GnuLib module: pow

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

### 10.772 powf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/powf.html>

GnuLib module: powf

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 9.

Portability problems not fixed by GnuLib:

### 10.773 powl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/powl.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

### 10.774 pread

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pread.html>

GnuLib module: pread

Portability problems fixed by GnuLib:

- This function is missing on some platforms: mingw, MSVC 14.



- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function returns zero instead of positive values when large file support is enabled on some platforms: HP-UX 11.11.
- This function does not fail on pipes on some platforms: HP-UX 11.31.

Portability problems not fixed by Gnulib:

## 10.775 printf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/printf.html>

Gnulib module: `printf-posix` or `printf-gnu` or `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by either Gnulib module `printf-posix` or `printf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf` of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as `"%2$s"`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘ ’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.

- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- `printf "%#.0x"` or `printf "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with `"%.511f"`) on some platforms: Solaris 10.
- This function produces wrong output for the `'lc'` directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `printf-gnu`:

- This function does not support the `'B'` directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `printf-posix` or `printf-gnu`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio` or `printf-posix` or `printf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical `'long double'` numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the `"C"` locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.

## 10.776 pselect

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pselect.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.

- On some platforms, this function fails to detect invalid fds with EBADF, but only if they lie beyond the current maximum open fd: FreeBSD 8.2.

Portability problems not fixed by Gnulib:

- This function has a slightly incompatible declaration on some platforms: AIX 7.1 (when `_ALL_SOURCE` is defined).
- When the *sigmask* argument is nonnull on platforms that do not natively support this function, race conditions are possible when its gnulib implementation temporarily modifies the signal mask, and the behavior is unspecified in a multi-threaded process.

### 10.777 psiginfo

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/psiginfo.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 4.1.

### 10.778 psignal

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/psignal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 4.1.

### 10.779 pthread\_atfork

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_atfork.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_atfork.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14, Android 3.0.

### 10.780 pthread\_attr\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_destroy.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.781 pthread\_attr\_getdetachstate

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getdetachstate.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getdetachstate.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.782 pthread\_attr\_getguardsize

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getguardsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getguardsize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.

### 10.783 pthread\_attr\_getinheritsched

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getinheritsched.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getinheritsched.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.784 pthread\_attr\_getschedparam

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getschedparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.785 pthread\_attr\_getschedpolicy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getschedpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getschedpolicy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.786 pthread\_attr\_getscope

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getscope.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getscope.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.787 pthread\_attr\_getstack

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getstack.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getstack.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

### 10.788 pthread\_attr\_getstacksize

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_getstacksize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_getstacksize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.789 pthread\_attr\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_init.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
- This function is only defined as an inline function on some platforms: HP-UX 11.11.

Portability problems not fixed by Gnulib:

### 10.790 pthread\_attr\_setdetachstate

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setdetachstate.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setdetachstate.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.791 pthread\_attr\_setguardsize

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setguardsize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setguardsize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14.

### 10.792 pthread\_attr\_setinheritsched

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setinheritsched.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setinheritsched.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.793 pthread\_attr\_setschedparam

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setschedparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.794 pthread\_attr\_setschedpolicy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setschedpolicy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setschedpolicy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.795 pthread\_attr\_setscope

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setscope.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setscope.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.796 pthread\_attr\_setstack

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setstack.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setstack.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14.

### 10.797 pthread\_attr\_setstacksize

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_attr\\_setstacksize.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_attr_setstacksize.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.798 pthread\_barrier\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrier\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_destroy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.799 pthread\_barrier\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrier\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_init.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.



### 10.800 pthread\_barrier\_wait

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrier\\_wait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrier_wait.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.801 pthread\_barrierattr\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrierattr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_destroy.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.802 pthread\_barrierattr\_getpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrierattr\\_getpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_getpshared.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.803 pthread\_barrierattr\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrierattr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_init.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.804 `pthread_barrierattr_setpshared`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_barrierattr\\_setpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_barrierattr_setpshared.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 10.805 `pthread_cancel`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cancel.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cancel.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.806 `pthread_cleanup_pop`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cleanup\\_pop.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cleanup_pop.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, NetBSD 9.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.807 pthread\_cleanup\_push

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cleanup\\_push.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cleanup_push.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, NetBSD 9.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.808 pthread\_cond\_broadcast

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_broadcast.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_broadcast.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.809 pthread\_cond\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_destroy.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.810 pthread\_cond\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_init.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.811 pthread\_cond\_signal

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_signal.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_signal.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.812 pthread\_cond\_timedwait

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_timedwait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_timedwait.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.813 pthread\_cond\_wait

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_cond\\_wait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_cond_wait.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.814 pthread\_condattr\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_destroy.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.815 pthread\_condattr\_getclock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_getclock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_getclock.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.

### 10.816 pthread\_condattr\_getpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_getpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_getpshared.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.817 pthread\_condattr\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_init.html)

Gnulib module: pthread-cond

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.818 pthread\_condattr\_setclock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_setclock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_setclock.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.2, macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.

### 10.819 pthread\_condattr\_setpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_condattr\\_setpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_condattr_setpshared.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.820 pthread\_create

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_create.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_create.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.
- This function is only defined as an inline function on some platforms: HP-UX 11.11.

Portability problems not fixed by Gnulib:

- On Linux/glibc platforms before the advent of NPTL in 2003, signals could only be sent to one particular thread. In POSIX, signals are sent to the entire process and executed by any thread of the process that happens to have the particular signal currently unblocked.

### 10.821 pthread\_detach

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_detach.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_detach.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.822 pthread\_equal

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_equal.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_equal.html)

Gnulib module: pthread-thread

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.823 pthread\_exit

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_exit.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_exit.html)

GnuLib module: pthread-thread

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.824 pthread\_getconcurrency

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_getconcurrency.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getconcurrency.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. You can remove calls to this function.

### 10.825 pthread\_getcpuclockid

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_getcpuclockid.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getcpuclockid.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

### 10.826 pthread\_getschedparam

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_getschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getschedparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.827 pthread\_getspecific

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_getspecific.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_getspecific.html)

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.828 pthread\_join

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_join.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_join.html)

Gnulib module: pthread-thread

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.829 pthread\_key\_create

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_key\\_create.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_key_create.html)

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:



### 10.830 pthread\_key\_delete

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_key\\_delete.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_key_delete.html)

Gnulib module: pthread-tss

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.831 pthread\_kill

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_kill.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_kill.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.832 pthread\_mutex\_consistent

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_consistent.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_consistent.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.833 pthread\_mutex\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_destroy.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.834 pthread\_mutex\_getprioceiling

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_getprioceiling.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_getprioceiling.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.835 pthread\_mutex\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_init.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.836 pthread\_mutex\_lock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_lock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_lock.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.837 pthread\_mutex\_setprioceiling

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_setprioceiling.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_setprioceiling.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.838 pthread\_mutex\_timedlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_timedlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_timedlock.html)

Gnulib module: pthread\_mutex\_timedlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.839 pthread\_mutex\_trylock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_trylock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_trylock.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.840 pthread\_mutex\_unlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutex\\_unlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutex_unlock.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.841 pthread\_mutexattr\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_destroy.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.842 pthread\_mutexattr\_getprioceiling

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_getprioceiling.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getprioceiling.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.843 pthread\_mutexattr\_getprotocol

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_getprotocol.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getprotocol.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.844 pthread\_mutexattr\_getpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_getpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getpshared.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.845 pthread\_mutexattr\_getrobust

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_getrobust.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_getrobust.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the provided replacement is just a dummy.

Portability problems not fixed by Gnulib:

### 10.846 pthread\_mutexattr\_gettype

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_gettype.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_gettype.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.847 pthread\_mutexattr\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_init.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.848 pthread\_mutexattr\_setprioceiling

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_setprioceiling.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setprioceiling.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.849 pthread\_mutexattr\_setprotocol

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_setprotocol.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setprotocol.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, NetBSD 7.1, Minix 3.1.8, mingw, MSVC 14, Android 8.1.

### 10.850 pthread\_mutexattr\_setpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_setpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setpshared.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.851 pthread\_mutexattr\_setrobust

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_setrobust.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_setrobust.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.11, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the provided replacement is just a dummy.

Portability problems not fixed by Gnulib:

### 10.852 pthread\_mutexattr\_settype

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_mutexattr\\_settype.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_mutexattr_settype.html)

Gnulib module: pthread-mutex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.853 pthread\_once

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_once.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_once.html)

Gnulib module: pthread-once

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.854 pthread\_rwlock\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_destroy.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.855 pthread\_rwlock\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_init.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.856 pthread\_rwlock\_rdlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_rdlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_rdlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibc 2.28. As a workaround, you can use the `gl_rwlock_t` type from the Gnulib module ‘lock’.

### 10.857 pthread\_rwlock\_timedrdlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_timedrdlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_timedrdlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibc 2.28.

### 10.858 pthread\_rwlock\_timedwrlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_timedwrlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_timedwrlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.859 pthread\_rwlock\_tryrdlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_tryrdlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_tryrdlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- This function prefers readers to writers (meaning, when this function is called on an rwlock that is already taken by one or more readers, and another writer is already waiting to take it, this function may return successfully immediately) – a behaviour that may lead to writer starvation – on some platforms: glibc 2.28.



### 10.860 pthread\_rwlock\_trywrlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_trywrlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_trywrlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.861 pthread\_rwlock\_unlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_unlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_unlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.862 pthread\_rwlock\_wrlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlock\\_wrlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlock_wrlock.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.3. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.863 pthread\_rwlockattr\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlockattr\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_destroy.html)

Gnulib module: pthread-rwlock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.864 pthread\_rwlockattr\_getpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlockattr\\_getpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_getpshared.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14.

### 10.865 pthread\_rwlockattr\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlockattr\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_init.html)

GnuLib module: pthread-rwlock

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.866 pthread\_rwlockattr\_setpshared

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_rwlockattr\\_setpshared.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_rwlockattr_setpshared.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14.

### 10.867 pthread\_self

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_self.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_self.html)

GnuLib module: pthread-thread

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.868 `pthread_setcancelstate`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setcancelstate.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setcancelstate.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.869 `pthread_setcanceltype`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setcanceltype.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setcanceltype.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.870 `pthread_setconcurrency`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setconcurrency.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setconcurrency.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. You can remove calls to this function.

### 10.871 `pthread_setschedparam`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setschedparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setschedparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.872 `pthread_setschedprio`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setschedprio.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setschedprio.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.3, macOS 11.1, FreeBSD 14.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 8.1.

### 10.873 `pthread_setspecific`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_setspecific.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_setspecific.html)

Gnulib module: `pthread-tss`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.874 `pthread_sigmask`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_sigmask.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_sigmask.html)

Gnulib module: `pthread_sigmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is declared in `<pthread.h>` instead of `<signal.h>` on some platforms: FreeBSD 6.4, OpenBSD 3.8.
- This function does nothing and always returns 0 in programs that are not linked with `-lpthread` on some platforms: FreeBSD 14.0, MidnightBSD 1.1, HP-UX 11.31, Solaris 9.
- When it fails, this functions returns `-1` instead of the error number on some platforms: Cygwin 1.7.5.
- This function does not immediately raise signals that were pending before the call and unblocked by the call on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

- On platforms that do not natively support this function, it has unspecified behavior in a multi-threaded process.
- In case of failure, the return value is wrong on some platforms: NetBSD 9.0 when `libpthread` is not in use.

### 10.875 pthread\_spin\_destroy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_spin\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_destroy.html)

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.876 pthread\_spin\_init

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_spin\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_init.html)

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.877 pthread\_spin\_lock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_spin\\_lock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_lock.html)

Gnulib module: pthread-spin

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

### 10.878 pthread\_spin\_trylock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_spin\\_trylock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_trylock.html)

Gnulib module: pthread-spin

Portability problems fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.879 pthread\_spin\_unlock

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_spin\\_unlock.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_spin_unlock.html)

GnuLib module: pthread-spin

Portability problems fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.9, mingw, MSVC 14, Android 6.0. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.880 pthread\_testcancel

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread\\_testcancel.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/pthread_testcancel.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.881 ptsname

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ptsname.html>

GnuLib module: ptsname

Portability problems fixed by GnuLib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.
- This function fails to set errno on failure on some platforms: FreeBSD 8.2.

Portability problems not fixed by GnuLib:

- On Solaris 11 2010-11, this function fails on all BSD-style `/dev/pty*` device files.
- This function is not thread-safe on some platforms: Cygwin 1.7.9. Likewise, the gnuLib replacement is not thread-safe.

Note that the Glibc module `ptsname_r` is a version of this function that is more likely to be thread-safe.

## 10.882 `putc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putc.html>

Glibc module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Glibc module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Glibc module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Glibc:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

## 10.883 `putc_unlocked`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/putc\\_unlocked.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/putc_unlocked.html)

Glibc module: —

Portability problems fixed by Glibc:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Glibc:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

## 10.884 `putchar`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putchar.html>

Glibc module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Glibc module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.885 `putchar_unlocked`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/putchar\\_unlocked.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/putchar_unlocked.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.886 `putenv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putenv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

Extension: Gnulib provides a module ‘`putenv`’ that substitutes a `putenv` implementation that can also be used to remove environment variables.

### 10.887 `putmsg`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 10.888 putpmsg

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putpmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.889 puts

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/puts.html>

Gnulib module: `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.890 pututxline

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pututxline.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.891 putwc

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putwc.html>

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.892 `putwchar`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/putwchar.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.893 `pwrite`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/pwrite.html>

GnuLib module: `pwrite`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: mingw, MSVC 14.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function does not fail when an invalid (negative) offset is passed when large file support is enabled on some platforms: HP-UX 11.11.
- This function uses an arbitrary offset instead of the `off_t` argument when large file support is enabled on some platforms: HP-UX 11.11.

Portability problems not fixed by GnuLib:

### 10.894 `qsort`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/qsort.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

### 10.895 `quick_exit`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 9, Android 4.4.

### 10.896 `raise`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/raise.html>

Gnulib module: `raise`

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.897 `rand`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand.html>

Gnulib module: `rand`

Portability problems fixed by Gnulib:

- This function crashes when used in multithreaded programs on some platforms: CheriBSD.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 4.4.
- This function is not multithread-safe on some platforms: musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.3, AIX 7.1, Solaris 11.4.

### 10.898 `rand_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/rand_r.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `random_r` from Gnulib module `random_r` instead.

## 10.899 random

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/random.html>

Gnulib module: random

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is only defined as an inline function on some platforms: Android 4.4.
- This function is not multithread-safe on some platforms: macOS 12.5, FreeBSD 13.2, Solaris 11.4, Cygwin 3.4.6, Haiku.

Portability problems not fixed by Gnulib:

- This function has a slightly incompatible declaration (the return type being ‘int’ instead of ‘long’) on some platforms: Cygwin 1.5.25, Haiku.
- When ‘srandom’ was not called, this function returns a non-deterministic sequence rather than a deterministic sequence of numbers on some platforms: OpenBSD 7.4.

## 10.900 read

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/read.html>

Gnulib module: read, stdio, nonblocking

Portability problems fixed by Gnulib module `read`:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: mingw, MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function may fail with error `EINTR`, even in programs that don’t install any signal handlers, on some platforms: macOS 11.1.

For handling `EINTR`, Gnulib provides a module ‘`safe-read`’ with a function `safe_read`.

## 10.901 readdir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/readdir.html>

Gnulib module: readdir

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.

- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- Although POSIX places no restrictions on `d_ino` values, some older systems are rumored to return `d_ino` values equal to zero for directory entries that do not really exist. Although Gnulib formerly attempted to cater to these older systems, this caused misbehavior on standard systems and so Gnulib does not attempt to cater to them any more. If you know of any problems caused by this, please send a bug report.

### 10.902 `readdir_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/readdir\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/readdir_r.html)

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function is planned to be removed from POSIX and to be deprecated in glibc. Portable applications should use `readdir`.
- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.903 `readlink`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/readlink.html>

Gnulib module: readlink

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- Some platforms mistakenly succeed on file names ending in `/`: FreeBSD 7.2, Solaris 9, Mac OS X 10.10.
- On some platforms, this function returns `int` instead of `ssize_t`: glibc 2.4, FreeBSD 6.0, OpenBSD 6.7, Cygwin 1.5.x, AIX 7.1.

Portability problems mostly fixed by Gnulib:

- On some platforms, this function fails and sets `errno` to `ERANGE` rather than returning truncated contents: AIX 7.2, HP-UX 11. The Gnulib replacement normally works as

POSIX requires by returning the truncated contents. However, if the full link contents are unreasonably large (more than 4000 bytes) the replacement clears the entire buffer and returns the buffer size; although this is not a complete fix, it suffices for typical callers, which ignore the buffer contents anyway.

Portability problems not fixed by Gnulib:

- This function always fails on platforms that don't support symlinks: mingw, MSVC 14.
- When this function is called on a directory: In the case of NFS mounted directories, Cygwin sets `errno` to `ENOENT` or `EIO` instead of `EINVAL`. To avoid this problem, check for a directory before calling this function.
- When this function is called on a file that is not a symbolic link: IRIX may set `errno` to `ENXIO` instead of `EINVAL`. Cygwin may set `errno` to `EACCES` instead of `EINVAL`.
- When this function fails because it is called on an existing non-directory's name concatenated to `/`, it sets `errno` to `EINVAL`: AIX 7.2.
- Symlink contents do not always have a trailing null byte, and there is no indication if symlink contents were truncated if the return value matches the length. Furthermore, Linux sets `errno` to `EINVAL` if the requested length is zero. Use the `gnulib` module `areadlink` for improved ability to read symlink contents.

## 10.904 readlinkat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/readlinkat.html>

Gnulib module: `readlinkat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.9, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- Some platforms mistakenly succeed on file names ending in `/`: OS X 10.10.
- On some platforms, this function returns `int` instead of `ssize_t`: AIX 7.1.

Portability problems mostly fixed by Gnulib:

- On some platforms, this function fails and sets `errno` to `ERANGE` rather than returning truncated contents: AIX 7.2. The Gnulib replacement normally works as POSIX requires by returning the truncated contents. However, if the full link contents are unreasonably large (more than 4000 bytes) the replacement clears the entire buffer and returns the buffer size; although this is not a complete fix, it suffices for typical callers, which ignore the buffer contents anyway.

Portability problems not fixed by Gnulib:

- This function always fails on platforms that don't support symlinks: mingw, MSVC 14.
- When this function is called on a directory: In the case of NFS mounted directories, Cygwin sets `errno` to `ENOENT` or `EIO` instead of `EINVAL`. To avoid this problem, check for a directory before calling this function.

- When this function is called on a file that is not a symbolic link: IRIX may set `errno` to `ENXIO` instead of `EINVAL`. Cygwin may set `errno` to `EACCES` instead of `EINVAL`.
- When this function fails because it is called on an existing non-directory's name concatenated to `/`, it sets `errno` to `EINVAL`: AIX 7.2.
- When this function is called on an empty file name, it fails with error `EBADF` instead of `ENOENT`: Cygwin 3.4.6.
- Symlink contents do not always have a trailing null byte, and there is no indication if symlink contents were truncated if the return value matches the length. Furthermore, Linux sets `errno` to `EINVAL` if the requested length is zero. Use the `gnulib` module `readlink` for improved ability to read symlink contents.

### 10.905 `readv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/readv.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.906 `realloc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/realloc.html>

Gnulib module: `realloc-posix`

Portability problems fixed by Gnulib:

- Upon failure, the function does not set `errno` to `ENOMEM` on some platforms: mingw, MSVC 14.
- On some platforms, `realloc(p, n)` can succeed even if `n` exceeds `PTRDIFF_MAX`. Although this behavior is arguably allowed by POSIX it can lead to behavior not defined by POSIX later, so `realloc-posix` does not allow going over the limit.

Without the `'realloc-gnu'` module described below, it is not portable to call `realloc` with a size of 0. With a `NULL` pointer argument, this is the same ambiguity as `malloc(0)` on whether a unique zero-size object is created. With a non-`NULL` pointer argument `p`, C17 says that it is implementation-defined whether `realloc(p, 0)` frees `p`. Behavior varies on whether `realloc(p, 0)` always frees `p` and successfully returns a null pointer, or always fails and leaves `p` valid, or usually succeeds and returns a unique zero-size object; a program not suspecting these variations in semantics will leak memory (either the still-valid `p`, or the non-`NULL` return value).

Extension: Gnulib provides a module `'realloc-gnu'` that substitutes a `realloc` implementation that behaves more like the `glibc` implementation. It fixes these portability problems:

- `realloc(NULL, 0)` returns `NULL` on success on some platforms: AIX 7.2.
- On some platforms, `realloc(p, 0)` with non-null `p` might not free `p`, or might clobber `errno`, or might not return `NULL`.

## 10.907 `realpath`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/realpath.html>

Gnulib module: `canonicalize-lgpl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function does not allow for a NULL ‘`resolved`’ parameter on some platforms: Mac OS X 10.5, FreeBSD 6.4, OpenBSD 4.4, Solaris 10.
- This function does not always return an absolute path on some platforms: Solaris 10.
- This function fails to detect trailing slashes on non-directories on some platforms: glibc 2.3.5, macOS 11.1, OpenBSD 6.0.
- This function fails to recognize non-directories or symlinks to non-directories followed by ‘`..`’ on some platforms: Cygwin 2.9.
- This function misbehaves on consecutive slashes on some platforms: musl libc 1.2.2, AIX 7.

Portability problems not fixed by Gnulib:

- This function does not allow to determine the required size of output buffer; the use of a non-NULL ‘`resolved`’ buffer is non-portable, since `PATH_MAX`, if it is defined, is nothing more than a guess.

## 10.908 `recv`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/recv.html>

Gnulib module: `recv`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

## 10.909 `recvfrom`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/recvfrom.html>

Gnulib module: `recvfrom`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On HP-UX 11, in 64-bit mode, when the macro `_HPUX_ALT_XOPEN_SOCKET_API` is not defined, this function behaves incorrectly because it is declared to take a pointer to a 64-bit wide `socklen_t` entity but in fact considers it as a pointer to a 32-bit wide `unsigned int` entity.



Portability problems not fixed by Gnulib:

- Some platforms don't have a `socklen_t` type; in this case this function's sixth argument type is `'int *'`.

### 10.910 `recvmsg`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/recvmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.911 `regcomp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/regcomp.html>

Gnulib module: `regex`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- Many regular expression implementations have bugs.

Portability problems not fixed by Gnulib:

### 10.912 `regerror`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/regerror.html>

Gnulib module: `regex`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.913 `regexec`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/regexec.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-regexec-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-regexec-2.html)

Gnulib module: `regex`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- Many regular expression implementations have bugs.

Portability problems not fixed by Gnulib:

### 10.914 regfree

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/regfree.html>

Gnulib module: regex

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.915 remainder

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainder.html>

Gnulib module: remainder or remainder-ieee

Portability problems fixed by either Gnulib module `remainder` or `remainder-ieee`:

- This function is missing on some platforms: MSVC 9.

Portability problems fixed by Gnulib module `remainder-ieee`:

Portability problems not fixed by Gnulib:

### 10.916 remainderf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainderf.html>

Gnulib module: remainderf or remainderf-ieee

Portability problems fixed by either Gnulib module `remainderf` or `remainderf-ieee`:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.
- This function may go into an endless loop on some platforms: IRIX 6.5.

Portability problems fixed by Gnulib module `remainderf-ieee`:

Portability problems not fixed by Gnulib:

### 10.917 remainderl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remainderl.html>

Gnulib module: remainderl or remainderl-ieee

Portability problems fixed by either Gnulib module `remainderl` or `remainderl-ieee`:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function is not declared on some platforms: IRIX 6.5.

- This function returns completely wrong values on some platforms: OpenBSD 5.1/SPARC.
- This function produces results which are accurate to only 16 digits on some platforms: musl libc 1.2.2/arm64, musl libc 1.2.2/s390x.

Portability problems fixed by Gnulib module `remainder1-ieee`:

Portability problems not fixed by Gnulib:

### 10.918 `remove`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remove.html>

Gnulib module: `remove`

Portability problems fixed by Gnulib:

- This function fails to reject trailing slashes on non-directories on some platforms: FreeBSD 7.2, Solaris 9.
- This function mistakenly removes a directory with `remove("dir/.")` on some platforms: Cygwin 1.5.x.
- This function does not remove empty directories on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.919 `remque`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remque.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

### 10.920 `remquo`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquo.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

### 10.921 `remquof`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquof.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.922 `remquol`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/remquol.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

### 10.923 `rename`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rename.html>

Gnulib module: `rename`

Portability problems fixed by Gnulib:

- This function does not allow trailing slashes when creating a destination directory, as in `rename("dir", "new/")`: NetBSD 1.6.
- This function does not reject trailing slashes on the destination for non-directories on some platforms, as in `rename("file", "new/")`: AIX 7.1, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not reject trailing slashes on symlinks to non-directories on some platforms, as in `rename("link-to-file/", "f")`: FreeBSD 7.2.
- This function ignores trailing slashes on symlinks on some platforms, such that `rename("link/", "new")` corrupts `link`: Solaris 9.
- This function incorrectly reduces the link count when comparing two spellings of a hard link on some platforms: NetBSD 1.6, Cygwin 1.5.x.
- This function will not always replace an existing destination on some platforms: Cygwin 1.5.x, mingw, MSVC 14. However, the replacement is not atomic for directories, and may end up losing the empty destination if the source could not be renamed.
- This function mistakenly allows names ending in `'.'` or `'..'` on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

- This function does not reject attempts to rename existing directories and non-directories onto one another on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- POSIX requires that `rename("symlink-to-dir/","dir2")` rename `dir` and leave `symlink-to-dir` dangling; likewise, it requires that `rename("dir","dangling/")` rename `dir` so that `dangling` is no longer a dangling symlink. This behavior is counter-intuitive, so on some systems, `rename` fails with `ENOTDIR` if either argument is a symlink with a trailing slash: glibc, OpenBSD, Cygwin 1.7.
- POSIX requires that `rename` do nothing and return 0 if the source and destination are hard links to the same file. This behavior is counterintuitive, and on some systems `renameat` is a no-op in this way only if the source and destination identify the same directory entry. On these systems, for example, although renaming `./f` to `f` is a no-op, renaming `f` to `g` deletes `f` when `f` and `g` are hard links to the same file: NetBSD 7.0.
- After renaming a non-empty directory over an existing empty directory, the old directory name is still visible through the `stat` function for 30 seconds after the rename, on NFS file systems, on some platforms: Linux 2.6.18.
- This function will not rename a source that is currently opened by any process: mingw, MSVC 14.

## 10.924 renameat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/renameat.html>

Gnulib module: `renameat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function is declared in `<unistd.h>`, not in `<stdio.h>`, on some platforms: NetBSD 7.0, Solaris 11.4.
- This function is declared in `<sys/stat.h>`, not in `<stdio.h>`, on some platforms: Android 4.3.
- This function does not reject trailing slashes on non-directories on some platforms, as in `renameat(fd,"file",fd,"new/")`: Solaris 11.4.
- This function ignores trailing slashes on symlinks on some platforms, such that `renameat(fd,"link/",fd,"new")` corrupts `link`: Solaris 9.

Portability problems not fixed by Gnulib:

- POSIX requires that `renameat(fd,"symlink-to-dir/",fd,"dir2")` rename `dir` and leave `symlink-to-dir` dangling; likewise, it requires that `renameat(fd,"dir",fd,"dangling/")` rename `dir` so that `dangling` is no longer a dangling symlink. This behavior is counter-intuitive, so on some systems, `renameat` fails with `ENOTDIR` if either argument is a symlink with a trailing slash: glibc, OpenBSD, Cygwin 1.7.

- POSIX requires that `renameat` do nothing and return 0 if the source and destination are hard links to the same file. This behavior is counterintuitive, and on some systems `renameat` is a no-op in this way only if the source and destination identify the same directory entry. On these systems, for example, although renaming `./f` to `f` is a no-op, renaming `f` to `g` deletes `f` when `f` and `g` are hard links to the same file: NetBSD 7.0.
- After renaming a non-empty directory over an existing empty directory, the old directory name is still visible through the `stat` function for 30 seconds after the rename, on NFS file systems, on some platforms: Linux 2.6.18.
- This function will not rename a source that is currently opened by any process: mingw, MSVC 14.

### 10.925 `rewind`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rewind.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

### 10.926 `rewinddir`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rewinddir.html>

Gnulib module: `rewinddir`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- On Mac OS X platforms where `long int` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.927 `rint`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rint.html>

Gnulib module: `rint`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 9.

Portability problems not fixed by Gnulib:

### 10.928 `rprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rprintf.html>

Gnulib module: `rprintf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

### 10.929 `rintl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rintl.html>

Gnulib module: `rintl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- This function produces wrong results for negative numbers on some platforms: NetBSD 8.0.

Portability problems not fixed by Gnulib:

### 10.930 `rmdir`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/rmdir.html>

Gnulib module: `rmdir`

Portability problems fixed by Gnulib:

- This function is declared in different header files (namely, `<io.h>` or `<direct.h>`) on some platforms: mingw, MSVC 14.
- This function mistakenly removes a directory with `rmdir("dir/.")` on some platforms: Cygwin 1.5.x.
- This function fails with `EINVAL` instead of the expected `ENOTDIR` for `rmdir("file/")` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- When `rmdir` fails because the specified directory is not empty, the `errno` value is system dependent.
- POSIX requires that `rmdir("link-to-empty/")` remove `empty` and leave `link-to-empty` as a dangling symlink. This is counter-intuitive, so some systems fail with `ENOTDIR` instead: glibc

### 10.931 round

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/round.html>

Gnulib module: round or round-ieee

Portability problems fixed by either Gnulib module round or round-ieee:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: glibc 2.8, IRIX 6.5.
- This functions returns a wrong result for  $x = 1/2 - 2^{-54}$  on some platforms: NetBSD 3.0, AIX 7.1.

Portability problems fixed by Gnulib module round-ieee:

- This function returns a positive zero for an argument between  $-0.5$  and  $0$  on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.932 roundeven

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.933 roundevenf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 10.934 roundevenl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.935 roundf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/roundf.html>

Gnulib module: roundf or roundf-ieee

Portability problems fixed by either Gnulib module `roundf` or `roundf-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, MSVC 9.
- This function is not declared on some platforms: glibc 2.8, IRIX 6.5.
- This functions returns a wrong result for  $x = 1/2 - 2^{-25}$  on some platforms: mingw.

Portability problems fixed by Gnulib module `roundf-ieee`:

- This function returns a positive zero for an argument between  $-0.5$  and  $0$  on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.936 roundl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/roundl.html>

Gnulib module: roundl or roundl-ieee

Portability problems fixed by either Gnulib module `roundl` or `roundl-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, older IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
- This function is not declared on some platforms: glibc 2.8, IRIX 6.5.

Portability problems fixed by Gnulib module `roundl-ieee`:

- This function returns a positive zero for an argument between  $-0.5$  and  $0$  on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

### 10.937 scalbln

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbln.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 9.0.

### 10.938 scalblnf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalblnf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 9.0.

### 10.939 scalblnl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalblnl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 9.0.

### 10.940 scalbn

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbn.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, IRIX 6.5, MSVC 9.

### 10.941 scalbnf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbnf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.942 scalbnl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scalbnl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.

### 10.943 scandir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scandir.html>

Gnulib module: scandir

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Solaris 9, mingw, MSVC 14.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- The fourth parameter of this function is declared as `int (*) (const void *, const void *)` on some platforms: glibc 2.3.6, macOS 10.7, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7.
- The fourth parameter of this function is declared as `int (*) (void *, void *)` on some platforms: AIX 5.1.

### 10.944 scanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/scanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scanf.html)

Gnulib module: `stdio`, `nonblocking`

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- C99 and POSIX.1-2001 and later require end-of-file to be sticky, that is, they require this function to act as if it reads end-of-file if `feof` would return nonzero. However, on some systems this function attempts to read from the underlying file descriptor even if the stream's end-of-file indicator is set. These systems include glibc and default Solaris.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function doesn't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

### 10.945 `sched_get_priority_max`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_get\\_priority\\_max.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_get_priority_max.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

### 10.946 `sched_get_priority_min`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_get\\_priority\\_min.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_get_priority_min.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

### 10.947 `sched_getparam`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_getparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_getparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.948 sched\_getscheduler

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_getscheduler.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_getscheduler.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.949 sched\_rr\_get\_interval

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_rr\\_get\\_interval.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_rr_get_interval.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

### 10.950 sched\_setparam

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_setparam.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_setparam.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.951 sched\_setscheduler

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_setscheduler.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_setscheduler.html)

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setscheduler.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setscheduler.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 10.952 sched\_yield

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched\\_yield.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sched_yield.html)

GnuLib module: sched\_yield

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14. But the provided replacement is just a dummy on some of these platforms: Minix 3.1.8.

Portability problems not fixed by GnuLib:

### 10.953 seed48

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/seed48.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.954 seekdir

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/seekdir.html>

GnuLib module: —

Portability problems fixed by GnuLib:

- On platforms where `long int` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: MSVC 14, Android 5.1.

### 10.955 select

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/select.html>

GnuLib module: select

Portability problems fixed by GnuLib:

- On Windows platforms (excluding Cygwin), `select` can only be called on descriptors created by the `socket` function, not on regular file descriptors.

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.
- On some platforms, this function fails to detect invalid fds with `EBADF`, but only if they lie beyond the current maximum open fd: FreeBSD 8.2.

Portability problems not fixed by GnuLib:

- When you call `select` with a timeout, some implementations modify the timeout parameter so that upon return from the function, it contains the amount of time not slept. Other implementations leave the timeout parameter unmodified.
- Under Windows, when passing a pipe, GnuLib's `select` replacement might return 0 even before the timeout has passed. Programs using it with pipes can thus busy wait.
- On Linux, when some file descriptor refers to a regular file, `select` may fail, setting `errno` to `EBADF`.

### 10.956 `sem_close`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_close.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_close.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.957 `sem_destroy`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_destroy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_destroy.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.

### 10.958 `sem_getvalue`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_getvalue.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_getvalue.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.

### 10.959 `sem_init`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_init.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_init.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not implemented on some platforms: Mac OS X 10.11.

### 10.960 `sem_open`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.961 `sem_post`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_post.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_post.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.962 `sem_timedwait`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_timedwait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_timedwait.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.



### 10.963 `sem_trywait`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_trywait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_trywait.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.964 `sem_unlink`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_unlink.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_unlink.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14.

### 10.965 `sem_wait`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem\\_wait.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/sem_wait.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.966 `semctl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/semctl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.967 `semget`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/semget.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.968 semop

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/semop.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.969 send

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/send.html>

Gnulib module: send

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

### 10.970 sendmsg

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sendmsg.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.971 sendto

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sendto.html>

Gnulib module: sendto

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

### 10.972 setbuf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setbuf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.973 setegid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setegid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.23, mingw, MSVC 14.

### 10.974 setenv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setenv.html>

Gnulib module: setenv

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- On some platforms, this function does not fail with ‘EINVAL’ when passed an empty string or a string containing ‘=’: Mac OS X 10.5, FreeBSD 6.0, NetBSD 1.6, OpenBSD 6.7, Cygwin 1.5.x.
- On some platforms, this function removes a leading ‘=’ from the value argument: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

- Older versions of POSIX required that `setenv(NULL, "", 0)` gracefully fail with `EINVAL`, but not all implementations guarantee this, and the requirement was removed.

### 10.975 seteuid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/seteuid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.23, mingw, MSVC 14.

### 10.976 setgid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setgid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.977 setgrent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setgrent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.978 sethostent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sethostent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.

### 10.979 setitimer

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setitimer.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the functions `timer_create` and `timer_settime` instead.

### 10.980 setjmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setjmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- POSIX does not specify whether `setjmp` saves the signal mask in the `jmp_buf`. It does on BSD platforms, and on glibc platforms when `_BSD_SOURCE` (and/or `_DEFAULT_SOURCE` on glibc  $\geq 2.19$ ) is defined; in this case `setjmp` behaves like `sigsetjmp(.,1)`, and functions `_setjmp` and `_longjmp` are available that don't save or restore the signal mask. On System V platforms (excluding HP-UX), and on glibc platforms by default, `setjmp` doesn't save the signal mask.

## 10.981 setkey

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setkey.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.34, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in `<stdlib.h>` (without `-D_GNU_SOURCE`) on some platforms: glibc (at least 2.11–2.13).
- POSIX 202x says this function is obsolescent and it is planned to be removed in a future version.

## 10.982 setlocale

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setlocale.html>

Gnulib module: `setlocale`, `setlocale-null`

Portability problems fixed by Gnulib module `setlocale`:

- On Windows platforms (excluding Cygwin), `setlocale(category, NULL)` ignores the environment variables `LC_ALL`, `category`, and `LANG`.
- On Windows platforms (excluding Cygwin) and Cygwin 1.5.x, `setlocale(LC_ALL, name)` succeeds and sets the `LC_CTYPE` category to 'C' when it does not support the encoding, instead of failing.
- On Windows platforms (excluding Cygwin), `setlocale` understands different locale names, that are not based on ISO 639 language names and ISO 3166 country names.
- On Android < 5.0, which doesn't have locales, the `setlocale` function always fails. The replacement, however, supports only the locale names "C" and "POSIX".

Portability problems fixed by Gnulib module `setlocale` or `setlocale-null`:

- Invocations of `setlocale(..., NULL)` are not multithread-safe on some platforms: musl libc, macOS, FreeBSD, NetBSD, OpenBSD, AIX, Haiku, Cygwin. To make these invocations multithread-safe, you need the Gnulib module `setlocale`, or you need to change the code to invoke `setlocale_null` or `setlocale_null_r` instead.

Portability problems not fixed by Gnulib:

- On Cygwin 1.5.x, which doesn't have locales, `setlocale(LC_ALL, NULL)` always returns "C".
- On Cygwin 1.7.0, only the charset portion of a locale designation is honored.
- On OpenBSD, `setlocale(LC_ALL, "")` will only update categories that are deemed appropriate for the `LC_ALL` environment value, even if there are other categories set to different values in the environment. In addition any value is accepted for `LC_CTYPE`, and so `NULL` is never returned to indicate a failure to set locale. To verify category values, each category must be set individually with `setlocale(LC_COLLATE, "")` etc.

- On Android 5.0 and newer, the default locale (i.e. the locale in use when `setlocale` was not called) is the "C.UTF-8" locale, not the "C" locale. Additionally, a `setlocale` call that is meant to set the "C" or "POSIX" locale actually sets an equivalent of the "C.UTF-8" locale.

### 10.983 `setlogmask`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setlogmask.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.984 `setnetent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setnetent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 2.9, mingw, MSVC 14, Android 8.1.

### 10.985 `setpayload`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.986 `setpayloadf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.987 setpayloadl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.988 setpayloadsig

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.989 setpayloadsigf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.990 setpayloadsigl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Bit-Twiddling.html](https://www.gnu.org/software/libc/manual/html_node/FP-Bit-Twiddling.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.991 `setpgid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpgid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.992 `setpgrp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpgrp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `setpgid` or `setsid` instead, as appropriate.

### 10.993 `setpriority`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpriority.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.994 `setprotoent`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setprotoent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 8.1.



### 10.995 setpwent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setpwent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.996 setregid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setregid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.997 setreuid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setreuid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.998 setrlimit

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setrlimit.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getrlimit-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getrlimit-1.html)

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `rlim_t` is a 32-bit type, this function does not allow to set limits 4 GiB and larger, such as for `RLIMIT_FSIZE`. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.999 setservernt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setservernt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1000 setsid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setsid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1001 setsockopt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setsockopt.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setsockopt-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setsockopt-2.html)

Gnulib module: setsockopt

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

- Many socket options are not available on all platforms.

### 10.1002 setstate

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setstate.html>

Gnulib module: random

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Cygwin 1.5.25.

Portability problems not fixed by Gnulib:

- This function has a slightly incompatible declaration (the argument type being ‘`const char *`’ instead of ‘`char *`’) on some platforms: macOS 11.1, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Solaris 11 OpenIndiana.

### 10.1003 setuid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setuid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1004 setutxent

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setutxent.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 10.1005 setvbuf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/setvbuf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows platforms (excluding Cygwin), `_IOLBF` (line-buffering) is treated as if it were `_IOFBF` (full buffering), possibly with a warning generated.

### 10.1006 shm\_open

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm\\_open.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm_open.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.1007 shm\_unlink

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm\\_unlink.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/shm_unlink.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 10.1008 shmat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmat.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- On Linux, the flag `SHM_REMAP` is needed in order to force `shmat` to replace existing memory mappings in the specify address range. On other platforms, it is not needed.

### 10.1009 shmctl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmctl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.1010 shmdt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmdt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.

### 10.1011 shmget

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/shmget.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 7.1.
- On many platforms (not Linux), SHMMAX is so small that it is unusable for reasonable applications, and/or `shmget` requires superuser privileges.

### 10.1012 shutdown

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/shutdown.html>

Gnulib module: shutdown

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

### 10.1013 sigaction

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaction.html>

Gnulib module: sigaction

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- POSIX recommends that when specifying `SA_RESETHAND`, `SA_NODEFER` must also be specified.
- Support for `SA_ONSTACK` is missing on some platforms: mingw, MSVC 14, cygwin.
- Support for `SA_SIGINFO` is missing on some platforms: mingw, MSVC 14.
- Support for `SIGCHLD`, and thus for `SA_NOCLDSTOP` and `SA_NOCLDWAIT`, is missing on some platforms: mingw, MSVC 14.
- Support for `SA_RESETHAND` is missing on some platforms: NonStop.
- Support for `SA_RESTART` is missing on some platforms: mingw, MSVC 14, NonStop.
- The symbolic value `SIG_IGN` for the `SIGCHLD` signal is equivalent to a signal handler

```

void handle_child (int sigchld)
{
    while (waitpid (-1, NULL, WNOHANG) > 0)
        ;
}

```

except that `SIG_IGN` for `SIGCHLD` has the effect that the children execution times are not accounted in the `times` function. On some platforms (BSD? SystemV? Linux?), you need to use the `sigaction` flag `SA_NOCLDWAIT` in order to obtain this behavior.

### 10.1014 `sigaddset`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaddset.html>

Gnulib module: `sigprocmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1015 `sigaltstack`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigaltstack.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.x, mingw, MSVC 14.
- `sigaltstack` doesn't work on HP-UX 11/IA-64 and OpenBSD 3.6/Sparc64.
- This function interprets the `ss_sp` member of `stack_t` as the upper bound instead of the lower bound of the alternate stack on some platforms: IRIX 6.5

### 10.1016 `sigdelset`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigdelset.html>

Gnulib module: `sigprocmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1017 sigemptyset

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigemptyset.html>

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1018 sigfillset

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigfillset.html>

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1019 sighold

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sighold.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 7.1.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigprocmask` instead.

### 10.1020 sigignore

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigignore.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigaction` instead.

### 10.1021 siginterrupt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/siginterrupt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigaction` instead.

Note: POSIX recommends using `sigaction` with `SA_RESTART` instead of `siginterrupt (sig, 0)`.

### 10.1022 sigismember

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigismember.html>

Gnulib module: `sigprocmask`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1023 siglongjmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/siglongjmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This is only provided as a macro on some platforms: Cygwin.

### 10.1024 signal

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/signal.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.



- On System V platforms, when the signal is triggered, the kernel uninstalls the handler (i.e. resets the signal's action to SIG\_DFL) before invoking the handler. This opens the door to race conditions: undesired things happen if the signal is triggered twice and the signal handler was not quick enough reinstalling itself as a handler. On BSD platforms and glibc platforms, on the other hand, when the signal is triggered, the kernel blocks the signal before invoking the handler. This is saner, but POSIX still allows either behavior. To avoid this problem, use `sigaction` instead of `signal`.

### 10.1025 `signbit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/signbit.html>

Gnulib module: `signbit`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, AIX 5.1, IRIX 6.5, Solaris 11.0, MSVC 9, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1026 `signgam`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/signgam.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 10.13, Minix 3.1.8, AIX 5.1, IRIX 6.5, mingw, MSVC 14.

### 10.1027 `sigpause`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigpause.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigpause-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigpause-3.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 7.1.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigsuspend` instead.

### 10.1028 sigpending

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigpending.html>

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1029 sigprocmask

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigprocmask.html>

Gnulib module: sigprocmask

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- In case of failure, the return value is wrong on some platforms: NetBSD 9.0 when libpthread is in use.

Note: Although `sigprocmask` officially has undefined behaviour in multi-threaded programs, in practice it is essentially equivalent to `pthread_sigmask`, with only a difference regarding the error return convention. It's simpler to use `sigprocmask`, since it does not require linking with `-lpthread` on some platforms: glibc, NetBSD, OpenBSD, AIX, IRIX.

### 10.1030 sigqueue

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigqueue.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 5.1.

### 10.1031 sigrelse

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigrelse.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 7.1.

- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigprocmask` instead.

### 10.1032 `sigset`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigset.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `sigaction` instead.

### 10.1033 `sigsetjmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigsetjmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.1034 `sigsuspend`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigsuspend.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1035 `sigtimedwait`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigtimedwait.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 5.1.
- Linux implements the meaning of NULL timeout by doing what `sigwaitinfo` does; other platforms may not do the same.

### 10.1036 sigwait

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigwait.html>

Gnulib module: extensions

Portability problems fixed by Gnulib:

- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- On Linux/glibc platforms before the advent of NPTL, signals could only be sent to one particular thread. In POSIX, signals are sent to the entire process and executed by any thread of the process that happens to have the particular signal currently unblocked.

### 10.1037 sigwaitinfo

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sigwaitinfo.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 5.1.

### 10.1038 sin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sin.html>

Gnulib module: sin

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1039 sinf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinf.html>

Gnulib module: sinf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1040 `sinh`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinh.html>

Gnulib module: `sinh`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1041 `sinhf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinhf.html>

Gnulib module: `sinhf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1042 `sinhl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinhl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

### 10.1043 `sinl`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sinl.html>

Gnulib module: `sinl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

## 10.1044 `sleep`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sleep.html>

Gnulib module: `sleep`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw (2005 or newer), MSVC 14.
- This function takes milliseconds as argument and returns `void` on some platforms: mingw (2005 and older).
- This function cannot sleep longer than 49.7 days on some platforms: Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

- According to POSIX, the `sleep` function may interfere with the program's use of the `SIGALRM` signal. On Linux, it doesn't; on other platforms, it may.

## 10.1045 `snprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/snprintf.html>

Gnulib module: `snprintf` or `snprintf-posix` or `snprintf-gnu`

Portability problems fixed by either Gnulib module `snprintf` or `snprintf-posix` or `snprintf-gnu`:

- This function is missing on some platforms: MSVC 14.
- This function does not support format directives that access arguments in an arbitrary order, such as `%"%2$s"`, on some platforms: NetBSD 3.0, mingw.
- This function does not return a byte count as specified in C99 on some platforms: HP-UX 11, IRIX 6.5, Solaris 9, mingw.

Portability problems fixed by either Gnulib module `snprintf-posix` or `snprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw.
- `printf` of 'long double' numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the 'a' and 'A' directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the 'b' directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- `printf "%#.0x"` or `"%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with `"%.511f"`) on some platforms: Solaris 10.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- This function does not truncate the result as specified in C99 on some platforms: mingw, MSVC 14.
- This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw.

Portability problems fixed by Gnulib module `snprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

### 10.1046 `socketatmark`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/socketatmark.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 10.1047 `socket`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/socket.html>

Gnulib module: `socket`

Portability problems fixed by Gnulib:

- On Windows platforms (excluding Cygwin), the descriptors returned by the `socket` function cannot be used in calls to `read`, `write`, and `close`; you have to use `recv`, `send`, `closesocket` in these cases instead.
- On Windows platforms (excluding Cygwin), error codes from this function are not placed in `errno`, and `WSAGetLastError` must be used instead.

Portability problems not fixed by Gnulib:

### 10.1048 `socketpair`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/socketpair.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1049 `sprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sprintf.html>

Gnulib module: `sprintf-posix` or `sprintf-gnu`

Portability problems fixed by either Gnulib module `sprintf-posix` or `sprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.



- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf “%f”, “%e”, “%g” of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as “%2\$s”, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- printf “%010f” of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- printf “%#.0x” or “%#.0X” with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with “%.511f”) on some platforms: Solaris 10.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- The compiler warns that this function is deprecated: macOS 13.0.

Portability problems fixed by Gnulib module `sprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by GnuLib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

## 10.1050 sqrt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrt.html>

GnuLib module: `sqrt`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

## 10.1051 sqrtf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrtf.html>

GnuLib module: `sqrtf`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by GnuLib:

## 10.1052 sqrtl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sqrtl.html>

GnuLib module: `sqrtl`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.
- This function produces very imprecise results on some platforms: OpenBSD 5.1/SPARC.

Portability problems not fixed by GnuLib:

### 10.1053 srand

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/srand.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 4.4.
- This function has no effect on `rand` invocations in other threads on some platforms: Cygwin 3.4.6.

### 10.1054 srand48

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/srand48.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.1055 srandom

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/srandom.html>

Gnulib module: `random`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is only defined as an inline function on some platforms: Android 4.4.

Portability problems not fixed by Gnulib:

- This function has a slightly incompatible declaration (the return type being `'long'` instead of `'void'`) on some platforms: Cygwin 1.5.25.
- The parameter is `unsigned long` instead of `unsigned int` on some platforms: MidnightBSD 2.0.
- This function has no effect on some platforms: OpenBSD 7.4. This platform has, instead, a function `srandom_deterministic`.

### 10.1056 sscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function doesn't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

## 10.1057 `stat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stat.html>

Gnulib module: `stat`

Portability problems fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, `stat` may not correctly report the size of files or block devices 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- On Linux/x86 and Linux/x86\_64, applications compiled in 32-bit mode cannot access files that happen to have a 64-bit inode number. This can occur with file systems such as XFS (typically on large disks) and NFS. See Section 14.2 [Large File Support], page 761.
- The `st_atime`, `st_ctime`, `st_mtime` fields are affected by the current time zone and by the DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the environment variable `TZ` is set).
- On MSVC 14, this function fails with error `ENOENT` on files such as `'C:\pagefile.sys'` and on directories such as `'C:\System Volume Information'`.
- On some platforms, `stat("link-to-file/",buf)` succeeds instead of failing with `ENOTDIR`. macOS 11.1, FreeBSD 7.2, AIX 7.1, Solaris 9, mingw64.
- On some platforms, `stat(".",buf)` and `stat("./",buf)` give different results: mingw, MSVC 14.
- On macOS 12.6, when this function yields a timestamp with a nonpositive `tv_sec` value, `tv_nsec` might be in the range `-999999999..-1`, representing a negative nanoseconds offset from `tv_sec`. Solaris 11.4 is similar, except that `tv_sec` might also be `-1000000000`.

Portability problems not fixed by Gnulib:

- See Section 9.65 [sys/stat.h], page 76, for general portability problems with `struct stat`.
- Cygwin's `stat` function sometimes sets `errno` to `EACCES` when `ENOENT` would be more appropriate.
- Because of the definition of `struct stat`, it is not possible to portably replace `stat` via an object-like macro. Therefore, expressions such as `(islnk ? lstat : stat) (name, buf)` are not portable, and should instead be written `islnk ? lstat (name, buf) : stat (name, buf)`.

### 10.1058 statvfs

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/statvfs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `f_blocks` in `struct statvfs` is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. See Section 14.2 [Large File Support], page 761. This affects glibc/Hurd, HP-UX 11, Solaris.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, mingw, MSVC 14, Android 4.3.
- This function can hang if it stats all preceding entries in `/proc/mounts`, and any of those file systems are hard-mounted and not available. This affects Linux < 2.6.36.

Gnulib provides a module `fsusage` that provides similar information as `statvfs`.

### 10.1059 stderr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stderr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- `stderr` is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use `freopen(NULL, "r+", stderr)` on Cygwin 1.5.21 or newer. Another is to use the gnulib `ftello` module and do `ftello(stderr)`.
- POSIX states that a setuid application can guarantee that fd 2 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 2 closed, use of `stderr` can affect an unrelated file that happened to be assigned to fd 2. The gnulib `*-safer` modules may be used to guarantee that fd 2 stays reserved for `stderr`.

### 10.1060 stdin

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stdin.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- `stdin` is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use `freopen(NULL, "r", stdin)` on Cygwin 1.5.21 or newer. Another is to use the gnulib `ftello` module and do `ftello(stdin)`.

- POSIX states that a setuid application can guarantee that fd 0 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 0 closed, use of `stdin` can affect an unrelated file that happened to be assigned to fd 0. The glibc \*-safer modules may be used to guarantee that fd 0 stays reserved for `stdin`.

### 10.1061 stdout

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stdout.html>

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- `stdout` is created in 32-bit mode instead of 64-bit mode: Cygwin 1.5.x. One workaround is to use `freopen(NULL, "w", stdout)` on Cygwin 1.5.21 or newer. Another is to use the glibc `ftello` module and do `ftello(stdout)`.
- POSIX states that a setuid application can guarantee that fd 1 is open, but some systems guarantee this even for non-setuid programs. If an application is executed with fd 1 closed, use of `stdout` can affect an unrelated file that happened to be assigned to fd 1. The glibc \*-safer modules may be used to guarantee that fd 1 stays reserved for `stdout`.

### 10.1062 stpcpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stpcpy.html>

Glibc module: `stpcpy`

Portability problems fixed by Glibc:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Glibc:

### 10.1063 stpncpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/stpncpy.html>

Glibc module: `stpncpy`

Portability problems fixed by Glibc:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function has an incompatible return value on some platforms: AIX 5.1.

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by GnuLib:

### 10.1064 `strcasecmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcasecmp.html>

GnuLib module: `strcase`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: MSVC 14.

Portability problems not fixed by GnuLib:

- This function cannot work correctly on character strings in multibyte locales. GnuLib provides an alternative function `mbcasecmp` that does a case insensitive comparison of character strings and that works in all locales.

### 10.1065 `strcasecmp_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcasecmp\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcasecmp_l.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 10.1066 `strcat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcat.html>

GnuLib module: `string`

Portability problems fixed by GnuLib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by GnuLib:

### 10.1067 strchr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strchr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in some multibyte locales. Gnulib provides an alternative function `mbschr` that works on character strings in all locales.

### 10.1068 strcmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1069 strcoll

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcoll.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function fails, setting `errno` to `EILSEQ`, on Solaris 10, in UTF-8 locales, when at least one of the strings contains a Unicode character in a block that was not assigned in Unicode 4.0.

### 10.1070 strcoll\_l

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcoll\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcoll_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.



### 10.1071 strcpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcpy.html>

Gnulib module: string

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: `strcpy(dst, src)` is only safe to use when you can guarantee that there are at least `strlen(src) + 1` bytes allocated at `dst`.

### 10.1072 strcspn

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strcspn.html>

Gnulib module: strcspn

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbscspn` that works on character strings in all locales.

### 10.1073 strdup

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strdup.html>

Gnulib module: strdup or strdup-posix

Portability problems fixed by either Gnulib module `strdup` or `strdup-posix`:

- This function has no prototype in `<string.h>` on some old platforms.

Portability problems fixed by Gnulib module `strdup-posix`:

- Upon failure, the function does not set `errno` to `ENOMEM` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1074 strerror

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror.html>

Gnulib module: strerror

Portability problems fixed by Gnulib:

- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, NonStop Kernel, Cygwin 1.5.x, mingw, MSVC 14.

- This function reports failure for `strerror(0)` (by setting `errno` or using a string similar to out-of-range values), although POSIX requires this to leave `errno` unchanged and report success, on some platforms: FreeBSD 8.2, NetBSD 9.0, OpenBSD 4.7, macOS 11.1.
- This function fails to return a string for out-of-range integers on some platforms: HP-UX 11, IRIX 6.5. (Some return `NULL` which is a POSIX violation, others return the empty string which is valid but not as useful); this can still cause bugs because most programs call `strerror` without setting and testing `errno`.)

Portability problems not fixed by Gnulib:

### 10.1075 `strerror_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.5, macOS 11.1, FreeBSD 12.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 10.1076 `strerror_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strerror_r.html)

LSB specification:

- [https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strerror-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strerror-r.html)
- [https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---xpg-strerror-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---xpg-strerror-r.html)

Gnulib module: `strerror_r-posix`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- glibc, Cygwin, and Android have an incompatible version of this function. The POSIX compliant code

```
char *s = (strerror_r (err, buf, buflen) == 0 ? buf : NULL);
```

is essentially equivalent to this code using the glibc function:

```
char *s = strerror_r (err, buf, buflen);
```

- This function clobbers the `strerror` buffer on some platforms: Cygwin 1.7.9.
- This function is sometimes not declared in `<string.h>` on some platforms: glibc 2.8.
- The third argument is of type `int` instead of `size_t` on some platforms: AIX 5.1.

- When this function fails, it returns `-1` and sets `errno`, instead of returning the error number, on some platforms: glibc 2.12 with `-D_POSIX_C_SOURCE=200112L`, AIX 6.1.
- When this function fails, it corrupts `errno`, on some platforms: Solaris 10.
- This function does not support many error values defined in `<errno.h>` on some platforms: MSVC 14.
- This function does not support the error values that are specified by POSIX but not defined by the system, on some platforms: OpenBSD 4.0, NonStop Kernel, Cygwin 1.5.x.
- This function reports failure for `strerror_r(0, buf, len)`, although POSIX requires this to succeed, on some platforms: FreeBSD 8.2.
- This function produces a different string for 0 than `strerror` on some platforms: macOS 11.1.
- This function always fails when the third argument is less than 80 on some platforms: HP-UX 11.31.
- When the buffer is too small and the value is in range, this function does not fail, but instead truncates the result and returns 0 on some platforms: AIX 6.1, Haiku 2017.
- When the value is not in range or the buffer is too small, this function fails to leave a NUL-terminated string in the buffer on some platforms: glibc 2.13, FreeBSD 8.2, Solaris 10.
- When the value is out of range but the buffer is too small, this function does not always return the longest possible string on some platforms: OpenBSD 4.7.

Portability problems not fixed by Gnulib:

Note: Gnulib has a module `xstrerror`, with the property that `xstrerror(NULL, errnum)` returns the value of `strerror_r` as a freshly allocated string. (Recall that the expression `strerror(errnum)` is not multithread-safe.)

### 10.1077 `strfmon`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strfmon.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.1, mingw, MSVC 14, Android 9.0.

### 10.1078 `strfmon_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strfmon\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strfmon_l.html)

Gnulib module: `strfmon_l`

Portability problems fixed by GnuLib:

- This function ignores the locale argument on some platforms: FreeBSD 13.0, Cygwin 2.9.
- This function uses a wrong locale for the numbers on some platforms: glibc 2.23.

Portability problems not fixed by GnuLib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 10.1079 strfromd

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Printing-of-Floats.html](https://www.gnu.org/software/libc/manual/html_node/Printing-of-Floats.html),
- man strfromd.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1080 strfromf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Printing-of-Floats.html](https://www.gnu.org/software/libc/manual/html_node/Printing-of-Floats.html),
- man strfromf.

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1081 strfroml

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Printing-of-Floats.html](https://www.gnu.org/software/libc/manual/html_node/Printing-of-Floats.html),
- man strfroml.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1082 `strftime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime.html>

Gnulib module: `strftime-fixes`

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by Gnulib:

- The Windows C runtime library (which is used by MinGW) does not support the `%e` specifier (and possibly the other more recent SUS specifiers too, i.e., `%C`, `%D`, `%h`, `%n`, `%r`, `%R`, `%t`, and `%T`).
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [`tzset`], page 449.

Extension: Gnulib offers a module ‘`nstrftime`’ that provides an `nstrftime` function with various GNU extensions.

### 10.1083 `strftime_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strftime_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.1084 `strlen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strlen.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1085 strncasecmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncasecmp.html>

Gnulib module: strcase

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides alternative functions `mbsncasecmp` and `mbspcasecmp` that do a case insensitive comparison of character strings and that work in all locales.

### 10.1086 strncasecmp\_l

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncasecmp\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncasecmp_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 10.1087 strncat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncat.html>

Gnulib module: strncat

Portability problems fixed by Gnulib:

- This function dereferences too much memory on some platforms: Solaris 11.4 on SPARC, Solaris 11.0 on x86.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

### 10.1088 strncmp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1089 strncpy

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strncpy.html>

Gnulib module: string

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function was designed for the use-case of filling a fixed-size record with a string, before writing it to a file. This function is **not** appropriate for copying a string into a bounded memory area, because you have no guarantee that the result will be NUL-terminated. Even if you add the NUL byte at the end yourself, this function is inefficient (as it spends time clearing unused memory) and will allow silent truncation to occur, which is not a good behavior for GNU programs. For more details, see <https://meyering.net/crusade-to-eliminate-strncpy/>.

### 10.1090 strndup

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strndup.html>

Gnulib module: strndup

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.
- This function does not NUL-terminate the result on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:

### 10.1091 strlen

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strlen.html>

Gnulib module: strlen

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw.

Portability problems not fixed by Gnulib:

### 10.1092 `strpbrk`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strpbrk.html>

Gnulib module: `strpbrk`

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbspbrk` that works on character strings in all locales.

### 10.1093 `strptime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strptime.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strptime-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strptime-3.html)

Gnulib module: `strptime`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1094 `strrchr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strrchr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in some multibyte locales. Gnulib provides an alternative function `mbsrchr` that works on character strings in all locales.

### 10.1095 `strsignal`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strsignal.html>

Gnulib module: `strsignal`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
- This function does not return a string for out-of-range numbers on some platforms: Solaris, AIX 5.1.



- This function is declared in `unistd.h` instead of `string.h` on some platforms: NetBSD 5.0.

Portability problems not fixed by GnuLib:

- This function returns `const char *` instead of `char *` on some platforms: cygwin 1.5.25.

### 10.1096 `strspn`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strspn.html>

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function cannot work correctly on character strings in multibyte locales. GnuLib provides an alternative function `mbsspn` that works on character strings in all locales.

### 10.1097 `strstr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strstr.html>

GnuLib module: `strstr` or `strstr-simple`

Portability problems fixed by either GnuLib module `strstr-simple` or `strstr`:

- This function can trigger `memchr` bugs on some platforms: glibc 2.10.
- This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.
- This function may fail to find matches on some platforms: glibc 2.28.

Portability problems fixed by GnuLib module `strstr`:

- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, macOS 12.5, FreeBSD 11.4, NetBSD 9.0, OpenBSD 6.1, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- This function cannot work correctly on character strings in most multibyte locales. GnuLib provides an alternative function `mbsstr` that works on character strings in all locales.

### 10.1098 `strtod`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtod.html>

GnuLib module: `strtod` or `strtod-obsolete`

Portability problems fixed by either GnuLib module `strtod` or `strtod-obsolete`:

- This function mis-parses strings with leading ‘+’ on some old platforms: Old versions of Linux.
- This function returns a wrong end pointer on some old platforms.

- This function consumes whitespace even when there is nothing that should be parsed on some platforms: IRIX 6.5.
- This function allows whitespace between ‘e’ and the exponent on some platforms: HP-UX 11.11, IRIX 6.5.
- This function returns the wrong end pointer for ‘-0x’ on some platforms: glibc 2.4, Mac OS X 10.5, FreeBSD 6.2, AIX 7.1, Cygwin < 1.5.25-11.
- This function returns +0.0 (not -0.0) for ‘-0’ on some platforms: IRIX 6.5.
- This function fails to parse Infinities and plain NaNs on some platforms: OpenBSD 4.0, HP-UX 11.11, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- This function fails to parse ‘NaN()’ on some platforms: glibc-2.3.6, Mac OS X 10.5, FreeBSD 6.2, OpenBSD 4.0, AIX 7.1, HP-UX 11.11, IRIX 6.5, Cygwin < 1.5.25-11, mingw, MSVC 14.
- This function fails to parse ‘NaN(*n-char-sequence*)’ on some platforms: OpenBSD 4.0, HP-UX 11.11, IRIX 6.5, mingw, MSVC 14.
- This function parses ‘NaN(*n-char-sequence*)’, but returns the wrong end pointer on some platforms: glibc-2.4, AIX 7.1.
- This function fails to parse C99 hexadecimal floating point on some platforms: NetBSD 5.0, OpenBSD 4.0, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.
- In hexadecimal floats, this function allows whitespace between ‘p’ and the exponent on some platforms: HP-UX 11.31/ia64.
- This function returns the wrong end pointer for ‘0x1p’ on some platforms: AIX 7.1.

Portability problems fixed by Gnulib module `strtod-obsolete`:

- This function is missing on some old platforms.

Portability problems not fixed by Gnulib:

- This function returns +0.0 (not -0.0) for negative underflow on some platforms: glibc 2.7, Cygwin 1.5.x, mingw, MSVC 14.
- This function cannot distinguish between “nan” and “-nan” on some platforms: glibc 2.7, IRIX 6.5, mingw, MSVC 14.
- This function fails to correctly parse very long strings on some platforms: Mac OS X 10.5, FreeBSD 6.2, NetBSD 5.0, OpenBSD 4.0, IRIX 6.5, Cygwin, mingw, MSVC 14.
- The replacement function does not always return correctly rounded results.

## 10.1099 `strtof`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtof.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9, Android 4.4.

### 10.1100 `strtoimax`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoimax.html>

Gnulib module: `strtoimax`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, IRIX 6.5, Solaris 9, MSVC 9.
- This function fails on valid input strings on some platforms: AIX 5.1.

Portability problems not fixed by Gnulib:

- This function is only defined as a macro on some platforms: HP-UX 11.11.

### 10.1101 `strtok`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1102 `strtok_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtok_r.html)

Gnulib module: `strtok_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function crashes when invoked from code compiled with optimization enabled on some platforms: glibc 2.7.

Portability problems not fixed by Gnulib:

- This function cannot work correctly on character strings in multibyte locales. Gnulib provides an alternative function `mbstok_r` that works on character strings in all locales.

### 10.1103 `strtol`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtol.html>

Gnulib module: `strtol`

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.
- This function does not parse the leading ‘0’ when the input string is “0x” and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

## 10.1104 strtold

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtold.html>

Gnulib module: strtold

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, older IRIX 6.5, Solaris 9, older Cygwin 1.7.x, MSVC 9, Android 4.4.
- This function returns a struct, not a `long double`, on some platforms: HP-UX 11.31/hppa.
- This function consumes whitespace even when there is nothing that should be parsed on some platforms: IRIX 6.5.
- This function allows whitespace between ‘e’ and the exponent on some platforms: HP-UX 11.31/ia64, IRIX 6.5.
- This function returns the wrong end pointer for ‘-0x’ on some platforms: glibc-2.3.2, Mac OS X 10.5, Haiku.
- This function returns +0.0 (not -0.0) for ‘-0’ on some platforms: IRIX 6.5.
- This function fails to parse Infinities and plain NaNs on some platforms: HP-UX 11.31/ia64, IRIX 6.5.
- This function fails to parse ‘NaN()’ on some platforms: glibc-2.3.2, IRIX 6.5, mingw, Haiku.
- This function fails to parse ‘NaN(*n-char-sequence*)’ on some platforms: IRIX 6.5.
- This function parses ‘NaN(*n-char-sequence*)’, but returns the wrong end pointer on some platforms: glibc-2.3.2, mingw, Haiku.
- This function fails to parse C99 hexadecimal floating point on some platforms: IRIX 6.5, mingw.
- In hexadecimal floats, this function allows whitespace between ‘p’ and the exponent on some platforms: HP-UX 11.31/ia64.
- This function fails to set `errno` upon underflow on some platforms: Cygwin 2.9.

Portability problems not fixed by Gnulib:

- The replacement function does not always return correctly rounded results.

## 10.1105 strtoll

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoll.html>

Gnulib module: strtoll

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, MSVC 9.
- This function does not parse the leading ‘0’ when the input string is “0x” and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

### 10.1106 strtoul

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoul.html>

Gnulib module: strtoul

Portability problems fixed by Gnulib:

- This function is missing on some old platforms.
- This function does not parse the leading ‘0’ when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

### 10.1107 strtoull

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoull.html>

Gnulib module: strtoull

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.11, MSVC 9.
- This function does not parse the leading ‘0’ when the input string is "0x" and the base is 16 or 0 on some platforms: Minix 3.3, mingw, MSVC 14.
- This function does not parse binary integers (with a ‘0b’ or ‘0B’ prefix) when the base is 2 or 0 on many platforms.

Portability problems not fixed by Gnulib:

### 10.1108 strtoumax

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strtoumax.html>

Gnulib module: strtoumax

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 9, MSVC 9.

Portability problems not fixed by Gnulib:

- This function is only defined as a macro on some platforms: HP-UX 11.11.

### 10.1109 strxfrm

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/strxfrm.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function has a wrong return value on some platforms: Haiku.

### 10.1110 `strxfrm_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/strxfrm\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/strxfrm_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.1111 `swab`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/swab.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 8.1.

### 10.1112 `swprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/swprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- This function has a different signature on some platforms: MSVC 9.
- This function is only defined as a macro on some platforms: MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function sometimes returns a wrong value through the ‘n’ directive on some platforms: musl libc 1.2.3.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On Windows, this function does not take a buffer size as second argument.
- This function produces wrong values for the ‘La’ directive on some platforms: glibc 2.15, Haiku.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

- This function ignores the minimum field width in the ‘`lc`’ directive on some platforms: musl libc 1.2.3.
- This function is broken when it produces output that contains null wide characters on some platforms: musl libc 1.2.3, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, mingw.
- This function does not support the ‘`b`’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35, musl libc 1.2.4, FreeBSD 13.2, NetBSD 9.3, OpenBSD 7.2, Cygwin 2.9.0.
- The `%lc` directive may fail on some platforms: musl libc 1.2.4, FreeBSD 13.2, NetBSD 9.3, OpenBSD 7.2.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

### 10.1113 `swscanf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/swscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-swscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-swscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1114 `symlink`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/symlink.html>

Gnulib module: `symlink`

Portability problems fixed by Gnulib:

- On some systems, `symlink(value,"name/")` mistakenly creates a symlink: macOS 11.1, FreeBSD 7.2, AIX 7.1, Solaris 9.
- This function is missing on some platforms; however, the replacement always fails with `EPERM`: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- Some file systems do not support symbolic links.

### 10.1115 `symlinkat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/symlinkat.html>

Gnulib module: `symlinkat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- Some platforms declare this function in `stdio.h` instead of `unistd.h`: Cygwin 1.7.1.
- On some systems, `symlinkat(value, fd, "name/")` mistakenly creates a symlink: macOS 11.1, AIX 7.1.

Portability problems not fixed by Gnulib:

- This function always fails with ‘ENOSYS’ on platforms that don’t support symlinks: mingw, MSVC 14.

### 10.1116 `sync`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sync.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1117 `sysconf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/sysconf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysconf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysconf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.



### 10.1118 syslog

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/syslog.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1119 system

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/system.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-system-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-system-3.html)

Gnulib module: system-posix

Portability problems fixed by Gnulib:

- The macros WIFSIGNALED, WIFEXITED, WIFSTOPPED, WTERMSIG, WEXITSTATUS, WNOHANG, WUNTRACED, WSTOPSIG are not defined in `<stdlib.h>` (only in `<sys/wait.h>`) on some platforms: MirBSD 10.

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), the command processor used by the `system` function is `cmd.exe`, not `/bin/sh`. Accordingly, the rules for quoting shell arguments containing spaces, quote or other special characters are different.

### 10.1120 tan

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tan.html>

Gnulib module: tan

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1121 tanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanf.html>

Gnulib module: tanf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1122 tanh

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanh.html>

Gnulib module: tanh

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1123 tanhf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanhf.html>

Gnulib module: tanhf

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 9.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1124 tanhl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanhl.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

### 10.1125 tanl

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tanl.html>

Gnulib module: tanl

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, Android 4.4.
- This function is only defined as a macro with arguments on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1126 tcdrain

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcdrain.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- On some platforms, `tcdrain` on a non-tty fails with `errno` set to `EINVAL` or, on Mac OS X, also `EOPNOTSUPP` or `ENODEV`, rather than `ENOTTY`.

### 10.1127 tcflow

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcflow.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.1128 tcflush

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcflush.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.
- On some platforms, `tcflush` of `TCIFLUSH` on a non-tty fails with `errno` set to `EINVAL` rather than `ENOTTY`.
- On some platforms, `tcflush` of `TCOFLUSH` on a non-tty fails with `errno` set to `EINVAL` or, on IRIX, also `ENOSYS`, or, on Mac OS X, also `EOPNOTSUPP` or `ENODEV`, rather than `ENOTTY`.

### 10.1129 tcgetattr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetattr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.1130 tcgetpgrp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetpgrp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.1131 tcgetsid

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcgetsid.html>

Gnulib module: tcgetsid

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, OpenBSD 4.5, Minix 3.1.8, Cygwin 1.7.9, mingw, MSVC 14, Android 4.4.
- The declaration of this function in C++ compilation units has C++ linkage, not C linkage, on some platforms: HP-UX 11.00.

Portability problems not fixed by Gnulib:

- This function always fails on some platforms: FreeBSD 6.0, Cygwin 1.7.8, mingw, MSVC 14.
- This function returns int instead of pid\_t on some platforms: Cygwin 1.7.11.

### 10.1132 tcsendbreak

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsendbreak.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.1133 tcsetattr

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsetattr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 10.1134 `tcsetpgrp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tcsetpgrp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 10.1135 `tdelete`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tdelete.html>

Gnulib module: `tsearch`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.
- `tdelete` returns `NULL` when removing the last element of a tree on some platforms: OpenBSD 4.0.

Portability problems not fixed by Gnulib:

### 10.1136 `telldir`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/telldir.html>

Gnulib module: —

Portability problems fixed by Gnulib:

- On platforms where `long int` is a 32-bit type, this function may not work correctly on huge directories 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: MSVC 14, Android 5.1.

### 10.1137 `tempnam`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tempnam.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the function `mkstemp` instead.
- This function is not appropriate for creating temporary files. (It has security risks.) Better use `mkstemp` instead.

### 10.1138 tfind

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tfind.html>

Gnulib module: tsearch

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.

Portability problems not fixed by Gnulib:

### 10.1139 tgamma

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgamma.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.1140 tgammaf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgammaf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, MSVC 9.

### 10.1141 tgamma1

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tgamma1.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.

### 10.1142 `thrd_create`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

Gnulib module: `thrd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function uses an incorrectly defined `thrd_start_t` on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

### 10.1143 `thrd_current`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

Gnulib module: `thrd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1144 `thrd_detach`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

Gnulib module: `thrd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1145 `thrd_equal`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

Gnulib module: `thrd`

Portability problems fixed by GnuLib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by GnuLib:

### 10.1146 `thrd_exit`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

GnuLib module: `thrd`

Portability problems fixed by GnuLib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- The exit code provided to this function is discarded on some platforms: AIX 7.3.1.

Portability problems not fixed by GnuLib:

### 10.1147 `thrd_join`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

GnuLib module: `thrd`

Portability problems fixed by GnuLib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function never stores an exit code on some platforms: AIX 7.3.1.
- This function crashes when the second argument is `NULL` on some platforms: Solaris 11.4.

Portability problems not fixed by GnuLib:

### 10.1148 `thrd_sleep`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

GnuLib module: `thrd`

Portability problems fixed by GnuLib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by GnuLib:



### 10.1149 `thrd_yield`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread-Management.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread-Management.html).

Gnulib module: `thrd`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1150 `time`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/time.html>

Gnulib module: `time`

Portability problems fixed by Gnulib:

- This function is not consistent with `gettimeofday` and `timespec_get` on some platforms: glibc 2.31 or newer on Linux, FreeBSD 12.2/sparc64, AIX 7.2, native Windows. Namely, in the first 1 to 2.5 milliseconds of every second (or, on AIX and Windows, in the first 5 milliseconds of every second), `time` returns a value that is one less than the `tv_sec` part of the return value of `gettimeofday` or `timespec_get`.

Portability problems not fixed by Gnulib:

### 10.1151 `timegm`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Broken\\_002ddown-Time.html](https://www.gnu.org/software/libc/manual/html_node/Broken_002ddown-Time.html),
- `man timegm`.

Gnulib module: `timegm`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 3.0.

Portability problems not fixed by Gnulib:

### 10.1152 `timer_create`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer\\_create.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_create.html)

Gnulib module: `timer-time`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with `ENOSYS` on some platforms: OpenBSD 4.9.

### 10.1153 `timer_delete`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer\\_delete.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_delete.html)

GnuLib module: `timer-time`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with `ENOSYS` on some platforms: OpenBSD 4.9.

### 10.1154 `timer_getoverrun`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer\\_getoverrun.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_getoverrun.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.0, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.

### 10.1155 `timer_gettime`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer\\_gettime.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_gettime.html)

GnuLib module: `timer-time`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with `ENOSYS` on some platforms: OpenBSD 4.9.

### 10.1156 `timer_settime`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer\\_settime.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/timer_settime.html)

Gnulib module: `timer-time`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.11, FreeBSD 6.4, Minix 3.1.8, mingw, MSVC 14.
- This function fails with `ENOSYS` on some platforms: OpenBSD 4.9.

### 10.1157 `times`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/times.html>

Gnulib module: `times`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- There is no function on Windows to measure consumed process child times, thus the `tms_cutime` and `tms_cstime` will always be 0 when the module is used.

### 10.1158 `timespec_getres`

ISO C23 specification:

<http://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf> section 7.29.2.7

Gnulib module: `timespec_getres`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.33, macOS 12, FreeBSD 14.0, NetBSD 9.2, OpenBSD 7.0, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- On some platforms, this function returns a value other than the clock resolution of `timespec_get`, i.e., the minimum distance between differing timestamps. For example, on GNU/Linux it typically returns 1 nanosecond regardless of the actual clock resolution.

The Gnulib module `gettime-res` is a partial substitute; it implements the `TIME_UTC` functionality of `timespec_getres`.

### 10.1159 `timezone`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/timezone.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: IRIX 6.5, mingw.
- The address of this variable is not a compile-time constant on some platforms: mingw.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [tzset], page 449.

A more portable way of getting the UTC offset is to use `strftime` with the `%z` format. See Section 10.1082 [strftime], page 416.

### 10.1160 `tmpfile`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tmpfile.html>

Gnulib module: `tmpfile`

Portability problems fixed by Gnulib:

- This function always fails on some platforms: Android 4.3.
- This function often fails for trivial reasons on some platforms: mingw, MSVC 14.
- On platforms where `off_t` is a 32-bit type, `tmpfile` may not work correctly to create files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.

Portability problems not fixed by Gnulib:

### 10.1161 `tmpnam`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tmpnam.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is not appropriate for creating temporary files. (It has security risks.) Better use `mkstemp` instead.

### 10.1162 `toascii`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/toascii.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x.

### 10.1163 `tolower`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tolower.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are four alternative APIs:

`c_tolower`

This function operates in a locale independent way and returns a different value than the argument only for uppercase ASCII characters. It is provided by the Gnulib module `'c-ctype'`.

`tolower` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module `'wctype'`.

`c32tolower`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `'c32tolower'`.

`uc_tolower`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `'unicase/tolower'`.

### 10.1164 `tolower_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/tolower\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/tolower_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 10.1165 totalorder

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).
- <https://lists.gnu.org/archive/html/bug-gnulib/2023-10/msg00037.html>

Gnulib module: totalorder

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

Portability problems not fixed by Gnulib:

- This function treats signalling NaNs incorrectly on some platforms: glibc 2.35/sh4.

### 10.1166 totalorderf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).
- <https://lists.gnu.org/archive/html/bug-gnulib/2023-10/msg00037.html>

Gnulib module: totalorderf

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

Portability problems not fixed by Gnulib:

- This function treats signalling NaNs incorrectly on some platforms: glibc 2.35/sh4.

### 10.1167 totalorderl

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).
- <https://lists.gnu.org/archive/html/bug-gnulib/2023-10/msg00037.html>

Gnulib module: totalorderl

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

- This function has a different signature on some platforms: glibc 2.30.

Portability problems not fixed by Gnulib:

- This function treats signalling NaNs incorrectly on some platforms: glibc 2.35/sh4.

### 10.1168 totalordermag

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

### 10.1169 totalordermagf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

### 10.1170 totalordermagl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/FP-Comparison-Functions.html](https://www.gnu.org/software/libc/manual/html_node/FP-Comparison-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.30.

## 10.1171 toupper

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper.html>

Gnulib module: `ctype`

Portability problems fixed by Gnulib:

- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

Note: This function's behaviour depends on the locale, but does not support the multi-byte characters that occur in strings in locales with `MB_CUR_MAX > 1` (this includes all the common UTF-8 locales). There are four alternative APIs:

### `c_toupper`

This function operates in a locale independent way and returns a different value than the argument only for lowercase ASCII characters. It is provided by the Gnulib module `'c-ctype'`.

`toupper` This function operates in a locale dependent way, on wide characters. In order to use it, you first have to convert from multibyte to wide characters, using the `mbrtowc` function. It is provided by the Gnulib module `'wctype'`.

### `c32toupper`

This function operates in a locale dependent way, on 32-bit wide characters. In order to use it, you first have to convert from multibyte to 32-bit wide characters, using the `mbrtoc32` function. It is provided by the Gnulib module `'c32toupper'`.

### `uc_toupper`

This function operates in a locale independent way, on Unicode characters. It is provided by the Gnulib module `'unicase/toupper'`.

## 10.1172 toupper\_l

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.



### 10.1173 towctrans

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/towctrans.html>

Gnulib module: towctrans

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw, MSVC 9, Android 7.1.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32_apply_mapping`, provided by Gnulib module `c32_apply_mapping`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1174 towctrans\_l

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/towctrans\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/towctrans_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1175 towlower

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower.html>

Gnulib module: wctype-h

Portability problems fixed by Gnulib:

- This function returns values of which the upper 16 bits are incorrect on some platforms: mingw.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32tolower`, provided by Gnulib module `c32tolower`, operates on 32-bit wide characters and therefore does not have this limitation.
- This function returns wrong values even for the ASCII characters in a `zh_CN.GB18030` locale on some platforms: NetBSD 9.0.

### 10.1176 `towlower_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/towlower_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1177 `toupper`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper.html>

Gnulib module: `wctype-h`

Portability problems fixed by Gnulib:

- This function returns values of which the upper 16 bits are incorrect on some platforms: mingw.
- This function cannot be called from plain inline or extern inline functions on some platforms: OS X 10.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32toupper`, provided by Gnulib module `c32toupper`, operates on 32-bit wide characters and therefore does not have this limitation.
- This function returns wrong values even for the ASCII characters in a `zh_CN.GB18030` locale on some platforms: NetBSD 9.0.

### 10.1178 `toupper_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/toupper_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1179 `trunc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/trunc.html>

Gnulib module: `trunc` or `trunc-ieee`

Portability problems fixed by either Gnulib module `trunc` or `trunc-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Solaris 9, MSVC 9.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module `trunc-ieee`:

Portability problems not fixed by Gnulib:

### 10.1180 `truncate`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/truncate.html>

Gnulib module: `truncate`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4 with `AC_SYS_LARGEFILE` in effect.
- On platforms where `off_t` is a 32-bit type, this function is not applicable to arbitrary lengths for files 2 GiB and larger. See Section 14.2 [Large File Support], page 761.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

### 10.1181 `truncf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/truncf.html>

Gnulib module: `truncf` or `truncf-ieee`

Portability problems fixed by either Gnulib module `truncf` or `truncf-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 9, MSVC 9.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module `truncf-ieee`:

Portability problems not fixed by Gnulib:

### 10.1182 `trunc1`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/trunc1.html>

Gnulib module: `trunc1` or `trunc1-ieee`

Portability problems fixed by either Gnulib module `trunc1` or `trunc1-ieee`:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.

Portability problems fixed by Gnulib module `trunc1-ieee`:

Portability problems not fixed by Gnulib:

### 10.1183 `tsearch`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tsearch.html>

Gnulib module: `tsearch`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.0.4.

Portability problems not fixed by Gnulib:

### 10.1184 `tss_create`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread\\_002dlocal-Storage.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread_002dlocal-Storage.html).

Gnulib module: `tss`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1185 `tss_delete`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread\\_002dlocal-Storage.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread_002dlocal-Storage.html).

Gnulib module: `tss`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1186 `tss_get`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread\\_002dlocal-Storage.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread_002dlocal-Storage.html).

Gnulib module: `tss`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1187 `tss_set`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/ISO-C-Thread\\_002dlocal-Storage.html](https://www.gnu.org/software/libc/manual/html_node/ISO-C-Thread_002dlocal-Storage.html).

Gnulib module: `tss`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.27, macOS 11.1, FreeBSD 9.3, NetBSD 8.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 10.1188 `ttyname`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ttyname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.
- This function is just a stub that produces an error message on standard error on some platforms: Android 4.3.

### 10.1189 `ttyname_r`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/ttyname\\_r.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/ttyname_r.html)

Gnulib module: `ttyname_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, Minix 3.1.8, mingw, MSVC 14.

- This function is not declared unless `_REENTRANT` is defined, on some platforms: HP-UX 11.
- This function has an incompatible declaration on some platforms: Solaris 11.4 (when `_POSIX_PTHREAD_SEMANTICS` is not defined).
- This function refuses to do anything when the output buffer is less than 128 bytes large, on some platforms: Solaris 11 2010-11.
- This function is just a stub that produces an error message on standard error on some platforms: Android 4.3.

Portability problems not fixed by Gnulib:

### 10.1190 `twalk`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/twalk.html>

Gnulib module: `tsearch`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

### 10.1191 `tzname`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tzname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: IRIX 6.5, mingw.
- The address of this variable is not a compile-time constant on some platforms: Cygwin, mingw.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones supported by GNU or specified by POSIX. See Section 10.1192 [`tzset`], page 449.

A more portable way of getting the time zone abbreviation is to use `strftime` with the `%Z` format. See Section 10.1082 [`strftime`], page 416.

### 10.1192 `tzset`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/tzset.html>

Gnulib module: `tzset`

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by Gnulib:

- Native Windows platforms (mingw, MSVC) support only a subset of POSIX-specified values for the TZ environment variable, consisting of a time zone abbreviation containing exactly three ASCII letters with no daylight saving time or angle brackets, and with no support for tz database settings like TZ='America/New\_York'. Even this subset does not work on applications built via the Universal Windows Platform, as it does not make environment variables like TZ available to applications.
- Older POSIX platforms do not support angle brackets in TZ values, as this feature was added in IEEE Std 1003.1-2001.

### 10.1193 ufromfp

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1194 ufromfpf

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1195 ufromfpl

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1196 `ufromfpx`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1197 `ufromfpxf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1198 `ufromfpxl`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Rounding-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Rounding-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.24, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 10.1199 `ulimit`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ulimit.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. Use the functions `getrlimit` and `setrlimit` instead.



### 10.1200 `umask`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/umask.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1201 `uname`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/uname.html>

Gnulib module: `uname`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 10.1202 `ungetc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ungetc.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.

### 10.1203 `ungetwc`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/ungetwc.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

## 10.1204 unlink

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlink.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-unlink-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-unlink-3.html)

Gnulib module: `unlink`

Portability problems fixed by Gnulib:

- This function is declared in a different header file (namely, `<stdio.h>`) on some platforms: MSVC 14.
- Some systems mistakenly succeed on `unlink("link-to-file/")`: GNU/Hurd, FreeBSD 7.2, AIX 7.1, Solaris 9.
- On Mac OS X 10.10, in a writable HFS mount, `unlink("../")` succeeds without doing anything.

Portability problems not fixed by Gnulib:

- Some systems allow a superuser to unlink directories, even though this can cause file system corruption. The error given if a process is not permitted to unlink directories varies across implementations; it is not always the POSIX value of `EPERM`. Meanwhile, if a process has the ability to unlink directories, POSIX requires that `unlink("symlink-to-dir/")` remove `dir` and leave `symlink-to-dir` dangling; this behavior is counter-intuitive. The gnulib module `unlinkdir` can help determine whether code must be cautious of unlinking directories.
- Removing an open file is non-portable: On Unix this allows the programs that have the file already open to continue working with it; the file's storage is only freed when the no process has the file open any more. On Windows, the attempt to remove an open file fails.

## 10.1205 unlinkat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlinkat.html>

Gnulib module: `unlinkat`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14. But the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function is declared in `<fcntl.h>`, not in `<unistd.h>`, on some platforms: Cygwin 1.7.1, Android 4.3.
- On Mac OS X 10.10, in a writable HFS mount, `unlinkat(fd, "..", 0)` succeeds without doing anything.
- Some systems mistakenly succeed on `unlinkat(fd, "file/", flag)`: GNU/Hurd, Solaris 9.

Portability problems not fixed by GnuLib:

- When `unlinkat(fd,name,AT_REMOVEDIR)` fails because the specified directory is not empty, the `errno` value is system dependent.
- POSIX requires that `unlinkdir(fd,"link-to-empty/",AT_REMOVEDIR)` remove `empty` and leave `link-to-empty` as a dangling symlink. This is counter-intuitive, so some systems fail with `ENOTDIR` instead: glibc
- Some systems allow a superuser to unlink directories, even though this can cause file system corruption. The error given if a process is not permitted to unlink directories varies across implementations; it is not always the POSIX value of `EPERM`. Meanwhile, if a process has the ability to unlink directories, POSIX requires that `unlinkat(fd,"symlink-to-dir/",0)` remove `dir` and leave `symlink-to-dir` dangling; this behavior is counter-intuitive. The `gnulib` module `unlinkdir` can help determine whether code must be cautious of unlinking directories.
- Removing an open file is non-portable: On Unix this allows the programs that have the file already open to continue working with it; the file's storage is only freed when the no process has the file open any more. On Windows, the attempt to remove an open file fails.

## 10.1206 unlockpt

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/unlockpt.html>

GnuLib module: `unlockpt`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- This function reports success for invalid file descriptors on some platforms: NetBSD 5.1, Cygwin 1.7.9.

## 10.1207 unsetenv

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/unsetenv.html>

GnuLib module: `unsetenv`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, mingw, MSVC 14.
- This function has the return type 'void' instead of 'int' on some platforms: FreeBSD 6.0, NetBSD 1.6, OpenBSD 3.8.
- On some platforms, this function does not fail with 'EINVAL' when passed an empty string or a string containing '=': FreeBSD 6.0, NetBSD 1.6, OpenBSD 4.7.
- This function removes only the first value association for the given environment variable, not all of them, on some platforms: Solaris 11.4, Haiku.

Portability problems not fixed by Gnulib:

- Older versions of POSIX required that `unsetenv(NULL)` gracefully fail with `EINVAL`, but not all implementations guarantee this, and the requirement was removed.

## 10.1208 `uselocale`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/uselocale.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 9.0, NetBSD 9.0, OpenBSD 6.1, Minix 3.1.8, AIX 6.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.5.x, mingw, MSVC 14, Android 4.4.
- This function is not documented and leads to crashes in subsequent `setlocale` invocations on some platforms: AIX 7.2.
- This function is useless because the `locale_t` type is not defined on some platforms: z/OS.
- This function is useless because the `locale_t` type contains basically no information on some platforms: OpenBSD 6.3.

## 10.1209 `utime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/utime.html>

Gnulib module: `utime`

Portability problems fixed by Gnulib:

- The times that are set on the file are affected by the current time zone and by the DST flag of the current time zone on some platforms: mingw, MSVC 14 (when the environment variable `TZ` is set).
- On some platforms, the prototype for `utime` omits `const` for the second argument: mingw, MSVC 14.
- On some platforms, `utime("link-to-file/",buf)` succeeds instead of failing with `ENOTDIR`. macOS 11.1.

Portability problems not fixed by Gnulib:

- On some platforms, this function mis-handles a trailing slash: Solaris 9.
- This function cannot set full timestamp resolution. Use `utimensat(AT_FDCWD,file,times,0)`, or the gnulib module `utimens`, instead.
- POSIX says this function is obsolescent and it is planned to be removed in POSIX 202x. You can use Gnulib module `utimens` instead.

### 10.1210 utimensat

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/utimensat.html>

Gnulib module: utimensat

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.5, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 3.0. However, the replacement function may end up truncating timestamps to worse resolution than supported by the file system. Furthermore, the replacement function is not safe to be used in libraries and is not multithread-safe.
- This function returns a bogus value instead of failing with `ENOSYS` on some platforms: Linux kernel 2.6.21.
- This function fails with `ENOSYS` if passed the flag `AT_SYMLINK_NOFOLLOW` on a regular file: Linux kernel 2.6.22.
- When using `UTIME_OMIT` or `UTIME_NOW`, some systems require the `tv_sec` argument to be 0, and don't necessarily handle all file permissions in the manner required by POSIX: Linux kernel 2.6.25.
- When using `UTIME_OMIT` for the modification time, but specifying an access time, some systems fail to update the change time: Linux kernel 2.6.32, macOS 11.1, NetBSD 9.0, Solaris 11.1.
- Out-of-range values of `tv_nsec` do not lead to a failure on some platforms: Linux kernel 2.6.22.19 on hppa.
- On some platforms, this function mis-handles a trailing slash: AIX 7.2.

Portability problems not fixed by Gnulib:

- On some platforms, timestamps of symbolic links cannot be modified, so the replacement fails with `ENOSYS` if passed the flag `AT_SYMLINK_NOFOLLOW` on a symlink.
- The mere act of using `lstat` modifies the access time of symlinks on some platforms, so `utimensat` with `AT_SYMLINK_NOFOLLOW` can only effectively change modification time: Cygwin.
- The mere act of using `stat` modifies the access time of directories on some platforms, so `utimensat` can only effectively change directory modification time: Cygwin 1.5.x.

The gnulib module `fdutimensat` provides a similar interface.

### 10.1211 utimes

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/utimes.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

- On some platforms, this function mis-handles a trailing slash: FreeBSD 7.2, Solaris 9.
- This function cannot set full timestamp resolution. In particular, some platforms incorrectly round rather than truncate. Use `utimensat(AT_FDCWD,file,times,0)`, or the glibc module `utimens`, instead.
- On some platforms, `utimes (file, NULL)` fails to set the file's timestamp to the current time: glibc 2.3.3.
- On some platforms, `utimes` failed on read-only files when `utime` worked fine. glibc 2.2.5.
- On OS/2, this function cannot set the timestamp to earlier than the year 1980 in local time.
- On OS/2, this function cannot set the timestamp to an odd number of seconds.
- On OS/2, this function does not work on an opened file.

Extension: Glibc provides a module 'utimens' that works around these problems and allows to set the time with nanosecond resolution (as far as supported by the file system).

## 10.1212 va\_arg

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/va\\_arg.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_arg.html)

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- The second argument of `va_arg` must be a type that is invariant under the “default argument promotions” (ISO C 99 6.5.2.2 paragraph 6). This means that the following are not valid here:

'float'      Use 'double' instead.

'bool'        Use 'int' instead.

Integer types smaller than 'int'.

          Use 'int' or 'unsigned int' instead.

This is a portability problem because you don't know the width of some abstract types like `uid_t`, `gid_t`, `mode_t`. So, instead of

```
mode = va_arg (ap, mode_t);
```

you have to write

```
mode = (sizeof (mode_t) < sizeof (int)
? va_arg (ap, int)
: va_arg (ap, mode_t));
```

## 10.1213 va\_copy

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/va\\_copy.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_copy.html)

Glibc module: `stdarg`

Portability problems fixed by Gnulib:

- This macro is missing on some platforms: AIX 5.1 with `cc` or `xlc`, HP-UX 11 with `cc`, IRIX 6.5 with `cc`.

Portability problems not fixed by Gnulib:

### 10.1214 `va_end`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/va\\_end.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_end.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1215 `va_start`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/va\\_start.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/va_start.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 10.1216 `vdprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vdprintf.html>

Gnulib module: `vdprintf` or `vdprintf-posix` or `vdprintf-gnu`

Portability problems fixed by either Gnulib module `vdprintf` or `vdprintf-posix` or `vdprintf-gnu`:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems fixed by either Gnulib module `vdprintf-posix` or `vdprintf-gnu`:

- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: `glibc`, `musl libc`, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.4.
- This function does not support the `'a'` and `'A'` directives on some platforms: `glibc-2.3.6`, Solaris 11.4.
- This function does not support the `'b'` directive, required by ISO C23, on some platforms: `glibc 2.34`, `musl libc`, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.

- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Solaris 11.4.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.

Portability problems fixed by Gnulib module `vdprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

## 10.1217 `vfprintf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfprintf.html>

Gnulib module: `vfprintf-posix` or `vfprintf-gnu` or `stdio`, nonblocking, sigpipe

Portability problems fixed by either Gnulib module `vfprintf-posix` or `vfprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf` of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.



- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as `"%2$s"`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- `printf "%#.0x"` or `"%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with `"%.511f"`) on some platforms: Solaris 10.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `vfprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `vfprintf-posix` or `vfprintf-gnu`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio` or `vfprintf-posix` or `vfprintf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.

## 10.1218 vfscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfscanf.html)

Gnulib module: `vfscanf`, `nonblocking`

Portability problems fixed by Gnulib module `vfscanf`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, this function doesn't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

## 10.1219 vfwprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfwprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.1220 vfwscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vfwscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfwscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vfwscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1221 vprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vprintf.html>

Gnulib module: `vprintf-posix` or `vprintf-gnu` or `stdio`, `nonblocking`, `sigpipe`

Portability problems fixed by either Gnulib module `vprintf-posix` or `vprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf "%f", "%e", "%g" of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as "%2\$s", on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- printf "%#.0x" or "%#.0X" with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with "%.511f") on some platforms: Solaris 10.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `vprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems fixed by Gnulib module `stdio` or `vprintf-posix` or `vprintf-gnu`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnulib module `stdio` or `vprintf-posix` or `vprintf-gnu`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- Attempting to write to a read-only stream fails with `EOF` but does not set the error flag for `ferror` on some platforms: glibc 2.13, cygwin 1.7.9.

### 10.1222 vscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vscanf.html)

Gnulib module: `vscanf`, `nonblocking`

Portability problems fixed by Gnulib module `vscanf`, together with module `nonblocking`:

- When reading from a non-blocking pipe whose buffer is empty, this function fails with `errno` being set to `EINVAL` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, these functions don't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

### 10.1223 vsnprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsnprintf.html>

Gnulib module: `vsnprintf` or `vsnprintf-posix` or `vsnprintf-gnu`

Portability problems fixed by either GnuLib module `vsnprintf` or `vsnprintf-posix` or `vsnprintf-gnu`:

- This function does not support format directives that access arguments in an arbitrary order, such as `%"2$s"`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function does not return a byte count as specified in C99 on some platforms: HP-UX 11, IRIX 6.5, Solaris 9, mingw, MSVC 14.

Portability problems fixed by either GnuLib module `vsnprintf-posix` or `vsnprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf `%"f"`, `%"e"`, `%"g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function doesn’t support the ‘l’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- printf `%"010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- printf `%"#.0x"` or `%"#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.

- This function mishandles large floating point precisions (for example, formatting 1.0 with `"%.511f"`) on some platforms: Solaris 10.
- This function produces wrong output for the `'lc'` directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- This function does not truncate the result as specified in C99 on some platforms: mingw, MSVC 14.
- This function does not fully support the `'n'` directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, HP-UX 11, mingw, MSVC 14.
- This function overwrites memory even when a zero size argument is passed on some platforms: HP-UX 11.

Portability problems fixed by Gnuilib module `vsprintf-gnu`:

- This function does not support the `'B'` directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnuilib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical `'long double'` numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

## 10.1224 vsprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsprintf.html>

Gnuilib module: `vsprintf-posix` or `vsprintf-gnu`

Portability problems fixed by either Gnuilib module `vsprintf-posix` or `vsprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- printf of `'long double'` numbers is unsupported on some platforms: mingw, MSVC 14.
- printf `"%f"`, `"%e"`, `"%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.4, mingw, MSVC 14.
- This function does not support the `'a'` and `'A'` directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: glibc when used with `_FORTIFY_SOURCE >= 2` (set by default on Ubuntu), Android, OpenBSD, macOS 11.1, MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as `"%2$s"`, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘ ’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes, or wrong capitalization) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC/clang.
- `printf "%#.0x"` or `"%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: AIX 7.1, Solaris 10/x86, mingw, MSVC/clang.
- This function mishandles large floating point precisions (for example, formatting 1.0 with `"%.511f"`) on some platforms: Solaris 10.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- The compiler warns that this function is deprecated: macOS 13.0.

Portability problems fixed by Gnulib module `vsprintf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- Formatting noncanonical ‘long double’ numbers produces nonmeaningful results on some platforms: glibc and others, on x86, x86\_64, IA-64 CPUs.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the “C” locale on some platforms: NetBSD 5.1.



## 10.1225 vsscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vsscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: MSVC 14.
- On Windows platforms (excluding Cygwin), this function does not set `errno` upon failure.
- On Windows, these functions don't support the `hh`, `ll`, `j`, `t`, `z` size specifiers.

## 10.1226 vswprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vswprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- On Windows, this function does not take a buffer size as second argument.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the 'b' directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.

### 10.1227 vswscanf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vswscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vswscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vswscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1228 vwprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vwprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.7.
- This function exists, but does not support wide arguments on some platforms: Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.1229 `vwscanf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/vwscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vwscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vwscanf.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 1.5.x, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1230 `wait`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wait.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1231 `waitid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/waitid.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14.
- As of 2005, no system is known on which `waitid` with flag `WNOWAIT` works correctly.

### 10.1232 `waitpid`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/waitpid.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-waitpid-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-waitpid-3.html)

Gnulib module: `waitpid`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

Portability problems not fixed by GnuLib:

### 10.1233 `wcpcpy`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcpcpy.html>

GnuLib module: `wcpcpy`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.13.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1234 `wcpncpy`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcpncpy.html>

GnuLib module: `wcpncpy`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.13.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1235 `wcrtomb`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcrtomb.html>

GnuLib module: `wcrtomb`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function produces wrong characters in the C locale on some platforms: Android 4.3.
- This function returns 0 when the first argument is NULL in some locales on some platforms: Solaris 11.3.
- This function does not ignore the second argument when the first argument is NULL on some platforms: MSVC 14.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the ISO C11 function `c32rtomb`, provided by GnuLib module `c32rtomb`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1236 `wscasecmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscasecmp.html>

GnuLib module: `wscasecmp`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1237 `wscasecmp_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscasecmp\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscasecmp_l.html)

GnuLib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1238 `wscat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscat.html>

GnuLib module: `wscat`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1239 `wcschr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcschr.html>

Gnulib module: `wcschr`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1240 `wcscmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscmp.html>

Gnulib module: `wcscmp`

Portability problems fixed by Gnulib:

- This function compares the wide characters as if they were unsigned, although `wchar_t` is signed, on some platforms: glibc 2.14.1 on x86 or x86\_64, musl libc 1.2.3, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.
- This function may return a wrong result if the two arguments are of different length, on some platforms: glibc 2.37 on arm and arm64 CPUs, AIX 7.2 in 64-bit mode.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1241 `wcscoll`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscoll.html>

Gnulib module: `wcscoll`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1242 `wcscoll_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscoll\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscoll_l.html)

Gnulib module: —

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1243 `wcscopy`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscopy.html>

GnuLib module: `wcscopy`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

Note: `wcscopy(dst, src)` is only safe to use when you can guarantee that there are at least `wcslen(src) + 1` wide characters allocated at `dst`.

### 10.1244 `wcscspn`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcscspn.html>

GnuLib module: `wcscspn`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1245 `wcsdup`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsdup.html>

GnuLib module: `wcsdup`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1246 `wcsftime`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsftime.html>

Gnulib module: `wcsftime`

Portability problems fixed by Gnulib:

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable `TZ` has been set by Cygwin.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- Native Windows platforms (mingw, MSVC) support only a subset of time zones specified by POSIX. See Section 10.1192 [tzset], page 449.

### 10.1247 `wcslen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcslen.html>

Gnulib module: `wcslen`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1248 `wcsncasecmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncasecmp.html>

Gnulib module: `wcsncasecmp`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 3.0, OpenBSD 3.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1249 `wcsncasecmp_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncasecmp\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncasecmp_l.html)

Gnulib module: —



Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1250 `wcsncat`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncat.html>

GnuLib module: `wcsncat`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1251 `wcsncmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncmp.html>

GnuLib module: `wcsncmp`

Portability problems fixed by GnuLib:

- This function compares the wide characters as if they were unsigned, although `wchar_t` is signed, on some platforms: glibc 2.14.1 on x86 or x86\_64, musl libc 1.2.3, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.
- This function may return a wrong result if the two arguments are of different length, on some platforms: AIX 7.2 in 64-bit mode.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1252 `wcsncpy`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsncpy.html>

GnuLib module: `wcsncpy`

Portability problems fixed by GnuLib:

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

Note: This function has no real use: It cannot be used for filling a fixed-size record with a wide string, before writing it to a file, because the wide string encoding is platform dependent and, on some platforms, also locale dependent. And this function is **not** appropriate for copying a wide string into a bounded memory area, because you have no guarantee that the result will be null-terminated. Even if you add the null character at the end yourself, this function is inefficient (as it spends time clearing unused memory) and will allow silent truncation to occur, which is not a good behavior for GNU programs.

### 10.1253 `wcsnlen`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsnlen.html>

Gnulib module: `wcsnlen`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1254 `wcsnrtombs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsnrtombs.html>

Gnulib module: `wcsnrtombs`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.
- This function cannot consume valid sequences of wide characters on some platforms: Solaris 11.4.
- In C++ mode, the system's `<wchar.h>` defines `std::wcsnrtombs` but not `::wcsnrtombs` on some platforms: Solaris 11 OpenIndiana.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32snrtombs`, provided by Gnulib module `c32snrtombs`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1255 `wcspbrk`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcspbrk.html>

Gnulib module: `wcspbrk`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1256 `wcsrchr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsrchr.html>

Gnulib module: `wcsrchr`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1257 `wcsrtombs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsrtombs.html>

Gnulib module: `wcsrtombs`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw.
- This function does not ignore the length argument if the destination argument is NULL on some platforms: mingw.
- This function updates the source pointer also if the destination argument is NULL on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32srtombs`, provided by Gnulib module `c32srtombs`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1258 `wcsspn`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsspn.html>

Gnulib module: `wcsspn`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1259 `wcsstr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsstr.html>

Gnulib module: `wcsstr` or `wcsstr-simple`

Portability problems fixed by either Gnulib module `wcsstr-simple` or `wcsstr`:

- This function is missing on some platforms: HP-UX 11.00.

Portability problems fixed by Gnulib module `wcsstr`:

- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.37, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1260 `wcstod`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstod.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1261 `wcstof`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstof.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1262 `wcstoimax`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoimax.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1263 `wcstok`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstok.html>

Gnulib module: `wcstok`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x.
- This function takes only two arguments on some platforms: mingw, older MSVC.
- This function may use hidden state, ignoring the third argument, and thus exhibit a bug when two or more `wcstok` iteration loops are being performed in the same thread, on some platforms: HP-UX 11.31.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1264 `wcstol`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstol.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1265 `wcstold`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstold.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 9, Cygwin 1.7.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1266 `wcstoll`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoll.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1267 `wcstombs`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstombs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32stombs`, provided by Gnulib module `c32stombs`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1268 `wcstoul`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoul.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1269 `wcstoull`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoull.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1270 `wcstoumax`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcstoumax.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Solaris 9, Cygwin 1.5.x, MSVC 9, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1271 `wcswidth`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcswidth.html>

Gnulib module: `wcswidth`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32swidth`, provided by Gnulib module `c32swidth`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1272 `wcsxfrm`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsxfrm.html>

Gnulib module: `wcsxfrm`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.5.x.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1273 `wcsxfrm_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsxfrm\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcsxfrm_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1274 `wctob`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctob.html>

Gnulib module: `wctob`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, mingw.
- This function clobbers caller-owned registers on some platforms: Cygwin 1.7.5.
- This function does not work on some platforms: Solaris 9.
- This function is missing a declaration on some platforms: IRIX 6.5.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32tob`, provided by Gnulib module `c32tob`, operates on 32-bit wide characters and therefore does not have this limitation.



### 10.1275 `wctomb`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctomb.html>

Gnulib module: `wctomb`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1276 `wctrans`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans.html>

Gnulib module: `wctrans`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, mingw, MSVC 9, Android 7.1.
- This function does not support the `"tolower"` and `"toupper"` mappings on some platforms: NetBSD 9.3. (It returns non-null values for the arguments `"tolower"` and `"toupper"`, but with these values, the function `towctrans` always crashes.)

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32_get_mapping`, provided by Gnulib module `c32_get_mapping`, operates on 32-bit wide characters and therefore does not have this limitation.

### 10.1277 `wctrans_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctrans_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

## 10.1278 `wctype`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype.html>

Gnulib module: `wctype`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, MSVC 9.
- This function is declared in `<wchar.h>`, not in `<wctype.h>`, on some platforms: HP-UX 11.00.
- This function does not support the "blank" character class on some platforms: mingw.
- The object returned by this function for the "blank" character class is inconsistent with the `iswblank` and `isblank` functions on some platforms: MSVC 14.
- The object returned by this function for the "punct" character class is inconsistent with the `ispunct` function on some platforms: Android 11.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the Gnulib function `c32_get_type_test`, provided by Gnulib module `c32_get_type_test`, operates on 32-bit wide characters and therefore does not have this limitation.

## 10.1279 `wctype_l`

POSIX specification:

[https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype\\_l.html](https://pubs.opengroup.org/onlinepubs/9699919799/functions/wctype_l.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

## 10.1280 `wcwidth`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wcwidth.html>

Gnulib module: `wcwidth`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.
- This function is not declared (without `-D_GNU_SOURCE`) on some platforms: glibc 2.8.
- This function handles combining characters in UTF-8 locales incorrectly on some platforms: macOS 12.5, NetBSD 9.0, OpenBSD 5.8, MidnightBSD 1.1.

- This function returns 2 for characters with ambiguous east asian width, even in Western locales, on some platforms: Solaris 11.4.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters. However, the GnuLib function `c32width`, provided by GnuLib module `c32width`, operates on 32-bit wide characters and therefore does not have this limitation.
- This function treats zero-width spaces like control characters on some platforms: AIX 7.2.

### 10.1281 `wmemchr`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemchr.html>

GnuLib module: `wmemchr`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 14.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1282 `wmemcmp`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemcmp.html>

GnuLib module: `wmemcmp`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 14.
- This function compares the wide characters as if they were unsigned, although `wchar_t` is signed, on some platforms: glibc 2.14.1 on x86 or x86\_64, musl libc 1.2.3, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1283 `wmemcpy`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemcpy.html>

GnuLib module: `wmemcpy`

Portability problems fixed by GnuLib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.

Portability problems not fixed by GnuLib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1284 wmemmove

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemmove.html>

Gnulib module: wmemmove

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1285 wmemset

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wmemset.html>

Gnulib module: wmemset

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11.00, IRIX 6.5, MSVC 9.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 10.1286 wordexp

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wordexp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

### 10.1287 wordfree

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wordfree.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

## 10.1288 wprintf

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wprintf.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5.
- This function exists, but does not support wide arguments on some platforms: Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function does not support size specifiers as in C23 (`w8`, `w16`, `w32`, `w64`, `wf8`, `wf16`, `wf32`, `wf64`) on some platforms: glibc, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- `printf "%#.0x" or "%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.
- In the C or POSIX locales, the `%c` and `%s` conversions may fail on some platforms: glibc 2.35.
- When formatting an integer with grouping flag, this function inserts thousands separators even in the "C" locale on some platforms: NetBSD 5.1.
- On some platforms, this function does not set `errno` or the stream error indicator on attempts to write to a read-only stream: Cygwin 1.7.9.

## 10.1289 write

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/write.html>

Gnulib module: write, nonblocking, sigpipe

Portability problems fixed by Gnulib module `write`:

- This function is declared in a different header file (namely, `<io.h>`) on some platforms: mingw, MSVC 14.
- This function crashes when invoked with invalid arguments on some platforms: MSVC 14.

Portability problems fixed by Gnulib module `stdio`, together with module `nonblocking`:

- When writing to a non-blocking pipe whose buffer is full, this function fails with `errno` being set to `ENOSPC` instead of `EAGAIN` on some platforms: mingw, MSVC 14.

- When writing to a non-blocking pipe on which no reader is currently waiting an amount of bytes that exceeds the pipe buffer's size, then—even if the pipe's buffer is empty—this function fails, instead of performing a partial write into the pipe buffer, on some platforms: mingw, MSVC 14.

Portability problems fixed by Gnuilib module `stdio`, together with module `sigpipe`:

- When writing to a pipe with no readers, this function fails with error `EINVAL`, instead of obeying the current `SIGPIPE` handler, on some platforms: mingw, MSVC 14.

Portability problems not fixed by Gnuilib:

- This function may fail with error `EINTR`, even in programs that don't install any signal handlers, on some platforms: macOS 11.1.

For handling `EINTR`, Gnuilib provides a module 'safe-write' with a function `safe_write`.

### 10.1290 `writev`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/writev.html>

Gnuilib module: —

Portability problems fixed by Gnuilib:

Portability problems not fixed by Gnuilib:

- This function is missing on some platforms: mingw, MSVC 14.

### 10.1291 `wscanf`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/wscanf.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wscanf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wscanf.html)

Gnuilib module: —

Portability problems fixed by Gnuilib:

Portability problems not fixed by Gnuilib:

- This function is missing on some platforms: NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**10.1292** `y0`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/y0.html>

Gnulib module: `y0`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

**10.1293** `y1`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/y1.html>

Gnulib module: `y1`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

**10.1294** `yn`

POSIX specification:

<https://pubs.opengroup.org/onlinepubs/9699919799/functions/yn.html>

Gnulib module: `yn`

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8.

## 11 Past POSIX Function Substitutes

This chapter describes which functions and function-like macros specified by older versions of POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the function. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-gnulib at gnu dot org>.

### 11.1 bcmp

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/bcmp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function is marked as “legacy” in POSIX. Better use `memcmp` instead.

### 11.2 bcopy

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/bcopy.html>

Gnulib module: `bcopy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- This function is marked as “legacy” in POSIX. Better use `memcpy` or `memmove` instead.

### 11.3 bsd\_signal

POSIX specification: [https://pubs.opengroup.org/onlinepubs/009695399/functions/bsd\\_signal.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/bsd_signal.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 7.1, Cygwin 2.9, mingw, MSVC 14.



## 11.4 bzero

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/bzero.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function is marked as “legacy” in POSIX. Better use `memset` instead.

## 11.5 ecvt

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/ecvt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 9.0, Android 9.0.
- This function is not declared on some platforms: Cygwin 2.9.
- This function is marked as “legacy” in POSIX. Better use `sprintf` instead.

## 11.6 fcvt

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/fcvt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, NetBSD 9.0, Android 9.0.
- This function is not declared on some platforms: Cygwin 2.9.
- This function is marked as “legacy” in POSIX. Better use `sprintf` instead.

## 11.7 ftime

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/ftime.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Android 9.0.
- This function is not declared on some platforms: Android 13.

- On native Windows platforms (mingw, MSVC), this function works incorrectly when the environment variable TZ has been set by Cygwin.
- This function is marked as “legacy” in POSIX. Better use `gettimeofday` or `clock_gettime` instead, and use `ftime` only as a fallback for portability to Windows platforms.

## 11.8 gcvt

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/gcvt.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, Android 9.0.
- This function is not declared on some platforms: Cygwin 2.9.
- This function is marked as “legacy” in POSIX. Better use `sprintf` instead.

## 11.9 getcontext

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/getcontext.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Note: A third-party implementation is available at <https://github.com/kaniini/libucontext/>.

## 11.10 gethostbyaddr

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/gethostbyaddr.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 11.11 gethostbyname

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/gethostbyname.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 11.12 getwd

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/getwd.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- The size of the buffer required for this function is not a compile-time constant. Also, the function truncates a result that would be larger than the minimum buffer size. For these reasons, this function is marked as “legacy” in POSIX. Better use the `getcwd` function instead.

### 11.13 h\_errno

POSIX specification: [https://pubs.opengroup.org/onlinepubs/009695399/functions/h\\_errno.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/h_errno.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.34, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 11.14 index

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/index.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.
- This function is marked as “legacy” in POSIX. Better use `strchr` instead.

### 11.15 `makecontext`

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/makecontext.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Note: A third-party implementation is available at <https://github.com/kaniini/libucontext/>.

### 11.16 `mktemp`

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/mktemp.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is not appropriate for creating temporary files. (It has security risks.) Therefore it is marked as “legacy” in POSIX. Better use `mkstemp` instead.

### 11.17 `pthread_attr_getstackaddr`

POSIX specification:  
[https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread\\_attr\\_getstackaddr.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_getstackaddr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.

### 11.18 `pthread_attr_setstackaddr`

POSIX specification:  
[https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread\\_attr\\_setstackaddr.html](https://pubs.opengroup.org/onlinepubs/009695399/functions/pthread_attr_setstackaddr.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

- This function is not declared on some platforms: Android 13.

### 11.19 rindex

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/rindex.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function is marked as “legacy” in POSIX. Better use `strrchr` instead.

### 11.20 scalb

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/scalb.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

### 11.21 setcontext

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/setcontext.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- The effects of this call are system and compiler optimization dependent, since it restores the contents of register-allocated variables but not the contents of stack-allocated variables.

Note: A third-party implementation is available at <https://github.com/kaniini/libucontext/>.

### 11.22 swapcontext

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/swapcontext.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Note: A third-party implementation is available at <https://github.com/kaniini/libucontext/>.

### 11.23 ualarm

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/ualarm.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

### 11.24 usleep

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/usleep.html>

Gnulib module: `usleep`

Portability problems fixed by Gnulib:

- On some systems, `usleep` rejects attempts to sleep longer than 1 second, as allowed by POSIX: NetBSD 9.0, mingw.

Portability problems not fixed by Gnulib:

- According to POSIX, the `usleep` function may interfere with the program's use of the `SIGALRM` signal. On Linux, it doesn't; on other platforms, it may.

### 11.25 vfork

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/vfork.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: IRIX 6.5, mingw, MSVC 14.

### 11.26 wcs wcs

POSIX specification: <https://pubs.opengroup.org/onlinepubs/009695399/functions/wcs wcs.html>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.
- This function is marked as “legacy” in POSIX. Better use `wcsstr` instead.

## 12 Glibc Header File Substitutes

This chapter describes which header files contained in GNU libc but not specified by ISO C or POSIX are substituted by Gnulib, which portability pitfalls are fixed by Gnulib, and which (known) portability problems are not worked around by Gnulib.

The notation “Gnulib module: —” means that Gnulib does not provide a module providing a substitute for the header file. When the list “Portability problems not fixed by Gnulib” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this header file important enough to contribute a substitute for it. If you need this particular header file, you may write to <bug-gnulib at gnu dot org>.

### 12.1 a.out.h

Describes the structure of executables (and object files?) in the old a.out format.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This header file is useless because most executables and object files are in ELF format on some platforms: glibc 2.3.6, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7.

### 12.2 aliases.h

Defines the type `struct aliasent` and declares the functions `setaliasent`, `endaliasent`, `getaliasent`, `getaliasent_r`, `getaliasbyname`, `getaliasbyname_r`.

Documentation:

- `man setaliasent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

### 12.3 alloca.h

Declares the `alloca` function of function-like macro.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Variable-Size-Automatic.html](https://www.gnu.org/software/libc/manual/html_node/Variable-Size-Automatic.html),
- `man alloca`.



Gnulib module: `alloca`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 12.4 `ar.h`

Describes the structure of files produced by the ‘`ar`’ program. Defines the type `struct ar_hdr` and the macros `ARMAG`, `SARMAG`, `ARFMAG`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 12.5 `argp.h`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argp.html](https://www.gnu.org/software/libc/manual/html_node/Argp.html).

Gnulib module: `argp`

Portability problems fixed by Gnulib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

## 12.6 `argz.h`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- The `argz` functions do not work on some platforms: Cygwin.

Portability problems not fixed by Gnulib:

## 12.7 `byteswap.h`

Defines the functions or function-like macros `bswap_16`, `bswap_32`, `bswap_64`.

Gnulib module: `byteswap`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 12.8 `crypt.h`

Defines the type `struct crypt_data` and declares the functions `crypt`, `crypt_r`, `setkey`, `setkey_r`, `encrypt`, `encrypt_r`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/crypt.html](https://www.gnu.org/software/libc/manual/html_node/crypt.html), [https://www.gnu.org/software/libc/manual/html\\_node/DES-Encryption.html](https://www.gnu.org/software/libc/manual/html_node/DES-Encryption.html),
- `man crypt`, `man encrypt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- The functions `crypt`, `setkey`, `encrypt` are missing on some platforms: HP-UX 11.
- The type `struct crypt_data` and the functions `crypt_r`, `setkey_r`, `encrypt_r` are missing on some platforms: IRIX 6.5, Solaris 11.4, Cygwin.

## 12.9 `endian.h`

Describe's the platform's endianness (byte ordering of words stored in memory). Defines the macros `BYTE_ORDER`, `LITTLE_ENDIAN`, `BIG_ENDIAN`, `PDP_ENDIAN`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

## 12.10 envz.h

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

## 12.11 err.h

Declares the functions `warn`, `vwarn`, `warnx`, `vwarnx`, `err`, `verr`, `errx`, `verrx`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man err`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

## 12.12 error.h

Declares the functions `error`, `error_at_line` and the variables `error_print_progname`, `error_message_count`, `error_one_per_line`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man error`.

Gnulib module: `error-h`

Portability problems fixed by Gnulib:

- This header file is missing on many platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 12.13 `execinfo.h`

Declares the functions `backtrace`, `backtrace_symbols`, `backtrace_symbols_fd`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Backtraces.html](https://www.gnu.org/software/libc/manual/html_node/Backtraces.html),
- `man backtrace`.

Gnulib module: —

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- On platforms where the header file is missing, the Gnulib substitute implementation is just a stub, and does nothing.

### 12.14 `fpu_control.h`

Handling of the FPU control word. Defines the `fpu_control_t` type, declares the `__fpu_control` variable, and defines the `_FPU_GETCW`, `_FPU_SETCW` macros.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

### 12.15 `fstab.h`

Defines the type `struct fstab`, the macros `FSTAB_*`, `_PATH_FSTAB`, and declares the functions `setfsent`, `endfsent`, `getfsent`, `getfsspec`, `getfsfile`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- `man setfsent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.
- The macro `_PATH_FSTAB` is missing on some platforms: AIX 5.1, HP-UX 11.

## 12.16 `fts.h`

Defines the types `FTS`, `FTSENT` and the macros `FTS_*`, and declares the functions `fts_open`, `fts_read`, `fts_children`, `fts_set`, `fts_close`.

Documentation:

- `man fts`.

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 12.17 `getopt.h`

Defines the type `struct option` and declares the variables `optarg`, `optind`, `opterr`, `optopt` and the functions `getopt`, `getopt_long`, `getopt_long_only`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Getopt.html](https://www.gnu.org/software/libc/manual/html_node/Getopt.html),
- `man getopt`.

Gnulib module: `getopt-gnu`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: AIX 7.2, HP-UX 11, MSVC 14.
- The function `getopt_long` is missing on some platforms: IRIX 6.5, Solaris 9.
- The function `getopt_long_only` is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, IRIX 6.5, Solaris 9, mingw.
- The method to reset options is incompatible on some platforms: FreeBSD 6.0, NetBSD 9.0(?), OpenBSD 6.7, Cygwin 1.5.x, mingw.
- The function `getopt` does not handle a leading '+' character in the options string on some platforms: Solaris 11 2010-11.

Portability problems not fixed by Gnulib:

## 12.18 `gshadow.h`

Defines the type `struct sgrp` and declares the functions `setsgent`, `endsgent`, `getsgent`, `getsgnam`, `sgetsgent`, `fgetsgent`, `putsgent`, `getsgent_r`, `getsgnam_r`, `sgetsgent_r`, `fgetsgent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

### 12.19 `ieee754.h`

Defines the types `union ieee754_float`, `union ieee754_double`, `union ieee854_long_double`.

Gnulib module: —

Portability problems fixed by Gnulib:

- This header file is missing on all non-glibc platforms: glibc/sparc64 in 32-bit mode, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- The substitute for this header file has not been tested for `long double` and does not work on some platforms.
- The substitute for this header file returns nonsense on (now-quite-rare) platforms that do not use IEEE floating point.

### 12.20 `ifaddrs.h`

Defines the type `struct ifaddrs` and declares the functions `getifaddrs`, `freeifaddrs`.

Documentation:

- <https://www.kernel.org/doc/man-pages/online/pages/man3/getifaddrs.3.html>.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.

### 12.21 `libintl.h`

Defines the macros `__USE_GNU_GETTEXT`, `__GNU_GETTEXT_SUPPORTED_REVISION`, and declares the functions `gettext`, `dgettext`, `dcgettext`, `ngettext`, `dngettext`, `dcngettext`, `textdomain`, `bindtextdomain`, `bind_textdomain_codeset`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Message-catalogs-with-gettext.html](https://www.gnu.org/software/libc/manual/html_node/Message-catalogs-with-gettext.html),
- [https://www.gnu.org/software/gettext/manual/html\\_node/gettext.html](https://www.gnu.org/software/gettext/manual/html_node/gettext.html).

Gnulib module: `gettext`

Portability problems fixed by Gnulib, if GNU `gettext` is installed:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14, Android 9.0.
- The functions cannot deal with GNU `.mo` files with system-dependent strings (of major version 1 or of minor version 1) on some non-glibc platforms: NetBSD 3.0, Solaris 10.

Portability problems not fixed by Gnulib:

## 12.22 `link.h`

Defines the type `struct dl_phdr_info`, and declares the function `dl_iterate_phdr`.

Documentation: —

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, AIX 7.1, HP-UX 11.31, IRIX 6.5, Cygwin 2.9.0, mingw, MSVC 14.

## 12.23 `malloc.h`

Declares the function `memalign` and functions for customizing the `malloc` behavior.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Unconstrained-Allocation.html](https://www.gnu.org/software/libc/manual/html_node/Unconstrained-Allocation.html).

Gnulib module: `malloc-h`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, OpenBSD 6.7.

Portability problems not fixed by Gnulib:

## 12.24 `mcheck.h`

Defines the type `enum mcheck_status` and declares the functions `mcheck`, `mcheck_pedantic`, `mcheck_check_all`, `mprobe`, `mtrace`, `muntrace`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Heap-Consistency-Checking.html](https://www.gnu.org/software/libc/manual/html_node/Heap-Consistency-Checking.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

## 12.25 `mntent.h`

Defines the type `struct mntent` and the macros `MNTTAB`, `MOUNTED`, `MNTTYPE_*`, `MNTOPT_*`, and declares the functions `setmntent`, `getmntent`, `getmntent_r`, `addmntent`, `endmntent`, `hasmntopt`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mntab.html](https://www.gnu.org/software/libc/manual/html_node/mntab.html),
- `man setmntent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14.
- The function `getmntent_r` is missing on all non-glibc platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin, Android 9.0.

Gnulib module `mountlist` provides a higher-level abstraction.

## 12.26 `obstack.h`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Obstacks.html](https://www.gnu.org/software/libc/manual/html_node/Obstacks.html).

Gnulib module: `obstack`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

## 12.27 `paths.h`

Defines the macros `_PATH_*`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11 2010-11, mingw, MSVC 14.
- The set of `_PATH_*` macros is platform dependent.

## 12.28 `printf.h`

Defines the type `struct printf_info` and the macros and enum values `PA_*`, and declares the functions `printf_function`, `printf_arginfo_function`, `register_printf_function`, `parse_printf_format`, `printf_size`, `printf_size_info`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Parsing-a-Template-String.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-a-Template-String.html).

Gnulib module: —



Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

## 12.29 `pty.h`

Declares the functions `openpty` and `forkpty`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Pseudo\\_002dTerminal-Pairs.html](https://www.gnu.org/software/libc/manual/html_node/Pseudo_002dTerminal-Pairs.html),
- `man openpty`.

Gnulib module: `pty`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms that declare the `forkpty` and `openpty` functions in `util.h` or `libutil.h` instead: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7.
- This header file is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4.

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.

## 12.30 `resolv.h`

Defines the types `res_sendhookact`, `res_send_qhook`, `res_send_rhook`, `res_state`, `struct res_sym` and the macros `_PATH_RESCONF`, `RES_*`, and declares the functions `res_close`, `res_init`, `res_mkquery`, `res_query`, `res_querydomain`, `res_search`, `res_send`.

Documentation:

- `man res_init`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.
- The functions are missing on some platforms: HP-UX 11.

### 12.31 shadow.h

Defines the type `struct spwd` and declares the functions `setspent`, `endspent`, `getspent`, `getspent_r`, `getspnam`, `getspnam_r`, `sgetspent`, `sgetspent_r`, `fgetspent`, `fgetspent_r`, `putspent`, `lckpword`, `ulckpword`.

Documentation:

- `man setspent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin, mingw, MSVC 14, Android 9.0.
- The functions `getspent_r`, `getspnam_r`, `sgetspent_r`, `fgetspent`, `fgetspent_r`, `putspent` are missing on some platforms: HP-UX 11.
- The functions `sgetspent`, `sgetspent_r` are missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4.

### 12.32 sys/file.h

Declares the function `flock`.

Gnulib module: `sys_file`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: MSVC 14.

Portability problems not fixed by Gnulib:

- This header file does not declare the `flock` function on some platforms: AIX 7.1, HP-UX 11.23, Solaris 11.4.

### 12.33 sys/ioctl.h

Declares the function `ioctl`.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/IOCTLS.html](https://www.gnu.org/software/libc/manual/html_node/IOCTLS.html),
- `man ioctl`.

Gnulib module: `sys_ioctl`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file does not declare the `ioctl` function on some platforms: AIX 5.1, Solaris 11.4, Haiku 2017.

Portability problems not fixed by Gnulib:

### 12.34 `sys/random.h`

Declares the function `getrandom` and the flags for it.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Unpredictable-Bytes.html](https://www.gnu.org/software/libc/manual/html_node/Unpredictable-Bytes.html),
- `man getrandom`.

Gnulib module: `sys_random`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: glibc 2.24, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.6.x, mingw, MSVC 14.
- This header file is not self-contained on some platforms: uClibc, macOS 11.1.

Portability problems not fixed by Gnulib:

### 12.35 `sysexits.h`

Defines the `EX_*` macros, including `EX_OK`.

Gnulib module: `sysexits`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: mingw, MSVC 14.
- This header file defines no `EX_*` macros if `_BSD_SOURCE` is not defined on some platforms: Haiku.
- The macro `EX_CONFIG` is missing on some platforms: HP-UX 11.

Portability problems not fixed by Gnulib:

### 12.36 `ttyent.h`

Defines the type `struct ttyent` and declares the functions `setttyent`, `endttyent`, `getttyent`, `getttyent`, `getttyent`.

Documentation:

- `man setttyent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This header file is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin, mingw, MSVC 14, Android 9.0.

### 12.37 utmp.h

Defines functions for login and logout (to a tty session) and for examining the history of logins and logouts.

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man utmp`.

Gnulib module: `utmp`

Portability problems fixed by Gnulib:

- This header file is missing on some platforms: FreeBSD 14.0, mingw, MSVC 14.
- `<sys/types.h>` is a prerequisite of `<utmp.h>` on some platforms: FreeBSD 8.0, OpenBSD 7.2.

Portability problems not fixed by Gnulib:

- While some platforms have the `struct utmp` field `ut_user`, older platforms have the field `ut_name`.
- The `struct utmp` fields `ut_id`, `ut_pid`, `ut_type` do not exist on some platforms: macOS, old FreeBSD, NetBSD, OpenBSD, Minix.
- The `struct utmp` field `ut_host` does not exist on some platforms: IRIX, Solaris.
- The `struct utmp` field `ut_exit` does not exist on some platforms: macOS, old FreeBSD, NetBSD, OpenBSD, Minix, Cygwin.
- The `struct utmp` field `ut_session` does not exist on some platforms: macOS, old FreeBSD, NetBSD, OpenBSD, Minix, AIX, HP-UX, IRIX, Solaris, Cygwin.
- The `struct utmp` field `ut_addr` or `ut_addr_v6` does not exist on some platforms: macOS, old FreeBSD, NetBSD, OpenBSD, Minix, AIX, IRIX, Solaris.
- On some platforms, this API does not support timestamps past the year 2038: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits.
- On some platforms, this header misbehaves if the `year2038` or `year2038-recommended` modules are used and the program is configured without the `--disable-year2038` option. The `readutmp` module works around this problem: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits. See Section 14.5 [Avoiding the year 2038 problem], page 762.

## 13 Glibc Function Substitutes

This chapter describes which functions and function-like macros provided as extensions by at least GNU libc are also supported by Glibc, which portability pitfalls are fixed by Glibc, and which (known) portability problems are not worked around by Glibc.

The notation “Glibc module: —” means that Glibc does not provide a module providing a substitute for the function. When the list “Portability problems not fixed by Glibc” is empty, such a module is not needed: No portability problems are known. Otherwise, it indicates that such a module would be useful but is not available: No one so far found this function important enough to contribute a substitute for it. If you need this particular function, you may write to <bug-glibc at gnu dot org>.

This list of functions is sorted according to the header that declares them.

### 13.1 Glibc Extensions to <stdio.h>

#### 13.1.1 aio\_init

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Configuration-of-AIO.html](https://www.gnu.org/software/libc/manual/html_node/Configuration-of-AIO.html),
- man aio\_init.

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2 Glibc <aliases.h>

#### 13.2.1 endaliasent

Documentation:

man endaliasent

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.2 `getaliasbyname`

Documentation:

`man getaliasbyname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.3 `getaliasbyname_r`

Documentation:

`man getaliasbyname_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.4 `getaliasent`

Documentation:

`man getaliasent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.5 `getaliasent_r`

Documentation:

`man getaliasent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.2.6 setaliasent

Documentation:

man setaliasent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.3 Glibc <argp.h>

### 13.3.1 argp\_err\_exit\_status

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Global-Variables.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Global-Variables.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.2 argp\_error

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Helper-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Helper-Functions.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.3 argp\_failure

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Helper-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Helper-Functions.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.4 `argp_help`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Help.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Help.html).

Gnulib module: `argp`

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.5 `argp_parse`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp.html](https://www.gnu.org/software/libc/manual/html_node/Argp.html).

Gnulib module: `argp`

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.6 `argp_program_bug_address`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Global-Variables.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Global-Variables.html).

Gnulib module: `argp`

Portability problems fixed by Gnulib:

- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.7 `argp_program_version`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Global-Variables.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Global-Variables.html).

Gnulib module: `argp`

Portability problems fixed by Gnulib:

- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:



### 13.3.8 argp\_program\_version\_hook

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Global-Variables.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Global-Variables.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This variable is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.9 argp\_state\_help

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Helper-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Helper-Functions.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.3.10 argp\_usage

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Argp-Helper-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argp-Helper-Functions.html).

Gnulib module: argp

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

## 13.4 Glibc <argz.h>

### 13.4.1 argz\_add

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- man argz-add.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.2 argz\_add\_sep

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz-add_sep`.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.3 argz\_append

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz-append`.

Gnulib module: argz

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.4 `argz_count`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz-count`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.5 `argz_create`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz-create`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.6 `argz_create_sep`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz-create_sep`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.7 argz\_delete

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_delete`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.8 argz\_extract

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_extract`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.9 argz\_insert

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_insert`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.10 `argz_next`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_next`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.11 `argz_replace`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_replace`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

### 13.4.12 argz\_stringify

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-argz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Argz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Argz-Functions.html),
- `man argz_stringify`.

Gnulib module: `argz`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.
- This function is broken on some platforms: Cygwin 1.5.24.

Portability problems not fixed by Gnulib:

## 13.5 Glibc Extensions to `<arpa/inet.h>`

### 13.5.1 `inet_aton`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inet-aton-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inet-aton-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html),
- `man inet_aton`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 13.5.2 `inet_lnaof`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html),
- `man inet_lnaof`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

### 13.5.3 inet\_makeaddr

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html),
- `man inet_makeaddr`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

### 13.5.4 inet\_net\_ntop

Documentation:

`man inet_net_ntop`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.5.5 inet\_net\_pton

Documentation:

`man inet_net_pton`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.5.6 inet\_netof

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html),
- `man inet_netof`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 4.4.

### 13.5.7 inet\_network

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Functions.html),
- `man inet_network`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 4.4.

### 13.5.8 inet\_nsap\_addr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, HP-UX 11.00, Cygwin 2.9, mingw, MSVC 14.

### 13.5.9 inet\_nsap\_ntoa

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, HP-UX 11.00, Cygwin 2.9, mingw, MSVC 14.

## 13.6 Glibc <byteswap.h>

### 13.6.1 bswap\_16

Documentation:

`man bswap_16`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.6.2 bswap\_32

Documentation:

man bswap\_32

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.6.3 bswap\_64

Documentation:

man bswap\_64

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.7 Glibc Extensions to <complex.h>

### 13.7.1 clog10

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- man clog10.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 9, Android 9.0.

### 13.7.2 clog10f

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- `man clog10f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 9, Android 9.0.

### 13.7.3 `clog10l`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib---clog10l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- `man clog10l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 9, Android 9.0.

## 13.8 Glibc Extensions to `<ctype.h>`

### 13.8.1 `isctype`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.9 Glibc Extensions to `<dirent.h>`

### 13.9.1 getdirentries

Documentation:

man getdirentries

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on huge directories larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

### 13.9.2 scandirat

Documentation:

man scandirat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.10, mingw, MSVC 14, Android 6.0.

### 13.9.3 versionsort

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-Directory-Content.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-Directory-Content.html),
- man versionsort.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

## 13.10 Glibc Extensions to `<dlfcn.h>`

### 13.10.1 dladdr

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dladdr-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dladdr-3.html)

Documentation:

man dladdr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14.

### 13.10.2 dladdr1

Documentation:

man dladdr1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.10.3 dlinfo

Documentation:

man dlinfo

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.10.4 dlmopen

Documentation:

man dlmopen

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.10.5 dlvsym

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlvsym-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dlvsym-1.html)

Documentation:

man dlvsym

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

## 13.11 Glibc <envz.h>

### 13.11.1 envz\_add

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz_add`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.11.2 envz\_entry

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz_entry`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.11.3 envz\_get

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz-get`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.11.4 envz\_merge

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz-merge`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.11.5 envz\_remove

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz_remove`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.11.6 envz\_strip

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-envz-add.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Envz-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Envz-Functions.html),
- `man envz_strip`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

## 13.12 Glibc <err.h>

### 13.12.1 err

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-err-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-err-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man err`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.2 errx

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-errx-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-errx-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man errx`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.3 verr

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man verr`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.4 verrx

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-verrx-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-verrx-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man verrx`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.5 vwarn

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man vwarn`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.6 vwarnx

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man vwarnx`.



Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.7 warn

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warn-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warn-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- man warn.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

### 13.12.8 warnx

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warnx-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-warnx-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- man warnx.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

## 13.13 Glibc Extensions to <errno.h>

### 13.13.1 program\_invocation\_name

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- man program\_invocation\_name.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 9.0.

### 13.13.2 `program_invocation_short_name`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man program_invocation_short_name`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 9.0.

## 13.14 Glibc `<error.h>`

### 13.14.1 `error`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-error-n.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-error-n.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man error`.

Gnulib module: `error`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.
- This function outputs an extra space if `error_print_progname` is set, on some platforms: Android 11.

Portability problems not fixed by Gnulib:

### 13.14.2 `error_at_line`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man error_at_line`.

Gnulib module: error

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

### 13.14.3 `error_message_count`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man error_message_count`.

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

### 13.14.4 `error_one_per_line`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html),
- `man error_one_per_line`.

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

### 13.14.5 `error_print_progname`

Documentation:

`man error_print_progname`

Gnulib module: error

Portability problems fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

## 13.15 Glibc <execinfo.h>

### 13.15.1 backtrace

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Backtraces.html](https://www.gnu.org/software/libc/manual/html_node/Backtraces.html),
- man backtrace.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.15.2 backtrace\_symbols

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Backtraces.html](https://www.gnu.org/software/libc/manual/html_node/Backtraces.html),
- man backtrace\_symbols.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.15.3 backtrace\_symbols\_fd

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-backtrace-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Backtraces.html](https://www.gnu.org/software/libc/manual/html_node/Backtraces.html),
- man backtrace\_symbols\_fd.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.16 Glibc Extensions to `<fcntl.h>`

### 13.16.1 `fallocate`

Documentation:

`man fallocate`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on older glibc versions and many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly across the entire data range of files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

### 13.16.2 `name_to_handle_at`

Documentation:

`man name_to_handle_at`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.16.3 `readahead`

Documentation:

`man readahead`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.0.4.

### 13.16.4 `open_by_handle_at`

Documentation:

`man open_by_handle_at`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.16.5 `sync_file_range`

Documentation:

`man sync_file_range`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.5, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

## 13.17 Glibc Extensions to `<fcntl.h>`

### 13.17.1 `fedisableexcept`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fedisableexcept.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fedisableexcept.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Control-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html),
- `man fedisableexcept`.

Gnulib module: `fcntl-exceptions-trapping`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, musl libc, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

### 13.17.2 `feenableexcept`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feenableexcept.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feenableexcept.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Control-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html),
- `man feenableexcept`.

Gnulib module: `fcntl-exceptions-trapping`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, musl libc, FreeBSD 5.2.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.
- This function does not detect failures on glibc 2.19/aarch64, FreeBSD 12.2/arm, FreeBSD 12.2/arm64.

Portability problems not fixed by Gnulib:

- The resulting signal is `SIGILL` instead of `SIGFPE` on some platforms: Linux/hppa, macOS 12.5/arm64.

### 13.17.3 fegetexcept

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fegetexcept.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fegetexcept.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Control-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Control-Functions.html),
- `man fegetexcept`.

Gnulib module: `fcntl-exceptions-trapping`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, musl libc, FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.7, mingw, MSVC 14, Android 4.4.

Portability problems not fixed by Gnulib:

## 13.18 Glibc Extensions to `<fmtmsg.h>`

### 13.18.1 addseverity

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Adding-Severity-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Adding-Severity-Classes.html),
- `man addseverity`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.19 Glibc <fstab.h>

### 13.19.1 endfsent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- man endfsent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.19.2 getfsent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- man getfsent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.19.3 getfsfile

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- man getfsfile.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.19.4 getfsspec

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- `man getfsspec`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.19.5 setfsent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/fstab.html](https://www.gnu.org/software/libc/manual/html_node/fstab.html),
- `man setfsent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.20 Glibc <fts.h>

### 13.20.1 fts\_children

Documentation:

`man fts_children`

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not correctly report the size of files or block devices larger than 2 GB and may not work correctly on huge directories larger than 2 GB. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. The fix is to use the `AC_SYS_LARGEFILE` macro (only on Mac OS X systems).

### 13.20.2 fts\_close

Documentation:

`man fts_close`

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 13.20.3 `fts_open`

Documentation:

`man fts_open`

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 13.20.4 `fts_read`

Documentation:

`man fts_read`

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

- On platforms where `off_t` is a 32-bit type, this function may not correctly report the size of files or block devices larger than 2 GB and may not work correctly on huge directories larger than 2 GB. Also, on platforms where `ino_t` is a 32-bit type, this function may report inode numbers incorrectly. The fix is to use the `AC_SYS_LARGEFILE` macro (only on Mac OS X systems).

### 13.20.5 `fts_set`

Documentation:

`man fts_set`

Gnulib module: `fts`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

## 13.21 Glibc `<getopt.h>`

### 13.21.1 getopt\_long

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Getopt-Long-Options.html](https://www.gnu.org/software/libc/manual/html_node/Getopt-Long-Options.html),
- `man getopt_long`.

Gnulib module: `getopt-gnu`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, MSVC 14.
- The function `getopt_long` does not obey the combination of '+' and ':' flags in the options string on some platforms: glibc 2.11.
- The use of 'W;' in the `optstring` argument to does not always allow `-W foo` to behave synonymously with `--foo`: glibc 2.11.
- The function `getopt_long` does not support the '+' flag in the options string on some platforms: macOS 11.1, AIX 5.2, Solaris 10.
- The value of `optind` after a missing required argument is wrong on some platforms: macOS 11.1.
- The function `getopt_long` does not obey the '-' flag in the options string when `POSIXLY_CORRECT` is set on some platforms: Cygwin 1.7.0.
- Some implementations fail to reset state, including re-checking `POSIXLY_CORRECT`, when `optind` is set to '0': NetBSD, Cygwin 1.7.0.
- The function `getopt_long` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, IRIX 6.5, Solaris 11 2010-11, Cygwin 1.5.x.
- This function crashes if the option string includes `W`; but there are no long options, on some platforms: glibc 2.14.

Portability problems not fixed by Gnulib:

### 13.21.2 getopt\_long\_only

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-only-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getopt-long-only-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Getopt-Long-Options.html](https://www.gnu.org/software/libc/manual/html_node/Getopt-Long-Options.html),
- `man getopt_long_only`.

Gnulib module: `getopt-gnu`

Portability problems fixed by Gnulib:

- The function `getopt_long_only` does not obey the combination of '+' and ':' flags in the options string on some platforms: glibc 2.11.

- The use of 'W;' in the optstring argument to does not always allow `-W foo` to behave synonymously with `--foo`: glibc 2.11.
- The function `getopt_long_only` does not support the '+' flag in the options string on some platforms: macOS 11.1, AIX 5.2, Solaris 10.
- The value of `optind` after a missing required argument is wrong on some platforms: macOS 11.1.
- The function `getopt_long_only` does not obey the '-' flag in the options string when `POSIXLY_CORRECT` is set on some platforms: Cygwin 1.7.0.
- Some implementations fail to reset state, including re-checking `POSIXLY_CORRECT`, when `optind` is set to '0': NetBSD, Cygwin 1.7.0.
- The function `getopt_long_only` does not support options with optional arguments on some platforms: macOS 11.1, OpenBSD 4.0, AIX 5.2, Solaris 11 2010-11, Cygwin 1.5.x.
- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.
- This function crashes if the option string includes W; but there are no long options, on some platforms: glibc 2.14.

Portability problems not fixed by Gnulib:

- Some implementations return success instead of reporting an ambiguity if user's option is a prefix of two long options with the same outcome: FreeBSD.
- The GNU Coding Standards discourage the use of `getopt_long_only` in new programs.

## 13.22 Glibc Extensions to `<glob.h>`

### 13.22.1 `glob_pattern_p`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

## 13.23 Glibc Extensions to `<gnu/libc-version.h>`

### 13.23.1 `gnu_get_libc_release`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html)

Documentation:

`man gnu_get_libc_release`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.23.2 gnu\_get\_libc\_version

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gnu-get-libc-version-1.html)

Documentation:

man gnu\_get\_libc\_version

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.24 Glibc Extensions to <grp.h>

### 13.24.1 fgetgrent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html),
- man fgetgrent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.24.2 fgetgrent\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html),
- man fgetgrent\_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.24.3 getgrent\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrent-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrent-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Groups.html),
- `man getgrent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.24.4 getgrouplist

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrouplist-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getgrouplist-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Setting-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Setting-Groups.html),
- `man getgrouplist`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function takes `int` instead of `gid_t` parameters on some platforms: OS X 10.11.
- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.0, Cygwin 1.7.9, mingw, MSVC 14.

The Gnulib module `getugroups` provides a similar API.

### 13.24.5 initgroups

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initgroups-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initgroups-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Setting-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Setting-Groups.html),
- `man initgroups`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is unsafe to call between `fork` and `exec` if the parent process is multi-threaded. Instead, use `getgroups` or `getgrouplist` (or use the gnulib module `mgetgroups`) before forking, and `setgroups` in the child.
- This function is missing on some platforms: mingw, MSVC 14.

### 13.24.6 putgrent

Documentation:

man putgrent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.24.7 setgroups

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setgroups-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setgroups-2.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Setting-Groups.html](https://www.gnu.org/software/libc/manual/html_node/Setting-Groups.html),
- man setgroups.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.
- On very old systems, this function operated on an array of ‘`int`’, even though that was a different size than an array of ‘`gid_t`’; you can use `autoconf`’s `AC_TYPE_GETGROUPS` to set `GETGROUPS_T` to the appropriate size (since `getgroups` and `setgroups` share the same bug).

## 13.25 Glibc <gshadow.h>

### 13.25.1 endsgent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.2 `fgetsgent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.3 `fgetsgent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.4 `getsgent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.5 `getsgent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.6 `getsgnam`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.25.7 getsnam\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.8 putsget

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.9 setsget

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.10 sgetsget

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.25.11 sgetsget\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.26 Glibc <ifaddrs.h>

### 13.26.1 getifaddrs

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getifaddrs.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getifaddrs.html)

Documentation:

man getifaddrs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

### 13.26.2 freeifaddrs

Documentation:

man freeifaddrs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

## 13.27 Glibc <libintl.h>

### 13.27.1 bind\_textdomain\_codeset

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bind-textdomain-codeset.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bind-textdomain-codeset.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Charset-conversion-in-gettext.html](https://www.gnu.org/software/libc/manual/html_node/Charset-conversion-in-gettext.html),
- man bind\_textdomain\_codeset.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.2 bindtextdomain

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindtextdomain.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindtextdomain.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Locating-gettext-catalog.html](https://www.gnu.org/software/libc/manual/html_node/Locating-gettext-catalog.html),
- man bindtextdomain.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.3 dcgettext

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcgettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcgettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Translation-with-gettext.html](https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html),
- man dcgettext.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.4 dcngettext

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcngettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dcngettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Advanced-gettext-functions.html](https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html),

- `man dcngettext`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.5 `dgettext`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dgettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dgettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Translation-with-gettext.html](https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html),
- `man dgettext`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.6 `dngettext`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dngettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dngettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Advanced-gettext-functions.html](https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html),
- `man dngettext`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.7 gettext

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Translation-with-gettext.html](https://www.gnu.org/software/libc/manual/html_node/Translation-with-gettext.html),
- `man gettext`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.8 ngettext

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ngettext.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ngettext.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Advanced-gettext-functions.html](https://www.gnu.org/software/libc/manual/html_node/Advanced-gettext-functions.html),
- `man ngettext`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.27.9 textdomain

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-textdomain.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-textdomain.html)

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1122>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Locating-gettext-catalog.html](https://www.gnu.org/software/libc/manual/html_node/Locating-gettext-catalog.html),

- `man textdomain`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.28 Glibc <link.h>

### 13.28.1 `dl_iterate_phdr`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dl-iterate-phdr-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dl-iterate-phdr-1.html)

Documentation:

`man dl_iterate_phdr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

## 13.29 Glibc <malloc.h>

### 13.29.1 `mallinfo`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Statistics-of-Malloc.html](https://www.gnu.org/software/libc/manual/html_node/Statistics-of-Malloc.html),
- `man mallinfo`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14.

### 13.29.2 `mallinfo2`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Statistics-of-Malloc.html](https://www.gnu.org/software/libc/manual/html_node/Statistics-of-Malloc.html),
- `man mallinfo2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.32, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.29.3 malloc\_info

Documentation:

man malloc\_info

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.29.4 malloc\_stats

Documentation:

man malloc\_stats

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.29.5 malloc\_trim

Documentation:

man malloc\_trim

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.29.6 malloc\_usable\_size

Documentation:

man malloc\_usable\_size

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 4.1.

### 13.29.7 mallopt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Malloc-Tunable-Parameters.html](https://www.gnu.org/software/libc/manual/html_node/Malloc-Tunable-Parameters.html),
- `man mallopt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11 2010-11, mingw, MSVC 14, Android 7.1.

### 13.29.8 memalign

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Aligned-Memory-Blocks.html](https://www.gnu.org/software/libc/manual/html_node/Aligned-Memory-Blocks.html),
- `man memalign`.

Gnulib module: `memalign`

Portability problems fixed by Gnulib:

- This function is declared in `<stdlib.h>` instead of `<malloc.h>` on some platforms: Solaris 11.
- This function doesn't accept an alignment of 1 or 2 on some platforms: Solaris 11.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.00, mingw, MSVC 14.

The Gnulib module `aligned-malloc` provides functions for allocating and freeing blocks of suitably aligned memory.

### 13.29.9 pvalloc

Documentation:

`man pvalloc`

Gnulib module: —



Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.30 Glibc Extensions to `<math.h>`

### 13.30.1 `drem`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drem.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drem.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Remainder-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html),
- `man drem`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, mingw, MSVC 14.

### 13.30.2 `dremf`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dremf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dremf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Remainder-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html),
- `man dremf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

### 13.30.3 `dreml`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dreml.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-dreml.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Remainder-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Remainder-Functions.html),
- `man dreml`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.30.4 `exp10`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- `man exp10`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.30.5 `exp10f`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- `man exp10f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.30.6 exp10l

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-exp10l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Exponents-and-Logarithms.html](https://www.gnu.org/software/libc/manual/html_node/Exponents-and-Logarithms.html),
- `man exp10l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.30.7 finite

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finite.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finite.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man finite`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, MSVC 14.

### 13.30.8 finitelf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitelf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitelf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man finitelf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14.

### 13.30.9 finitel

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitel.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-finitel.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man finitel`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.30.10 gamma

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gamma.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gamma.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man gamma`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 13.30.11 gammaf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gammaf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gammaf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man gammaf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.12 `gammal`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gammal.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gammal.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man gammal`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.13 `isinff`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man isinff`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Android 9.0.

### 13.30.14 `isinfl`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man isinfl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Android 9.0.

### 13.30.15 isnanf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man isnanf`.

Gnulib module: `isnanf`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, MSVC 14.

Portability problems not fixed by Gnulib:

### 13.30.16 isnanl

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Floating-Point-Classes.html](https://www.gnu.org/software/libc/manual/html_node/Floating-Point-Classes.html),
- `man isnanl`.

Gnulib module: `isnanl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, MSVC 14, Android 4.4.
- This function is not declared on some platforms: Android 9.0.

Portability problems not fixed by Gnulib:

### 13.30.17 j0f

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j0f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j0f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man j0f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.18 j0l

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j0l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j0l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man j0l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.19 j1f

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j1f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j1f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man j1f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.20 j1l

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j1l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-j1l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man j1l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.21 jnf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- man jnf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.22 jnl

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnl.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jnl.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- man jnl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.23 lgamma\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgamma-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgamma-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),



- `man lgamma_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5 x86, Minix 3.1.8, IRIX 6.5, mingw, MSVC 14.

### 13.30.24 `lgammaf_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammaf-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammaf-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man lgammaf_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.25 `lgammal_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammal-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lgammal-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man lgammal_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 13.30.26 `matherr`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-matherr-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-matherr-1.html)

Documentation:

man matherr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14, Android 9.0.

### 13.30.27 pow10

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10.html)

Documentation:

man pow10

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.30.28 pow10f

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10f.html)

Documentation:

man pow10f

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.30.29 pow10l

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pow10l.html)

Documentation:

man pow10l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.30.30 scalbf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Normalization-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Normalization-Functions.html),
- man scalbf.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.31 scalbl

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbl.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-scalbl.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Normalization-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Normalization-Functions.html),
- man scalbl.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.30.32 significand

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significand.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significand.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Normalization-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Normalization-Functions.html),

- `man significand`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.33 `significandf`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significandf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significandf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Normalization-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Normalization-Functions.html),
- `man significandf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.34 `significandl`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significandl.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-significandl.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Normalization-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Normalization-Functions.html),
- `man significandl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

### 13.30.35 `sincos`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincos.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincos.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Trig-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html),

- `man sincos`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.36 `sincosf`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincosf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincosf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Trig-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html),
- `man sincosf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.37 `sincosl`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincosl.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sincosl.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Trig-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Trig-Functions.html),
- `man sincosl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14.

### 13.30.38 `y0f`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),

- `man y0f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.39 `y0l`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y0l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man y0l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.40 `y1f`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1f.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1f.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man y1f`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.41 y1l

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1l.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-y1l.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man y1l`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.30.42 ynf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man ynf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.30.43 ynl

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynl.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ynl.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Special-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Special-Functions.html),
- `man ynl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.31 Glibc <mcheck.h>

### 13.31.1 mcheck

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Heap-Consistency-Checking.html](https://www.gnu.org/software/libc/manual/html_node/Heap-Consistency-Checking.html),
- `man mcheck`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.31.2 mcheck\_check\_all

Documentation:

`man mcheck_check_all`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.31.3 mcheck\_pedantic

Documentation:

`man mcheck_pedantic`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.31.4 mprobe

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Heap-Consistency-Checking.html](https://www.gnu.org/software/libc/manual/html_node/Heap-Consistency-Checking.html),
- `man mprobe`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.31.5 mtrace

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Tracing-malloc.html](https://www.gnu.org/software/libc/manual/html_node/Tracing-malloc.html),
- `man mtrace`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.31.6 muntrace

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Tracing-malloc.html](https://www.gnu.org/software/libc/manual/html_node/Tracing-malloc.html),
- `man muntrace`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.32 Glibc <mntent.h>

### 13.32.1 addmntent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man addmntent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.32.2 endmntent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man endmntent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14, Android 4.4.

### 13.32.3 getmntent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man getmntent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.32.4 getmntent\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man getmntent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 13.32.5 hasmntopt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man hasmntopt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 13.32.6 setmntent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/mtab.html](https://www.gnu.org/software/libc/manual/html_node/mtab.html),
- `man setmntent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Solaris 11.4, mingw, MSVC 14, Android 4.4.

## 13.33 Glibc Extensions to <netdb.h>

### 13.33.1 endnetgrent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Lookup-Netgroup.html](https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html),
- `man endnetgrent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.2 gethostbyaddr\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyaddr-r-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyaddr-r-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Names.html](https://www.gnu.org/software/libc/manual/html_node/Host-Names.html),
- `man gethostbyaddr_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.33.3 gethostbyname2

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Names.html](https://www.gnu.org/software/libc/manual/html_node/Host-Names.html),
- `man gethostbyname2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.

### 13.33.4 gethostbyname2\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-r-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname2-r-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Names.html](https://www.gnu.org/software/libc/manual/html_node/Host-Names.html),
- `man gethostbyname2_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.33.5 gethostbyname\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname-r-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-gethostbyname-r-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Names.html](https://www.gnu.org/software/libc/manual/html_node/Host-Names.html),
- `man gethostbyname_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14.

### 13.33.6 gethostent\_r

Documentation:

man gethostent\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.7 getnetbyaddr\_r

Documentation:

man getnetbyaddr\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.8 getnetbyname\_r

Documentation:

man getnetbyname\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.9 getnetent\_r

Documentation:

man getnetent\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.10 getnetgrent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Lookup-Netgroup.html](https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html),
- `man getnetgrent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.11 getnetgrent\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Lookup-Netgroup.html](https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html),
- `man getnetgrent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.12 getprotobyname\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotobyname-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotobyname-r.html)

Documentation:

`man getprotobyname_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.13 getprotobynumber\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotobynumber-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotobynumber-r.html)

Documentation:

`man getprotobynumber_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.33.14 `getprotoent_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotoent-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getprotoent-r.html)

Documentation:

`man getprotoent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.33.15 `getservbyname_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservbyname-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservbyname-r.html)

Documentation:

`man getservbyname_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.33.16 `getservbyport_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservbyport-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservbyport-r.html)

Documentation:

`man getservbyport_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.17 `getservent_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservent-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getservent-r.html)

Documentation:

`man getservent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.18 `herror`

Documentation:

`man herror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

### 13.33.19 `hstrerror`

Documentation:

`man hstrerror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

### 13.33.20 `innetgr`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Netgroup-Membership.html](https://www.gnu.org/software/libc/manual/html_node/Netgroup-Membership.html),
- `man innetgr`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



**13.33.21 rcmd**

Documentation:

man rcmd

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

**13.33.22 rcmd\_af**

Documentation:

man rcmd\_af

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

**13.33.23 rexec**

Documentation:

man rexec

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

**13.33.24 rexec\_af**

Documentation:

man rexec\_af

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.33.25 rresvport**

Documentation:

man rresvport

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.33.26 `rresvport_af`

Documentation:

`man rresvport_af`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.33.27 `ruserok`

Documentation:

`man ruserok`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.33.28 `ruserok_af`

Documentation:

`man ruserok_af`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.33.29 `setnetgrent`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Lookup-Netgroup.html](https://www.gnu.org/software/libc/manual/html_node/Lookup-Netgroup.html),
- `man setnetgrent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.34 Glibc <netinet/ether.h>

### 13.34.1 ether\_aton

Documentation:

man ether\_aton

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

### 13.34.2 ether\_aton\_r

Documentation:

man ether\_aton\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

### 13.34.3 ether\_hostton

Documentation:

man ether\_hostton

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.34.4 ether\_line

Documentation:

man ether\_line

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.34.5 ether\_ntoa

Documentation:

man ether\_ntoa

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

### 13.34.6 ether\_ntoa\_r

Documentation:

man ether\_ntoa\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 2.3.

### 13.34.7 ether\_ntohost

Documentation:

man ether\_ntohost

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.35 Glibc Extensions to <netinet/in.h>

### 13.35.1 bindresvport

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindresvport-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-bindresvport-3.html)

Documentation:

man bindresvport

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 1.5.x, mingw, MSVC 14.

### 13.35.2 getipv4sourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.3 getsourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.4 in6addr\_any

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Data-Type.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Data-Type.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

### 13.35.5 in6addr\_loopback

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Host-Address-Data-Type.html](https://www.gnu.org/software/libc/manual/html_node/Host-Address-Data-Type.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11.00, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 6.0.

### 13.35.6 inet6\_option\_alloc

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.7 `inet6_option_append`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.8 `inet6_option_find`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.9 `inet6_option_init`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.10 `inet6_option_next`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.11 `inet6_option_space`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.12 `inet6_opt_append`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.13 `inet6_opt_find`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.14 `inet6_opt_finish`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.15 `inet6_opt_get_val`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.16 `inet6_opt_init`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.17 `inet6_opt_next`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.35.18 inet6\_opt\_set\_val**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.35.19 inet6\_rth\_add**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.35.20 inet6\_rth\_getaddr**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.35.21 inet6\_rth\_init**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.35.22 inet6\_rth\_reverse**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.35.23 inet6\_rth\_segments

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.24 inet6\_rth\_space

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.4, Mac OS X 10.5, NetBSD 3.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 9, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.25 setipv4sourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.35.26 setsourcefilter

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.36 Glibc <obstack.h>

### 13.36.1 obstack\_alloc\_failed\_handler

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Preparing-for-Obstacks.html](https://www.gnu.org/software/libc/manual/html_node/Preparing-for-Obstacks.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.36.2 `obstack_exit_failure`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.36.3 `obstack_free`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Freeing-Obstack-Objects.html](https://www.gnu.org/software/libc/manual/html_node/Freeing-Obstack-Objects.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.36.4 `obstack_printf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Dynamic-Output.html](https://www.gnu.org/software/libc/manual/html_node/Dynamic-Output.html).

Gnulib module: `obstack-printf` or `obstack-printf-posix` or `obstack-printf-gnu`

Portability problems fixed by either Gnulib module `obstack-printf` or `obstack-printf-posix` or `obstack-printf-gnu`:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems fixed by either Gnulib module `obstack-printf-posix` or `obstack-printf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- `printf` of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.0, mingw, MSVC 14.

- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as “%2\$s”, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘ ’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 6.1.
- printf “%010f” of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.0, Cygwin 1.5.x, mingw, MSVC/clang.
- printf “%#.0x” or “%#.0X” with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: Solaris 10/x86, mingw, MSVC/clang.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw, MSVC 14.

Portability problems fixed by Gnulib module `obstack-printf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.

### 13.36.5 `obstack_vprintf`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Variable-Arguments-Output.html](https://www.gnu.org/software/libc/manual/html_node/Variable-Arguments-Output.html).

Gnulib module: `obstack-printf` or `obstack-printf-posix` or `obstack-printf-gnu`

Portability problems fixed by either Gnulib module `obstack-printf` or `obstack-printf-posix` or `obstack-printf-gnu`:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems fixed by either Gnulib module `obstack-printf-posix` or `obstack-printf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.24, old mingw, MSVC 9.
- printf of ‘long double’ numbers is unsupported on some platforms: mingw, MSVC 14.
- printf “%f”, “%e”, “%g” of Infinity and NaN yields an incorrect result on some platforms: AIX 5.2, Solaris 11.0, mingw, MSVC 14.
- This function does not support the ‘a’ and ‘A’ directives on some platforms: glibc-2.3.6, NetBSD 9.0, OpenBSD 4.0, AIX 5.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘b’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9.0, mingw, MSVC 14.
- This function does not support the ‘F’ directive on some platforms: NetBSD 3.0, AIX 5.1, HP-UX 11.23, IRIX 6.5, Solaris 9, Cygwin 1.5.x, mingw, MSVC 14.
- This function does not support the ‘n’ directive on some platforms: MSVC 14.
- This function does not support the ‘ls’ directive on some platforms: OpenBSD 4.0, IRIX 6.5, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘ls’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as “%2\$s”, on some platforms: NetBSD 3.0, mingw, MSVC 14.
- This function doesn’t support the ‘ ’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24, mingw, MSVC 14.
- This function does not round the argument of the ‘a’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 6.1.
- printf “%010f” of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, AIX 5.2, IRIX 6.5, Solaris 11.0, Cygwin 1.5.x, mingw, MSVC/clang.
- printf “%#.0x” or “%#.0X” with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function does not support precisions larger than 512 or 1024 in integer, floating-point and pointer output on some platforms: Solaris 10/x86, mingw, MSVC/clang.
- This function produces wrong output for the ‘lc’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.

- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.
- This function does not fully support the ‘n’ directive on some platforms: HP-UX 11, mingw, MSVC 14.

Portability problems fixed by Gnulib module `obstack-printf-gnu`:

- This function does not support the ‘B’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.

## 13.37 Glibc Extensions to `<poll.h>`

### 13.37.1 `ppoll`

Documentation:

`man ppoll`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 3.8, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 4.3.

## 13.38 Glibc `<printf.h>`

### 13.38.1 `parse_printf_format`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Parsing-a-Template-String.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-a-Template-String.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.2 `printf_size`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Predefined-Printf-Handlers.html](https://www.gnu.org/software/libc/manual/html_node/Predefined-Printf-Handlers.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.3 `printf_size_info`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Predefined-Printf-Handlers.html](https://www.gnu.org/software/libc/manual/html_node/Predefined-Printf-Handlers.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.4 `register_printf_function`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Registering-New-Conversions.html](https://www.gnu.org/software/libc/manual/html_node/Registering-New-Conversions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.5 `register_printf_modifier`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.6 `register_printf_specifier`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.38.7 register\_printf\_type

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.39 Glibc Extensions to <pthread.h>

### 13.39.1 pthread\_attr\_getaffinity\_np

Documentation:

man pthread\_attr\_getaffinity\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.3.3.

### 13.39.2 pthread\_attr\_setaffinity\_np

Documentation:

man pthread\_attr\_setaffinity\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.3.3.

### 13.39.3 pthread\_attr\_getsigmask\_np

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Initial-Thread-Signal-Mask.html](https://www.gnu.org/software/libc/manual/html_node/Initial-Thread-Signal-Mask.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.4 pthread\_attr\_setsigmask\_np

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Initial-Thread-Signal-Mask.html](https://www.gnu.org/software/libc/manual/html_node/Initial-Thread-Signal-Mask.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.5 pthread\_clockjoin\_np

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Default-Thread-Attributes.html](https://www.gnu.org/software/libc/manual/html_node/Default-Thread-Attributes.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.6 pthread\_cond\_clockwait

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Non\\_002dPOSIX-Extensions.html](https://www.gnu.org/software/libc/manual/html_node/Non_002dPOSIX-Extensions.html),

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.7 pthread\_getaffinity\_np

Documentation:

man pthread\_getaffinity\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



- This function has a different signature on some platforms: glibc 2.3.3.
- The third parameter has a different type on some platforms: FreeBSD 14.0, NetBSD 9.0.

### 13.39.8 pthread\_getattr\_default\_np

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Default-Thread-Attributes.html](https://www.gnu.org/software/libc/manual/html_node/Default-Thread-Attributes.html),
- `man pthread_getattr_default_np`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.17, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.9 pthread\_getattr\_np

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread-getattr-np-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread-getattr-np-1.html)

Documentation:

`man pthread_getattr_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.9, mingw, MSVC 14.

### 13.39.10 pthread\_getname\_np

Documentation:

`man pthread_getname_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 12.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

**13.39.11 pthread\_kill\_other\_threads\_np**

Documentation:

man pthread\_kill\_other\_threads\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.39.12 pthread\_mutex\_clocklock**

Documentation: —

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.39.13 pthread\_rwlock\_clockrdlock**

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Non\\_002dPOSIX-Extensions.html](https://www.gnu.org/software/libc/manual/html_node/Non_002dPOSIX-Extensions.html),

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.39.14 pthread\_rwlock\_clockwrlock**

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Non\\_002dPOSIX-Extensions.html](https://www.gnu.org/software/libc/manual/html_node/Non_002dPOSIX-Extensions.html),

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.15 pthread\_rwlockattr\_getkind\_np

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread\\_rwlockattr\\_getkind\\_np-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread_rwlockattr_getkind_np-1.html)

Documentation:

man pthread\_rwlockattr\_getkind\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.39.16 pthread\_rwlockattr\_setkind\_np

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread\\_rwlockattr\\_getkind\\_np-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pthread_rwlockattr_getkind_np-1.html)

Documentation:

man pthread\_rwlockattr\_setkind\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.39.17 pthread\_setaffinity\_np

Documentation:

man pthread\_setaffinity\_np

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has a different signature on some platforms: glibc 2.3.3.
- The third parameter has a different type on some platforms: FreeBSD 14.0, NetBSD 9.0.

### 13.39.18 pthread\_setattr\_default\_np

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Default-Thread-Attributes.html](https://www.gnu.org/software/libc/manual/html_node/Default-Thread-Attributes.html),
- `man pthread_setattr_default_np`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.17, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.39.19 pthread\_setname\_np

Documentation:

`man pthread_setname_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.11, Mac OS X 10.5, FreeBSD 12.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14.
- This function has a different signature on some platforms: NetBSD 9.0. On NetBSD the second argument is interpreted as a `printf` format string, with the third argument as parameter.

### 13.39.20 pthread\_sigqueue

Documentation:

`man pthread_sigqueue`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

### 13.39.21 pthread\_timedjoin\_np

Documentation:

`man pthread_timedjoin_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 6.4, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- FreeBSD 6.4 has a function of this name in `libthr` but not in `libpthread`, and it also is missing a declaration.

### 13.39.22 `pthread_tryjoin_np`

Documentation:

man `pthread_tryjoin_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.3.2, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.40 Glibc `<pty.h>`

### 13.40.1 `forkpty`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Pseudo\\_002dTerminal-Pairs.html](https://www.gnu.org/software/libc/manual/html_node/Pseudo_002dTerminal-Pairs.html),
- man `forkpty`.

Gnulib module: `forkpty`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- On some systems (at least including Cygwin and Mac OS X) linking with `-lutil` is not required.
- On glibc, OpenBSD, NetBSD and FreeBSD linking with `-lutil` is required.
- The function is declared in `pty.h` on glibc and Cygwin. It is declared in `util.h` on Mac OS X, OpenBSD, and NetBSD. It is declared in `libutil.h` on FreeBSD. It is declared in `termios.h` on Solaris.
- Some platforms declare the function without marking the last two parameters `const`. FreeBSD 14.0, Solaris 11.4, Cygwin 1.7.1.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 13.40.2 openpty

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Pseudo\\_002dTerminal-Pairs.html](https://www.gnu.org/software/libc/manual/html_node/Pseudo_002dTerminal-Pairs.html),
- `man openpty`.

Gnulib module: `openpty`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- On some systems (at least including Cygwin and Mac OS X) linking with `-lutil` is not required.
- On glibc, OpenBSD, NetBSD and FreeBSD linking with `-lutil` is required.
- The function is declared in `pty.h` on glibc and Cygwin. It is declared in `util.h` on Mac OS X, OpenBSD, and NetBSD. It is declared in `libutil.h` on FreeBSD. It is declared in `termios.h` on Solaris.
- Some platforms declare the function without marking the last two parameters `const`. FreeBSD 14.0, Solaris 11.4, Cygwin 1.7.1.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

## 13.41 Glibc Extensions to `<pwd.h>`

### 13.41.1 fgetpwent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Users.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html),
- `man fgetpwent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.41.2 fgetpwent\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Users.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html),
- `man fgetpwent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.41.3 getpw

Documentation:

man getpw

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.41.4 getpwent\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpwent-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpwent-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scanning-All-Users.html](https://www.gnu.org/software/libc/manual/html_node/Scanning-All-Users.html),
- man getpwent\_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.41.5 putpwent

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Writing-a-User-Entry.html](https://www.gnu.org/software/libc/manual/html_node/Writing-a-User-Entry.html),
- man putpwent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.42 Glibc Extensions to <regex.h>

### 13.42.1 re\_comp

Documentation:

man re\_comp

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.2 re\_compile\_fastmap

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.3 re\_compile\_pattern

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.4 re\_exec

Documentation:

man re\_exec

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.5 re\_match

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.42.6 `re_match_2`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.7 `re_search`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.8 `re_search_2`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.9 `re_set_registers`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.10 `re_set_syntax`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.42.11 re\_syntax\_options

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.43 Glibc <regex.h>

### 13.43.1 advance

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.43.2 loc1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.43.3 loc2

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.43.4 locs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.43.5 step

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.44 Glibc <resolv.h>

### 13.44.1 dn\_comp

Documentation:

man dn\_comp

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.2 dn\_expand

Documentation:

man dn\_expand

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.3 dn\_skipname

Documentation:

man dn\_skipname

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.4 res\_dnok

Documentation:

man res\_dnok

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.44.5 `res_hnok`

Documentation:

man `res_hnok`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.44.6 `res_init`

Documentation:

man `res_init`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

#### 13.44.7 `res_mailok`

Documentation:

man `res_mailok`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.44.8 `res_mkquery`

Documentation:

man `res_mkquery`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.9 res\_nmquery

Documentation:

man res\_nmquery

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.10 res\_nquery

Documentation:

man res\_nquery

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.11 res\_nquerydomain

Documentation:

man res\_nquerydomain

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.12 res\_nsearch

Documentation:

man res\_nsearch

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.13 `res_nsend`

Documentation:

`man res_nsend`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.31, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.14 `res_ownok`

Documentation:

`man res_ownok`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, HP-UX 11.11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.44.15 `res_query`

Documentation:

`man res_query`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.16 `res_querydomain`

Documentation:

`man res_querydomain`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.44.17 `res_search`

Documentation:

`man res_search`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Cygwin 1.5.x, mingw, MSVC 14.

### 13.44.18 `res_send`

Documentation:

`man res_send`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.3.0, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

## 13.45 Glibc `<rpc/auth.h>`

### 13.45.1 `authdes_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.2 `authdes_pk_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.3 `authnone_create`

Documentation:

`man authnone_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.4 `authunix_create`

Documentation:

`man authunix_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.5 `authunix_create_default`

Documentation:

`man authunix_create_default`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.6 `getnetname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.7 `host2netname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.8 `key_decryptsession`

Documentation:

`man key_decryptsession`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.45.9 `key_decryptsession_pk`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.10 `key_encryptsession`

Documentation:

man `key_encryptsession`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.11 `key_encryptsession_pk`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.12 `key_gendes`

Documentation:

man `key_gendes`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.13 `key_get_conv`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.14 `key_secretkey_is_set`

Documentation:

`man key_secretkey_is_set`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.15 `key_setsecret`

Documentation:

`man key_setsecret`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.16 `netname2host`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.17 `netname2user`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.45.18 `user2netname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.19 xdr\_des\_block

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.45.20 xdr\_opaque\_auth

Documentation:

man xdr\_opaque\_auth

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.46 Glibc <rpc/auth\_des.h>

### 13.46.1 authdes\_getucred

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.46.2 getpublickey

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.46.3 getsecretkey

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.46.4 `rtime`

Documentation:

`man rtime`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.47 Glibc `<rpc/auth_unix.h>`

### 13.47.1 `xdr_authunix_parms`

Documentation:

`man xdr_authunix_parms`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.48 Glibc `<rpc/clnt.h>`

### 13.48.1 `callrpc`

Documentation:

`man callrpc`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.2 `clnt_create`

Documentation:

`man clnt_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.3 `clnt_pcreateerror`

Documentation:

man `clnt_pcreateerror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.4 `clnt_perrno`

Documentation:

man `clnt_perrno`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.5 `clnt_perror`

Documentation:

man `clnt_perror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.6 `clnt_spcreateerror`

Documentation:

man `clnt_spcreateerror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.7 `clnt_sperrno`

Documentation:

man `clnt_sperrno`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.8 `clnt_sperror`

Documentation:

man `clnt_sperror`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.9 `clntraw_create`

Documentation:

man `clntraw_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.10 `clnttcp_create`

Documentation:

man `clnttcp_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.11 `clntudp_bufcreate`

Documentation:

man `clntudp_bufcreate`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.12 `clntudp_create`

Documentation:

`man clntudp_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.13 `clntunix_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.14 `get_myaddress`

Documentation:

`man get_myaddress`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.15 `getrpcport`

Documentation:

`man getrpcport`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.48.16 `rpc_createerr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.49 Glibc <rpc/key\_prot.h>

### 13.49.1 xdr\_cryptkeyarg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.2 xdr\_cryptkeyarg2

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.3 xdr\_cryptkeyres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.4 xdr\_getcredres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.5 xdr\_key\_netstarg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.49.6 xdr\_key\_netstres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.7 xdr\_keybuf

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.8 xdr\_keystatus

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.9 xdr\_netnamestr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.49.10 xdr\_unixcred

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.50 Glibc <rpc/netdb.h>

### 13.50.1 `endrpcent`

Documentation:

`man endrpcent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.2 `getrpcbyname`

Documentation:

`man getrpcbyname`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.3 `getrpcbyname_r`

Documentation:

`man getrpcbyname_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.4 `getrpcbynumber`

Documentation:

`man getrpcbynumber`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.5 `getrpcbynumber_r`

Documentation:

`man getrpcbynumber_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.6 `getrpcnt`

Documentation:

`man getrpcnt`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.7 `getrpcnt_r`

Documentation:

`man getrpcnt_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.50.8 `setrpcnt`

Documentation:

`man setrpcnt`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.51 Glibc `<rpc/pmap_clnt.h>`

### 13.51.1 `clnt_broadcast`

Documentation:

`man clnt_broadcast`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.51.2 pmmap\_getmaps

Documentation:

man pmmap\_getmaps

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.51.3 pmmap\_getport

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmmap-getport-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmmap-getport-3.html)

Documentation:

man pmmap\_getport

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.51.4 pmmap\_rmtcall

Documentation:

man pmmap\_rmtcall

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.51.5 pmmap\_set

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmmap-set-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmmap-set-3.html)

Documentation:

man pmmap\_set

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.51.6 pmap\_unset

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmap-unset-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-pmap-unset-3.html)

Documentation:

man pmap\_unset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.52 Glibc <rpc/pmap\_prot.h>

### 13.52.1 xdr\_pmap

Documentation:

man xdr\_pmap

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.52.2 xdr\_pmaplist

Documentation:

man xdr\_pmaplist

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.53 Glibc <rpc/pmap\_rmt.h>

### 13.53.1 xdr\_rmtcall\_args

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.53.2 xdr\_rmtcallres

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.54 Glibc <rpc/rpc\_msg.h>

### 13.54.1 xdr\_callhdr

Documentation:

man xdr\_callhdr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.54.2 xdr\_callmsg

Documentation:

man xdr\_callmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.54.3 xdr\_replymsg

Documentation:

man xdr\_replymsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.55 Glibc <rpc/svc.h>

### 13.55.1 svc\_exit

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.2 svc\_fdset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.3 svc\_getreq

Documentation:

man svc\_getreq

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.4 svc\_getreq\_common

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.5 svc\_getreq\_poll

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.6 `svc_getreqset`

Documentation:

`man svc_getreqset`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.7 `svc_max_pollfd`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.8 `svc_pollfd`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.9 `svc_register`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-register-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-register-3.html)

Documentation:

`man svc_register`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.55.10 `svc_run`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-run-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-run-3.html)

Documentation:

`man svc_run`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.11 `svc_sendreply`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-sendreply-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svc-sendreply-3.html)

Documentation:

`man svc_sendreply`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.12 `svc_unregister`

Documentation:

`man svc_unregister`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.13 `svcerr_auth`

Documentation:

`man svcerr_auth`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.14 `svcerr_decode`

Documentation:

`man svcerr_decode`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.15 `svcerr_noproc`

Documentation:

`man svcerr_noproc`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.16 `svcerr_noprogram`

Documentation:

`man svcerr_noprogram`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.17 `svcerr_programvers`

Documentation:

`man svcerr_programvers`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.18 `svcerr_systemerr`

Documentation:

`man svcerr_systemerr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.19 `svcerr_weakauth`

Documentation:

`man svcerr_weakauth`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.20 `svcraw_create`

Documentation:

`man svcraw_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.21 `svctcp_create`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svctcp-create-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svctcp-create-3.html)

Documentation:

`man svctcp_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.22 `svcudp_bufcreate`

Documentation:

`man svcudp_bufcreate`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.23 `svcudp_create`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svcudp-create-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-svcudp-create-3.html)

Documentation:

`man svcudp_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.24 `svcunix_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.25 `xprt_register`

Documentation:

`man xprt_register`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.55.26 `xprt_unregister`

Documentation:

`man xprt_unregister`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.56 Glibc <rpc/xdr.h>

### 13.56.1 xdr\_array

Documentation:

man xdr\_array

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.2 xdr\_bool

Documentation:

man xdr\_bool

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.3 xdr\_bytes

Documentation:

man xdr\_bytes

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.4 xdr\_char

Documentation:

man xdr\_char

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.5 xdr\_double

Documentation:

man xdr\_double

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.6 xdr\_enum

Documentation:

man xdr\_enum

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.7 xdr\_float

Documentation:

man xdr\_float

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.8 xdr\_free

Documentation:

man xdr\_free

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.9 xdr\_hyper

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.10 xdr\_int

Documentation:

man xdr\_int

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.11 xdr\_int16\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.12 xdr\_int32\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.13 xdr\_int64\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.14 xdr\_int8\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.15 xdr\_long

Documentation:

man xdr\_long

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.16 xdr\_longlong\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.17 xdr\_netobj

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.18 xdr\_opaque

Documentation:

man xdr\_opaque

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.19 xdr\_pointer

Documentation:

man xdr\_pointer

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.



### 13.56.20 xdr\_quad\_t

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.56.21 xdr\_reference

Documentation:

man xdr\_reference

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.22 xdr\_short

Documentation:

man xdr\_short

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.23 xdr\_sizeof

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.24 xdr\_string

Documentation:

man xdr\_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.25 xdr\_u\_char

Documentation:

man xdr\_u\_char

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.26 xdr\_u\_hyper

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.27 xdr\_u\_int

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-xdr-u-int-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-xdr-u-int-3.html)

Documentation:

man xdr\_u\_int

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.28 xdr\_u\_long

Documentation:

man xdr\_u\_long

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

**13.56.29** `xdr_u_longlong_t`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

**13.56.30** `xdr_u_quad_t`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.56.31** `xdr_u_short`

Documentation:

`man xdr_u_short`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

**13.56.32** `xdr_uint16_t`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

**13.56.33** `xdr_uint32_t`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

**13.56.34 xdr\_uint64\_t**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

**13.56.35 xdr\_uint8\_t**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared in the header on some platforms: Cygwin 1.7.5.

**13.56.36 xdr\_union**

Documentation:

man xdr\_union

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

**13.56.37 xdr\_vector**

Documentation:

man xdr\_vector

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

**13.56.38 xdr\_void**

Documentation:

man xdr\_void

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### **13.56.39 xdr\_wrapstring**

Documentation:

man xdr\_wrapstring

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### **13.56.40 xdrmem\_create**

Documentation:

man xdrmem\_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### **13.56.41 xdrrec\_create**

Documentation:

man xdrrec\_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### **13.56.42 xdrrec\_endofrecord**

Documentation:

man xdrrec\_endofrecord

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.43 `xdrrec_eof`

Documentation:

`man xdrrec_eof`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.44 `xdrrec_skiprecord`

Documentation:

`man xdrrec_skiprecord`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

### 13.56.45 `xdrstdio_create`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-xdrstdio-create-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-xdrstdio-create-3.html)

Documentation:

`man xdrstdio_create`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.4, mingw, MSVC 14, Android 9.0.

## 13.57 Glibc `<rpcsvc/nislib.h>`

### 13.57.1 `nis_add`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.2 nis\_add\_entry

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.3 nis\_addmember

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.4 nis\_checkpoint

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.5 nis\_clone\_object

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.6 nis\_creategroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.7 nis\_destroy\_object

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.8 nis\_destroygroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.9 nis\_dir\_cmp

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.10 nis\_domain\_of

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.11 nis\_domain\_of\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.57.12 `nis_first_entry`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.13 `nis_freenames`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.14 `nis_freeresult`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.15 `nis_freeservlist`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.16 `nis_freetags`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.17 nis\_getnames

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.18 nis\_getservlist

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.19 nis\_ismember

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.20 nis\_leaf\_of

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.21 nis\_leaf\_of\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.22 nis\_lerror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.23 nis\_list

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.24 nis\_local\_directory

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.25 nis\_local\_group

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.26 nis\_local\_host

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.27 nis\_local\_principal**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.28 nis\_lookup**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.29 nis\_mkdir**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.30 nis\_modify**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.31 nis\_modify\_entry**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.32 nis\_name\_of**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.33 nis\_name\_of\_r**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.34 nis\_next\_entry**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.35 nis\_perror**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.36 nis\_ping**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.37 nis\_print\_directory**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.38 nis\_print\_entry**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.39 nis\_print\_group**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.40 nis\_print\_group\_entry**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.41 nis\_print\_link**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.42 nis\_print\_object

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.43 nis\_print\_result

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.44 nis\_print\_rights

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.45 nis\_print\_table

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.46 nis\_remove

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.47 nis\_remove\_entry**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.48 nis\_removemember**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.49 nis\_rmdir**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.50 nis\_servstate**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.57.51 nis\_sperrno**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.57.52 nis\_sperror

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.53 nis\_sperror\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.54 nis\_stats

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.57.55 nis\_verifygroup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.58 Glibc <rpcsvc/nis\_callback.h>

### 13.58.1 xdr\_cback\_data

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.58.2 xdr\_obj\_p

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.59 Glibc <rpcsvc/yp.h>

### 13.59.1 xdr\_domainname

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.2 xdr\_keydat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.3 xdr\_valdat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.4 xdr\_ypbind\_resptype

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.5 xdr\_yymap\_parms

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.6 xdr\_yymaplist

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.7 xdr\_yppushresp\_xfr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.8 xdr\_yppreq\_key

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.9 xdr\_yppreq\_nokey

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.10 xdr\_yppreq\_xfr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, OpenBSD 3.8, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.11 xdr\_ypresp\_all**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.12 xdr\_ypresp\_key\_val**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.13 xdr\_ypresp\_maplist**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.14 xdr\_ypresp\_master**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.15 xdr\_ypresp\_order**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.59.16 xdr\_ypresp\_val**

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.17 xdr\_ypresp\_xfr

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.18 xdr\_ypstat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 5.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.59.19 xdr\_ypxfrstat

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.60 Glibc <rpcsvc/ypclnt.h>

### 13.60.1 yp\_all

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.2 yp\_bind

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.3 `yp_first`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.4 `yp_get_default_domain`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.5 `yp_master`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.6 `yp_match`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.7 `yp_next`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.8 `yp_order`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.9 yp\_unbind

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.10 ypbinderr\_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.11 yperr\_string

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.60.12 ypprot\_err

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.61 Glibc Extensions to <sched.h>

### 13.61.1 clone

Documentation:

man clone

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.61.2 getcpu

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/CPU-Affinity.html](https://www.gnu.org/software/libc/manual/html_node/CPU-Affinity.html),
- `man getcpu`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.28, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.61.3 sched\_getaffinity

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-getaffinity.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-getaffinity.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/CPU-Affinity.html](https://www.gnu.org/software/libc/manual/html_node/CPU-Affinity.html),
- `man sched_getaffinity`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 3.0.

### 13.61.4 sched\_getcpu

Documentation:

`man sched_getcpu`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on most non-glibc platforms: glibc 2.5, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.61.5 sched\_setaffinity

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setaffinity.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sched-setaffinity.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/CPU-Affinity.html](https://www.gnu.org/software/libc/manual/html_node/CPU-Affinity.html),



- `man sched_setaffinity`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 3.0.

### 13.61.6 `setns`

Documentation:

`man setns`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

## 13.62 Glibc Extensions to `<search.h>`

### 13.62.1 `hcreate_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hcreate-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hcreate-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Hash-Search-Function.html](https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html),
- `man hcreate_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

### 13.62.2 `hdestroy_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hdestroy-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hdestroy-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Hash-Search-Function.html](https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html),

- `man hdestroy_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

### 13.62.3 `hsearch_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hsearch-r.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-hsearch-r.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Hash-Search-Function.html](https://www.gnu.org/software/libc/manual/html_node/Hash-Search-Function.html),
- `man hsearch_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 8.1.

### 13.62.4 `tdestroy`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Tree-Search-Function.html](https://www.gnu.org/software/libc/manual/html_node/Tree-Search-Function.html),
- `man tdestroy`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.0, mingw, MSVC 14, Android 4.0.4.

### 13.62.5 `twalk_r`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Tree-Search-Function.html](https://www.gnu.org/software/libc/manual/html_node/Tree-Search-Function.html),
- `man twalk_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.63 Glibc Extensions to <selinux/selinux.h>

### 13.63.1 fgetfilecon

Documentation:

man fgetfilecon

Gnulib module: selinux-h

Portability problems fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets `errno` to `ENOTSUP` and returns `'-1'`.
- On systems with SELinux support, this module provides a wrapper for the `fgetfilecon` function that insulates the caller from API-nonconforming behavior. Without this wrapper, `fgetfilecon` can return `'0'` and set the `context` pointer to `NULL`, and in another scenario can return `'10'` and set the `context` pointer to `'unlabeled'`. This wrapper returns `'-1'` in each case and sets `errno` to `ENOTSUP` and `ENODATA` respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

### 13.63.2 getfilecon

Documentation:

man getfilecon

Gnulib module: selinux-h

Portability problems fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets `errno` to `ENOTSUP` and returns `'-1'`.
- On systems with SELinux support, this module provides a wrapper for the `getfilecon` function that insulates the caller from API-nonconforming behavior. Without this wrapper, `getfilecon` can return `'0'` and set the `context` pointer to `NULL`, and in another scenario can return `'10'` and set the `context` pointer to `'unlabeled'`. This

wrapper returns ‘-1’ in each case and sets `errno` to `ENOTSUP` and `ENODATA` respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

### 13.63.3 `lgetfilecon`

Documentation:

`man lgetfilecon`

Gnulib module: `selinux-h`

Portability problems fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. On those platforms, this module provides a stub that always sets `errno` to `ENOTSUP` and returns ‘-1’.
- On systems with SELinux support, this module provides a wrapper for the `lgetfilecon` function that insulates the caller from API-nonconforming behavior. Without this wrapper, `lgetfilecon` can return ‘0’ and set the `context` pointer to `NULL`, and in another scenario can return ‘10’ and set the `context` pointer to ‘unlabeled’. This wrapper returns ‘-1’ in each case and sets `errno` to `ENOTSUP` and `ENODATA` respectively. While the conditions that can provoke such behavior are rare, the average caller does not handle them because the possibility of such behavior is not documented.

Portability problems not fixed by Gnulib:

## 13.64 Glibc Extensions to `<semaphore.h>`

### 13.64.1 `sem_clockwait`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Non\\_002dPOSIX-Extensions.html](https://www.gnu.org/software/libc/manual/html_node/Non_002dPOSIX-Extensions.html),

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65 Glibc `<shadow.h>`

### 13.65.1 endspent

Documentation:

man endspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.2 fgetspent

Documentation:

man fgetspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.3 fgetspent\_r

Documentation:

man fgetspent\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.4 getspent

Documentation:

man getspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.5 `getspent_r`

Documentation:

`man getspent_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.6 `getspnam`

Documentation:

`man getspnam`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.7 `getspnam_r`

Documentation:

`man getspnam_r`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.8 `lckpwordf`

Documentation:

`man lckpwordf`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.9 putspent

Documentation:

man putspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.10 setspent

Documentation:

man setspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.11 sgetspent

Documentation:

man sgetspent

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.12 sgetspent\_r

Documentation:

man sgetspent\_r

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.65.13 `ulckpwn`

Documentation:

`man ulckpwn`

Gnlib module: —

Portability problems fixed by Gnlib:

Portability problems not fixed by Gnlib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.66 Glibc Extensions to `<signal.h>`

### 13.66.1 `gsignal`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Signaling-Yourself.html](https://www.gnu.org/software/libc/manual/html_node/Signaling-Yourself.html),
- `man gsignal`.

Gnlib module: —

Portability problems fixed by Gnlib:

Portability problems not fixed by Gnlib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.2 `sigandset`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigandset.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigandset.html)

Documentation:

`man sigandset`

Gnlib module: —

Portability problems fixed by Gnlib:

Portability problems not fixed by Gnlib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.3 `sigblock`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Signal-Handling.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Signal-Handling.html),
- `man sigblock`.



Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

#### 13.66.4 siggetmask

Documentation:

man siggetmask

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.66.5 sigisemptyset

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigisemptyset.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigisemptyset.html)

Documentation:

man sigisemptyset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.66.6 sigorset

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigorset.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigorset.html)

Documentation:

man sigorset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.7 sigreturn

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigreturn-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sigreturn-2.html)

Documentation:

man sigreturn

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.8 sigsetmask

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Signal-Handling.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Signal-Handling.html),
- man sigsetmask.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.66.9 sigstack

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Signal-Stack.html](https://www.gnu.org/software/libc/manual/html_node/Signal-Stack.html),
- man sigstack.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.10 sigvec

Documentation:

man sigvec

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.11 `ssignal`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Basic-Signal-Handling.html](https://www.gnu.org/software/libc/manual/html_node/Basic-Signal-Handling.html),
- `man ssignal`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.12 `sys_siglist`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Signal-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Signal-Messages.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This constant is missing on some platforms: macOS 10.13, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

### 13.66.13 `sysv_signal`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Basic-Signal-Handling.html](https://www.gnu.org/software/libc/manual/html_node/Basic-Signal-Handling.html),
- `man sysv_signal`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.66.14 `tgkill`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Signaling-Another-Process.html](https://www.gnu.org/software/libc/manual/html_node/Signaling-Another-Process.html),
- `man tgkill`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on most non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.67 Glibc Extensions to `<spawn.h>`

### 13.67.1 `posix_spawn_file_actions_addchdir_np`

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1208>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.28, macOS 10.13, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 3.4.6, mingw, MSVC 14, Android 9.0.

Note: Gnulib has a module `posix_spawn_file_actions_addchdir` that provides equivalent functionality, just without the suffix `_np`.

### 13.67.2 `posix_spawn_file_actions_addclosefrom_np`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.33, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.67.3 `posix_spawn_file_actions_addfchdir_np`

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1208>

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.28, macOS 10.13, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 3.4.6, mingw, MSVC 14, Android 9.0.

Note: Gnulib has a module `posix_spawn_file_actions_addfchdir` that provides equivalent functionality, just without the suffix `_np`.

## 13.68 Glibc Extensions to <stdio.h>

### 13.68.1 asprintf

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-asprintf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-asprintf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Dynamic-Output.html](https://www.gnu.org/software/libc/manual/html_node/Dynamic-Output.html),
- `man asprintf`.

Gnulib module: `vasprintf` or `vasprintf-posix` or `vasprintf-gnu`

Portability problems fixed by either Gnulib module `vasprintf` or `vasprintf-posix` or `vasprintf-gnu`:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems fixed by either Gnulib module `vasprintf-posix` or `vasprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: Cygwin 1.5.24.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.0.
- This function does not support the ‘`a`’ and ‘`A`’ directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, Solaris 11.4, Cygwin 1.5.x.
- This function does not support the ‘`b`’ directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the ‘`F`’ directive on some platforms: NetBSD 3.0, Cygwin 1.5.x.
- This function does not support the ‘`ls`’ directive on some platforms: OpenBSD 4.0, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the ‘`ls`’ directive correctly on some platforms: Solaris 11.4.
- This function does not support format directives that access arguments in an arbitrary order, such as `"%2$s"`, on some platforms: NetBSD 3.0.
- This function doesn’t support the ‘`'`’ flag on some platforms: NetBSD 3.0, Cygwin 1.5.24.
- This function does not round the argument of the ‘`a`’ directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- `printf "%010f"` of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, Solaris 11.0, Cygwin 1.5.x.
- `printf "%#.0x"` or `"%#.0X"` with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.

- This function produces wrong output for the ‘`lc`’ directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `vasprintf-gnu`:

- This function does not support the ‘`B`’ directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The `%m` directive is not portable, use `%s` mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.

### 13.68.2 `cuserid`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Who-Logged-In.html](https://www.gnu.org/software/libc/manual/html_node/Who-Logged-In.html),
- `man cuserid`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, mingw, MSVC 14, Android 9.0.

### 13.68.3 `clearerr_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-clearerr-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-clearerr-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Error-Recovery.html](https://www.gnu.org/software/libc/manual/html_node/Error-Recovery.html),
- `man clearerr_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 13.68.4 `fcloseall`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Closing-Streams.html](https://www.gnu.org/software/libc/manual/html_node/Closing-Streams.html),
- `man fcloseall`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, Android 9.0.
- This functions returns void instead of int on some platforms: FreeBSD 14.0.

### 13.68.5 feof\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feof-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-feof-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/EOF-and-Errors.html](https://www.gnu.org/software/libc/manual/html_node/EOF-and-Errors.html),
- man feof\_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 13.68.6 ferror\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ferror-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ferror-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/EOF-and-Errors.html](https://www.gnu.org/software/libc/manual/html_node/EOF-and-Errors.html),
- man ferror\_unlocked.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1.

### 13.68.7 fflush\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fflush-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fflush-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Flushing-Buffers.html](https://www.gnu.org/software/libc/manual/html_node/Flushing-Buffers.html),

- `man fflush_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.8 `fgetc_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Character-Input.html](https://www.gnu.org/software/libc/manual/html_node/Character-Input.html),
- `man fgetc_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.9 `fgets_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgets-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgets-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Line-Input.html](https://www.gnu.org/software/libc/manual/html_node/Line-Input.html),
- `man fgets_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.



### 13.68.10 `fileno_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fileno-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fileno-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Descriptors-and-Streams.html](https://www.gnu.org/software/libc/manual/html_node/Descriptors-and-Streams.html),
- `man fileno_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 6.0.

### 13.68.11 `fopencookie`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Streams-and-Cookies.html](https://www.gnu.org/software/libc/manual/html_node/Streams-and-Cookies.html),
- `man fopencookie`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.68.12 `fputc_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man fputc_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.13 fputs\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputs-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputs-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man fputs_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.14 fread\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fread-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fread-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Block-Input\\_002fOutput.html](https://www.gnu.org/software/libc/manual/html_node/Block-Input_002fOutput.html),
- `man fread_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.15 fwrite\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fwrite-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fwrite-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Block-Input\\_002fOutput.html](https://www.gnu.org/software/libc/manual/html_node/Block-Input_002fOutput.html),
- `man fwrite_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.68.16 `getw`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Character-Input.html](https://www.gnu.org/software/libc/manual/html_node/Character-Input.html),
- `man getw`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Android 9.0.

### 13.68.17 `putw`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man putw`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is not declared on some platforms: Android 9.0.

### 13.68.18 `renameat2`

Documentation:

`man renameat2`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.68.19 `setbuffer`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setbuffer-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setbuffer-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Controlling-Buffering.html](https://www.gnu.org/software/libc/manual/html_node/Controlling-Buffering.html),

- `man setbuffer`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, mingw, MSVC 14.

### 13.68.20 `setlinebuf`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Controlling-Buffering.html](https://www.gnu.org/software/libc/manual/html_node/Controlling-Buffering.html),
- `man setlinebuf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.23, mingw, MSVC 14.

### 13.68.21 `sys_errlist`

Documentation:

`man sys_errlist`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: Minix 3.1.8, macOS 10.13, IRIX 6.5, Cygwin 2.9, mingw, Android 9.0.

### 13.68.22 `sys_nerr`

Documentation:

`man sys_nerr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on some platforms: macOS 10.13, Minix 3.1.8, IRIX 6.5, Cygwin 2.9, mingw, Android 9.0.

**13.68.23 tmpnam\_r**

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Temporary-Files.html](https://www.gnu.org/software/libc/manual/html_node/Temporary-Files.html),
- `man tmpnam_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

**13.68.24 vasprintf**

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vasprintf.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vasprintf.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Variable-Arguments-Output.html](https://www.gnu.org/software/libc/manual/html_node/Variable-Arguments-Output.html),
- `man vasprintf`.

Gnulib module: `vasprintf` or `vasprintf-posix` or `vasprintf-gnu`

Portability problems fixed by either Gnulib module `vasprintf` or `vasprintf-posix` or `vasprintf-gnu`:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems fixed by either Gnulib module `vasprintf-posix` or `vasprintf-gnu`:

- This function does not support size specifiers as in C99 (`hh`, `ll`, `j`, `t`, `z`) on some platforms: Cygwin 1.5.24.
- `printf "%f", "%e", "%g"` of Infinity and NaN yields an incorrect result on some platforms: Solaris 11.0.
- This function does not support the `'a'` and `'A'` directives on some platforms: glibc-2.3.6, Mac OS X 10.5, NetBSD 9.0, OpenBSD 4.0, Solaris 11.4, Cygwin 1.5.x.
- This function does not support the `'b'` directive, required by ISO C23, on some platforms: glibc 2.34, musl libc, macOS 12.5, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, AIX 7.2, Solaris 11.4, Cygwin 2.9.0.
- This function does not support the `'F'` directive on some platforms: NetBSD 3.0, Cygwin 1.5.x.
- This function does not support the `'ls'` directive on some platforms: OpenBSD 4.0, Cygwin 1.5.x, Haiku.
- This function does not support precisions in the `'ls'` directive correctly on some platforms: Solaris 11.4.

- This function does not support format directives that access arguments in an arbitrary order, such as "%2\$s", on some platforms: NetBSD 3.0.
- This function doesn't support the ' flag on some platforms: NetBSD 3.0, Cygwin 1.5.24.
- This function does not round the argument of the 'a' directive correctly on some platforms: Mac OS X 10.12, FreeBSD 14.0.
- printf "%010f" of NaN and Infinity yields an incorrect result (padded with zeroes) on some platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, Solaris 11.0, Cygwin 1.5.x.
- printf "%#.0x" or "%#.0X" with a zero argument yields an incorrect result (non-empty) on some platforms: Mac OS X 10.6.
- This function produces wrong output for the 'lc' directive with a NUL wide character argument on some platforms: musl libc 1.2.4.
- This function can crash in out-of-memory conditions on some platforms: FreeBSD 14.0, NetBSD 5.0.

Portability problems fixed by Gnulib module `vasprintf-gnu`:

- This function does not support the 'B' directive on some platforms: glibc 2.34, FreeBSD 13.2, NetBSD 9.0, OpenBSD 7.2, macOS 12.5, AIX 7.2, Solaris 11.4, and others.

Portability problems not fixed by Gnulib:

- The %m directive is not portable, use %s mapped to an argument of `strerror(errno)` (or a version of `strerror_r`) instead.

## 13.69 Glibc Extensions to `<stdlib.h>`

### 13.69.1 `canonicalize_file_name`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Symbolic-Links.html](https://www.gnu.org/software/libc/manual/html_node/Symbolic-Links.html),
- `man canonicalize_file_name`.

Gnulib module: `canonicalize-lgpl`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.
- This function fails to detect trailing slashes on non-directories on some platforms: glibc 2.3.5.

Portability problems not fixed by Gnulib:

### 13.69.2 `cfree`

Documentation:

`man cfree`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.3 clearenv

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Environment-Access.html](https://www.gnu.org/software/libc/manual/html_node/Environment-Access.html),
- `man clearenv`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.2, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, IRIX 6.5, Solaris 10, Cygwin 2.9, mingw, MSVC 14.

### 13.69.4 drand48\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-drand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man drand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.5 ecvt\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man ecvt_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.6 erand48\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-erand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-erand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man erand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.7 fcvt\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man fcvt_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.8 getloadavg

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getloadavg-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getloadavg-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Processor-Resources.html](https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html),
- `man getloadavg`.

Gnulib module: `getloadavg`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in `<sys/loadavg.h>`, not `<stdlib.h>`, on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:



### 13.69.9 getpt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Allocation.html](https://www.gnu.org/software/libc/manual/html_node/Allocation.html),
- `man getpt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.

### 13.69.10 initstate\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initstate-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-initstate-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Random.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Random.html),
- `man initstate_r`.

Gnulib module: `random_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has an incompatible declaration on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

- This function crashes if the state buffer is unaligned on some platforms: glibc 2.36/sparc.
- This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

### 13.69.11 jrand48\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jrand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-jrand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man jrand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.12 lcong48\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lcong48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lcong48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- man lcong48\_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.13 lrand48\_r

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lrand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-lrand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- man lrand48\_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.14 mkostemp

Documentation:

man mkostemp

Gnulib module: mkostemp

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.6, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.5, mingw, MSVC 14, Android 5.1.

- This function is declared in `<unistd.h>` instead of `<stdlib.h>` on some platforms: macOS 11.1.
- On platforms where `off_t` is a 32-bit type, `mkostemp` may not work correctly to create files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

The gnulib module `clean-temp` can create temporary files that will not be left behind after signals such as `SIGINT`.

### 13.69.15 `mkostemps`

Documentation:

`man mkostemps`

Gnulib module: `mkostemps`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, Mac OS X 10.5, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.5, mingw, MSVC 14, Android 5.1.
- This function is declared in `<unistd.h>` instead of `<stdlib.h>` on some platforms: macOS 11.1.
- On platforms where `off_t` is a 32-bit type, `mkostemps` may not work correctly to create files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

The gnulib module `clean-temp` can create temporary files that will not be left behind after signals such as `SIGINT`.

### 13.69.16 `mkstemps`

Documentation:

`man mkstemps`

Gnulib module: `mkstemps`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
- This function is declared in `<unistd.h>` instead of `<stdlib.h>` on some platforms: macOS 11.1.
- On platforms where `off_t` is a 32-bit type, `mkstemps` may not work correctly to create files larger than 2 GB. (Cf. `AC_SYS_LARGEFILE`.)

Portability problems not fixed by Gnulib:

The gnulib module `clean-temp` can create temporary files that will not be left behind after signals such as `SIGINT`.

### 13.69.17 `rand48_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mrand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mrand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man mrand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.18 `rand48_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-nrand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-nrand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man nrand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.19 `on_exit`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Cleanups-on-Exit.html](https://www.gnu.org/software/libc/manual/html_node/Cleanups-on-Exit.html),
- `man on_exit`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.69.20 ptsname\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Allocation.html](https://www.gnu.org/software/libc/manual/html_node/Allocation.html),
- `man ptsname_r`.

Gnulib module: `ptsname_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.12, FreeBSD 12.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14.
- When this function fails, it returns -1 instead of the error code on some platforms: macOS 11.1, FreeBSD 14.0, Android 4.3.

Portability problems not fixed by Gnulib:

- When this function fails, it returns 0 and stores an empty string as result on some platforms: Cygwin 2.9.

Note: Portable programs should expect to find the error code as the return value of this function, not as the value of `errno`. This is needed for compatibility with musl libc and with the forthcoming POSIX Issue 8.

### 13.69.21 qecvt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man qecvt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.22 qecvt\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man qecvt_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.23 qfcvt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man qfcvt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.24 qfcvt\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man qfcvt_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.25 qgcvt

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-V-Number-Conversion.html](https://www.gnu.org/software/libc/manual/html_node/System-V-Number-Conversion.html),
- `man qgcvt`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.26 `qsort_r`

Documentation:

`man qsort_r`

Gnulib module: —

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.7, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function has an incompatible API on some platforms: FreeBSD 13.2.

Portability problems not fixed by Gnulib:

### 13.69.27 `random_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-random-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-random-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Random.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Random.html),
- `man random_r`.

Gnulib module: `random_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has an incompatible declaration on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

- This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.

### 13.69.28 `rpmatch`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Yes\\_002dor\\_002dNo-Questions.html](https://www.gnu.org/software/libc/manual/html_node/Yes_002dor_002dNo-Questions.html),
- `man rpmatch`.

Gnulib module: `rpmatch`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 10.13, FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.69.29 `secure_getenv`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Environment-Access.html](https://www.gnu.org/software/libc/manual/html_node/Environment-Access.html),
- `man secure_getenv`.

Gnulib module: `secure_getenv`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.16, OS X 10.8, FreeBSD 13.2, NetBSD 9.0, OpenBSD 5.2, Minix 3.2.0, AIX 7.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.69.30 `seed48_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-seed48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-seed48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man seed48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.31 `setstate_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setstate-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setstate-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Random.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Random.html),
- `man setstate_r`.

Gnulib module: `random_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function has an incompatible declaration on some platforms: AIX 7.1.

Portability problems not fixed by Gnulib:

- This function has a slightly different (but compatible) declaration on some platforms: Haiku 2017.



### 13.69.32 `srand48_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srand48-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srand48-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/SVID-Random.html](https://www.gnu.org/software/libc/manual/html_node/SVID-Random.html),
- `man srand48_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.69.33 `srandom_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srandom-r-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-srandom-r-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Random.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Random.html),
- `man srandom_r`.

Gnulib module: `random_r`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.69.34 `strtod_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

### 13.69.35 `strtod_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

### 13.69.36 strtol\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

### 13.69.37 strtold\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 13.69.38 strtoll\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 13.69.39 strtouq

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtoq-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtoq-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Parsing-of-Integers.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-of-Integers.html),
- `man strtouq`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

- This function is not declared on some platforms: Android 9.0.

### 13.69.40 strtoul\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

### 13.69.41 strtoull\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

### 13.69.42 strtouq

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtouq-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strtouq-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Parsing-of-Integers.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-of-Integers.html),
- man strtouq.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.
- This function is not declared on some platforms: Android 9.0.

### 13.69.43 valloc

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Aligned-Memory-Blocks.html](https://www.gnu.org/software/libc/manual/html_node/Aligned-Memory-Blocks.html),
- man valloc.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14.

## 13.70 Glibc Extensions to `<string.h>`

### 13.70.1 `explicit_bzero`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Erasing-Sensitive-Data.html](https://www.gnu.org/software/libc/manual/html_node/Erasing-Sensitive-Data.html),
- `man explicit_bzero`.

Gnulib module: `explicit_bzero`

The `explicit_bzero` function is an approximation to what is needed, and does not suffice in general to erase information. Although calling `explicit_bzero` should clear the memory in question, the information that was in memory may still be available elsewhere on the machine. Proper implementation of information erasure requires support from levels below C code.

C23 specifies the function `memset_explicit`, which should be preferred to `explicit_bzero` in new code. See Section 10.606 [`memset_explicit`], page 274.

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.24, FreeBSD 10, NetBSD 7.1, OpenBSD 5.4, macOS 10.12, Solaris 11.4, Android 9.0, and many other systems.

Portability problems not fixed by Gnulib:

- Although the module's implementation should clear the memory on platforms compatible with GCC and on platforms using traditional linkers, it may not clear the memory on non-GCC platforms that use whole-program optimization.

### 13.70.2 `ffsl`

Documentation:

`man ffsl`

Gnulib module: `ffsl`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 5.2.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in `<strings.h>` instead of `<string.h>` on some platforms: AIX 7.2, Android 13.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 13.

### 13.70.3 `ffsll`

Documentation:

`man ffsll`

Gnulib module: `ffsll`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: Mac OS X 10.5, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function is declared in `<strings.h>` instead of `<string.h>` on some platforms: AIX 7.2, Android 13.
- This function returns completely wrong values on some platforms: AIX 7.2 in 32-bit mode.

Portability problems not fixed by Gnulib:

- This function is only defined as an inline function on some platforms: Android 13.

### 13.70.4 memfrob

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Obfuscating-Data.html](https://www.gnu.org/software/libc/manual/html_node/Obfuscating-Data.html),
- `man memfrob`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.70.5 memmem

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memmem-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memmem-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html),
- `man memmem`.

Gnulib module: `memmem` or `memmem-simple`

Both modules implement the same replacement for the `memmem` function with the `memmem` module providing a replacement on more platforms where the existing `memmem` function has a quadratic worst-case complexity.

Portability problems fixed by either Gnulib module `memmem-simple` or `memmem`:

- This function is missing on some platforms: Mac OS X 10.5, FreeBSD 5.2.1, OpenBSD 4.0, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.
- This function has reversed arguments on some older platforms: Linux libc 5.0.9
- This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.

- This function returns incorrect values in some cases, such as when given an empty needle: glibc <= 2.0, macOS 12.5, AIX 7.2, Solaris 11.3, Cygwin 1.5.x.

Performance problems fixed by Gnulib module `memmem`:

- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, macOS 12.5, FreeBSD 11.4, NetBSD 8.2, OpenBSD 6.6, AIX 7.2, Solaris 11.4, Cygwin 1.5.x. Note for small needles the replacement may be slower.

Portability problems not fixed by Gnulib:

### 13.70.6 `mempcpy`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Copying-Strings-and-Arrays.html](https://www.gnu.org/software/libc/manual/html_node/Copying-Strings-and-Arrays.html),
- `man mempcpy`.

Gnulib module: `mempcpy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

### 13.70.7 `memrchr`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memrchr.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-memrchr.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html),
- `man memrchr`.

Gnulib module: `memrchr`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 13.70.8 `rawmemchr`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html),
- `man rawmemchr`.

Gnulib module: rawmemchr

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.70.9 sigabbrev\_np

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Signal-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Signal-Messages.html).

Gnulib module: sigabbrev\_np

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

Note: Gnulib has a module `sig2str` that contains an equivalent function and also one that does the opposite conversion, from an abbreviated signal name to a signal number.

### 13.70.10 sigdescr\_np

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Signal-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Signal-Messages.html).

Gnulib module: sigdescr\_np

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

- The description of SIGCHLD is wrong on some platforms: glibc.
- The description of SIGEMT is completely unintelligible on some platforms: glibc.

Note: This function is hardly useful, because it returns English strings, not internationalized strings. Better use the function `strsignal`, which returns internationalized strings.

### 13.70.11 strcasestr

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strcasestr.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strcasestr.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html),
- `man strcasestr`.

Gnulib module: `strcasestr` or `strcasestr-simple`

Portability problems fixed by either Gnulib module `strcasestr-simple` or `strcasestr`:

- This function is missing on some platforms: AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.5.x, mingw, MSVC 14.
- This function can trigger `memchr` bugs on some platforms: glibc 2.10.
- This function can trigger false positives for long periodic needles on some platforms: glibc 2.12, Cygwin 1.7.7.
- This function may fail to find matches on some platforms: glibc 2.28.

Portability problems fixed by Gnulib module `strcasestr`:

- This function has quadratic instead of linear worst-case complexity on some platforms: glibc 2.8, musl libc 1.2.3, macOS 12.5, FreeBSD 13.1, NetBSD 9.0, OpenBSD 7.2, Solaris 11.4.

Portability problems not fixed by Gnulib:

### 13.70.12 `strchrnul`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html),
- `man strchrnul`.

Gnulib module: `strchrnul`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.8, mingw, MSVC 14, Android 6.0.
- This function crashes when no occurrence is found on some platforms: Cygwin 1.7.9.

Portability problems not fixed by Gnulib:

### 13.70.13 `strerrordesc_np`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



### 13.70.14 `strerrorname_np`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Error-Messages.html](https://www.gnu.org/software/libc/manual/html_node/Error-Messages.html).

Gnulib module: `strerrorname_np`

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function returns wrong values on some platforms: glibc 2.37.

Portability problems not fixed by Gnulib:

### 13.70.15 `strfry`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Shuffling-Bytes.html](https://www.gnu.org/software/libc/manual/html_node/Shuffling-Bytes.html),
- `man strfry`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.70.16 `strsep`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strsep-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-strsep-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Finding-Tokens-in-a-String.html](https://www.gnu.org/software/libc/manual/html_node/Finding-Tokens-in-a-String.html),
- `man strsep`.

Gnulib module: `strsep`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 10, mingw, MSVC 14.

Portability problems not fixed by Gnulib:

### 13.70.17 `strverscmp`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/String\\_002fArray-Comparison.html](https://www.gnu.org/software/libc/manual/html_node/String_002fArray-Comparison.html),
- `man strverscmp`.

Gnulib module: `strverscmp`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: macOS 11.1, FreeBSD 13.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- This function treats ASCII letters as smaller than a digit sequence on some platforms: musl libc 1.2.3, Cygwin 3.4.6.

Portability problems not fixed by Gnulib:

- On older glibc platforms, this function does not always properly treat digit strings with leading zeros as fractions (for example, `strverscmp` ("B0075022800016.gbp.corp.com", "B007502357019.GBP.CORP.COM") does not yield a negative number as it should): glibc 2.9

## 13.71 Glibc `<sys/auxv.h>`

### 13.71.1 `getauxval`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Auxiliary-Vector.html](https://www.gnu.org/software/libc/manual/html_node/Auxiliary-Vector.html),
- `man getauxval`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.15, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.72 Glibc `<sys/capability.h>`

### 13.72.1 `capget`

Documentation:

`man capget`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.72.2 capset

Documentation:

man capset

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.73 Glibc <sys/epoll.h>

### 13.73.1 epoll\_create

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-create-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-create-1.html)

Documentation:

man epoll\_create

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.73.2 epoll\_create1

Documentation:

man epoll\_create1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

### 13.73.3 epoll\_ctl

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-ctl-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-ctl-1.html)

Documentation:

man epoll\_ctl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.73.4 `epoll_pwait`

Documentation:

man `epoll_pwait`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.5, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

### 13.73.5 `epoll_wait`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-wait-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-epoll-wait-1.html)

Documentation:

man `epoll_wait`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.74 Glibc `<sys/eventfd.h>`

### 13.74.1 `eventfd`

Documentation:

man `eventfd`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.74.2 eventfd\_read

Documentation:

man eventfd\_read

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.74.3 eventfd\_write

Documentation:

man eventfd\_write

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.75 Glibc <sys/fanotify.h>

### 13.75.1 fanotify\_init

Documentation:

man fanotify\_init

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.75.2 fanotify\_mark

Documentation:

man fanotify\_mark

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.76 Glibc <sys/file.h>

### 13.76.1 flock

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-flock-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-flock-2.html)

Documentation:

man flock

Gnulib module: flock

Portability problems fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14
- This function is missing on some platforms: AIX 7.1, HP-UX 11.23, Solaris 11.4. But the replacement function does not really work; it exhibits test failures.

Portability problems not fixed by Gnulib:

## 13.77 Glibc <sys/fsuid.h>

### 13.77.1 setfsgid

Documentation:

man setfsgid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

### 13.77.2 setfsuid

Documentation:

man setfsuid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

## 13.78 Glibc <sys/gmon.h>

### 13.78.1 monstartup

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.79 Glibc <sys/inotify.h>

### 13.79.1 inotify\_add\_watch

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-add-watch.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-add-watch.html)

Documentation:

man inotify\_add\_watch

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.79.2 inotify\_init

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-init.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-init.html)

Documentation:

man inotify\_init

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.79.3 inotify\_init1

Documentation:

man inotify\_init1

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

#### 13.79.4 inotify\_rm\_watch

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-rm-watch.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-inotify-rm-watch.html)

Documentation:

man inotify\_rm\_watch

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on most non-glibc platforms: glibc 2.3.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.80 Glibc <sys/io.h>, <sys/perm.h>

#### 13.80.1 ioperm

Documentation:

man ioperm

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

#### 13.80.2 iopl

Documentation:

man iopl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



## 13.81 Glibc <sys/kdaemon.h>

### 13.81.1 bdflush

Documentation:

man bdflush

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.82 Glibc <sys/klog.h>

### 13.82.1 klogctl

Documentation:

man klogctl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.83 Glibc Extensions to <sys/mman.h>

### 13.83.1 madvise

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory\\_002dmapped-I\\_002f0.html](https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002f0.html),
- man madvise.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 1.7.7, mingw, MSVC 14.

### 13.83.2 memfd\_create

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory\\_002dmapped-I\\_002f0.html](https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002f0.html),

- `man memfd_create`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and FreeBSD and is therefore missing on many non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.3 `mincore`

Documentation:

`man mincore`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

### 13.83.4 `mlock2`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Page-Lock-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Page-Lock-Functions.html),
- `man mlock2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.5 `mremap`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mremap.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-mremap.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory\\_002dmapped-I\\_002f0.html](https://www.gnu.org/software/libc/manual/html_node/Memory_002dmapped-I_002f0.html),
- `man mremap`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: macOS 11.1, FreeBSD 14.0, NetBSD 3.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.83.6 pkey\_alloc

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory-Protection.html](https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html),
- man pkey\_alloc.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.7 pkey\_free

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory-Protection.html](https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html),
- man pkey\_free.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.8 pkey\_get

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Memory-Protection.html](https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.9 pkey\_mprotect

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Memory-Protection.html](https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html),
- `man pkey_mprotect`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.10 pkey\_set

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Memory-Protection.html](https://www.gnu.org/software/libc/manual/html_node/Memory-Protection.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.83.11 remap\_file\_pages

Documentation:

`man remap_file_pages`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.84 Glibc <sys/mount.h>

### 13.84.1 mount

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Mount\\_002dUnmount\\_002dRemount.html](https://www.gnu.org/software/libc/manual/html_node/Mount_002dUnmount_002dRemount.html),
- `man mount`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 13.84.2 umount

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Mount\\_002dUnmount\\_002dRemount.html](https://www.gnu.org/software/libc/manual/html_node/Mount_002dUnmount_002dRemount.html),
- `man umount`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, AIX 5.1, mingw, MSVC 14.

### 13.84.3 umount2

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Mount\\_002dUnmount\\_002dRemount.html](https://www.gnu.org/software/libc/manual/html_node/Mount_002dUnmount_002dRemount.html),
- `man umount2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.23, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14.

## 13.85 Glibc <sys/personality.h>

### 13.85.1 personality

Documentation:

`man personality`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.0.2.

## 13.86 Glibc <sys/prctl.h>

### 13.86.1 prctl

Documentation:

man prctl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.87 Glibc <sys/profil.h>

### 13.87.1 sprofil

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.88 Glibc <sys/ptrace.h>

### 13.88.1 ptrace

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ptrace-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-ptrace-1.html)

Documentation:

man ptrace

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

## 13.89 Glibc <sys/quota.h>

### 13.89.1 quotactl

Documentation:

man quotactl

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 7.1.

## 13.90 Glibc <sys/random.h>

### 13.90.1 getentropy

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1134>

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Unpredictable-Bytes.html](https://www.gnu.org/software/libc/manual/html_node/Unpredictable-Bytes.html),
- `man getentropy`.

Gnulib module: `getentropy`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.24, Mac OS X 10.11, FreeBSD 11.0, NetBSD 9.0, OpenBSD 5.5, Minix 3.3, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- This function is declared in <sys/random.h>, not in <unistd.h>, on some platforms: macOS 11.1, Solaris 11.4, Android 9.0.

Portability problems not fixed by Gnulib:

Although this function is intended to produce random data, the data’s security properties may not be appropriate for your application. For example, identical “random” data streams might be produced by rebooted virtual machines. If this is of concern you may need to use additional techniques such as hedging.<sup>1</sup>

Related modules include `getrandom`, which has a more-flexible but more-complex API, and `crypto/gc-random`, which is likely a better match for code already using the other `crypto` APIs.

### 13.90.2 getrandom

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Unpredictable-Bytes.html](https://www.gnu.org/software/libc/manual/html_node/Unpredictable-Bytes.html),
- `man getrandom`.

Gnulib module: `getrandom`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: glibc 2.24, macOS 11.1, FreeBSD 11.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.0, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

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<sup>1</sup> Ristenpart T, Yilek S. When good randomness goes bad: virtual machine vulnerabilities and hedging deployed cryptography (<http://pages.cs.wisc.edu/~rist/papers/sslhedge.pdf>). NDSS 2010.

- This function has a different return type on some platforms: Solaris 11.4.

Portability problems not fixed by Gnulib:

- The `GRND_INSECURE` flag is missing on some platforms: glibc 2.34, macOS 10.15, GNU/kFreeBSD, FreeBSD 12.0, OpenBSD 6.7, Minix 3.3, Haiku.
- The `GRND_RANDOM` flag has different effects on different platforms. Some platforms ignore the flag, or yield data that can fail to be random in some cases.

Although this function is intended to produce random data, the data’s security properties may not be appropriate for your application. For example, identical “random” data streams might be produced by rebooted virtual machines. If this is of concern you may need to use additional techniques such as hedging.<sup>2</sup>

Related modules include `getentropy`, which has a simpler but more-limited API, and `crypto/gc-random`, which is likely a better match for code already using the other `crypto` APIs.

## 13.91 Glibc `<sys/reboot.h>`

### 13.91.1 `reboot`

Documentation:

`man reboot`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

## 13.92 Glibc Extensions to `<sys/resource.h>`

### 13.92.1 `prlimit`

Documentation:

`man prlimit`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.12, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

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<sup>2</sup> Ristenpart T, Yilek S. When good randomness goes bad: virtual machine vulnerabilities and hedging deployed cryptography (<http://pages.cs.wisc.edu/~rist/papers/sslhedge.pdf>). NDSS 2010.



## 13.93 Glibc Extensions to `<sys/sem.h>`

### 13.93.1 `semtimedop`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Semaphores.html](https://www.gnu.org/software/libc/manual/html_node/Semaphores.html),
- `man semtimedop`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11.11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

## 13.94 Glibc `<sys/sendfile.h>`

### 13.94.1 `sendfile`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sendfile.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sendfile.html)

Documentation:

`man sendfile`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11 2010-11, Cygwin 2.9, mingw, MSVC 14, Android 4.4.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

## 13.95 Glibc `<sys/signalfd.h>`

### 13.95.1 `signalfd`

Documentation:

`man signalfd`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and illumos and is therefore missing on many non-glibc platforms: glibc 2.6, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

## 13.96 Glibc <sys/single\_threaded.h>

### 13.96.1 \_\_libc\_single\_threaded

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Single\\_002dThreaded.html](https://www.gnu.org/software/libc/manual/html_node/Single_002dThreaded.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This variable is missing on all non-glibc platforms: glibc 2.31, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.97 Glibc Extensions to <sys/socket.h>

### 13.97.1 accept4

Documentation:

man accept4

Gnulib module: accept4

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.9, macOS 11.1, FreeBSD 6.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 4.4. But the replacement function is not atomic; this matters in multi-threaded programs that spawn child processes.

Portability problems not fixed by Gnulib:

- `SOCK_CLOEXEC` and `SOCK_NONBLOCK` may not be defined as they're also significant to the `socket()` function.

### 13.97.2 isfdtype

Documentation:

man isfdtype

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.97.3 recvmmsg

Documentation:

man recvmmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.11, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

### 13.97.4 sendmmsg

Documentation:

man sendmmsg

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 6.4, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 4.4.

## 13.98 Glibc Extensions to <sys/stat.h>

### 13.98.1 getumask

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Setting-Permissions.html](https://www.gnu.org/software/libc/manual/html_node/Setting-Permissions.html),
- man getumask.

Gnulib module: getumask

Portability problems fixed by Gnulib:

- This function exists only on Hurd and is therefore missing on all non-glibc platforms: glibc/Linux, glibc/kFreeBSD, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3, AIX 7.2, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.98.2 lchmod

Gnulib module: lchmod

Portability problems fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: HP-UX 11.31.
- This function always fails with `errno` set to `ENOSYS`, even when the file is not a symbolic link: GNU/Linux with glibc 2.31.
- This function does not fail when the file name argument ends in a slash and (without the slash) names a non-directory, on some platforms: AIX 7.2.

Portability problems not fixed by Gnulib:

- Some platforms do not allow changing the access bits on symbolic links.
- This function can fail with `errno` set to `EMFILE` or `ENFILE`, and it fails with `errno` set to `EOPNOTSUPP` if the `/proc` file system is not mounted: GNU/Linux with glibc 2.34.

### 13.98.3 statx

Documentation:

man statx

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.27, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- There is an incompatible function of the same name on some platforms: AIX 5.2 or newer.

## 13.99 Glibc <sys/statfs.h>

### 13.99.1 fstatfs

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fstatfs-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fstatfs-2.html)

Documentation:

man fstatfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.
- On platforms where `f_blocks` in `'struct statfs'` is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. The fix is to use the `AC_SYS_LARGEFILE` macro. This affects Mac OS X.

### 13.99.2 statfs

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-statfs-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-statfs-2.html)

Documentation:

man statfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, mingw, MSVC 14.

- On platforms where `f_blocks` in `'struct statfs'` is a 32-bit value, this function may not work correctly on files systems larger than 4 TiB. The fix is to use the `AC_SYS_LARGEFILE` macro. This affects Mac OS X.

## 13.100 Glibc `<sys/swap.h>`

### 13.100.1 `swapoff`

Documentation:

`man swapoff`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

### 13.100.2 `swapon`

Documentation:

`man swapon`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

## 13.101 Glibc `<sys/sysctl.h>`

### 13.101.1 `sysctl`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-Parameters.html](https://www.gnu.org/software/libc/manual/html_node/System-Parameters.html),
- `man sysctl`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.34, Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.102 Glibc <sys/sysinfo.h>

### 13.102.1 get\_avphys\_pages

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Query-Memory-Parameters.html](https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html),
- `man get_avphys_pages`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

### 13.102.2 get\_nprocs

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Processor-Resources.html](https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html),
- `man get_nprocs`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

Gnulib provides the module `nproc` that performs a similar function but is portable to more systems.

### 13.102.3 get\_nprocs\_conf

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Processor-Resources.html](https://www.gnu.org/software/libc/manual/html_node/Processor-Resources.html),
- `man get_nprocs_conf`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 10, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

### 13.102.4 get\_phys\_pages

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Query-Memory-Parameters.html](https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html),
- `man get_phys_pages`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.1, mingw, MSVC 14, Android 5.1.

### 13.102.5 sysinfo

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysinfo-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sysinfo-1.html)

Documentation:

`man sysinfo`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 1.7.9, mingw, MSVC 14.
- This function is not declared and thus not part of the Android API for Android API levels < 9.

## 13.103 Glibc <sys/syslog.h>

### 13.103.1 vsyslog

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsyslog-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-vsyslog-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/syslog\\_003b-vsyslog.html](https://www.gnu.org/software/libc/manual/html_node/syslog_003b-vsyslog.html),
- `man vsyslog`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14.

## 13.104 Glibc <sys/sysmacros.h>

### 13.104.1 gnu\_dev\_major

Documentation:

man gnu\_dev\_major

Gnulib module: —

Portability problems fixed by Gnulib:

- The `AC_HEADER_MAJOR` macro in Autoconf 2.69 and earlier fails to set `MAJOR_IN_SYSMACROS` when it detects namespace pollution in `sys/types.h`; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.104.2 gnu\_dev\_makedev

Documentation:

man gnu\_dev\_makedev

Gnulib module: —

Portability problems fixed by Gnulib:

- The `AC_HEADER_MAJOR` macro in Autoconf 2.69 and earlier fails to set `MAJOR_IN_SYSMACROS` when it detects namespace pollution in `sys/types.h`; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.104.3 gnu\_dev\_minor

Documentation:

man gnu\_dev\_minor

Gnulib module: —

Portability problems fixed by Gnulib:

- The `AC_HEADER_MAJOR` macro in Autoconf 2.69 and earlier fails to set `MAJOR_IN_SYSMACROS` when it detects namespace pollution in `sys/types.h`; which in turn provokes deprecation warnings in glibc 2.25.

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.



## 13.105 Glibc Extensions to <sys/time.h>

### 13.105.1 adjtime

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-adjtime-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-adjtime-2.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/High\\_002dResolution-Calendar.html](https://www.gnu.org/software/libc/manual/html_node/High_002dResolution-Calendar.html),
- `man adjtime`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.105.2 futimes

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-futimes.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-futimes.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/File-Times.html](https://www.gnu.org/software/libc/manual/html_node/File-Times.html),
- `man futimes`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 7.1.
- This function cannot set full timestamp resolution. Use `futimens(fd,times)` instead.

### 13.105.3 futimesat

Documentation:

`man futimesat`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.3.6, macOS 11.1, FreeBSD 6.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 1.5.x, mingw, MSVC 14, Android 7.1.
- On some platforms, this function mis-handles a trailing slash: Solaris 9.

- This function cannot set full timestamp resolution. Use
 

```
file ? utimensat(fd, file, times, 0)
      : futimens(fd, times)
```

 or the glibc module `fdutimensat`, instead.

### 13.105.4 lutimes

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/File-Times.html](https://www.gnu.org/software/libc/manual/html_node/File-Times.html),
- `man lutimes`.

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 7.1.
- This function cannot set full timestamp resolution. Use `utimensat(AT_FDCWD, file, times, AT_SYMLINK_NOFOLLOW)`, or the glibc module `utimens`, instead.
- The mere act of using `lstat` modifies the access time of symlinks on some platforms, so `lutimes` can only effectively change modification time: Cygwin.

### 13.105.5 settimeofday

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/High\\_002dResolution-Calendar.html](https://www.gnu.org/software/libc/manual/html_node/High_002dResolution-Calendar.html),
- `man settimeofday`.

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function is missing on some platforms: mingw, MSVC 14.

## 13.106 Glibc <sys/timerfd.h>

### 13.106.1 timerfd\_create

Documentation:

`man timerfd_create`

Glibc module: —

Portability problems fixed by Glibc:

Portability problems not fixed by Glibc:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.2, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

### 13.106.2 timerfd\_gettime

Documentation:

man timerfd\_gettime

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.2, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

### 13.106.3 timerfd\_settime

Documentation:

man timerfd\_settime

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux, FreeBSD, and illumos and is therefore missing on many non-glibc platforms: glibc 2.7, macOS 11.1, FreeBSD 13.2, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 4.3.

## 13.107 Glibc <sys/timex.h>

### 13.107.1 adjtimex

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/High\\_002dResolution-Calendar.html](https://www.gnu.org/software/libc/manual/html_node/High_002dResolution-Calendar.html),
- man adjtimex.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

### 13.107.2 ntp\_adjtime

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/High-Accuracy-Clock.html](https://www.gnu.org/software/libc/manual/html_node/High-Accuracy-Clock.html),
- man ntp\_adjtime.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.107.3 ntp\_gettime

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/High-Accuracy-Clock.html](https://www.gnu.org/software/libc/manual/html_node/High-Accuracy-Clock.html),
- `man ntp_gettime`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Mac OS X 10.5, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.107.4 ntp\_gettimex

Documentation:

`man ntp_gettimex`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.11, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.108 Glibc Extensions to <sys/uio.h>

### 13.108.1 preadv

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scatter\\_002dGather.html](https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html),
- `man preadv`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.9, macOS 10.13, FreeBSD 5.2.1, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

### 13.108.2 preadv2

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scatter\\_002dGather.html](https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html),
- `man preadv2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.25, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.108.3 process\_vm\_readv

Documentation:

`man process_vm_readv`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.108.4 process\_vm\_writev

Documentation:

`man process_vm_writev`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.14, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

### 13.108.5 pwritev

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scatter\\_002dGather.html](https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html),
- `man pwritev`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.9, macOS 10.13, FreeBSD 5.2.1, Minix 3.1.8, AIX 5.2, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.
- On platforms where `off_t` is a 32-bit type, this function may not work correctly on files larger than 2 GB. The fix is to use the `AC_SYS_LARGEFILE` macro.

### 13.108.6 `pwritev2`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Scatter\\_002dGather.html](https://www.gnu.org/software/libc/manual/html_node/Scatter_002dGather.html),
- `man pwritev2`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.25, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.109 Glibc `<sys/ustat.h>`

### 13.109.1 `ustat`

Documentation:

`man ustat`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.110 Glibc `<sys/vlimit.h>`

### 13.110.1 `vlimit`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Limits-on-Resources.html](https://www.gnu.org/software/libc/manual/html_node/Limits-on-Resources.html),
- `man vlimit`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.111 Glibc Extensions to `<sys/wait.h>`

#### 13.111.1 `wait3`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/BSD-Wait-Functions.html](https://www.gnu.org/software/libc/manual/html_node/BSD-Wait-Functions.html),
- `man wait3`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13.

#### 13.111.2 `wait4`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wait4-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wait4-2.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Process-Completion.html](https://www.gnu.org/software/libc/manual/html_node/Process-Completion.html),
- `man wait4`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11.11, IRIX 6.5, mingw, MSVC 14, Android 4.2.

### 13.112 Glibc `<sys/xattr.h>`

#### 13.112.1 `fgetxattr`

Documentation:

`man fgetxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.
- This function has extra `offset` and `options` parameters: macOS 11.1.

### 13.112.2 `flistxattr`

Documentation:

`man flistxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.3 `fremovexattr`

Documentation:

`man fremovexattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.4 `fsetxattr`

Documentation:

`man fsetxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.5 `getxattr`

Documentation:

`man getxattr`

Gnulib module: —



Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.
- This function has extra `offset` and `options` parameters: macOS 11.1.

### 13.112.6 `lgetxattr`

Documentation:

`man lgetxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.7 `listxattr`

Documentation:

`man listxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.8 `llistxattr`

Documentation:

`man llistxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.9 `lremovexattr`

Documentation:

`man lremovexattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.10 `lsetxattr`

Documentation:

`man lsetxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.11 `removexattr`

Documentation:

`man removexattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

### 13.112.12 `setxattr`

Documentation:

`man setxattr`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.0.4.

## 13.113 Glibc Extensions to `<termios.h>`

### 13.113.1 cfmakeraw

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfmakeraw-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfmakeraw-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Noncanonical-Input.html](https://www.gnu.org/software/libc/manual/html_node/Noncanonical-Input.html),
- `man cfmakeraw`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.5.x, mingw, MSVC 14, Android 4.4.

### 13.113.2 cfsetspeed

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfsetspeed-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-cfsetspeed-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Line-Speed.html](https://www.gnu.org/software/libc/manual/html_node/Line-Speed.html),
- `man cfsetspeed`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

## 13.114 Glibc Extensions to `<time.h>`

### 13.114.1 `clock_adjtime`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on many non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 6.0.

### 13.114.2 dysize

Documentation:

man dysize

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.114.3 getdate\_r

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/General-Time-String-Parsing.html](https://www.gnu.org/software/libc/manual/html_node/General-Time-String-Parsing.html),
- man getdate\_r.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.114.4 stime

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-stime-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-stime-2.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Calendar-Time.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Calendar-Time.html),
- man stime.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

### 13.114.5 strptime\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.

### 13.114.6 timelocal

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Broken\\_002ddown-Time.html](https://www.gnu.org/software/libc/manual/html_node/Broken_002ddown-Time.html),
- `man timelocal`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, mingw, MSVC 14, Android 3.0.

### 13.114.7 timespec\_get

ISO C23 specification:

<http://www.open-std.org/jtc1/sc22/wg14/www/docs/n3047.pdf> section 7.29.2.6

Gnulib module: `timespec_get`

Portability problems fixed by Gnulib:

- This function is missing on many platforms: glibc 2.15, macOS 10.13, FreeBSD 11.0, NetBSD 7.1, OpenBSD 6.0, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.3, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

## 13.115 Glibc <ttyent.h>

### 13.115.1 endttyent

Documentation:

`man endttyent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.115.2 `getttyent`

Documentation:

`man getttyent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.115.3 `getttynam`

Documentation:

`man getttynam`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.115.4 `setttyent`

Documentation:

`man setttyent`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

## 13.116 Glibc Extensions to `<unistd.h>`

### 13.116.1 `_Fork`

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Creating-a-Process.html](https://www.gnu.org/software/libc/manual/html_node/Creating-a-Process.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.33, macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.116.2 acct

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-acct-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-acct-3.html)

Documentation:

man acct

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

### 13.116.3 brk

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Resizing-the-Data-Segment.html](https://www.gnu.org/software/libc/manual/html_node/Resizing-the-Data-Segment.html),
- man brk.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 12.2/arm64, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

### 13.116.4 chroot

Documentation:

man chroot

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: AIX 5.1, mingw, MSVC 14.

### 13.116.5 closefrom

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Opening-and-Closing-Files.html](https://www.gnu.org/software/libc/manual/html_node/Opening-and-Closing-Files.html)

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.33, macOS 11.1, FreeBSD 7.2, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Note (quoted from man close): “The [POSIX] standard developers rejected a proposal to add `closefrom()` to the [POSIX] standard. Because the standard permits implementations to use inherited file descriptors as a means of providing a conforming environment for the child process, it is not possible to standardize an interface that closes arbitrary file descriptors above a certain value while still guaranteeing a conforming environment.”

### 13.116.6 `copy_file_range`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Copying-File-Data.html](https://www.gnu.org/software/libc/manual/html_node/Copying-File-Data.html),
- `man copy_file_range`.

Gnulib module: `copy-file-range`

Portability problems fixed by Gnulib:

- This function exists only on Linux and FreeBSD and is therefore missing on many non-glibc platforms: glibc 2.26, macOS 11.1, FreeBSD 12.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0. But the replacement function is only a stub: It always fails with error `ENOSYS`.
- This function has many problems on Linux kernel versions before 5.3. On these kernel versions, the replacement function always fails with error `ENOSYS`.

Portability problems not fixed by Gnulib:

### 13.116.7 `daemon`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-daemon-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-daemon-3.html)

Documentation:

`man daemon`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, mingw, MSVC 14.

### 13.116.8 `dup3`

Documentation:

`man dup3`

Gnulib module: `dup3`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 4.4.



- This function can crash on some platforms: Cygwin 1.7.25.

Portability problems not fixed by Gnulib:

### 13.116.9 eaccess

Documentation:

man eaccess

This function is an alias of `eidaccess`. See Section 13.116.11 [`eidaccess`], page 740.

### 13.116.10 endusershell

Documentation:

man endusershell

Gnulib module: `getusershell`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.
- This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

### 13.116.11 eidaccess

Documentation:

man eidaccess

Gnulib module: `eidaccess`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

Other problems of this function:

- There is an inherent race between calling this function and performing some action based on the results; you should think twice before trusting this function, especially in a set-uid or set-gid program.
- This function does not have an option for not following symbolic links (like `stat` versus `lstat`). If you need this option, use the Gnulib module `faccessat` with the `AT_EACCESS` flag.

### 13.116.12 execveat

Documentation: `man execveat`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: glibc 2.33/Linux, glibc 2.34/Hurd, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.3.0, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.116.13 `execvpe`

Documentation:

`man execvpe`

Gnulib module: `execvpe`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.10, macOS 11.1, FreeBSD 14.0, NetBSD 7.1, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.5.x, mingw, Android 4.4.
- This function is not declared on some platforms: AIX 7.1.
- On Windows platforms (excluding Cygwin), this function does not pass command-line arguments correctly if they contain space, tab, backslash, or double-quote characters.
- On Windows platforms (excluding Cygwin), this function spawns an asynchronous child process and then exits the current process immediately. As a consequence, the parent of the current process 1. may incorrectly proceed as if its child had exited, and 2. will never see the child's exit status.
- On Windows platforms (excluding Cygwin), the return type of this function is `intptr_t`, not `int`.

Portability problems not fixed by Gnulib:

### 13.116.14 `get_current_dir_name`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Working-Directory.html](https://www.gnu.org/software/libc/manual/html_node/Working-Directory.html),
- `man get_current_dir_name`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.9, mingw, MSVC 14, Android 9.0.

### 13.116.15 `getdomainname`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdomainname.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdomainname.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Identification.html](https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html),
- `man getdomainname`.

Gnulib module: `getdomainname`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Solaris 11.3, mingw, MSVC 14, Android 7.1.
- This function is declared in `netdb.h`, not in `unistd.h`, on some platforms: AIX 7.1.
- The second argument is of type `int`, not `size_t`, on some platforms: macOS 11.1, FreeBSD 14.0, AIX 7.1, IRIX 6.5.

Portability problems not fixed by Gnulib:

### 13.116.16 `getdtablesize`

SUSv2 specification: <https://pubs.opengroup.org/onlinepubs/7908799/xsh/getdtablesize.html>

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdtablesize.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getdtablesize.html)

Documentation:

`man getdtablesize`

Gnulib module: `getdtablesize`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Android LP64, mingw, MSVC 14, Android 9.0.
- This function is not declared on some platforms: Android 13 (LP32?).
- This function does not represent the true `RLIMIT_NOFILE` soft limit on some platforms: Android 13 (LP32?), Cygwin 1.7.25.

Portability problems not fixed by Gnulib:

- On OpenVMS, this function returns the maximum number of open file descriptors in a process. The possible values of file descriptors are not constrained by this function.

### 13.116.17 `getpagesize`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpagesize.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getpagesize.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Query-Memory-Parameters.html](https://www.gnu.org/software/libc/manual/html_node/Query-Memory-Parameters.html),
- `man getpagesize`.

Gnulib module: `getpagesize`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: MSVC 14, Android 4.4.
- This function is not declared on some platforms: HP-UX 11 with compiler option `-D_XOPEN_SOURCE=600`.
- This function is broken on some platforms: mingw.

Portability problems not fixed by Gnulib:

### 13.116.18 `getpass`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/getpass.html](https://www.gnu.org/software/libc/manual/html_node/getpass.html),
- `man getpass`.

Gnulib module: `getpass` or `getpass-gnu`

Portability problems fixed by either Gnulib module `getpass` or `getpass-gnu`:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.
- This function cannot be called from plain inline or extern inline functions on some platforms: Android 13.

Portability problems fixed by Gnulib module `getpass-gnu`:

- The returned password is truncated to `PASS_MAX` characters on some platforms: uClibc (256), musl (128), macOS 11.1 (128), FreeBSD 14.0 (128), NetBSD 3.0 (128), OpenBSD 4.0 (128), AIX 5.1 (32), HP-UX 11 (8), IRIX 6.5 (32), Solaris 11 2010-11 (8, even less than `PASS_MAX`), Cygwin (128). The gnulib implementation returns the password untruncated.

Portability problems not fixed by Gnulib:

### 13.116.19 `getresgid`

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1344>

Documentation:

`man getresgid`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.116.20 `getresuid`

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1344>

Documentation:

`man getresuid`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, HP-UX 11.00, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.116.21 `gettid`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Process-Identification.html](https://www.gnu.org/software/libc/manual/html_node/Process-Identification.html),
- `man gettid`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function exists only on Linux and is therefore missing on most non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.116.22 `getusershell`

Documentation:

`man getusershell`

Gnulib module: `getusershell`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.
- This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

### 13.116.23 `group_member`

Documentation:

`man group_member`

Gnulib module: `group-member`

Portability problems fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

Portability problems not fixed by Gnulib:

### 13.116.24 `pipe2`

Documentation:

`man pipe2`

Gnulib module: `pipe2`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: glibc 2.8, macOS 11.1, FreeBSD 6.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Cygwin 1.7.1, mingw, MSVC 14, Android 2.2. But the replacement function is not atomic; this matters in multi-threaded programs that spawn child processes.

Portability problems not fixed by Gnulib:

- This function crashes rather than failing with `EMFILE` if no resources are left on some platforms: Cygwin 1.7.9.

Note: This function portably supports the `O_NONBLOCK` flag only if the gnulib module `nonblocking` is also used.

### 13.116.25 `profil`

Documentation:

`man profil`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.116.26 `revoke`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.116.27 `sbrk`

Documentation:

`man sbrk`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 12.2/arm64, AIX 5.1, mingw, MSVC 14.

### 13.116.28 `setlogin`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.116.29 setdomainname

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Identification.html](https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html),
- `man setdomainname`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14, Android 7.1.

### 13.116.30 sethostid

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Identification.html](https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html),
- `man sethostid`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.116.31 sethostname

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sethostname-2.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-sethostname-2.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Host-Identification.html](https://www.gnu.org/software/libc/manual/html_node/Host-Identification.html),
- `man sethostname`.

Gnulib module: `sethostname`

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, Cygwin 1.7.x, mingw, MSVC 14, Android 5.1. Note that the Gnulib replacement may fail with `ENOSYS` on some platforms.
- This function is not declared on some platforms: AIX 7.1, Solaris 10.

Portability problems not fixed by Gnulib:

- The first parameter is `char *` instead of `const char *` on some platforms: Solaris 11 2010-11.
- The second parameter is `int` instead of `size_t` on some platforms: macOS 12.5, FreeBSD 14.0, MidnightBSD 3.0, IRIX 6.5, Solaris 11 2010-11, Solaris 11 OpenIndiana, Solaris 11 OmniOS.

### 13.116.32 setresgid

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1344>

Documentation:

man setresgid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.116.33 setresuid

Future POSIX specification:

<https://www.austingroupbugs.net/view.php?id=1344>

Documentation:

man setresuid

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, NetBSD 9.0, Minix 3.1.8, AIX 5.1, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14.

### 13.116.34 setusershell

Documentation:

man setusershell

Gnulib module: getusershell

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, IRIX 6.5, mingw, MSVC 14, Android 9.0.
- This function is missing a declaration on some platforms: Solaris 9.

Portability problems not fixed by Gnulib:

### 13.116.35 syncfs

Documentation:

man syncfs

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: glibc 2.13, macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 8.1.



### 13.116.36 syscall

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/System-Calls.html](https://www.gnu.org/software/libc/manual/html_node/System-Calls.html),
- `man syscall`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, Cygwin 2.9, mingw, MSVC 14.

### 13.116.37 ttyslot

Documentation:

`man ttyslot`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14, Android 9.0.

### 13.116.38 vhangup

Documentation:

`man vhangup`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, mingw, MSVC 14, Android 9.0.

## 13.117 Glibc <utmp.h>

### 13.117.1 endutent

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-endutent-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-endutent-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man endutent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

- This function is not declared on some platforms: Android before ca. 2015.

### 13.117.2 `getutent`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man `getutent`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.117.3 `getutent_r`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-r-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getutent-r-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man `getutent_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.4 `getutid`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man `getutid`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.117.5 `getutid_r`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man getutid_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.6 `getutline`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man getutline`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14, Android 9.0.

### 13.117.7 `getutline_r`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man getutline_r`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.

### 13.117.8 `pututline`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- `man pututline`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.117.9 setutent

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setutent-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-setutent-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man setutent.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.117.10 updwtmp

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man updwtmp.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, HP-UX 11, mingw, MSVC 14, Android 9.0.

### 13.117.11 utmpname

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-utmpname-3.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-utmpname-3.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Manipulating-the-Database.html](https://www.gnu.org/software/libc/manual/html_node/Manipulating-the-Database.html),
- man utmpname.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, mingw, MSVC 14.

### 13.117.12 login

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Logging-In-and-Out.html](https://www.gnu.org/software/libc/manual/html_node/Logging-In-and-Out.html),
- man login.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8, Minix 3.1.8, AIX 7.1, HP-UX 11.31, IRIX 6.5, Solaris 11.4, mingw, MSVC 14, Android 9.0.

### 13.117.13 login\_tty

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Logging-In-and-Out.html](https://www.gnu.org/software/libc/manual/html_node/Logging-In-and-Out.html),
- man login\_tty.

Gnulib module: login\_tty

Portability problems fixed by Gnulib:

- This function is missing on some platforms: Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.3, Android 5.1.
- This function is declared in `<utmp.h>` on glibc, Cygwin, Android, in `<util.h>` on macOS 11.1, NetBSD 5.0, OpenBSD 3.8, in `<libutil.h>` on FreeBSD 14.0, Haiku, and in `<termios.h>` on Solaris 11.4.
- This function requires linking with `-lutil` on some platforms: glibc 2.3.6, FreeBSD 14.0, NetBSD 5.0, OpenBSD 3.8. It is available without link options on other platforms: macOS 11.1, Cygwin.

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: mingw, MSVC 14.

### 13.118 Glibc Extensions to `<utmpx.h>`

### 13.118.1 getutmp

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/XPG-Functions.html](https://www.gnu.org/software/libc/manual/html_node/XPG-Functions.html),
- `man getutmp`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On some platforms, this function does not support timestamps past the year 2038: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits.
- On some platforms, this function misbehaves if the `year2038` or `year2038-recommended` modules are used and the program is configured without the `--disable-year2038` option. The `readutmp` module works around this problem: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits. See Section 14.5 [Avoiding the year 2038 problem], page 762.

### 13.118.2 getutmpx

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/XPG-Functions.html](https://www.gnu.org/software/libc/manual/html_node/XPG-Functions.html),
- `man getutmpx`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On some platforms, this function does not support timestamps past the year 2038: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits.
- On some platforms, this function misbehaves if the `year2038` or `year2038-recommended` modules are used and the program is configured without the `--disable-year2038` option. The `readutmp` module works around this problem: glibc 2.38 on 32-bit platforms like x86 and ARM where `time_t` was historically 32 bits. See Section 14.5 [Avoiding the year 2038 problem], page 762.

### 13.118.3 updwtmpx

Documentation:

`man updwtmpx`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, Cygwin 1.5.x, mingw, MSVC 14, Android 9.0.

### 13.118.4 utmpxname

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/XPG-Functions.html](https://www.gnu.org/software/libc/manual/html_node/XPG-Functions.html),
- `man utmpxname`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on some platforms: FreeBSD 14.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, mingw, MSVC 14, Android 9.0.

## 13.119 Glibc Extensions to `<wchar.h>`

### 13.119.1 fgetwc\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetwc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetwc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Character-Input.html](https://www.gnu.org/software/libc/manual/html_node/Character-Input.html),
- `man fgetwc_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.2 fgetws\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetws-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fgetws-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Line-Input.html](https://www.gnu.org/software/libc/manual/html_node/Line-Input.html),
- `man fgetws_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.3 `fputwc_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputwc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputwc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man fputwc_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.4 `fputws_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputws-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-fputws-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man fputws_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.5 `getwc_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Character-Input.html](https://www.gnu.org/software/libc/manual/html_node/Character-Input.html),



- `man getwc_unlocked`.

GnULib module: —

Portability problems fixed by GnULib:

Portability problems not fixed by GnULib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.6 `getwchar_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwchar-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-getwchar-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Character-Input.html](https://www.gnu.org/software/libc/manual/html_node/Character-Input.html),
- `man getwchar_unlocked`.

GnULib module: —

Portability problems fixed by GnULib:

Portability problems not fixed by GnULib:

- This function is missing on all non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.7 `putwc_unlocked`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwc-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwc-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man putwc_unlocked`.

GnULib module: —

Portability problems fixed by GnULib:

Portability problems not fixed by GnULib:

- This function is missing on some platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.8 putwchar\_unlocked

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwchar-unlocked-1.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-putwchar-unlocked-1.html)

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Simple-Output.html](https://www.gnu.org/software/libc/manual/html_node/Simple-Output.html),
- `man putwchar_unlocked`.

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.9 wcschrnul

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Search-Functions.html](https://www.gnu.org/software/libc/manual/html_node/Search-Functions.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.10 wcsftime\_l

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.11** `wcstod_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.12** `wcstof_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.13** `wcstol_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.14** `wcstold_l`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 7.1, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.15** `wcstoll_1`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.16** `wcstoq`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wcstoq.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wcstoq.html)

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Parsing-of-Integers.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-of-Integers.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.17** `wcstoul_1`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 8.1.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

**13.119.18** `wcstoull_1`

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many platforms: FreeBSD 6.0, NetBSD 5.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 1.7.x, mingw, MSVC 14, Android 4.4.

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.19 `wcstouq`

LSB specification:

[https://refspecs.linuxbase.org/LSB\\_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wcstouq.html](https://refspecs.linuxbase.org/LSB_5.0.0/LSB-Core-generic/LSB-Core-generic/baselib-wcstouq.html)

Documentation:

[https://www.gnu.org/software/libc/manual/html\\_node/Parsing-of-Integers.html](https://www.gnu.org/software/libc/manual/html_node/Parsing-of-Integers.html).

Gnulib module: —

Portability problems fixed by Gnulib:

Portability problems not fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 14.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 9.0.
- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

### 13.119.20 `wmempcpy`

Documentation:

- [https://www.gnu.org/software/libc/manual/html\\_node/Copying-Strings-and-Arrays.html](https://www.gnu.org/software/libc/manual/html_node/Copying-Strings-and-Arrays.html),
- `man wmempcpy`.

Gnulib module: `wmempcpy`

Portability problems fixed by Gnulib:

- This function is missing on many non-glibc platforms: macOS 11.1, FreeBSD 13.0, NetBSD 9.0, OpenBSD 6.7, Minix 3.1.8, AIX 5.1, HP-UX 11, IRIX 6.5, Solaris 11.4, Cygwin 2.9, mingw, MSVC 14, Android 5.1.

Portability problems not fixed by Gnulib:

- On Windows and 32-bit AIX platforms, `wchar_t` is a 16-bit type and therefore cannot accommodate all Unicode characters.

## 14 Native Windows Support

There are three ways to create binaries that run on Microsoft Windows:

- Native binaries, built using the MinGW tool chain.
- Native binaries, built using the MSVC (MS Visual C/C++) tool chain.
- Binaries for the Cygwin environment.

This chapter deals with the MinGW and MSVC platforms, commonly called “native Windows” platforms. Cygwin, on the other hand, is close enough to POSIX that it can be treated like any other Unix-like platform.

### 14.1 Libtool and Windows

If you want it to be possible to compile your program for a native Windows platform and you use Libtool, you need to use the `win32-dll` option of `LT_INIT`. In other words, put:

```
LT_INIT([win32-dll])
```

in your `configure.ac`. This sets the correct names for the `OBJDUMP`, `DLLTOOL`, and `AS` tools for the build.

If you are building a library, you will also need to pass `-no-undefined` to make sure Libtool produces a DLL for your library. From a `Makefile.am`:

```
libsas1_la_LDFLAGS += -no-undefined
```

### 14.2 Large File Support

This module provides support for files 2 GiB and larger, or with device or inode numbers exceeding 32 bits. To this effect, it attempts to ensure that types like `off_t` and `ino_t` are 64-bit, at least on the following platforms: glibc, Mac OS X, FreeBSD, NetBSD, OpenBSD, AIX, HP-UX, IRIX, Solaris, Cygwin, mingw, MSVC.

If the types cannot be made 64-bit, `configure` issues a warning and proceeds.

This module gives `configure` an option `--disable-largefile` that suppresses support for large files. This may be useful if the package links to other libraries whose user-facing ABIs still require `off_t` or most other file-related types to be 32-bit on your platform.

This module also adds to `configure` an option `--enable-year2038`, needed on some platforms to access files with timestamps past the year 2038. See Section 14.5 [Avoiding the year 2038 problem], page 762.

### 14.3 Inode numbers on Windows

The module `'windows-stat-inodes'` ensures that, on native Windows platforms, `struct stat` contains `st_dev`, `st_ino` fields that are able to distinguish different inodes.

Note: Such values can only be provided for most files on the file system. For a few files (such as inaccessible files), `st_dev` and `st_ino` are set to 0. Therefore, you should test whether `st_dev != 0 && st_ino != 0`, before going to make inferences based on the file identity based on `st_dev` and `st_ino`.

## 14.4 Precise file timestamps on Windows

The module `'windows-stat-timespec'` ensures that, on native Windows platforms, `struct stat` contains `st_atim`, `st_mtim`, `st_ctim` fields of type `struct timespec`, providing 100 ns resolution for the timestamps of files.

Note: On some types of file systems, the timestamp resolution is limited by the file system. For example, on FAT file systems, `st_mtim` only has a resolution of 2 seconds. For more details, see <https://docs.microsoft.com/en-us/windows/desktop/SysInfo/file-times>.

## 14.5 Avoiding the year 2038 problem

The *year 2038 problem* denotes unpredictable behaviour that will likely occur in the year 2038, for programs that use a 32-bit signed integer `'time_t'` type that cannot represent timestamps on or after 2038-01-19 03:14:08 UTC. See Year 2038 problem ([https://en.wikipedia.org/wiki/Year\\_2038\\_problem](https://en.wikipedia.org/wiki/Year_2038_problem)) for details.

The Gnulib module `'year2038'` fixes this problem on some platforms, by making `time_t` wide enough to represent timestamps after 2038. This has no effect on most current platforms, which have timestamps that are already wide enough. However, `'year2038'` by default arranges for builds on legacy 32-bit Linux kernels running glibc 2.34 and later to compile with `'_TIME_BITS=64'` to get wider timestamps. On older platforms that do not support timestamps after the year 2038, `'year2038'` causes `configure` to issue a warning but still proceed. On platforms that appear to support post-2038 timestamps but where something prevents this from working, `configure` fails.

The default behavior of `'year2038'` can be overridden by using the `configure` option `--disable-year2038`, which suppresses support for post-2038 timestamps. This may be useful if the package links to other libraries whose user-facing ABIs still require `time_t` to be 32-bit on your platform.

The Gnulib module `'year2038-recommended'` is like `'year2038'`, except it by default rejects platforms where `time_t` cannot represent timestamps after 2038. If this module is used and a 32-bit platform cannot support 64-bit `time_t`, one can still fix the year-2038 problem by using a 64-bit instead of a 32-bit build, as noted in the architecture list below. If all else fails one can configure with `--disable-year2038`; however, the resulting programs will mishandle timestamps after 2038.

The Gnulib module `'year2038-recommended'` is designed for packages intended for use on 32-bit platforms after the year 2038. If your package is commonly built on 32-bit platforms that will not be used after the year 2038, you can use the `'year2038'` module instead, to save builders the trouble of configuring with `--disable-year2038`.

If the Gnulib module `'largefile'` is used but neither `'year2038'` nor `'year2038-recommended'` is used, `configure` will have an option `--enable-year2038` that causes `configure` to behave as if `'year2038'` was used. This is for packages that have long used `'largefile'` but have not gotten around to upgrading their Gnulib module list to include `'year2038'` or `'year2038-recommended'`. See Section 14.2 [Large File Support], page 761.

With the `'year2038-recommended'` module, `configure` by default should work on the following 32-bit platforms (or 32-bit ABIs in bi-arch systems):

- Linux kernel 5.1 (2019) and later with glibc 2.34 (2021) and later on x86, arm, mips (o32 or n32 ABI), powerpc32, sparc32, s390, hppa, m68k, sh, csky, microblaze, nios2,
- Linux kernel 5.1 (2019) and later with musl libc 1.2 (2020) and later on x86,
- Linux on arc, loong32, ork1, riscv32 and x86\_64-x32,
- NetBSD 6.0 (2012) and later on x86 and sparc,
- OpenBSD 5.5 (2014) and later on x86,
- FreeBSD/arm,
- Minix 3.3 (2014).

Whereas with ‘year2038-recommended’, `configure` should by default fail on earlier versions of the abovementioned platforms if a version is listed, and it should also by default fail on all versions of the following older 32-bit platforms or ABIs:

- Android on ARMv7 or x86,
- Mac OS X 10.6 (2009) and earlier on x86 and powerpc,
- GNU/Hurd/x86,
- GNU/kFreeBSD/x86,
- FreeBSD/x86 (this port demoted to Tier 2 in FreeBSD 13 [2021] and planned to never have 64-bit `time_t`),
- MidnightBSD/x86,
- AIX/powerpc (to fix, configure with ‘CC=`gcc -maix64`’ AR=`ar -X64`’),
- Solaris 11.4 (2018) and earlier on x86 and sparc (to fix, configure with ‘CC=`gcc -m64`’),
- Cygwin 3.3.6 (2022) and earlier on x86,
- Haiku/x86.

If you use the ‘year2038’ or ‘year2038-recommended’ modules, and configure to support timestamps after the year 2038, your code should not include ‘`<utmp.h>`’ or ‘`<utmpx.h>`’ directly, because these include files do not work with 64-bit timestamps if the platform’s `time_t` was traditionally 32 bits. Your code can instead use the ‘`readutmp`’ module, which works around this problem.

## 14.6 Windows sockets

One of the portability problems for native Windows are sockets and networking functions.

### 14.6.1 Getaddrinfo and WINVER

This was written for the `getaddrinfo` module, but may be applicable to other functions too.

The `getaddrinfo` function exists in `ws2tcpip.h` and `-lws2_32` on Windows XP. The function declaration is present if `WINVER >= 0x0501`. Windows 2000 does not have `getaddrinfo` in its `WS2_32.DLL`.

Thus, if you want to assume Windows XP or later, you can add `AC_DEFINE([WINVER], [0x0501])` to avoid compiling the (partial) `getaddrinfo` implementation.

If you want to support Windows 2000, don’t do anything. The replacement function will open `WS2_32.DLL` during run-time to see if there is a `getaddrinfo` function available, and use it when available.



## 14.7 Native Windows Support without MSVC Support

If your package does not desire to have MSVC support, that is, if MinGW shall be the only native Windows platform that you wish to get support for from Gnulib, and you wish to minimize the number of files imported from Gnulib accordingly, you can do so by passing the options ‘`--avoid=msvc-inval --avoid=msvc-nothrow`’ to `gnulib-tool`.

## 14.8 Visual Studio Compatibility

The `lib-msvc-compat` module detects whether the linker supports `--output-def` when building a library. That parameter is used to generate a DEF file for a shared library (DLL). DEF files are useful for developers that use Visual Studio to develop programs that links to your library. See the GNU LD manual for more information.

There are other ways to create a DEF file, but we believe they are all sub-optimal to using `--output-def` during the build process. The variants we have considered include:

- Use `DUMPBIN /EXPORTS`. This is explained in <https://docs.microsoft.com/en-us/cpp/build/reference/dash-exports>. The tool does not generate DEF files directly, so its output needs to be post processed manually:

```
$ { echo EXPORTS; \
  dumpbin /EXPORTS libfoo-0.dll | tail -n+20 | awk '{ print $4 }'; \
} > libfoo-0.def
$ lib /def:libfoo-0.def
```

- Use `IMPDEF`. There is a tool called `IMPDEF` that can generate DEF files. However, it is not part of a standard Visual Studio installation. Further, it is documented as being an unreliable process.
- Use `DLLTOOL`. The `dlltool` is part of the MinGW suite, and thus not part of a standard Visual Studio installation. The documentation for the `IMPDEF` tool claims that `DLLTOOL` is the wrong tool for this job. Finally, `DLLTOOL` does not generate DEF files directly, so it requires post-processing of the output.

If you are using `libtool` to build your shared library, here is how to use this module. Import `lib-msvc-compat` to your project, and then add the following lines to the `Makefile.am` that builds the library:

```
if HAVE_LD_OUTPUT_DEF
libfoo_la_LDFLAGS += -Wl,--output-def,libfoo-$(DLL_VERSION).def
libfoo-$(DLL_VERSION).def: libfoo.la
defexecdir = $(libdir)
defexec_DATA = libfoo-$(DLL_VERSION).def
DISTCLEANFILES += $(defexec_DATA)
endif
```

The `DLL_VERSION` variable needs to be defined. It should be the shared library version number used in the DLL filename. For Windows targets you compute this value from the values you pass to `Libtool's -version-info`. Assuming you have variables `LT_CURRENT` and `LT_AGE` defined for the `CURRENT` and `AGE` `libtool` version integers, you compute `DLL_VERSION` as follows:

```
DLL_VERSION=`expr ${LT_CURRENT} - ${LT_AGE}`
AC_SUBST(DLL_VERSION)
```

## 15 Multithreading

Multithreading is a programming paradigm. In a multithreaded program, multiple threads execute concurrently (or quasi concurrently) at different places in the program.

There are three motivations for using multithreading in a program:

- Exploiting CPU hardware with multiple execution units. Nowadays, many CPUs have 2 to 8 execution cores in a single chip. Additionally, often multiple CPU chips are combined in a single package. Thus, some CPU packages support 64 or 96 simultaneous threads of execution.
- Simplifying program architecture. When a program has to read from different file descriptors, network sockets, or event channels at the same time, the classical single-threaded architecture is to have a main loop which uses `select` or `poll` on all the descriptors and then dispatches according to from which descriptor input arrived. In a multi-threaded program, you allocate one thread for each descriptor, and these threads can be programmed and managed independently.
- Offloading work from signal handlers. A signal handler is not allowed to call `malloc`; therefore you are very limited in what you can do in a signal handler. But a signal handler can notify a thread, and the thread can then do the appropriate processing, as complex as it needs to be.

A multithreading API offers

- Primitives for creating threads, for waiting until threads are terminated, and for reaping their results.
- Primitives through which different threads can operate on the same data or use some data structures for communicating between the threads. These are called “mutexes” or “locks”.
- Primitives for executing a certain (initialization) code at most once.
- Primitives for notifying one or more other threads. These are called wait queues or “condition variables”.
- Primitives for allowing different threads to have different values for a variable. Such a variable is said to reside in “thread-local storage” or “thread-specific storage”.
- Primitives for relinquishing control for some time and letting other threads go.

Note: Programs that achieve multithreading through OpenMP (cf. the glibc module ‘`openmp`’) don’t create and manage their threads themselves. Nevertheless, they need to use mutexes/locks in many cases.

### 15.1 The three multithreading APIs

Three multithreading APIs are available to Glibc users:

- POSIX multithreading,
- ISO C multithreading,
- Glibc multithreading.

They are supported on all platforms that have multithreading in one form or the other. Currently, these are all platforms supported by Glibc, except for Minix.

The main differences are:

- The exit code of a thread is a pointer in the POSIX and Gnulib APIs, but only an `int` in the ISO C API.
- The POSIX API has additional facilities for detaching threads, setting the priority of a thread, assigning a thread to a certain set of processors, and much more.
- In the POSIX and ISO C APIs, most functions have a return code, and you are supposed to check the return code; even locking and unlocking a lock can fail. In the Gnulib API, many functions don't have a return code; if they cannot complete, the program aborts. This sounds harsh, but such aborts have not been reported in 12 years.
- In the ISO C API, the initialization of a statically allocated lock is clumsy: You have to initialize it through a once-only function.

## 15.2 Choosing the right multithreading API

Here are guidelines for determining which multithreading API is best for your code.

In programs that use advanced POSIX APIs, such as spin locks, detached threads (`pthread_detach`), signal blocking (`pthread_sigmask`), priorities (`pthread_setschedparam`), processor affinity (`pthread_setaffinity_np`), it is best to use the POSIX API. This is because you cannot convert an ISO C `thrd_t` or a Gnulib `gl_thread_t` to a POSIX `pthread_t`.

In code that is shared with glibc, it is best to use the POSIX API as well.

In libraries, it is best to use the Gnulib API. This is because it gives the person who builds the library an option `'--enable-threads={isoc,posix,windows}'`, that determines on which native multithreading API of the platform to rely. In other words, with this choice, you can minimize the amount of glue code that your library needs to contain.

In the other cases, the POSIX API and the Gnulib API are equally well suited.

The ISO C API is never the best choice, as of this writing (2020).

## 15.3 The POSIX multithreading API

The POSIX multithreading API is documented in POSIX <https://pubs.opengroup.org/onlinepubs/9699919799/>.

To make use of POSIX multithreading, even on platforms that don't support it natively (most prominently, native Windows), use the following Gnulib modules:

<b>Purpose</b>	<b>Module</b>
For thread creation and management:	<code>pthread-thread</code>
For simple and recursive locks:	<code>pthread-mutex</code>
For read-write locks:	<code>pthread-rwlock</code>
For once-only execution:	<code>pthread-once</code>
For “condition variables” (wait queues):	<code>pthread-cond</code>
For thread-local storage:	<code>pthread-tss</code>
For relinquishing control:	<code>sched_yield</code>
For spin locks:	<code>pthread-spin</code>

There is also a convenience module named `pthread` which depends on all of these (except `sched_yield`); so you don't need to enumerate these modules one by one.

## 15.4 The ISO C multithreading API

The ISO C multithreading API is documented in ISO C 11 <http://www.open-std.org/jtc1/sc22/wg14/www/docs/n1570.pdf>.

To make use of ISO C multithreading, even on platforms that don't support it or have severe bugs, use the following Gnulib modules:

<b>Purpose</b>	<b>Module</b>
For thread creation and management:	<code>thrd</code>
For simple locks, recursive locks, and read-write locks:	<code>mtx</code>
For once-only execution:	<code>mtx</code>
For “condition variables” (wait queues):	<code>cnd</code>
For thread-local storage:	<code>tss</code>

There is also a convenience module named `threads` which depends on all of these; so you don't need to enumerate these modules one by one.

## 15.5 The Gnulib multithreading API

The Gnulib multithreading API is documented in the respective include files:

- `<glthread/thread.h>`
- `<glthread/lock.h>`
- `<glthread/cond.h>`
- `<glthread/tls.h>`
- `<glthread/yield.h>`

To make use of Gnulib multithreading, use the following Gnulib modules:

<b>Purpose</b>	<b>Module</b>
For thread creation and management:	<code>thread</code>
For simple locks, recursive locks, and read-write locks:	<code>lock</code>
For once-only execution:	<code>lock</code>
For “condition variables” (wait queues):	<code>cond</code>
For thread-local storage:	<code>tls</code>
For relinquishing control:	<code>yield</code>

The Gnulib multithreading supports a configure option ‘`--enable-threads={isoc,posix,windows}`’, that chooses the underlying thread implementation. Currently (2020):

- `--enable-threads=posix` is supported and is the best choice on all platforms except for native Windows. It may also work, to a limited extent, on mingw with the `winpthreads` library, but is not recommended there.
- `--enable-threads=windows` is supported and is the best choice on native Windows platforms (mingw and MSVC).
- `--enable-threads=isoc` is supported on all platforms that have the ISO C multithreading API. However, `--enable-threads=posix` is always a better choice.

## 15.6 Optimizations of multithreaded code

Despite all the optimizations of multithreading primitives that have been implemented over the years – from atomic operations in hardware (<https://en.wikipedia>.

org/wiki/Compare-and-swap), over futexes (<https://en.wikipedia.org/wiki/Futex>) and restartable sequences (<https://www.ffmpeg.com/blog/2019/02/08/linux-restartable-sequences/>) in the Linux kernel, to lock elision [1] (<https://lwn.net/Articles/534758/>) [2] ([https://www.gnu.org/software/libc/manual/html\\_node/Elision-Tunables.html](https://www.gnu.org/software/libc/manual/html_node/Elision-Tunables.html))) – single-threaded programs can still profit performance-wise from the assertion that they are single-threaded.

Gnulib defines four facilities that help optimizing for the single-threaded case.

- The Gnulib multithreading API, when used on `glibc ≤ 2.32` and \*BSD systems, uses weak symbols to detect whether the program is linked with `libpthread`. If not, the program has no way to create additional threads and must therefore be single-threaded. This optimization applies to all the Gnulib multithreading API (locks, thread-local storage, and more).
- The `thread-optim` module, on `glibc ≥ 2.32` systems, allows your code to skip locking between threads (regardless which of the three multithreading APIs you use). You need extra code for this: include the `"thread-optim.h"` header file, and use the macro `gl_multithreaded` like this:

```
bool mt = gl_multithreaded ();
if (mt) gl_lock_lock (some_lock);
...
if (mt) gl_lock_unlock (some_lock);
```

- You may use the `unlocked-io` module if you want the FILE stream functions `getc`, `putc`, etc. to use unlocked I/O if available, throughout the package. Unlocked I/O can improve performance, sometimes dramatically. But unlocked I/O is safe only in single-threaded programs, as well as in multithreaded programs for which you can guarantee that every FILE stream, including `stdin`, `stdout`, `stderr`, is used only in a single thread.

You need extra code for this optimization to be effective: include the `"unlocked-io.h"` header file. Some Gnulib modules that do operations on FILE streams have these preparations already included.

- You may define the C macro `GNULIB_REGEX_SINGLE_THREAD`, if all the programs in your package invoke the functions of the `regex` module only from a single thread.
- You may define the C macro `GNULIB_MBRTOWC_SINGLE_THREAD`, if all the programs in your package invoke the functions `mbrtowc`, `mbrtoc32`, and the functions of the `regex` module only from a single thread. (The `regex` module uses `mbrtowc` under the hood.)
- You may define the C macro `GNULIB_WCHAR_SINGLE_LOCALE`, if all the programs in your package set the locale early and
  - don't change the locale after it has been initialized, and
  - don't call locale sensitive functions (`mbrtowc`, `wcwidth`, etc.) before the locale has been initialized.

This macro optimizes the functions `mbrtowc`, `mbrtoc32`, and `wcwidth`. You can get this macro defined by including the Gnulib module `wchar-single`.

- You may define the C macro `GNULIB_GETUSERSHELL_SINGLE_THREAD`, if all the programs in your package invoke the functions `setusershell`, `getusershell`, `endusershell` only from a single thread.

- You may define the C macro `GNULIB_EXCLUDE_SINGLE_THREAD`, if all the programs in your package invoke the functions of the `exclude` module only from a single thread.

## 16 Strings and Characters

This chapter describes the APIs for strings and characters, provided by Gnulib.

### 16.1 Strings

Several possible representations exist for the representation of strings in memory of a running C program.

#### 16.1.1 The C string representation

The classical representation of a string in C is a sequence of characters, where each character takes up one or more bytes, followed by a terminating NUL byte. This representation is used for strings that are passed by the operating system (in the `argv` argument of `main`, for example) and for strings that are passed to the operating system (in system calls such as `open`). The C type to hold such strings is `char *` or, in places where the string shall not be modified, `const char *`. There are many C library functions, standardized by ISO C and POSIX, that assume this representation of strings.

A *character encoding*, or *encoding* for short, describes how the elements of a character set are represented as a sequence of bytes. For example, in the ASCII encoding, the UNDERSCORE character is represented by a single byte, with value 0x5F. As another example, the COPYRIGHT SIGN character is represented:

- in the ISO-8859-1 encoding, by the single byte 0xA9,
- in the UTF-8 encoding, by the two bytes 0xC2 0xA9,
- in the GB18030 encoding, by the four bytes 0x81 0x30 0x84 0x38.

Note: The `char` type may be signed or unsigned, depending on the platform. When we talk about the "byte 0xA9" we actually mean the `char` object whose value is `(char) 0xA9`; we omit the cast to `char` in this documentation, for brevity.

In POSIX, the character encoding is determined by the locale. The locale is some environmental attribute that the user can choose.

Depending on the encoding, in general, every character is represented by one or more bytes (up to 4 bytes in practice – but use `MB_LEN_MAX` instead of the number 4 in the code). When every character is represented by only 1 byte, we speak of an “unibyte locale”, otherwise of a “multibyte locale”.

It is important to realize that the majority of Unix installations nowadays use UTF-8 as locale encoding; therefore, the majority of users are using multibyte locales.

Three important facts to remember are:

A `char` is a byte, not a character.

As a consequence:

- The `<ctype.h>` API, that was designed only with unibyte encodings in mind, is useless nowadays for general text processing; it does not work in multibyte locales.
- The `strlen` function does not return the number of characters in a string. Nor does it return the number of screen columns occupied by a string after it is output. It merely returns the number of *bytes* occupied by a string.

- Truncating a string, for example, with `strncpy`, can have the effect of truncating it in the middle of a multibyte character. Such a string will, when output, have a garbled character at its end, often represented by a hollow box.

*Multibyte does not imply UTF-8 encoding.*

While UTF-8 is the most common multibyte encoding, GB18030 is also a supported locale encoding on GNU systems (mostly because it is a Chinese government standard, last revised in 2022).

*Searching for a character in a string is not the same as searching for a byte in the string.*

Take the above example of COPYRIGHT SIGN in the GB18030 encoding: A byte search will find the bytes '0' and '8' in this string. But a search for the *character* "0" or "8" in the string "©" must, of course, report “not found”.

As a consequence:

- `strchr` and `strrchr` do not work with multibyte strings if the locale encoding is GB18030 and the character to be searched is a digit.
- `strstr` does not work with multibyte strings if the locale encoding is different from UTF-8.
- `strcspn`, `strpbrk`, `strspn` cannot work correctly in multibyte locales: they assume the second argument is a list of single-byte characters. Even in this simple case, they do not work with multibyte strings if the locale encoding is GB18030 and one of the characters to be searched is a digit.
- `strsep` and `strtok_r` do not work with multibyte strings unless all of the delimiter characters are ASCII characters < 0x30.
- The `strcasemp`, `strncasemp`, and `strcasestr` functions do not work with multibyte strings.

Workarounds can be found in Gnulib, in the form of `mbs*` API functions:

- Gnulib has functions `mbslen` and `mbswidth` that can be used instead of `strlen` when the number of characters or the number of screen columns of a string is requested.
- Gnulib has functions `mbschr` and `mbsrchr` that are like `strchr` and `strrchr`, but work in multibyte locales.
- Gnulib has a function `mbsstr` that is like `strstr`, but works in multibyte locales.
- Gnulib has functions `mbscspn`, `mbspbrk`, `mbsspn` that are like `strcspn`, `strpbrk`, `strspn`, but work in multibyte locales.
- Gnulib has functions `mbssep` and `mbstok_r` that are like `strsep` and `strtok_r` but work in multibyte locales.
- Gnulib has functions `mbscasemp`, `mbsncasemp`, `mbspcasemp`, and `mbscasestr` that are like `strcasemp`, `strncasemp`, and `strcasestr`, but work in multibyte locales. Still, the function `ulc_casemp` is preferable to these functions.



*A C string can contain encoding errors.*

Not every NUL-terminated byte sequence represents a valid multibyte string. Byte sequences can contain encoding errors, that is, bytes or byte sequences that are invalid and do not represent characters.

String functions like `mbscasecmp` and `strcoll` whose behavior depends on encoding have unspecified behavior on strings containing encoding errors, unless the behavior is specifically documented. If an application needs a particular behavior on these strings it can iterate through them itself, as described in the next subsection.

### 16.1.2 Iterating through strings

For complex string processing, string functions may not be enough, and you need to iterate through a string while processing each (possibly multibyte) character or encoding error in turn. Gnulib has several modules for iterating forward through a string in this way. Backward iteration, that is, from the string's end to start, is not provided, as it is too hairy in general.

- The `mbiter` module iterates through a string whose length is already known. The string can contain NULs and encoding errors.
- The `mbiterf` module is like `mbiter` except it is more complex and typically faster.
- The `mbuiter` module iterates through a C string whose length is not a-priori known. The string can contain encoding errors and is terminated by the first NUL.
- The `mbuiterf` module is like `mbuiter` except it is more complex and typically faster.
- The `mcel` module is simpler than `mbiter` and `mbuiter` and can be faster than even `mbiterf` and `mbuiterf`. It can iterate through either strings whose length is known, or C strings, or strings terminated by other ASCII characters  $< 0x30$ .
- The `mcel-prefer` module is like `mcel` except that it causes some other modules to be based on `mcel` instead of on the `mbiter` family.

The choice of modules depends on the application's needs. The `mbiter` module family is more suitable for applications that treat some sequences of two or more bytes as a single encoding error, and for applications that need to support obsolescent encodings on non-GNU platforms, such as CP864, EBCDIC, Johab, and Shift JIS. In this module family, `mbuiter` and `mbuiterf` are more suitable than `mbiter` and `mbiterf` when arguments are C strings, lengths are not already known, and it is highly likely that only the first few multibyte characters need to be inspected.

The `mcel` module is simpler and can be faster than the `mbiter` family, and is more suitable for applications that do not need the `mbiter` family's special features.

The `mcel-prefer` module is like `mcel` except that it also causes some other modules, such as `mbscasecmp`, to use `mcel` rather than the `mbiter` family. This can be simpler and faster. However, it does not support the obsolescent encodings, and it may behave differently on data containing encoding errors where behavior is unspecified or undefined, because in `mcel` each encoding error is a single byte whereas in the `mbiter` family a single encoding error can contain two or more bytes.

If a package uses `mcel-prefer`, it may also want to give `gnulib-tool` one or more of the options `--avoid=mbiter`, `--avoid=mbiterf`, `--avoid=mbuiter` and `--avoid=mbuiterf`, to avoid packaging modules that are not needed.

### 16.1.3 Strings with NUL characters

The GNU Coding Standards, section [https://www.gnu.org/prep/standards/html\\_node/Semantics.html](https://www.gnu.org/prep/standards/html_node/Semantics.html), specifies:

Utilities reading files should not drop NUL characters, or any other nonprinting characters.

When it is a requirement to store NUL characters in strings, a variant of the C strings is needed. Gnulib offers a “string descriptor” type for this purpose. See Section 17.11 [Handling strings with NUL characters], page 798.

All remarks regarding encodings and multibyte characters in the previous section apply to string descriptors as well.

### 16.1.4 Character and String Functions in C Locale

The functions in this section are similar to the generic string functions from the standard C library, except that

- They behave as if the locale was set to the "C" locale, even when the locale is different, and/or
- They are specially optimized for the case where all characters are plain ASCII characters.

The functions are provided by the following modules.

#### 16.1.4.1 c-ctype

The `c-ctype` module contains functions operating on single-byte characters, like the functions in `<ctype.h>`, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions are:

```
extern bool c_isascii (int c);

extern bool c_isalnum (int c);
extern bool c_isalpha (int c);
extern bool c_isblank (int c);
extern bool c_iscntrl (int c);
extern bool c_isdigit (int c);
extern bool c_islower (int c);
extern bool c_isgraph (int c);
extern bool c_isprint (int c);
extern bool c_ispunct (int c);
extern bool c_isspace (int c);
extern bool c_isupper (int c);
extern bool c_isxdigit (int c);

extern int c_tolower (int c);
extern int c_toupper (int c);
```

These functions assign properties only to ASCII characters.

The `c` argument can be a `char` or `unsigned char` value, whereas the corresponding functions in `<ctype.h>` take an argument that is actually an `unsigned char` value.

The `c_is*` functions return `'bool'`, where the corresponding functions in `<ctype.h>` return `'int'` for historical reasons.

Note: The `<ctype.h>` functions support only unibyte locales.

#### 16.1.4.2 `c-strcase`

The `c-strcase` module contains case-insensitive string comparison functions operating on single-byte character strings, like the functions in `<strings.h>`, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions are:

```
extern int c_strcasecmp (const char *s1, const char *s2);
extern int c_strncasecmp (const char *s1, const char *s2, size_t n);
```

For case conversion here, only ASCII characters are considered to be upper case or lower case.

Note: The functions `strcasecmp`, `strncasecmp` from `<strings.h>` support only unibyte locales; for multibyte locales, you need the functions `mbscasecmp`, `mbsncasecmp`, `mbspcasecmp`.

#### 16.1.4.3 `c-strcaseeq`

The `c-strcaseeq` module contains an optimized case-insensitive string comparison function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The functions is actually implemented as a macro:

```
extern int STRCASEEQ (const char *s1, const char *s2,
                    int s20, int s21, int s22, int s23, int s24, int s25,
                    int s26, int s27, int s28);
```

`s2` should be a short literal ASCII string, and `s20`, `s21`, ... the individual characters of `s2`.

For case conversion here, only ASCII characters are considered to be upper case or lower case.

#### 16.1.4.4 `c-strcasestr`

The `c-strcasestr` module contains a case-insensitive string search function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```
extern char *c_strcasestr (const char *haystack, const char *needle);
```

For case conversion here, only ASCII characters are considered to be upper case or lower case.

Note: The function `strcasestr` from `<string.h>` supports only unibyte locales; for multibyte locales, you need the function `mbscasestr`.

### 16.1.4.5 c-strstr

The `c-strstr` module contains a substring search function operating on single-byte character strings, that operate as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```
extern char *c_strstr (const char *haystack, const char *needle);
```

Note: The function `strstr` from `<string.h>` supports only unibyte locales; for multibyte locales, you need the function `mbsstr`.

### 16.1.4.6 c-strtod

The `c-strtod` module contains a string to number ('double') conversion function operating on single-byte character strings, that operates as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```
extern double c_strtod (const char *string, char **endp);
```

In particular, only a period '.' is accepted as decimal point, even when the current locale's notion of decimal point is a comma ',', and no characters outside the basic character set are accepted.

On platforms without `strtod_l`, this function is not safe for use in multi-threaded applications since it calls `setlocale`.

### 16.1.4.7 c-strtold

The `c-strtold` module contains a string to number ('long double') conversion function operating on single-byte character strings, that operates as if the locale encoding was ASCII. (The "C" locale on many systems has the locale encoding "ASCII".)

The function is:

```
extern long double c_strtold (const char *string, char **endp);
```

In particular, only a period '.' is accepted as decimal point, even when the current locale's notion of decimal point is a comma ','.

## 16.1.5 Comparison of string APIs

This table summarizes the API functions available for strings, in POSIX and in GnuLib.

unibyte strings only	assume locale	C	multibyte strings	multibyte strings with NULs	wide character strings	32-bit wide character strings
<code>strlen</code>	<code>strlen</code>		<code>mbslen</code>	<code>string_desc_length</code>	<code>wcslen</code>	<code>u32_strlen</code>
<code>strnlen</code>	<code>strnlen</code>		<code>mbsnlen</code>	–	<code>wcsnlen</code>	<code>u32_strnlen</code> , <code>u32_mbsnlen</code>

<code>strcmp</code>	<code>strcmp</code>	<code>strcmp</code>	<code>string_</code> <code>desc_cmp</code>	<code>wscmp</code>	<code>u32_</code> <code>strcmp</code>
<code>strncmp</code>	<code>strncmp</code>	<code>strncmp</code>	–	<code>wcsncmp</code>	<code>u32_</code> <code>strncmp</code>
<code>strcasemp</code>	<code>strcasemp</code>	<code>mbscasemp</code>	–	<code>wscasemp</code>	<code>u32_</code> <code>casemp</code>
<code>strncasemp</code>	<code>strncasemp</code>	<code>mbsncasemp,</code> <code>mbspcasemp</code>	–	<code>wcsncasemp</code>	<code>u32_</code> <code>casemp</code>
<code>strcoll</code>	<code>strcmp</code>	<code>strcoll</code>	–	<code>wscoll</code>	<code>u32_</code> <code>strcoll</code>
<code>strxfrm</code>	–	<code>strxfrm</code>	–	<code>wsxfrm</code>	–
<code>strchr</code>	<code>strchr</code>	<code>mbschr</code>	<code>string_</code> <code>desc_index</code>	<code>wchr</code>	<code>u32_</code> <code>strchr</code>
<code>strrchr</code>	<code>strrchr</code>	<code>mbsrchr</code>	<code>string_</code> <code>desc_last_</code> <code>index</code>	<code>wsrchr</code>	<code>u32_</code> <code>strrchr</code>
<code>strstr</code>	<code>strstr</code>	<code>mbsstr</code>	<code>string_</code> <code>desc_</code> <code>contains</code>	<code>wsstr</code>	<code>u32_</code> <code>strstr</code>
<code>strcasestr</code>	<code>strcasestr</code>	<code>mbscasestr</code>	–	–	–
<code>strspn</code>	<code>strspn</code>	<code>mbsspn</code>	–	<code>wcsspn</code>	<code>u32_</code> <code>strspn</code>
<code>strcspn</code>	<code>strcspn</code>	<code>mbscspn</code>	–	<code>wscspn</code>	<code>u32_</code> <code>strcspn</code>
<code>strpbrk</code>	<code>strpbrk</code>	<code>mbspbrk</code>	–	<code>wcpbrk</code>	<code>u32_</code> <code>strpbrk</code>
<code>strtok_r</code>	<code>strtok_r</code>	<code>mbstok_r</code>	–	<code>wcstok</code>	<code>u32_</code> <code>strtok</code>
<code>strsep</code>	<code>strsep</code>	<code>mbssep</code>	–	–	–
<code>strcpy</code>	<code>strcpy</code>	<code>strcpy</code>	<code>string_</code> <code>desc_copy</code>	<code>wscopy</code>	<code>u32_</code> <code>strcpy</code>

stpcpy	stpcpy	stpcpy	–	wcpcpy	u32_ stpcpy
strncpy	strncpy	strncpy	–	wcsncpy	u32_ strncpy
stpncpy	stpncpy	stpncpy	–	wcpncpy	u32_ stpncpy
strcat	strcat	strcat	string_ desc_ concat	wscat	u32_ strcat
strncat	strncat	strncat	–	wcsncat	u32_ strncat
free	free	free	string_ desc_free	free	free
strdup	strdup	strdup	string_ desc_copy	wcsdup	u32_ strdup
strndup	strndup	strndup	–	–	–
mbswidth	mbswidth	mbswidth	–	wcswidth	c32swidth, u32_ strwidth
strtol	strtol	strtol	–	–	–
strtoul	strtoul	strtoul	–	–	–
strtoll	strtoll	strtoll	–	–	–
strtoull	strtoull	strtoull	–	–	–
strtoimax	strtoimax	strtoimax	–	wcstoimax	–
strtoumax	strtoumax	strtoumax	–	wcstoumax	–
strtof	–	strtof	–	–	–
strtod	c_strtod	strtod	–	–	–
strtold	c_strtold	strtold	–	–	–

<code>strfromf</code>	–	<code>strfromf</code>	–	–	–
<code>strfromd</code>	–	<code>strfromd</code>	–	–	–
<code>strfroml</code>	–	<code>strfroml</code>	–	–	–
–	–	–	–	<code>mbstowcs</code>	<code>mbstoc32s</code>
–	–	–	–	<code>mbsrtowcs</code>	<code>mbsrtoc32s</code>
–	–	–	–	<code>mbsnrtowcs</code>	<code>mbsnrtoc32s</code>
–	–	–	–	<code>wcstombs</code>	<code>c32stombs</code>
–	–	–	–	<code>wcsrtombs</code>	<code>c32srtombs</code>
–	–	–	–	<code>wcsnrtombs</code>	<code>c32snrtombs</code>

## 16.2 Characters

A *character* is the elementary unit that strings are made of.

What is a character? “A character is an element of a character set” is sort of a circular definition, but it highlights the fact that it is not merely a number. Although many characters are visually represented by a single glyph, there are characters that, for example, have a different glyph when used at the end of a word than when used inside a word. A character is also not the minimal rendered text processing unit; that is a grapheme cluster and in general consists of one or more characters. If you want to know more about the concept of character and various concepts associated with characters, refer to the Unicode standard.

For the representation in memory of a character, various types have been in use, and some of them were failures: `char` and `wchar_t` were invented for this purpose, but are not the right types. `char32_t` is the right type (successor of `wchar_t`); and `mbchar_t` (defined by Gnulib) is an alternative for specific kinds of processing.

### 16.2.1 The `char` type

The `char` type is in the C language since the beginning in the 1970ies, but – due to its limitation of 256 possible values – is no longer the adequate type for storing a character.

Technically, it is still adequate in unibyte locales. But since most locales nowadays are multibyte locales, it makes no sense to write a program that runs only in unibyte locales.

ISO C and POSIX standardized an API for characters of type `char`, in `<ctype.h>`. This API is nowadays useless and obsolete, when it comes to general text processing.

The important lessons to remember are:

A ‘`char`’ is just the elementary storage unit for a string, not a character.

*Never use <ctype.h>!*

### 16.2.2 The `wchar_t` type

The ISO C and POSIX standard creators made an attempt to overcome the dead end regarding the `char` type. They introduced

- a type `wchar_t`, designed to encapsulate a character,
- a “wide string” type `wchar_t *`, with some API functions declared in `<wchar.h>`, and
- functions declared in `<wctype.h>` that were meant to supplant the ones in `<ctype.h>`.

Unfortunately, this API and its implementation has numerous problems:

- On Windows platforms and on AIX in 32-bit mode, `wchar_t` is a 16-bit type. This means that it can never accommodate an entire Unicode character. Either the `wchar_t *` strings are limited to characters in UCS-2 (the “Basic Multilingual Plane” of Unicode), or – if `wchar_t *` strings are encoded in UTF-16 – a `wchar_t` represents only half of a character in the worst case, making the `<wctype.h>` functions pointless.
- On Solaris and FreeBSD, the `wchar_t` encoding is locale dependent and undocumented. This means, if you want to know any property of a `wchar_t` character, other than the properties defined by `<wctype.h>` – such as whether it’s a dash, currency symbol, paragraph separator, or similar –, you have to convert it to `char *` encoding first, by use of the function `wctomb`.
- When you read a stream of wide characters, through the functions `fgetwc` and `fgetws`, and when the input stream/file is not in the expected encoding, you have no way to determine the invalid byte sequence and do some corrective action. If you use these functions, your program becomes “garbage in - more garbage out” or “garbage in - abort”.

As a consequence, it is better to use multibyte strings. Such multibyte strings can bypass limitations of the `wchar_t` type, if you use functions defined in Gnulib and GNU libunistring for text processing. They can also faithfully transport malformed characters that were present in the input, without requiring the program to produce garbage or abort.

### 16.2.3 The `char32_t` type

The ISO C and POSIX standard creators then introduced the `char32_t` type. In ISO C 11, it was conceptually a “32-bit wide character” type. In ISO C 23, its semantics has been further specified: A `char32_t` value is a Unicode code point.

Thus, the `char32_t` type is not affected the problems that plague the `wchar_t` type.

The `char32_t` type and its API are defined in the `<uchar.h>` header file.

ISO C and POSIX specify only the basic functions for the `char32_t` type, namely conversion of a single character (`mbrtoc32` and `c32rtomb`). For convenience, Gnulib adds API for classification and case conversion of characters.

GNU libunistring can also be used on `char32_t` values. Since `char32_t` is the same as `uint32_t`, all `u32_*` functions of GNU libunistring are applicable to arrays of `char32_t` values.



On glibc systems, use of the 32-bit wide strings (`char32_t[]`) is exactly as efficient as the use of the older wide strings (`wchar_t[]`). This is possible because on glibc, `wchar_t` values already always were 32-bit and Unicode code points. `mbrtoc32` is just an alias of `mbrtowc`. The Gnuilib `*c32*` functions are optimized so that on glibc systems they immediately redirect to the corresponding `*wc*` functions.

Gnuilib implements the ISO C 23 semantics of `char32_t` when you import the `'uchar-c23'` module. Without this module, it implements only the ISO C 11 semantics; the effect is that on some platforms (macOS, FreeBSD, NetBSD, Solaris) a `char32_t` value is the same as a `wchar_t` value, not a Unicode code point. Thus, when you want to pass `char32_t` values to GNU libunistring or to some Unicode centric Gnuilib functions, you need the `'uchar-c23'` module in order to do so without portability problems.

### 16.2.4 The `mbchar_t` type

Gnuilib defines an alternate way to encode a multibyte character: `mbchar_t`. Its main feature is the ability to process a string or stream with some malformed characters without reporting an error.

The type `mbchar_t`, defined in `"mbchar.h"`, holds a character in both the multibyte and the 32-bit wide character representation. In case of a malformed character only the multibyte representation is used.

#### 16.2.4.1 Reading multibyte strings

If you want to process (possibly multibyte) characters while reading them from a `FILE * stream`, without reading them into a string first, the `mbfile` module is made for this purpose.

### 16.2.5 Comparison of character APIs

This table summarizes the API functions available for characters, in POSIX and in Gnuilib.

unibyte character	assume C locale	wide character	32-bit character	wide	<code>mbchar_t</code> character
<code>== '\0'</code>	<code>== '\0'</code>	<code>== L'\0'</code>	<code>== 0</code>		<code>mb_isnul</code>
<code>==</code>	<code>==</code>	<code>==</code>	<code>==</code>		<code>mb_equal</code>
<code>isalnum</code>	<code>c_isalnum</code>	<code>iswalnum</code>	<code>c32isalnum</code>		<code>mb_isalnum</code>
<code>isalpha</code>	<code>c_isalpha</code>	<code>iswalpha</code>	<code>c32isalpha</code>		<code>mb_isalpha</code>
<code>isblank</code>	<code>c_isblank</code>	<code>iswblank</code>	<code>c32isblank</code>		<code>mb_isblank</code>
<code>iscntrl</code>	<code>c_iscntrl</code>	<code>iswcntrl</code>	<code>c32iscntrl</code>		<code>mb_iscntrl</code>
<code>isdigit</code>	<code>c_isdigit</code>	<code>iswdigit</code>	<code>c32isdigit</code>		<code>mb_isdigit</code>

<code>isgraph</code>	<code>c_isgraph</code>	<code>iswgraph</code>	<code>c32isgraph</code>	<code>mb_isgraph</code>
<code>islower</code>	<code>c_islower</code>	<code>iswlower</code>	<code>c32islower</code>	<code>mb_islower</code>
<code>isprint</code>	<code>c_isprint</code>	<code>iswprint</code>	<code>c32isprint</code>	<code>mb_isprint</code>
<code>ispunct</code>	<code>c_ispunct</code>	<code>iswpunct</code>	<code>c32ispunct</code>	<code>mb_ispunct</code>
<code>isspace</code>	<code>c_isspace</code>	<code>iswspace</code>	<code>c32isspace</code>	<code>mb_isspace</code>
<code>isupper</code>	<code>c_isupper</code>	<code>iswupper</code>	<code>c32isupper</code>	<code>mb_isupper</code>
<code>isxdigit</code>	<code>c_isxdigit</code>	<code>iswxdigit</code>	<code>c32isxdigit</code>	<code>mb_isxdigit</code>
–	–	<code>wctype</code>	<code>c32_get_ type_test</code>	–
–	–	<code>iswctype</code>	<code>c32_apply_ type_test</code>	–
<code>tolower</code>	<code>c_tolower</code>	<code>towlower</code>	<code>c32tolower</code>	–
<code>toupper</code>	<code>c_toupper</code>	<code>towupper</code>	<code>c32toupper</code>	–
–	–	<code>wctrans</code>	<code>c32_get_ mapping</code>	–
–	–	<code>towctrans</code>	<code>c32_apply_ mapping</code>	–
–	–	<code>wcwidth</code>	<code>c32width</code>	<code>mb_width</code>

## 17 Particular Modules

### 17.1 `alloca`

The `alloca` module provides for a function `alloca` which allocates memory on the stack, where the system allows it. A memory block allocated with `alloca` exists only until the function that calls `alloca` returns or exits abruptly.

There are a few systems where this is not possible: HP-UX systems, and some other platforms when the C++ compiler is used. On these platforms the `alloca` module provides a `malloc` based emulation. This emulation will not free a memory block immediately when the calling function returns, but rather will wait until the next `alloca` call from a function with the same or a shorter stack length. Thus, in some cases, a few memory blocks will be kept although they are not needed any more.

The user can `#include <alloca.h>` and use `alloca` on all platforms. Note that the `#include <alloca.h>` must be the first one after the autoconf-generated `config.h`, for AIX 3 compatibility. Thanks to IBM for this nice restriction!

Note that GCC 3.1 and 3.2 can *inline* functions that call `alloca`. When this happens, the memory blocks allocated with `alloca` will not be freed until *the end of the calling function*. If this calling function runs a loop calling the function that uses `alloca`, the program easily gets a stack overflow and crashes. To protect against this compiler behaviour, you can mark the function that uses `alloca` with the following attribute:

```
#ifdef __GNUC__
__attribute__((__noinline__))
#endif
```

An alternative to this module is the ‘`alloca-opt`’ module.

### 17.2 `alloca-opt`

The `alloca-opt` module provides for a function `alloca` which allocates memory on the stack, where the system allows it. A memory block allocated with `alloca` exists only until the function that calls `alloca` returns or exits abruptly.

There are a few systems where this is not possible: HP-UX systems, and some other platforms when the C++ compiler is used. On these platforms the `alloca-opt` module provides no replacement, just a preprocessor macro `HAVE_ALLOCA`.

The user can `#include <alloca.h>` on all platforms, and use `alloca` on those platforms where the preprocessor macro `HAVE_ALLOCA` evaluates to true. If `HAVE_ALLOCA` is false, the code should use a heap-based memory allocation based on `malloc` or (in C++) `new`. Note that the `#include <alloca.h>` must be the first one after the autoconf-generated `config.h`, for AIX 3 compatibility. Thanks to IBM for this nice restriction!

Note that GCC 3.1 and 3.2 can *inline* functions that call `alloca`. When this happens, the memory blocks allocated with `alloca` will not be freed until *the end of the calling function*. If this calling function runs a loop calling the function that uses `alloca`, the program easily gets a stack overflow and crashes. To protect against this compiler behaviour, you can mark the function that uses `alloca` with the following attribute:

```
#ifdef __GNUC__
__attribute__((__noinline__))
#endif
```

### 17.3 Safe Allocation Macros

The standard C library `malloc/realloc/calloc/free` APIs are prone to a number of common coding errors. The `safe-alloc` module provides macros that make it easier to avoid many of them. It still uses the standard C allocation functions behind the scenes.

Some of the memory allocation mistakes that are commonly made are

- passing the incorrect number of bytes to `malloc`, especially when allocating an array,
- unchecked integer overflow when calculating array sizes,
- fail to check the return value of `malloc` and `realloc` for errors,
- forget to fully initialize memory just allocated with `malloc`,
- duplicate calls to `free` by forgetting to set the pointer variable to `NULL`,
- leaking memory in calls to `realloc` when that call fails.

The `safe-alloc` module addresses these problems in the following way:

- It defines macros that wrap around the standard C allocation functions. That makes it possible to use the compiler's knowledge of the size of objects for allocation; it also allows setting pointers passed in as arguments when appropriate.
- It uses return values only for a success/failure error condition flag, and annotates them with GCC's `__warn_unused_result__` attribute.
- When allocating a fresh array, it uses `calloc` instead of `malloc` so that the array's contents are zeroed. However, memory added to an already-existing array is uninitialized.

`int ALLOC(ptr)` [Macro]

Allocate `sizeof *ptr` bytes of memory and store the address of allocated memory in `ptr`. Fill the newly allocated memory with zeros.

Returns `-1` on failure, `0` on success.

`int ALLOC_N(ptr, count)` [Macro]

Allocate an array of `count` elements, each `sizeof *ptr` bytes long, and store the address of allocated memory in `ptr`. Fill the newly allocated memory with zeros.

Returns `-1` on failure, `0` on success.

`int ALLOC_N_UNINITIALIZED(ptr, count)` [Macro]

Allocate an array of `count` elements, each `sizeof *ptr` bytes long, and store the address of allocated memory in `ptr`. The allocated memory is not initialized.

Returns `-1` on failure, `0` on success.

`int REALLOC_N(ptr, count)` [Macro]

Reallocate the memory pointed to by `ptr` to be big enough to hold at least `count` elements, each `sizeof *ptr` bytes long, and store the address of allocated memory in `ptr`. If reallocation fails, the `ptr` variable is not modified. If the new array is smaller than the old one, discard excess contents; if larger, the newly added storage is not initialized.

Returns `-1` on failure, `0` on success.

`void FREE(ptr)` [Macro]

Free the memory stored in `ptr` and set `ptr` to `NULL`.

## 17.4 Attributes

This module provides a header file `attribute.h` that defines macros related to C and C++ attributes and the GCC `__attribute__` keyword.

Here is an example of its use:

```
#include <attribute.h>

NODISCARD
extern char *crypt (char const *, char const *)
    ATTRIBUTE_NOTHROW ATTRIBUTE_LEAF ATTRIBUTE_NONNULL ((1, 2));
```

`NODISCARD` expands to `[[nodiscard]]` if the compiler supports this C23 syntax, otherwise to `__attribute__((__warn_unused_result__))` if the compiler is a recent-enough GCC or GCC-like compiler, otherwise to nothing. `ATTRIBUTE_NOTHROW` expands to `__attribute__((__nothrow__))` if the compiler is a recent-enough GCC or GCC-like compiler, and to nothing otherwise. Similarly for `ATTRIBUTE_LEAF`. `ATTRIBUTE_NONNULL ((1, 2))` expands to `__attribute__((__nonnull__ (1, 2)))` if the compiler is recent-enough GCC, and to nothing otherwise.

Most of these attribute names begin with `ATTRIBUTE_`. A few do not, because they are part of C23 and their names are not likely to clash with other macro names. These macros are `DEPRECATED`, `FALLTHROUGH`, `MAYBE_UNUSED`, and `NODISCARD`, which can be defined to `[[deprecated]]` etc. on C23 platforms. Also, these exceptional macros should be placed at the start of function declarations, whereas the `ATTRIBUTE_*` macros can be placed at the end.

## 17.5 Compile-time Assertions

This module provides a header file `verify.h` that defines macros related to compile-time verification.

Two of these macros are `verify (V)` and `verify_expr (V, EXPR)`. Both accept an integer constant expression argument `V` and verify that it is nonzero. If not, a compile-time error results.

These two macros implement compile-time tests, as opposed to the standard `assert` macro which supports only runtime tests. Since the tests occur at compile-time, they are more reliable, and they require no runtime overhead.

`verify (V)`; is a declaration; it can occur outside of functions. In contrast, `verify_expr (V, EXPR)` is an expression that returns the value of `EXPR`; it can be used in macros that expand to expressions. If `EXPR` is an integer constant expression, then `verify_expr (V, EXPR)` is also an integer constant expression. Although `EXPR` and `verify_expr (V, EXPR)` are guaranteed to have the same side effects and value and type (after integer promotion), they need not have the same type if `EXPR`'s type is an integer that is narrower than `int` or `unsigned int`.

`V` should be an integer constant expression in the sense of the C standard. Its leaf operands should be integer, enumeration, or character constants; or `sizeof` expressions that return constants; or floating constants that are the immediate operands of casts. Outside a `sizeof` subexpression, `V` should not contain any assignments, function calls, comma

operators, casts to non-integer types, or subexpressions whose values are outside the representable ranges for their types. If  $V$  is not an integer constant expression, then a compiler might reject a usage like ‘`verify (V);`’ even when  $V$  is nonzero.

Although the standard `assert` macro is a runtime test, C23 and C++17 specify a builtin `static_assert (V)`, which differs from `verify` in two major ways. First, it can also be used within a `struct` or `union` specifier, in place of an ordinary member declaration. Second, it allows the programmer to specify, as an optional second argument, a compile-time diagnostic as a string literal. If your program is not intended to be portable to compilers that lack C23 or C++17 `static_assert`, the only advantage of `verify` is that its name is a bit shorter.

The `verify.h` header defines one more macro, `assume (E)`, which expands to an expression of type `void` that causes the compiler to assume that  $E$  yields a nonzero value.  $E$  should be a scalar expression, and should not have side effects; it may or may not be evaluated. The behavior is undefined if  $E$  would yield zero. The main use of `assume` is optimization, as the compiler may be able to generate better code if it assumes  $E$ . For best results,  $E$  should be simple enough that a compiler can determine that it has no side effects: if  $E$  calls an external function or accesses volatile storage the compiler may not be able to optimize  $E$  away and `assume (E)` may therefore slow down the program.

Here are some example uses of these macros.

```
#include <verify.h>

#include <limits.h>
#include <time.h>

/* Verify that time_t is an integer type. */
verify ((time_t) 1.5 == 1);

/* Verify that time_t is no smaller than int. */
verify (sizeof (int) <= sizeof (time_t));

/* Verify that time_t is signed. */
verify ((time_t) -1 < 0);

/* Verify that time_t uses two's complement representation. */
verify (~ (time_t) -1 == 0);

/* Return the maximum value of the integer type T,
   verifying that T is an unsigned integer type.
   The cast to (T) is outside the call to verify_expr
   so that the result is of type T
   even when T is narrower than unsigned int. */
#define MAX_UNSIGNED_VAL(t) \
    ((T) verify_expr (0 < (T) -1, -1))

/* Return T divided by CHAR_MAX + 1, where behavior is
   undefined if T < 0. In the common case where CHAR_MAX
   is 127 the compiler can therefore implement the division
```

```

    by shifting T right 7 bits, an optimization that would
    not be valid if T were negative. */
time_t
time_index (time_t t)
{
    assume (0 <= t);
    return t / (CHAR_MAX + 1);
}

```

## 17.6 Non-returning Functions

A "non-returning" function is a function which cannot return normally. Instead of returning, it can loop forever, or it can transfer control via `abort`, `execvp`, `exit`, `longjmp`, `throw` (in C++), or similar mechanisms. Non-returning functions are declared with a `void` return type.

It helps the compiler's ability to emit sensible warnings, following data-flow analysis, to declare which functions are non-returning. It can also help generate more-efficient code, as there is no need to save a return address when calling a non-returning function.

Gnulib has multiple ways to support such a declaration:

- The `_Noreturn` keyword. No modules are needed, as Gnulib arranges for `<config.h>` to define `_Noreturn` to an appropriate replacement on platforms lacking it. Unfortunately, although this approach works for all current C versions, the `_Noreturn` keyword is obsolescent in C23.
- The `'noreturn'` module. It provides a way to put this declaration at function declarations, at function definitions, and in function pointer types. The identifiers to use are:
  - `_GL_NORETURN_FUNC` for use in function declarations and function definitions.
  - `_GL_NORETURN_FUNCPTR` for use on function pointers.

The include file is `<noreturn.h>`.

Which of the approaches to use? If the non-returning functions you have to declare are unlikely to be accessed through function pointers, you should use `_Noreturn`; otherwise the module `noreturn` provides for better data-flow analysis and thus for better warnings.

There is also an obsolete `stdnoreturn` module, but its use is no longer recommended.

## 17.7 Integer Properties

The `intprops` module consists of an include file `<intprops.h>` that defines several macros useful for testing properties of integer types.

Integer overflow is a common source of problems in programs written in C and other languages. In some cases, such as signed integer arithmetic in C programs, the resulting behavior is undefined, and practical platforms do not always behave as if integers wrap around reliably. In other cases, such as unsigned integer arithmetic in C, the resulting behavior is well-defined, but programs may still misbehave badly after overflow occurs.

Many techniques have been proposed to attack these problems. These include precondition testing, wraparound behavior where signed integer arithmetic is guaranteed to be modular, saturation semantics where overflow reliably yields an extreme value, undefined behavior sanitizers where overflow is guaranteed to trap, and various static analysis techniques.

Gnlib supports wraparound arithmetic and precondition testing, as these are relatively easy to support portably and efficiently. There are two families of precondition tests: the first, for integer types, is easier to use, while the second, for integer ranges, has a simple and straightforward portable implementation.

Like other Gnlib modules, the implementation of the `intprops` module assumes that integers use a two's complement representation, but it does not assume that signed integer arithmetic wraps around. See Section 1.5.4 [Other portability assumptions], page 6.

### 17.7.1 Arithmetic Type Properties

`TYPE_IS_INTEGER (t)` is an arithmetic constant expression that yields 1 if the arithmetic type  $t$  is an integer type, 0 otherwise. `bool` counts as an integer type.

`TYPE_SIGNED (t)` is an arithmetic constant expression that yields 1 if the real type  $t$  is a signed integer type or a floating type, 0 otherwise. If  $t$  is an integer type, `TYPE_SIGNED (t)` is an integer constant expression.

`EXPR_SIGNED (e)` yields 1 if the real expression  $e$  has a signed integer type or a floating type, 0 otherwise. If  $e$  is an integer constant expression or an arithmetic constant expression, `EXPR_SIGNED (e)` is likewise. The expression  $e$  is not evaluated, and `EXPR_SIGNED (e)` is typically optimized to a constant.

Example usage:

```
#include <intprops.h>
#include <sys/types.h>

enum
{
    clock_t_is_integer = TYPE_IS_INTEGER (clock_t),
    uid_t_is_signed = TYPE_SIGNED (uid_t)
};

int
CLOCKS_PER_SEC_is_signed (void)
{
    return EXPR_SIGNED (CLOCKS_PER_SEC);
}
```

### 17.7.2 Integer Bounds

`INT_BUFSIZE_BOUND (t)` is an integer constant expression that is a bound on the size of the string representing an integer type or expression  $t$  in decimal notation, including the terminating null character and any leading `-` character. For example, if `INT_BUFSIZE_BOUND (int)` is 12, any value of type `int` can be represented in 12 bytes or less, including the terminating null. The bound is not necessarily tight.



Example usage:

```
#include <intprops.h>
#include <stdio.h>
int
int_strlen (int i)
{
    char buf[INT_BUFSIZE_BOUND (int)];
    return sprintf (buf, "%d", i);
}
```

`INT_STRLEN_BOUND (t)` is an integer constant expression that is a bound on the length of the string representing an integer type or expression *t* in decimal notation, including any leading `-` character. This is one less than `INT_BUFSIZE_BOUND (t)`.

`TYPE_MINIMUM (t)` and `TYPE_MAXIMUM (t)` are integer constant expressions equal to the minimum and maximum values of the integer type *t*. These expressions are of the type *t*.

Example usage:

```
#include <sys/types.h>
#include <intprops.h>
bool
in_off_t_range (long long int a)
{
    return TYPE_MINIMUM (off_t) <= a && a <= TYPE_MAXIMUM (off_t);
}
```

### 17.7.3 Checking Integer Overflow

Signed integer arithmetic has undefined behavior on overflow in C. Although almost all modern computers use two's complement signed arithmetic that is well-defined to wrap around, C compilers routinely optimize assuming that signed integer overflow cannot occur, which means that a C program cannot easily get at the underlying machine arithmetic. For example:

```
if ((a + b < b) == (a < 0))
    a += b;
else
    printf ("overflow\n");
```

might not work as expected if `a` and `b` are signed, because a compiler can assume that signed overflow cannot occur and treat the entire `if` expression as if it were true. And even if `a` is unsigned, the expression might not work as expected if `b` is negative or is wider than `a`.

The following macros work around this problem by yielding an overflow indication while computing the sum, difference, or product of two integers. For example, if `i` is of type `int`, `INT_ADD_OK (INT_MAX - 1, 1, &i)` sets `i` to `INT_MAX` and yields 1, whereas `INT_ADD_OK (INT_MAX, 1, &i)` yields 0.

Example usage:

```
#include <intprops.h>
#include <stdio.h>
```

```

/* Compute A * B, reporting whether overflow occurred.  */
void
print_product (long int a, long int b)
{
    long int r;
    if (INT_MULTIPLY_OK (a, b, &r))
        printf ("result is %ld\n", r);
    else
        printf ("overflow\n");
}

```

These macros work for both signed and unsigned integers, so they can be used with integer types like `time_t` that may or may not be signed, depending on the platform.

These macros have the following restrictions:

- Their first two arguments must be integer expressions.
- Their last argument must be a non-null pointer to an integer.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.
- They are not necessarily constant expressions, even if all their arguments are constant expressions.

`INT_ADD_OK (a, b, r)`

Compute the sum of *a* and *b*. If it fits into *\*r*, store it there and yield 1. Otherwise yield 0, possibly modifying *\*r* to an unspecified value. See above for restrictions.

`INT_SUBTRACT_OK (a, b, r)`

Compute the difference between *a* and *b*. If it fits into *\*r*, store it there and yield 1. Otherwise yield 0, possibly modifying *\*r* to an unspecified value. See above for restrictions.

`INT_MULTIPLY_OK (a, b, r)`

Compute the product of *a* and *b*. If it fits into *\*r*, store it there and yield 1. Otherwise yield 0, possibly modifying *\*r* to an unspecified value. See above for restrictions.

Other macros are available if you need wrapped-around results when overflow occurs (see Section 17.7.4 [Wraparound Arithmetic], page 789), or if you need to check for overflow in operations other than addition, subtraction, and multiplication (see Section 17.7.5 [Integer Type Overflow], page 791).

### 17.7.4 Wraparound Arithmetic with Integers

Signed integer arithmetic has undefined behavior on overflow in C. Although almost all modern computers use two's complement signed arithmetic that is well-defined to wrap around, C compilers routinely optimize assuming that signed integer overflow cannot occur, which means that a C program cannot easily get at the underlying machine arithmetic. For example, on a typical machine with 32-bit two's complement `int` the expression `INT_MAX + 1` does not necessarily yield `INT_MIN`, because the compiler may do calculations with a 64-bit register, or may generate code that traps on signed integer overflow.

The following macros work around this problem by storing the wraparound value, i.e., the low-order bits of the correct answer, and by yielding an overflow indication. For example, if `i` is of type `int`, `INT_ADD_WRAPV (INT_MAX, 1, &i)` sets `i` to `INT_MIN` and yields 1 on a two's complement machine. See Section 17.7.5 [Integer Type Overflow], page 791.

Example usage:

```
#include <intprops.h>
#include <stdio.h>

/* Print the low order bits of A * B,
   reporting whether overflow occurred. */
void
print_product (long int a, long int b)
{
    long int r;
    int overflow = INT_MULTIPLY_WRAPV (a, b, &r);
    printf ("result is %ld (%s)\n", r,
           (overflow
            ? "after overflow"
            : "no overflow"));
}
```

These macros work for both signed and unsigned integers, so they can be used with integer types like `time_t` that may or may not be signed, depending on the platform.

These macros have the following restrictions:

- Their first two arguments must be integer expressions.
- Their last argument must be a non-null pointer to an integer.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.
- They are not necessarily constant expressions, even if all their arguments are constant expressions.

`INT_ADD_WRAPV (a, b, r)`

Store the low-order bits of the sum of `a` and `b` into `*r`. Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct sum. See above for restrictions.

`INT_SUBTRACT_WRAPV (a, b, r)`

Store the low-order bits of the difference between `a` and `b` into `*r`. Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct difference. See above for restrictions.

`INT_MULTIPLY_WRAPV (a, b, r)`

Store the low-order bits of the product of `a` and `b` into `*r`. Yield 1 if overflow occurred, 0 if the low-order bits are the mathematically-correct product. See above for restrictions.

If your code includes `<intprops.h>` only for these `_WRAPV` macros, you may prefer to use Gnulib's `stdckdint` module instead, as it supports similar macros that were standardized

in C23 and are therefore independent of Gnulib if your code can assume C23 or later. See Section 9.48 [stdckdint.h], page 69.

Other macros are available if you do not need wrapped-around results when overflow occurs (see Section 17.7.3 [Checking Integer Overflow], page 788), or if you need to check for overflow in operations other than addition, subtraction, and multiplication (see Section 17.7.5 [Integer Type Overflow], page 791).

### 17.7.5 Integer Type Overflow

Although unsigned integer arithmetic wraps around modulo a power of two, signed integer arithmetic has undefined behavior on overflow in C. Almost all modern computers use two's complement signed arithmetic that is well-defined to wrap around, but C compilers routinely optimize based on the assumption that signed integer overflow cannot occur, which means that a C program cannot easily get at the underlying machine behavior. For example, the signed integer expression  $(a + b < b) != (a < 0)$  is not a reliable test for whether  $a + b$  overflows, because a compiler can assume that signed overflow cannot occur and treat the entire expression as if it were false.

These macros yield 1 if the corresponding C operators overflow, 0 otherwise. They work correctly on all known practical hosts, and do not rely on undefined behavior due to signed arithmetic overflow. They are integer constant expressions if their arguments are. They are typically easier to use than the integer range overflow macros (see Section 17.7.6 [Integer Range Overflow], page 792), and they support more operations and evaluation contexts than the integer overflow checking macros (see Section 17.7.3 [Checking Integer Overflow], page 788) or the wraparound macros (see Section 17.7.4 [Wraparound Arithmetic], page 789).

These macros can be tricky to use with arguments narrower than `int`. For example, in the common case with 16-bit `short int` and 32-bit `int`, if `a` and `b` are of type `short int` then `INT_MULTIPLY_OVERFLOW(a, b)` always yields 0, as `a * b` cannot overflow due to C's rule that `a` and `b` are widened to `int` before multiplying. For this reason, often it is better to use the integer overflow checking macros (see Section 17.7.3 [Checking Integer Overflow], page 788) or the wraparound macros (see Section 17.7.4 [Wraparound Arithmetic], page 789) when checking for overflow in addition, subtraction, or multiplication.

Example usage:

```
#include <intprops.h>
#include <limits.h>
#include <stdio.h>

/* Print A * B if in range, an overflow
   indicator otherwise. */
void
print_product (long int a, long int b)
{
    if (INT_MULTIPLY_OVERFLOW (a, b))
        printf ("multiply would overflow");
    else
        printf ("product is %ld", a * b);
}
```

```

/* Does the product of two ints always fit
   in a long int? */
enum {
    INT_PRODUCTS_FIT_IN_LONG
    = ! (INT_MULTIPLY_OVERFLOW
        ((long int) INT_MIN, INT_MIN))
};

```

These macros have the following restrictions:

- Their arguments must be integer expressions.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.

These macros are tuned for their last argument being a constant.

`INT_ADD_OVERFLOW (a, b)`

Yield 1 if `a + b` would overflow, 0 otherwise. See above for restrictions.

`INT_SUBTRACT_OVERFLOW (a, b)`

Yield 1 if `a - b` would overflow, 0 otherwise. See above for restrictions.

`INT_NEGATE_OVERFLOW (a)`

Yields 1 if `-a` would overflow, 0 otherwise. See above for restrictions.

`INT_MULTIPLY_OVERFLOW (a, b)`

Yield 1 if `a * b` would overflow, 0 otherwise. See above for restrictions.

`INT_DIVIDE_OVERFLOW (a, b)`

Yield 1 if `a / b` would overflow, 0 otherwise. See above for restrictions. Division overflow can happen on two's complement hosts when dividing the most negative integer by `-1`. This macro does not check for division by zero.

`INT_REMAINDER_OVERFLOW (a, b)`

Yield 1 if `a % b` would overflow, 0 otherwise. See above for restrictions. Remainder overflow can happen on two's complement hosts when dividing the most negative integer by `-1`; although the mathematical result is always 0, in practice some implementations trap, so this counts as an overflow. This macro does not check for division by zero.

`INT_LEFT_SHIFT_OVERFLOW (a, b)`

Yield 1 if `a << b` would overflow, 0 otherwise. See above for restrictions. The C standard says that behavior is undefined for shifts unless  $0 \leq b < w$  where  $w$  is  $a$ 's word width, and that when  $a$  is negative then `a << b` has undefined behavior, but this macro does not check these other restrictions.

### 17.7.6 Integer Range Overflow

These macros yield 1 if the corresponding C operators might not yield numerically correct answers due to arithmetic overflow, and 0 if the operators do not overflow. They do not rely on undefined or implementation-defined behavior. They are integer constant expressions if their arguments are. Their implementations are simple and straightforward, but

they are typically harder to use than the integer type overflow macros. See Section 17.7.5 [Integer Type Overflow], page 791.

Although the implementation of these macros is similar to that suggested in the SEI CERT C Secure Coding Standard, in its two sections “INT30-C. Ensure that unsigned integer operations do not wrap (<https://www.securecoding.cert.org/confluence/display/c/INT30-C.+Ensure+that+unsigned+integer+operations+do+not+wrap>)” and “INT32-C. Ensure that operations on signed integers do not result in overflow (<https://www.securecoding.cert.org/confluence/display/c/INT32-C.+Ensure+that+operations+on+signed+integers+do+not+result+in+overflow>)”, Gnulib’s implementation was derived independently of CERT’s suggestions.

Example usage:

```
#include <intprops.h>
#include <limits.h>
#include <stdio.h>

void
print_product (long int a, long int b)
{
    if (INT_MULTIPLY_RANGE_OVERFLOW (a, b, LONG_MIN, LONG_MAX))
        printf ("multiply would overflow");
    else
        printf ("product is %ld", a * b);
}

/* Does the product of two ints always fit
   in a long int? */
enum {
    INT_PRODUCTS_FIT_IN_LONG
    = ! (INT_MULTIPLY_RANGE_OVERFLOW
        ((long int) INT_MIN, (long int) INT_MIN,
         LONG_MIN, LONG_MAX))
};
```

These macros have the following restrictions:

- Their arguments must be integer expressions.
- They may evaluate their arguments zero or multiple times, so the arguments should not have side effects.
- The arithmetic arguments (including the *min* and *max* arguments) must be of the same integer type after the usual arithmetic conversions, and the type must have minimum value *min* and maximum *max*. Unsigned values should use a zero *min* of the proper type, for example, (unsigned int) 0.

These macros are tuned for constant *min* and *max*. For commutative operations such as  $a + b$ , they are also tuned for constant *b*.

```
INT_ADD_RANGE_OVERFLOW (a, b, min, max)
    Yield 1 if  $a + b$  would overflow in  $[min,max]$  integer arithmetic, 0 otherwise.
    See above for restrictions.
```

`INT_SUBTRACT_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if  $a - b$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions.

`INT_NEGATE_RANGE_OVERFLOW (a, min, max)`

Yield 1 if  $-a$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions.

`INT_MULTIPLY_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if  $a * b$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions.

`INT_DIVIDE_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if  $a / b$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions. Division overflow can happen on two's complement hosts when dividing the most negative integer by  $-1$ . This macro does not check for division by zero.

`INT_REMAINDER_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if  $a \% b$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions. Remainder overflow can happen on two's complement hosts when dividing the most negative integer by  $-1$ ; although the mathematical result is always 0, in practice some implementations trap, so this counts as an overflow. This macro does not check for division by zero.

`INT_LEFT_SHIFT_RANGE_OVERFLOW (a, b, min, max)`

Yield 1 if  $a \ll b$  would overflow in  $[min, max]$  integer arithmetic, 0 otherwise. See above for restrictions. Here,  $min$  and  $max$  are for  $a$  only, and  $b$  need not be of the same type as the other arguments. The C standard says that behavior is undefined for shifts unless  $0 \leq b < w$  where  $w$  is  $a$ 's word width, and that when  $a$  is negative then  $a \ll b$  has undefined behavior, but this macro does not check these other restrictions.

## 17.8 Static inline functions

In order to mark functions as `static inline`, the only prerequisite you need is an `AC_REQUIRE([AC_C_INLINE])`. No Gnulib module is needed.

## 17.9 Extern inline functions

The `extern-inline` module supports the use of C99-style `extern inline` functions so that the code still runs on compilers that do not support this feature correctly.

C code ordinarily should not use `inline`. Typically it is better to let the compiler figure out whether to inline, as compilers are pretty good about optimization nowadays. In this sense, `inline` is like `register`, another keyword that is typically no longer needed.

Functions defined (not merely declared) in headers are an exception, as avoiding `inline` would commonly cause problems for these functions. Suppose `aaa.h` defines the function `aaa_fun`, and `aaa.c`, `bbb.c` and `ccc.c` all include `aaa.h`. If code is intended to portable to non-C99 compilers, `aaa_fun` cannot be declared with the C99 `inline` keyword. This problem cannot be worked around by making `aaa_fun` an ordinary function, as it would

be defined three times with external linkage and the definitions would clash. Although `aaa_fun` could be a static function, with separate compilation if `aaa_fun` is not inlined its code will appear in the executable three times.

To avoid this code bloat, `aaa.h` can do this:

```
/* aaa.h */
/* #include any other headers here */
#ifndef _GL_INLINE_HEADER_BEGIN
    #error "Please include config.h first."
#endif
_GL_INLINE_HEADER_BEGIN
#ifndef AAA_INLINE
# define AAA_INLINE _GL_INLINE
#endif
...
AAA_INLINE int
aaa_fun (int i)
{
    return i + 1;
}
...
_GL_INLINE_HEADER_END
```

and `aaa.c` can do this:

```
/* aaa.c */
#include <config.h>
#define AAA_INLINE _GL_EXTERN_INLINE
#include <aaa.h>
```

whereas `bbb.c` and `ccc.c` can include `aaa.h` in the usual way. C99 compilers expand `AAA_INLINE` to C99-style `inline` usage, where `aaa_fun` is declared `extern inline` in `aaa.c` and plain `inline` in other modules. Non-C99 compilers that are compatible with GCC use GCC-specific syntax to accomplish the same ends. Other non-C99 compilers use `static inline` so they suffer from code bloat, but they are not mainline platforms and will die out eventually.

`_GL_INLINE` is a portable alternative to C99 plain `inline`.

`_GL_EXTERN_INLINE` is a portable alternative to C99 `extern inline`.

Invoke `_GL_INLINE_HEADER_BEGIN` before all uses of `_GL_INLINE` in an include file. This suppresses some bogus warnings in GCC versions before 5.1. If an include file includes other files, it is better to invoke this macro after including the other files.

Invoke `_GL_INLINE_HEADER_END` after all uses of `_GL_INLINE` in an include file.

## 17.10 Handling closed standard file descriptors

Usually, when a program gets invoked, its file descriptors 0 (for standard input), 1 (for standard output), and 2 (for standard error) are open. But there are situations when some of these file descriptors are closed. These situations can arise when

- The invoking process invokes `close()` on the file descriptor before `exec`, or



- The invoking process invokes `posix_spawn_file_actions_addclose()` for the file descriptor before `posix_spawn` or `posix_spawnnp`, or
- The invoking process is a Bourne shell, and the shell script uses the POSIX syntax for closing the file descriptor: `<&-` for closing standard input, `>&-` for closing standard output, or `2>&-` for closing standard error.

When a closed file descriptor is accessed through a system call, such as `fcntl()`, `fstat()`, `read()`, or `write()`, the system call fails with error `EBADF` ("Bad file descriptor").

When a new file descriptor is allocated, the operating system chooses the smallest non-negative integer that does not yet correspond to an open file descriptor. So, when a given `fd` (0, 1, or 2) is closed, opening a new file descriptor may assign the new file descriptor to this `fd`. This can have unintended effects, because now standard input/output/error of your process is referring to a file that was not meant to be used in that role.

This situation is a security risk because the behaviour of the program in this situation was surely never tested, therefore anything can happen then – from overwriting precious files of the user to endless loops.

To deal with this situation, you first need to determine whether your program is affected by the problem.

- Does your program invoke functions that allocate new file descriptors? These are the system calls
  - `open()`, `openat()`, `creat()`
  - `dup()`
  - `fopen()`, `freopen()`
  - `pipe()`, `pipe2()`, `popen()`
  - `opendir()`
  - `tmpfile()`, `mkstemp()`, `mkstemp()`, `mkostemp()`, `mkostemp()`

Note that you also have to consider the libraries that your program uses.

- If your program may open two or more file descriptors or FILE streams for reading at the same time, and some of them may reference standard input, your program *is affected*.
- If your program may open two or more file descriptors or FILE streams for writing at the same time, and some of them may reference standard output or standard error, your program *is affected*.
- If your program does not open new file descriptors or FILE streams, it is *not affected*.
- If your program opens only one new file descriptor or FILE stream at a time, it is *not affected*. This is often the case for programs that are structured in simple phases: first a phase where input is read from a file into memory, then a phase of processing in memory, finally a phase where the result is written to a file.
- If your program opens only two new file descriptors or FILE streams at a time, out of which one is for reading and the one is for writing, it is *not affected*. This is because if the first file descriptor is allocated and the second file descriptor is picked as 0, 1, or 2, and both happen to be the same, writing to the one opened in `O_RDONLY` mode will produce an error `EBADF`, as desired.

If your program is affected, what is the mitigation?

Some operating systems install open file descriptors in place of the closed ones, either in the `exec` system call or during program startup. When such a file descriptor is accessed through a system call, it behaves like an open file descriptor opened for the “wrong” direction: the system calls `fcntl()` and `fstat()` succeed, whereas `read()` from fd 0 and `write()` to fd 1 or 2 fail with error `EBADF` (“Bad file descriptor”). The important point here is that when your program allocates a new file descriptor, it will have a value greater than 2.

This mitigation is enabled on HP-UX, for all programs, and on glibc, FreeBSD, NetBSD, OpenBSD, but only for `setuid` or `setgid` programs. Since it is operating system dependent, it is not a complete mitigation.

For a complete mitigation, Gnulib provides two alternative sets of modules:

- The `xstdopen` module.
- The `*-safer` modules: `fcntl-safer`, `openat-safer`, `unistd-safer`, `fopen-safer`, `freopen-safer`, `pipe2-safer`, `popen-safer`, `dirent-safer`, `tmpfile-safer`, `stdlib-safer`.

The approach with the `xstdopen` module is simpler, but it adds three system calls to program startup. Whereas the approach with the `*-safer` modules is more complex, but adds no overhead (no additional system calls) in the normal case.

To use the approach with the `xstdopen` module:

1. Import the module `xstdopen` from Gnulib.
2. In the compilation unit that contains the `main` function, include `"xstdopen.h"`.
3. In the `main` function, near the beginning, namely right after the `i18n` related initializations (`setlocale`, `bindtextdomain`, `textdomain` invocations, if any) and the `closeout` initialization (if any), insert the invocation:

```
/* Ensure that stdin, stdout, stderr are open. */
xstdopen ();
```

To use the approach with the `*-safer` modules:

1. Import the relevant modules from Gnulib.
2. In the compilation units that contain these function calls, include the replacement header file.

Do so according to this table:

Function	Module	Header file
<code>open()</code>	<code>fcntl-safer</code>	<code>"fcntl--.h"</code>
<code>openat()</code>	<code>openat-safer</code>	<code>"fcntl--.h"</code>
<code>creat()</code>	<code>fcntl-safer</code>	<code>"fcntl--.h"</code>
<code>dup()</code>	<code>unistd-safer</code>	<code>"unistd--.h"</code>
<code>fopen()</code>	<code>fopen-safer</code>	<code>"stdio--.h"</code>
<code>freopen()</code>	<code>freopen-safer</code>	<code>"stdio--.h"</code>
<code>pipe()</code>	<code>unistd-safer</code>	<code>"unistd--.h"</code>
<code>pipe2()</code>	<code>pipe2-safer</code>	<code>"unistd--.h"</code>
<code>popen()</code>	<code>popen-safer</code>	<code>"stdio--.h"</code>
<code>opendir()</code>	<code>dirent-safer</code>	<code>"dirent--.h"</code>

<code>tmpfile()</code>	<code>tmpfile-safer</code>	<code>"stdio--.h"</code>
<code>mkstemp()</code>	<code>stdlib-safer</code>	<code>"stdlib--.h"</code>
<code>mkstemps()</code>	<code>stdlib-safer</code>	<code>"stdlib--.h"</code>
<code>mkostemp()</code>	<code>stdlib-safer</code>	<code>"stdlib--.h"</code>
<code>mkostemps()</code>	<code>stdlib-safer</code>	<code>"stdlib--.h"</code>

## 17.11 Handling strings with NUL characters

Strings in C are usually represented by a character sequence with a terminating NUL character. A `'char *'`, pointer to the first byte of this character sequence, is what gets passed around as function argument or return value.

The major restriction of this string representation is that it cannot handle strings that contain NUL characters: such strings will appear shorter than they were meant to be. In most application areas, this is not a problem, and the `char *` type is well usable.

In areas where strings with embedded NUL characters need to be handled, the common approach is to use a `char *ptr` pointer variable together with a `size_t nbytes` variable (or an `idx_t nbytes` variable, if you want to avoid problems due to integer overflow). This works fine in code that constructs or manipulates strings with embedded NUL characters. But when it comes to *storing* them, for example in an array or as key or value of a hash table, one needs a type that combines these two fields.

The GnuLib modules `string-desc`, `xstring-desc`, and `string-desc-quotearg` provide such a type. We call it a “string descriptor” and name it `string_desc_t`.

The type `string_desc_t` is a struct that contains a pointer to the first byte and the number of bytes of the memory region that make up the string. An additional terminating NUL byte, that may be present in memory, is not included in this byte count. This type implements the same concept as `std::string_view` in C++, or the `String` type in Java.

A `string_desc_t` can be passed to a function as an argument, or can be the return value of a function. This is type-safe: If, by mistake, a programmer passes a `string_desc_t` to a function that expects a `char *` argument, or vice versa, or assigns a `string_desc_t` value to a variable of type `char *`, or vice versa, the compiler will report an error.

Functions related to string descriptors are provided:

- Side-effect-free operations in `"string-desc.h"`,
- Memory-allocating operations in `"string-desc.h"`,
- Memory-allocating operations with out-of-memory checking in `"xstring-desc.h"`,
- Operations with side effects in `"string-desc.h"`.

For outputting a string descriptor, the `*printf` family of functions cannot be used directly. A format string directive such as `"%.*s"` would not work:

- it would stop the output at the first encountered NUL character,
- it would require to cast the number of bytes to `int`, and thus would not work for strings longer than `INT_MAX` bytes.

Therefore GnuLib offers

- a function `string_desc_fwrite` that outputs a string descriptor to a `FILE` stream,
- a function `string_desc_write` that outputs a string descriptor to a file descriptor,

- and for those applications where the NUL characters should become visible as ‘\0’, a family of `quotearg` based functions, that allow to specify the escaping rules in detail.

The functionality is thus split across three modules as follows:

- The module `string-desc`, under LGPL, defines the type and elementary functions.
- The module `xstring-desc`, under GPL, defines the memory-allocating functions with out-of-memory checking.
- The module `string-desc-quotearg`, under GPL, defines the `quotearg` based functions.

## 17.12 Container data types

Gnulib provides several generic container data types. They can be used to organize collections of application-defined objects.

### 17.12.1 Ordinary container data types

Data type	Details	Module	Main in-include file	Include file for operations with out-of-memory checking
Sequential list	Can contain any number of objects in any given order. Duplicates are allowed, but can optionally be forbidden.	<code>list</code>	"gl_ list.h"	"gl_ xlist.h"
Set	Can contain any number of objects; the order does not matter. Duplicates (in the sense of the comparator) are forbidden.	<code>set</code>	"gl_ set.h"	"gl_ xset.h"
Ordered set	Can contain any number of objects in the order of a given comparator function. Duplicates (in the sense of the comparator) are forbidden.	<code>oset</code>	"gl_ oset.h"	"gl_ xoset.h"
Map	Can contain any number of (key, value) pairs, where keys and values are objects; there are no (key, value1) and (key, value2) pairs with the same key (in the sense of a given comparator function).	<code>map</code>	"gl_ map.h"	"gl_ xmap.h"
Ordered map	Can contain any number of (key, value) pairs, where keys and values are objects; the (key, value) pairs are ordered by the key, in the order of a given comparator function; there are no (key, value1) and (key, value2) pairs with the same key (in the sense of the comparator function).	<code>omap</code>	"gl_ omap.h"	"gl_ xomap.h"

Operations without out-of-memory checking (suitable for use in libraries) are declared in the “main include file”. Whereas operations with out-of-memory checking (suitable only in programs) are declared in the “include file for operations with out-of-memory checking”.

For each of the data types, several implementations are available, with different performance profiles with respect to the available operations. This enables you to start with the simplest implementation (ARRAY) initially, and switch to a more suitable implementation after profiling your application. The implementation of each container instance is specified in a single place only: in the invocation of the function `gl*_create_empty` that creates the instance.

The implementations and the guaranteed average performance for the operations for the “sequential list” data type are:

Operation	ARRAY	CARRAY	LINKEDTREE	LINKEDHASH	HASHEDHASH		HASH	
					with duplicates	with- out duplicates	with duplicates	with- out duplicates
<code>gl_list_size</code>	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$
<code>gl_list_node_value</code>	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$
<code>gl_list_node_set_value</code>	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O(1)$	$O((\log n)\mathcal{E})$	$O(1)$
<code>gl_list_next_node</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_previous_node</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_first_node</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_last_node</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_get_at</code>	$O(1)$	$O(1)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(\log n)$
<code>gl_list_get_first</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_get_last</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(\log n)$
<code>gl_list_set_at</code>	$O(1)$	$O(1)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_set_first</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_set_last</code>	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_search</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(1)$	$O(\log n)$	$O(1)$
<code>gl_list_search_from</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_search_from_to</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_indexof</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(\log n)$
<code>gl_list_indexof_from</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})$	$O(\log n)$
<code>gl_list_indexof_from_to</code>	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})$	$O(\log n)$

gl_list_add_first	$O(n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_add_last	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_add_before	$O(n)$	$O(n)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_add_after	$O(n)$	$O(n)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_add_at	$O(n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_remove_node	$O(n)$	$O(n)$	$O(1)$	$O(\log n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_remove_at	$O(n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_remove_first	$O(n)$	$O(1)$	$O(1)$	$O(\log n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_remove_last	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_remove_iterator	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(n)$	$O(1)$	$O((\log n)\mathcal{E})(\log n)$
gl_list_iterator	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$ $O(\log n)$
gl_list_iterator_from_to	$O(1)$	$O(1)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$ $O(\log n)$
gl_list_iterator_next	$O(1)$	$O(1)$	$O(1)$	$O(\log n)$	$O(1)$	$O(1)$	$O(\log n)$ $O(\log n)$
gl_sortedlist_search	$O(\log n)$	$O(\log n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$ $O(\log n)$
gl_sortedlist_search_from	$O(\log n)$	$O(\log n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$ $O(\log n)$
gl_sortedlist_indexof	$O(\log n)$	$O(\log n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$ $O(\log n)$
gl_sortedlist_indexof_from	$O(\log n)$	$O(\log n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O(\log n)$ $O(\log n)$
gl_sortedlist_add	$O(n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})(\log n)$
gl_sortedlist_remove	$O(n)$	$O(n)$	$O(n)$	$O(\log n)$	$O(n)$	$O(n)$	$O((\log n)\mathcal{E})(\log n)$

The implementations and the guaranteed average performance for the operations for the “set” data type are:

Operation	ARRAY	LINKEDHASH, HASH
gl_set_size	$O(1)$	$O(1)$
gl_set_add	$O(n)$	$O(1)$
gl_set_remove	$O(n)$	$O(1)$
gl_set_search	$O(n)$	$O(1)$
gl_set_iterator	$O(1)$	$O(1)$

`gl_set_iterator_next`  $O(1)$   $O(1)$

The implementations and the guaranteed average performance for the operations for the “ordered set” data type are:

<b>Operation</b>	<b>ARRAY</b>	<b>TREE</b>
<code>gl_oset_size</code>	$O(1)$	$O(1)$
<code>gl_oset_add</code>	$O(n)$	$O(\log n)$
<code>gl_oset_remove</code>	$O(n)$	$O(\log n)$
<code>gl_oset_search</code>	$O(\log n)$	$O(\log n)$
<code>gl_oset_search_atleast</code>	$O(\log n)$	$O(\log n)$
<code>gl_oset_iterator</code>	$O(1)$	$O(\log n)$
<code>gl_oset_iterator_next</code>	$O(1)$	$O(\log n)$

The implementations and the guaranteed average performance for the operations for the “map” data type are:

<b>Operation</b>	<b>ARRAY</b>	<b>LINKEDHASH, HASH</b>
<code>gl_map_size</code>	$O(1)$	$O(1)$
<code>gl_map_get</code>	$O(n)$	$O(1)$
<code>gl_map_put</code>	$O(n)$	$O(1)$
<code>gl_map_remove</code>	$O(n)$	$O(1)$
<code>gl_map_search</code>	$O(n)$	$O(1)$
<code>gl_map_iterator</code>	$O(1)$	$O(1)$
<code>gl_map_iterator_next</code>	$O(1)$	$O(1)$

The implementations and the guaranteed average performance for the operations for the “ordered map” data type are:

<b>Operation</b>	<b>ARRAY</b>	<b>TREE</b>
<code>gl_omap_size</code>	$O(1)$	$O(1)$
<code>gl_omap_get</code>	$O(\log n)$	$O(\log n)$
<code>gl_omap_put</code>	$O(n)$	$O(\log n)$
<code>gl_omap_remove</code>	$O(n)$	$O(\log n)$
<code>gl_omap_search</code>	$O(\log n)$	$O(\log n)$
<code>gl_omap_search_atleast</code>	$O(\log n)$	$O(\log n)$
<code>gl_omap_iterator</code>	$O(1)$	$O(\log n)$
<code>gl_omap_iterator_next</code>	$O(1)$	$O(\log n)$

For C++, Gnulib provides a C++ template class for each of these container data types.

<b>Data type</b>	<b>C++ class</b>	<b>Module</b>	<b>Include file</b>
Sequential list	<code>gl_List</code>	<code>list-c++</code>	<code>"gl_list.hh"</code>
Set	<code>gl_Set</code>	<code>set-c++</code>	<code>"gl_set.hh"</code>
Ordered set	<code>gl_OSet</code>	<code>oset-c++</code>	<code>"gl_oset.hh"</code>
Map	<code>gl_Map</code>	<code>map-c++</code>	<code>"gl_map.hh"</code>
Ordered map	<code>gl_OMap</code>	<code>omap-c++</code>	<code>"gl_omap.hh"</code>

### 17.12.2 Specialized container data types

The `hamt` module implements the hash array mapped trie (HAMT) data structure. This is a data structure that contains (key, value) pairs. Lookup of a (key, value) pair given the key is on average an  $O(1)$  operation, assuming a good hash function for the keys is employed.

The HAMT data structure is useful when you want modifications (additions of pairs, removal, value changes) to be visible only to some part of your program, whereas other parts of the program continue to use the unmodified HAMT. The HAMT makes this possible in a space-efficient manner: the modified and the unmodified HAMT share most of their allocated memory. It is also time-efficient: Every such modification is  $O(1)$  on average, again assuming a good hash function for the keys.

A HAMT can be used whenever an ordinary hash table would be used. It does however, provide non-destructive updating operations without the need to copy the whole container. On the other hand, a hash table is simpler so that its performance may be better when non-destructive update operations are not needed.

For example, a HAMT can be used to model the dynamic environment in a LISP interpreter. Updating a value in the dynamic environment of one continuation frame would not modify values in earlier frames.

To use the module, include `hamt.h` in your code. The public interface is documented in that header file. You have to provide a hash function and an equivalence relation, which defines key equality. The module includes a test file `test-hamt.c`, which demonstrates how the API can be used.

In the current implementation, each inner node of the HAMT can store up to  $32 = 2^5$  entries and subtries. Whenever a collision between the initial bits of the hash values of two entries would happen, the next 5 bits of the hash values are examined and the two entries pushed down one level in the trie.

HAMTs have the same average access times as hash tables but grow and shrink dynamically, so they use memory more economically and do not have to be periodically resized.

They were described and analyzed in *Phil Bagwell (2000). Ideal Hash Trees (Report). Infoscience Department, École Polytechnique Fédérale de Lausanne.*

The persistence aspect of the HAMT data structure, which means that each updating operation (like inserting, replacing, or removing an entry) returns a new HAMT while leaving the original one intact, is achieved through structure sharing, which is even safe in the presence of multiple threads when the used C compiler supports atomics.

## 17.13 Recognizing Option Arguments

The module `'argmatch'` provides a simple textual user interface to a finite choice. It is for example well suited to recognize arguments of options or values of environment variables that accept a fixed set of valid choices.

These choices may be denoted by synonyms, such as `'none'` and `'off'` below.

```
$ my_cp --backup=none foo bar
$ my_cp --backup=non foo bar
$ my_cp --backup=no foo bar
$ my_cp --backup=n foo bar
my_cp: ambiguous argument 'n' for 'backup type'
Valid arguments are:
- 'no', 'none', 'off'
- 'numbered', 't', 'newstyle'
- 'existing', 'nil', 'numbered-existing'
- 'simple', 'never', 'single'
Try 'my_cp --help' for more information.
$ my_cp --backup=num foo bar
```



```

$ my_cp --backup=true foo bar
my_cp: invalid argument 'true' for 'backup type'
Valid arguments are:
- 'no', 'none', 'off'
- 'numbered', 't', 'newstyle'
- 'existing', 'nil', 'numbered-existing'
- 'simple', 'never', 'single'
Try 'my_cp --help' for more information.

```

To set up `argmatch`, first call `ARGMATCH_DEFINE_GROUP (name, type)` with the name of the `argmatch` group name, and the value type. For instance:

```

enum backup_type
{
    no_backups,
    simple_backups,
    numbered_existing_backups,
    numbered_backups
};

ARGMATCH_DEFINE_GROUP (backup, enum backup_type);

```

This defines a few types and functions named `argmatch_name_*`. Introduce the array that defines the mapping from user-input to actual value, with a terminator:

```

static const argmatch_backup_arg argmatch_backup_args[] =
{
    { "no",          no_backups },
    { "none",       no_backups },
    { "off",        no_backups },
    { "simple",      simple_backups },
    { "never",      simple_backups },
    { "single",     simple_backups },
    { "existing",   numbered_existing_backups },
    { "nil",       numbered_existing_backups },
    { "numbered-existing", numbered_existing_backups },
    { "numbered",  numbered_backups },
    { "t",         numbered_backups },
    { "newstyle",  numbered_backups },
    { NULL, no_backups }
};

```

Then introduce the array that defines the values, also with a terminator. Document only once per group of synonyms:

```

static const argmatch_backup_doc argmatch_backup_docs[] =
{
    { "no",          N_("never make backups (even if --backup is given)") },
    { "numbered",   N_("make numbered backups") },
    { "existing",    N_("numbered if numbered backups exist, simple otherwise") },
    { "simple",      N_("always make simple backups") },
    { NULL, NULL }
};

```

Finally, define the `argmatch` group:

```

const argmatch_backup_group_type argmatch_backup_group =

```

```

{
  argmatch_backup_args,
  argmatch_backup_docs,
  N_("\
The backup suffix is '~', unless set with --suffix or SIMPLE_BACKUP_SUFFIX.\n\
The version control method may be selected via the --backup option or through\n\
the VERSION_CONTROL environment variable. Here are the values:\n"),
  NULL
};

```

To use the argmatch group:

```

ptrdiff_t i = argmatch_backup_choice ("--backup", "none");
// argmatch_backup_group.args[i].arg is "none", so its value
// is argmatch_backup_group.args[i].val.
// Return -1 on invalid argument, and -2 on ambiguity.

enum backup_type val = *argmatch_backup_value ("--backup", "none");
// Returns a pointer to the value, and exit on errors.
// So argmatch_backup_group.args[i].val == val.

const char *arg = argmatch_backup_argument (&no_backups);
// arg is "no".

// Print the documentation on stdout.
argmatch_backup_usage (stdout);
// Gives:
//
// The backup suffix is '~', unless set with --suffix or SIMPLE_BACKUP_SUFFIX.
// The version control method may be selected via the --backup option or through
// the VERSION_CONTROL environment variable. Here are the values:
//
// no, none, off  never make backups (even if --backup is given)
// numbered, t, newstyle
//                 make numbered backups
// existing, nil, numbered-existing
//                 numbered if numbered backups exist, simple otherwise
// simple, never, single
//                 always make simple backups

```

## 17.14 Quoting

Gnlib provides ‘quote’ and ‘quotearg’ modules to help with quoting text, such as file names, in messages to the user. Here’s an example of using ‘quote’:

```

#include <quote.h>
...
error (0, errno, _("cannot change owner of %s"), quote (fname));

```

This differs from

```

error (0, errno, _("cannot change owner of '%s'"), fname);

```

in that quote escapes unusual characters in fname, e.g., ‘\’ and control characters like ‘\n’.

However, a caveat: quote reuses the storage that it returns. Hence if you need more than one thing quoted at the same time, you need to use quote\_n.

Also, the `quote` module is not suited for multithreaded applications. In that case, you have to use `quotearg_alloc`, defined in the ‘`quotearg`’ module, which is decidedly less convenient.

## 17.15 `progrname` and `getprogrname`

Gnulib has two modules for retrieving the name of the currently executing program: `progrname` and `getprogrname`.

The `progrname` module defines a variable `program_name`. It contains the name of the currently executing program, on all platforms. But it cannot be used implicitly: It requires that every `main` function be modified to invoke `set_program_name (argv[0])` as one of its first actions.

The `getprogrname` module defines a function `getprogrname()`. It returns the name of the currently executing program, on most platforms. The advantage of this module is that it can be used without prior initializations. But it has limitations: In some rare situations, it cannot determine the name; then it returns “?” instead. And on some platforms, it returns a truncated program name.

The `error` function uses the `getprogrname` module.

## 17.16 `gcd`: greatest common divisor

The `gcd` function returns the greatest common divisor of two numbers  $a > 0$  and  $b > 0$ . It is the caller’s responsibility to ensure that the arguments are non-zero.

If you need a `gcd` function for an integer type larger than ‘`unsigned long`’, you can include the `gcd.c` implementation file with parametrization. The parameters are:

- `WORD_T` Define this to the unsigned integer type that you need this function for.
- `GCD` Define this to the name of the function to be created.

The created function has the prototype

```
WORD_T GCD (WORD_T a, WORD_T b);
```

If you need the least common multiple of two numbers, it can be computed like this:  $\text{lcm}(a,b) = (a / \text{gcd}(a,b)) * b$  or  $\text{lcm}(a,b) = a * (b / \text{gcd}(a,b))$ . Avoid the formula  $\text{lcm}(a,b) = (a * b) / \text{gcd}(a,b)$  because—although mathematically correct—it can yield a wrong result, due to integer overflow.

In some applications it is useful to have a function taking the gcd of two signed numbers. In this case, the `gcd` function result is usually normalized to be non-negative (so that two gcd results can be compared in magnitude or compared against 1, etc.). Note that in this case the prototype of the function has to be

```
unsigned long gcd (long a, long b);
```

and not

```
long gcd (long a, long b);
```

because `gcd(LONG_MIN, LONG_MIN) = -LONG_MIN = LONG_MAX + 1` does not fit into a signed ‘`long`’.

## 17.17 Profiling of program phases

The module ‘timevar’ provides a simple self-profiling facility, based on timers.

```
Execution times (seconds)
read          : 0.09 (19%) usr 0.08 (80%) sys 0.09 (18%) wall
read: scan    : 0.04 ( 9%) usr 0.08 (80%) sys 0.12 (26%) wall
read: parse   : 0.05 (10%) usr 0.00 ( 0%) sys 0.05 (10%) wall
work         : 0.33 (70%) usr 0.00 ( 0%) sys 0.35 (71%) wall
work: phase 1 : 0.30 (64%) usr 0.00 ( 0%) sys 0.30 (64%) wall
work: phase 2 : 0.13 (28%) usr 0.00 ( 0%) sys 0.14 (29%) wall
output       : 0.04 ( 9%) usr 0.02 (20%) sys 0.04 ( 8%) wall
total time   : 0.47          0.10          0.49
```

To set up timevar, copy the stub file `gnulib/lib/timevar.def` next to where `timevar.h` and `timevar.c` were imported in your project, and define your timers there. For instance:

```
/* The total execution time. Mandatory. */
DEFTIMEVAR (tv_total, "total time")

/* Examples. */
DEFTIMEVAR (tv_read, "read")
DEFTIMEVAR (tv_work, "work")
DEFTIMEVAR (tv_work_1, "work: phase 1")
DEFTIMEVAR (tv_work_2, "work: phase 2")
DEFTIMEVAR (tv_output, "output")
```

Do not remove `tv_total`, it is mandatory. You may change its associated string.

Use `timevar_push/timevar_pop` to start/stop timers, as in the following example.

```
#include <config.h>
#include "timevar.h"

#include <stdio.h>
#include "read.h"
#include "work.h"
#include "output.h"

int
main (void)
{
    timevar_enabled = true;
    timevar_init ();
    timevar_start (tv_total);

    timevar_push (tv_read);
    reader ();
    timevar_pop (tv_read);

    timevar_push (tv_work);
    work ();
    timevar_pop (tv_work);

    timevar_push (tv_output);
    output ();
    timevar_pop (tv_output);

    timevar_stop (tv_total);
    timevar_print (stderr);
```

```

    }
with, for instance, in work.c
#include <config.h>
#include "work.h"

void
work (void)
{
    timevar_push (tv_work_phase1);
    work1 ();
    timevar_pop (tv_work_phase1);

    timevar_push (tv_work_phase2);
    work2 ();
    timevar_pop (tv_work_phase2);
}

```

## 17.18 Library version handling

The module ‘`check-version`’ can be useful when your gnulib application is a system library. You will typically wrap the call to the `check_version` function through a library API, your library header file may contain:

```

#define STRINGPREP_VERSION "0.5.18"
...
extern const char *stringprep_check_version (const char *req_version);

```

To avoid ELF symbol collisions with other libraries that use the ‘`check-version`’ module, add to `config.h` through a `AC_DEFINE` something like:

```

AC_DEFINE(check_version, stringprep_check_version,
          [Rename check_version.])

```

The `stringprep_check_version` function will thus be implemented by the `check_version` module.

There are two uses of the interface. The first is a way to provide for applications to find out the version number of the library it uses. The application may contain diagnostic code such as:

```

printf ("Stringprep version: header %s library %s",
        STRINGPREP_VERSION,
        stringprep_check_version (NULL));

```

Separating the library and header file version can be useful when searching for version mismatch related problems.

The second uses is as a rudimentary test of proper library version, by making sure the application get a library version that is the same, or newer, than the header file used when building the application. This doesn’t catch all problems, libraries may change backwards incompatibly in later versions, but enable applications to require a certain minimum version before it may proceed.

Typical uses look like:

```

/* Check version of libgcrypt. */
if (!gcry_check_version (GCRYPT_VERSION))
    die ("version mismatch\n");

```

## 17.19 Supporting Relocation

It has been a pain for many users of GNU packages for a long time that packages are not relocatable. It means a user cannot copy a program, installed by another user on the same machine, to his home directory, and have it work correctly (including `i18n`). So many users need to go through `configure; make; make install` with all its dependencies, options, and hurdles.

Red Hat, Debian, and other binary distributions solve the “ease of installation” problem, but they hardwire path names, usually to `/usr` or `/usr/local`. This means that users need root privileges to install a binary package, and prevents installing two different versions of the same binary package.

A relocatable program can be moved or copied to a different location on the file system. It is possible to make symlinks to the installed and moved programs, and invoke them through the symlink. It is possible to do the same thing with a hard link *only* if the hard link file is in the same directory as the real program.

The `relocatable-prog` module aims to ease the process of making a GNU program relocatable. It helps overcome two obstacles. First, it aids with relocating the hard-coded references to absolute file names that GNU programs often contain. These references must be fixed up at runtime if a program is to be successfully relocated. The `relocatable-prog` module provides a function `relocate` that does this job.

Second, the loader must be able to find shared libraries linked to relocatable executables or referenced by other shared libraries linked to relocatable executables. The `relocatable-prog` module helps out here in a platform-specific way:

- On most operating systems, it adds a linker option (`-rpath`) that causes the dynamic linker to search for libraries in a directory relative to the location of the invoked executable. This works on GNU/Linux and modern versions of GNU/Hurd, GNU/kFreeBSD, macOS, FreeBSD, NetBSD, OpenBSD, Solaris, Haiku.
- On other Unix systems, it installs a trampoline executable. The trampoline sets the environment variable that controls shared library searching (usually `LD_LIBRARY_PATH`) and then invokes the real executable. This applies to operating systems such as AIX, HP-UX, or Minix.
- On Windows, the executable’s own directory is searched for libraries, so installing shared libraries into the executable’s directory is sufficient.

You can make your program relocatable by following these steps:

1. Import the `relocatable-prog` module. For libraries, use the `relocatable-lib` or `relocatable-lib-lgpl` module, if the libraries are independent. For installing multiple libraries, at least one of which depends on another one, use the `relocatable-prog` module. If you need more than one module, or you need to use them with different settings, you will need multiple copies of `gnulib` (see Section 3.10 [Multiple instances], page 26).
2. In every program, add to `main` as the first statement (even before setting the locale or doing anything related to `libintl`):

```
set_program_name (argv[0]);
```

The prototype for this function is in `progname.h`.

- If you want your code to be portable to platforms that do not support automatic initialization, call `set_relocation_prefix`.
- Everywhere where you use a constant pathname from installation-time, wrap it in `relocate` so it gets translated to the run-time situation. Example:

```
bindtextdomain (PACKAGE, LOCALEDIR);
```

becomes:

```
bindtextdomain (PACKAGE, relocate (LOCALEDIR));
```

The prototype for this function is in `relocatable.h`.

There is also a variant of this function, named `relocate2`, that makes it easy to reclaim the memory allocated by the call.

- The `set_program_name` function can also configure some additional libraries to relocate files that they access, by defining corresponding C preprocessor symbols to 1. The libraries for which this is supported and the corresponding preprocessor symbols are:

```
libcharset  DEPENDS_ON_LIBCHARSET
```

```
libiconv    DEPENDS_ON_LIBICONV
```

```
libintl     DEPENDS_ON_LIBINTL
```

Defining the symbol for a library makes every program in the package depend on that library, whether the program really uses the library or not, so this feature should be used with some caution.

- If your package installs shell scripts, also import the `relocatable-script` module. Then, near the beginning of each shell script that your package installs, add the following:

```
@relocatable_sh@

prefix="@prefix@"
exec_prefix="@exec_prefix@" # usually needs $prefix.
datarootdir="@datarootdir@" # usually needs $prefix.

if test "@RELOCATABLE@" = yes; then
  bindir="@bindir@"
  orig_installdir="$bindir" # see Makefile.am's *_SCRIPTS variables
  func_find_curr_installdir # determine curr_installdir
  func_find_prefixes
  relocate () {
    echo "$1/" \
    | sed -e "s%^\${orig_installdir}/%${curr_installdir}/%" \
    | sed -e 's,/,$,,'
  }
else
  relocate () {
    echo "$1"
  }
fi

# Get some relocated directory names.
sysconfdir=`relocate "@sysconfdir@"` # usually needs $prefix.
some_datadir=`relocate "@datadir@/something"` # usually needs $datarootdir.
bindir=`relocate "@bindir@"` # usually needs $exec_prefix, hence $prefix.
```

You must adapt the definition of `orig_installdir`, depending on where the script gets installed. Also, at the end, instead of `sysconfdir` and `some_datadir`, transform those variables that you need.

7. If your package installs Perl scripts, also import the `relocatable-perl` module. Then, near the beginning of each Perl script that your package installs, add the following:

```
@relocatable_pl@
if ("@RELOCATABLE@" eq "yes") {
    my $exec_prefix = "@exec_prefix@";
    my $orig_installdir = "@bindir@"; # see Makefile.am's *_SCRIPTS variables
    my ($orig_installprefix, $curr_installprefix) =
        find_prefixes($orig_installdir, find_curr_installdir());

    # the subroutine is defined whether or not the enclosing block is executed
    sub relocate {
        my ($dir) = @_;
        if ("@RELOCATABLE@" eq "yes") {
            $dir =~ s/~/^$orig_installprefix/;$curr_installprefix/%;
            $dir =~ s/,/,$,;
        }
        return $dir;
    }
}

# Get some relocated directory names.
# (The gnulib module 'configmake' can help with this.)
$sysconfdir = relocate("@sysconfdir@");
$some_datadir = relocate("@datadir@/something");
```

You must adapt the definition of `$orig_installdir`, depending on where the script gets installed. Also, at the end, instead of `sysconfdir` and `some_datadir`, transform those variables that you need.

8. In your `Makefile.am`, for every program `foo` that gets installed in, say, `$(bindir)`, you add:

```
foo_CPPFLAGS = -DINSTALLDIR="\$(bindir)\\"
if RELOCATABLE_VIA_LD
foo_LDFLAGS = `$(RELOCATABLE_LDFLAGS) $(bindir)`
endif
```

When building gnulib to use with a relocatable library, you need to define the pre-processor symbol `IN_LIBRARY`. You may also want to build with `ENABLE_COSTLY_RELOCATABLE`, in which case you will also need to define `INSTALLDIR`. The following fragment can be added to an override `Makefile.am` used to build gnulib (see Section 3.8 [Modified build rules], page 25).

```
AM_CPPFLAGS += -DIN_LIBRARY -DENABLE_COSTLY_RELOCATABLE

if SHLIBS_IN_BINDIR
AM_CPPFLAGS += -DINSTALLDIR="\$(bindir)\\"
else
AM_CPPFLAGS += -DINSTALLDIR="\$(libdir)\\"
endif
```

`SHLIBS_IN_BINDIR` is defined in `configure.ac` as follows:

```
AM_CONDITIONAL([SHLIBS_IN_BINDIR],
```



```
[case "$host_os" in mingw* | cygwin*) true;; *) false;; esac]
```

9. In your `Makefile.am`, for every library `libfoo` that gets installed in, say, `$(libdir)`, you add:

```
if RELOCATABLE_VIA_LD
libfoo_la_LDFLAGS = `$(RELOCATABLE_LDFLAGS) $(libdir)`
endif
```

10. Add a couple of variable assignments to your `Makefile.am`.

If your package (or any package you rely on, e.g. `gettext-runtime`) will be relocated together with a set of installed shared libraries, then set `RELOCATABLE_LIBRARY_PATH` to a colon-separated list of those libraries' directories, e.g.

```
RELOCATABLE_LIBRARY_PATH = $(libdir)
```

If your `config.h` is not in `$(top_builddir)`, then set `RELOCATABLE_CONFIG_H_DIR` to its directory, e.g.

```
RELOCATABLE_CONFIG_H_DIR = $(top_builddir)/src
```

## 17.20 func

The `func` module makes sure that you can use the predefined identifier `__func__` as defined by C99 in your code.

A small example is:

```
#include <config.h>
#include <stdio.h> /* for printf */

int main (void)
{
    printf ("%s: hello world\n", __func__);
}
```

Note that `sizeof` cannot be applied to `__func__`: On SunPRO C compiler, `sizeof __func__` evaluates to 0.

## 17.21 stat-size

The `stat-size` module provides a small number of macros intended for interpreting the file size information in an instance of `struct stat`.

On POSIX systems, the `st_blocks` member of `struct stat` contains the number of disk blocks occupied by a file. The `ST_NBLOCKS` and `STP_NBLOCKS` macros estimate this quantity on systems which don't actually have `st_blocks`. Each of these blocks contains `ST_NBLOCKSIZE` bytes.

The value of `ST_NBLOCKSIZE` is often quite small, small enough that performing I/O in chunks that size would be inefficient. The `ST_BLKSIZE` and `STP_BLKSIZE` macros give the I/O block size recommended for I/O to this file. This is not guaranteed to give optimum performance, but it should be reasonably efficient.

## 18 Regular expressions

### 18.1 Overview

A *regular expression* (or *regexp*, or *pattern*) is a text string that describes some (mathematical) set of strings. A regexp  $r$  *matches* a string  $s$  if  $s$  is in the set of strings described by  $r$ .

Using the Regex library, you can:

- see if a string matches a specified pattern as a whole, and
- search within a string for a substring matching a specified pattern.

Some regular expressions match only one string, i.e., the set they describe has only one member. For example, the regular expression ‘foo’ matches the string ‘foo’ and no others. Other regular expressions match more than one string, i.e., the set they describe has more than one member. For example, the regular expression ‘f\*’ matches the set of strings made up of any number (including zero) of ‘f’s. As you can see, some characters in regular expressions match themselves (such as ‘f’) and some don’t (such as ‘\*’); the ones that don’t match themselves instead let you specify patterns that describe many different strings.

To either match or search for a regular expression with the Regex library functions, you must first compile it with a Regex pattern compiling function. A *compiled pattern* is a regular expression converted to the internal format used by the library functions. Once you’ve compiled a pattern, you can use it for matching or searching any number of times.

The Regex library is used by including `regex.h`. Regex provides three groups of functions with which you can operate on regular expressions. One group—the GNU group—is more powerful but not completely compatible with the other two, namely the POSIX and Berkeley Unix groups; its interface was designed specifically for GNU.

We wrote this chapter with programmers in mind, not users of programs—such as Emacs—that use Regex. We describe the Regex library in its entirety, not how to write regular expressions that a particular program understands.

### 18.2 Regular Expression Syntax

*Characters* are things you can type. *Operators* are things in a regular expression that match one or more characters. You compose regular expressions from operators, which in turn you specify using one or more characters.

Most characters represent what we call the match-self operator, i.e., they match themselves; we call these characters *ordinary*. Other characters represent either all or parts of fancier operators; e.g., ‘.’ represents what we call the match-any-character operator (which, no surprise, matches (almost) any character); we call these characters *special*. Two different things determine what characters represent what operators:

1. the regular expression syntax your program has told the Regex library to recognize, and
2. the context of the character in the regular expression.

In the following sections, we describe these things in more detail.

## 18.2.1 Syntax Bits

In any particular syntax for regular expressions, some characters are always special, others are sometimes special, and others are never special. The particular syntax that `Regex` recognizes for a given regular expression depends on the current syntax (as set by `re_set_syntax`) when the pattern buffer of that regular expression was compiled.

You get a pattern buffer by compiling a regular expression. See Section 18.6.1.1 [GNU Pattern Buffers], page 828, for more information on pattern buffers. See Section 18.6.1.2 [GNU Regular Expression Compiling], page 828, and Section 18.6.2.1 [BSD Regular Expression Compiling], page 835, for more information on compiling.

`Regex` considers the current syntax to be a collection of bits; we refer to these bits as *syntax bits*. In most cases, they affect what characters represent what operators. We describe the meanings of the operators to which we refer in Section 18.3 [Common Operators], page 819, and Section 18.4 [GNU Operators], page 827.

For reference, here is the complete list of syntax bits, in alphabetical order:

### RE\_BACKSLASH\_ESCAPE\_IN\_LISTS

If this bit is set, then `'\'` inside a list (see Section 18.3.6 [List Operators], page 822) quotes (makes ordinary, if it's special) the following character; if this bit isn't set, then `'\'` is an ordinary character inside lists. (See Section 18.2.4 [The Backslash Character], page 818, for what `'\'` does outside of lists.)

### RE\_BK\_PLUS\_QM

If this bit is set, then `'\+'` represents the match-one-or-more operator and `'\?'` represents the match-zero-or-more operator; if this bit isn't set, then `'+'` represents the match-one-or-more operator and `'?'` represents the match-zero-or-one operator. This bit is irrelevant if `RE_LIMITED_OPS` is set.

### RE\_CHAR\_CLASSES

If this bit is set, then you can use character classes in lists; if this bit isn't set, then you can't.

### RE\_CONTEXT\_INDEP\_ANCHORS

If this bit is set, then `'^'` and `'$'` are special anywhere outside a list; if this bit isn't set, then these characters are special only in certain contexts. See Section 18.3.9.1 [Match-beginning-of-line Operator], page 826, and Section 18.3.9.2 [Match-end-of-line Operator], page 826.

### RE\_CONTEXT\_INDEP\_OPS

If this bit is set, then certain characters are special anywhere outside a list; if this bit isn't set, then those characters are special only in some contexts and are ordinary elsewhere. Specifically, if this bit isn't set then `'*'`, and (if the syntax bit `RE_LIMITED_OPS` isn't set) `'+'` and `'?'` (or `'\+'` and `'\?'`, depending on the syntax bit `RE_BK_PLUS_QM`) represent repetition operators only if they're not first in a regular expression or just after an open-group or alternation operator. The same holds for `'{'` (or `'\{'`, depending on the syntax bit `RE_NO_BK_BRACES`) if it is the beginning of a valid interval and the syntax bit `RE_INTERVALS` is set.

**RE\_CONTEXT\_INVALID\_DUP**

If this bit is set, then an open-interval operator cannot occur at the start of a regular expression, or immediately after an alternation, open-group or close-interval operator.

**RE\_CONTEXT\_INVALID\_OPS**

If this bit is set, then repetition and alternation operators can't be in certain positions within a regular expression. Specifically, the regular expression is invalid if it has:

- a repetition operator first in the regular expression or just after a match-beginning-of-line, open-group, or alternation operator; or
- an alternation operator first or last in the regular expression, just before a match-end-of-line operator, or just after an alternation or open-group operator.

If this bit isn't set, then you can put the characters representing the repetition and alternation characters anywhere in a regular expression. Whether or not they will in fact be operators in certain positions depends on other syntax bits.

**RE\_DEBUG** If this bit is set, and the regex library was compiled with `-DDEBUG`, then internal debugging is turned on; if unset, then it is turned off.

**RE\_DOT\_NEWLINE**

If this bit is set, then the match-any-character operator matches a newline; if this bit isn't set, then it doesn't.

**RE\_DOT\_NOT\_NULL**

If this bit is set, then the match-any-character operator doesn't match a null character; if this bit isn't set, then it does.

**RE\_HAT\_LISTS\_NOT\_NEWLINE**

If this bit is set, nonmatching lists `['^...']` do not match newline; if not set, they do.

**RE\_ICASE** If this bit is set, then ignore case when matching; otherwise, case is significant.

**RE\_INTERVALS**

If this bit is set, then Regex recognizes interval operators; if this bit isn't set, then it doesn't.

**RE\_INVALID\_INTERVAL\_ORD**

If this bit is set, a syntactically invalid interval is treated as a string of ordinary characters. For example, the extended regular expression `'a{1}'` is treated as `'a\{1'`.

**RE\_LIMITED\_OPS**

If this bit is set, then Regex doesn't recognize the match-one-or-more, match-zero-or-one or alternation operators; if this bit isn't set, then it does.

**RE\_NEWLINE\_ALT**

If this bit is set, then newline represents the alternation operator; if this bit isn't set, then newline is ordinary.

**RE\_NO\_BK\_BRACES**

If this bit is set, then ‘{’ represents the open-interval operator and ‘}’ represents the close-interval operator; if this bit isn’t set, then ‘\{’ represents the open-interval operator and ‘\}’ represents the close-interval operator. This bit is relevant only if `RE_INTERVALS` is set.

**RE\_NO\_BK\_PARENS**

If this bit is set, then ‘(’ represents the open-group operator and ‘)’ represents the close-group operator; if this bit isn’t set, then ‘\(’ represents the open-group operator and ‘\)’ represents the close-group operator.

**RE\_NO\_BK\_REFS**

If this bit is set, then Regex doesn’t recognize ‘\’*digit* as the back-reference operator; if this bit isn’t set, then it does.

**RE\_NO\_BK\_VBAR**

If this bit is set, then ‘|’ represents the alternation operator; if this bit isn’t set, then ‘\|’ represents the alternation operator. This bit is irrelevant if `RE_LIMITED_OPS` is set.

**RE\_NO\_EMPTY\_RANGES**

If this bit is set, then a regular expression with a range whose ending point collates lower than its starting point is invalid; if this bit isn’t set, then Regex considers such a range to be empty.

**RE\_NO\_GNU\_OPS**

If this bit is set, GNU regex operators are not recognized; otherwise, they are.

**RE\_NO\_POSIX\_BACKTRACKING**

If this bit is set, succeed as soon as we match the whole pattern, without further backtracking. This means that a match may not be the leftmost longest; see Section 18.5 [What Gets Matched?], page 828, for what this means.

**RE\_NO\_SUB**

If this bit is set, then `no_sub` will be set to one during `re_compile_pattern`. This causes matching and searching routines not to record substring match information.

**RE\_UNMATCHED\_RIGHT\_PAREN\_ORD**

If this bit is set and the regular expression has no matching open-group operator, then Regex considers what would otherwise be a close-group operator (based on how `RE_NO_BK_PARENS` is set) to match ‘)’.

## 18.2.2 Predefined Syntaxes

If you’re programming with Regex, you can set a pattern buffer’s (see Section 18.6.1.1 [GNU Pattern Buffers], page 828) syntax either to an arbitrary combination of syntax bits (see Section 18.2.1 [Syntax Bits], page 814) or else to the configurations defined by Regex. These configurations define the syntaxes used by certain programs—GNU Emacs, POSIX Awk, traditional Awk, Grep, Egrep—in addition to syntaxes for POSIX basic and extended regular expressions.

The predefined syntaxes—taken directly from `regex.h`—are:

```
#define RE_SYNTAX_EMACS 0
```

```

#define RE_SYNTAX_AWK \
    (RE_BACKSLASH_ESCAPE_IN_LISTS | RE_DOT_NOT_NULL \
    | RE_NO_BK_PARENS | RE_NO_BK_REFS \
    | RE_NO_BK_VBAR | RE_NO_EMPTY_RANGES \
    | RE_UNMATCHED_RIGHT_PAREN_ORD)

#define RE_SYNTAX_POSIX_AWK \
    (RE_SYNTAX_POSIX_EXTENDED | RE_BACKSLASH_ESCAPE_IN_LISTS)

#define RE_SYNTAX_GREP \
    (RE_BK_PLUS_QM | RE_CHAR_CLASSES \
    | RE_HAT_LISTS_NOT_NEWLINE | RE_INTERVALS \
    | RE_NEWLINE_ALT)

#define RE_SYNTAX_EGREP \
    (RE_CHAR_CLASSES | RE_CONTEXT_INDEP_ANCHORS \
    | RE_CONTEXT_INDEP_OPS | RE_HAT_LISTS_NOT_NEWLINE \
    | RE_NEWLINE_ALT | RE_NO_BK_PARENS \
    | RE_NO_BK_VBAR)

#define RE_SYNTAX_POSIX_EGREP \
    (RE_SYNTAX_EGREP | RE_INTERVALS | RE_NO_BK_BRACES)

/* P1003.2/D11.2, section 4.20.7.1, lines 5078ff. */
#define RE_SYNTAX_ED RE_SYNTAX_POSIX_BASIC

#define RE_SYNTAX_SED RE_SYNTAX_POSIX_BASIC

/* Syntax bits common to both basic and extended POSIX regex syntax. */
#define _RE_SYNTAX_POSIX_COMMON \
    (RE_CHAR_CLASSES | RE_DOT_NEWLINE | RE_DOT_NOT_NULL \
    | RE_INTERVALS | RE_NO_EMPTY_RANGES)

#define RE_SYNTAX_POSIX_BASIC \
    (_RE_SYNTAX_POSIX_COMMON | RE_BK_PLUS_QM)

/* Differs from ..._POSIX_BASIC only in that RE_BK_PLUS_QM becomes
   RE_LIMITED_OPS, i.e., \? \+ \| are not recognized. Actually, this
   isn't minimal, since other operators, such as \`, aren't disabled. */
#define RE_SYNTAX_POSIX_MINIMAL_BASIC \
    (_RE_SYNTAX_POSIX_COMMON | RE_LIMITED_OPS)

#define RE_SYNTAX_POSIX_EXTENDED \
    (_RE_SYNTAX_POSIX_COMMON | RE_CONTEXT_INDEP_ANCHORS \
    | RE_CONTEXT_INDEP_OPS | RE_NO_BK_BRACES \
    | RE_NO_BK_PARENS | RE_NO_BK_VBAR \
    | RE_UNMATCHED_RIGHT_PAREN_ORD)

/* Differs from ..._POSIX_EXTENDED in that RE_CONTEXT_INVALID_OPS
   replaces RE_CONTEXT_INDEP_OPS and RE_NO_BK_REFS is added. */
#define RE_SYNTAX_POSIX_MINIMAL_EXTENDED \
    (_RE_SYNTAX_POSIX_COMMON | RE_CONTEXT_INDEP_ANCHORS \
    | RE_CONTEXT_INVALID_OPS | RE_NO_BK_BRACES \
    | RE_NO_BK_PARENS | RE_NO_BK_REFS \
    | RE_NO_BK_VBAR | RE_UNMATCHED_RIGHT_PAREN_ORD)

```

### 18.2.3 Collating Elements vs. Characters

POSIX generalizes the notion of a character to that of a collating element. It defines a *collating element* to be “a sequence of one or more bytes defined in the current collating sequence as a unit of collation.”

This generalizes the notion of a character in two ways. First, a single character can map into two or more collating elements. For example, the German “ß” collates as the collating element ‘s’ followed by another collating element ‘s’. Second, two or more characters can map into one collating element. For example, the Czech ‘ch’ collates after ‘h’ and before ‘i’.

Since POSIX’s “collating element” preserves the essential idea of a “character,” we use the latter, more familiar, term in this document.

### 18.2.4 The Backslash Character

The ‘\’ character has one of four different meanings, depending on the context in which you use it and what syntax bits are set (see Section 18.2.1 [Syntax Bits], page 814). It can: 1) stand for itself, 2) quote the next character, 3) introduce an operator, or 4) do nothing.

1. It stands for itself inside a list (see Section 18.3.6 [List Operators], page 822) if the syntax bit `RE_BACKSLASH_ESCAPE_IN_LISTS` is not set. For example, ‘[\]’ would match ‘\’.
2. It quotes (makes ordinary, if it’s special) the next character when you use it either:
  - outside a list,<sup>1</sup> or
  - inside a list and the syntax bit `RE_BACKSLASH_ESCAPE_IN_LISTS` is set.
3. It introduces an operator when followed by certain ordinary characters—sometimes only when certain syntax bits are set. See the cases `RE_BK_PLUS_QM`, `RE_NO_BK_BRACES`, `RE_NO_BK_VAR`, `RE_NO_BK_PARENS`, `RE_NO_BK_REF` in Section 18.2.1 [Syntax Bits], page 814. Also:

- ‘\b’ represents the match-word-boundary operator (see Section 18.4.1.1 [Match-word-boundary Operator], page 827).
- ‘\B’ represents the match-within-word operator (see Section 18.4.1.2 [Match-within-word Operator], page 827).
- ‘\<’ represents the match-beginning-of-word operator (see Section 18.4.1.3 [Match-beginning-of-word Operator], page 827).
- ‘\>’ represents the match-end-of-word operator (see Section 18.4.1.4 [Match-end-of-word Operator], page 827).
- ‘\w’ represents the match-word-constituent operator (see Section 18.4.1.5 [Match-word-constituent Operator], page 827).

---

<sup>1</sup> Sometimes you don’t have to explicitly quote special characters to make them ordinary. For instance, most characters lose any special meaning inside a list (see Section 18.3.6 [List Operators], page 822). In addition, if the syntax bits `RE_CONTEXT_INVALID_OPS` and `RE_CONTEXT_INDEP_OPS` aren’t set, then (for historical reasons) the matcher considers special characters ordinary if they are in contexts where the operations they represent make no sense; for example, then the match-zero-or-more operator (represented by ‘\*’) matches itself in the regular expression ‘\*foo’ because there is no preceding expression on which it can operate. It is poor practice, however, to depend on this behavior; if you want a special character to be ordinary outside a list, it’s better to always quote it, regardless.

- `\W` represents the match-non-word-constituent operator (see Section 18.4.1.6 [Match-non-word-constituent Operator], page 827).
- `\sclass` is equivalent to `[[:space:]]` (see Section 18.4.2.1 [Match-space Operator], page 827).
- `\Sclass` is equivalent to `[^[:space]]` (see Section 18.4.2.2 [Match-non-space Operator], page 827).
- `\`` represents the match-beginning-of-string operator and `\'` represents the match-end-of-string operator (see Section 18.4.3 [Whole-string Operators], page 827).

4. In all other cases, Regex ignores `\``. For example, `\n` matches `'n'`.

## 18.3 Common Operators

You compose regular expressions from operators. In the following sections, we describe the regular expression operators specified by POSIX; GNU also uses these. Most operators have more than one representation as characters. See Section 18.2 [Regular Expression Syntax], page 813, for what characters represent what operators under what circumstances.

For most operators that can be represented in two ways, one representation is a single character and the other is that character preceded by `\``. For example, either `'('` or `\('` represents the open-group operator. Which one does depends on the setting of a syntax bit, in this case `RE_NO_BK_PARENS`. Why is this so? Historical reasons dictate some of the varying representations, while POSIX dictates others.

Finally, almost all characters lose any special meaning inside a list (see Section 18.3.6 [List Operators], page 822).

### 18.3.1 The Match-self Operator (*ordinary character*)

This operator matches the character itself. All ordinary characters (see Section 18.2 [Regular Expression Syntax], page 813) represent this operator. For example, `'f'` is always an ordinary character, so the regular expression `'f'` matches only the string `'f'`. In particular, it does *not* match the string `'ff'`.

### 18.3.2 The Match-any-character Operator (`.`)

This operator matches any single printing or nonprinting character except it won't match a:

newline     if the syntax bit `RE_DOT_NEWLINE` isn't set.

null        if the syntax bit `RE_DOT_NOT_NULL` is set.

The `'.'` (period) character represents this operator. For example, `'a.b'` matches any three-character string beginning with `'a'` and ending with `'b'`.

### 18.3.3 The Concatenation Operator

This operator concatenates two regular expressions *a* and *b*. No character represents this operator; you simply put *b* after *a*. The result is a regular expression that will match a string if *a* matches its first part and *b* matches the rest. For example, `'xy'` (two match-self operators) matches `'xy'`.



### 18.3.4 Repetition Operators

Repetition operators repeat the preceding regular expression a specified number of times.

#### 18.3.4.1 The Match-zero-or-more Operator (`*`)

This operator repeats the smallest possible preceding regular expression as many times as necessary (including zero) to match the pattern. `*` represents this operator. For example, `o*` matches any string made up of zero or more `o`'s. Since this operator operates on the smallest preceding regular expression, `fo*` has a repeating `o`, not a repeating `fo`. So, `fo*` matches `f`, `fo`, `foo`, and so on.

Since the match-zero-or-more operator is a suffix operator, it may be useless as such when no regular expression precedes it. This is the case when it:

- is first in a regular expression, or
- follows a match-beginning-of-line, open-group, or alternation operator.

Three different things can happen in these cases:

1. If the syntax bit `RE_CONTEXT_INVALID_OPS` is set, then the regular expression is invalid.
2. If `RE_CONTEXT_INVALID_OPS` isn't set, but `RE_CONTEXT_INDEP_OPS` is, then `*` represents the match-zero-or-more operator (which then operates on the empty string).
3. Otherwise, `*` is ordinary.

The matcher processes a match-zero-or-more operator by first matching as many repetitions of the smallest preceding regular expression as it can. Then it continues to match the rest of the pattern.

If it can't match the rest of the pattern, it backtracks (as many times as necessary), each time discarding one of the matches until it can either match the entire pattern or be certain that it cannot get a match. For example, when matching `ca*ar` against `caaar`, the matcher first matches all three `a`'s of the string with the `a*` of the regular expression. However, it cannot then match the final `ar` of the regular expression against the final `r` of the string. So it backtracks, discarding the match of the last `a` in the string. It can then match the remaining `ar`.

#### 18.3.4.2 The Match-one-or-more Operator (`+` or `\+`)

If the syntax bit `RE_LIMITED_OPS` is set, then `Regex` doesn't recognize this operator. Otherwise, if the syntax bit `RE_BK_PLUS_QM` isn't set, then `+` represents this operator; if it is, then `\+` does.

This operator is similar to the match-zero-or-more operator except that it repeats the preceding regular expression at least once; see Section 18.3.4.1 [Match-zero-or-more Operator], page 820, for what it operates on, how some syntax bits affect it, and how `Regex` backtracks to match it.

For example, supposing that `+` represents the match-one-or-more operator; then `ca+r` matches, e.g., `car` and `caaar`, but not `cr`.

#### 18.3.4.3 The Match-zero-or-one Operator (`?` or `\?`)

If the syntax bit `RE_LIMITED_OPS` is set, then `Regex` doesn't recognize this operator. Otherwise, if the syntax bit `RE_BK_PLUS_QM` isn't set, then `?` represents this operator; if it is, then `\?` does.

This operator is similar to the match-zero-or-more operator except that it repeats the preceding regular expression once or not at all; see Section 18.3.4.1 [Match-zero-or-more Operator], page 820, to see what it operates on, how some syntax bits affect it, and how Regex backtracks to match it.

For example, supposing that ‘?’ represents the match-zero-or-one operator; then ‘ca?r’ matches both ‘car’ and ‘cr’, but nothing else.

#### 18.3.4.4 Interval Operators (`{ . . . }` or `\{ . . . \}`)

If the syntax bit `RE_INTERVALS` is set, then Regex recognizes *interval expressions*. They repeat the smallest possible preceding regular expression a specified number of times.

If the syntax bit `RE_NO_BK_BRACES` is set, ‘{’ represents the *open-interval operator* and ‘}’ represents the *close-interval operator*; otherwise, ‘\{’ and ‘\}’ do.

Specifically, supposing that ‘{’ and ‘}’ represent the open-interval and close-interval operators; then:

- `{count}` matches exactly *count* occurrences of the preceding regular expression.
- `{min,}` matches *min* or more occurrences of the preceding regular expression.
- `{min, max}` matches at least *min* but no more than *max* occurrences of the preceding regular expression.

The interval expression (but not necessarily the regular expression that contains it) is invalid if:

- *min* is greater than *max*, or
- any of *count*, *min*, or *max* are outside the range zero to `RE_DUP_MAX` (which symbol `regex.h` defines).

If the interval expression is invalid and the syntax bit `RE_NO_BK_BRACES` is set, then Regex considers all the characters in the would-be interval to be ordinary. If that bit isn’t set, then the regular expression is invalid.

If the interval expression is valid but there is no preceding regular expression on which to operate, then if the syntax bit `RE_CONTEXT_INVALID_OPS` is set, the regular expression is invalid. If that bit isn’t set, then Regex considers all the characters—other than backslashes, which it ignores—in the would-be interval to be ordinary.

#### 18.3.5 The Alternation Operator (`|` or `\|`)

If the syntax bit `RE_LIMITED_OPS` is set, then Regex doesn’t recognize this operator. Otherwise, if the syntax bit `RE_NO_BK_VBAR` is set, then ‘|’ represents this operator; otherwise, ‘\|’ does.

Alternatives match one of a choice of regular expressions: if you put the character(s) representing the alternation operator between any two regular expressions *a* and *b*, the result matches the union of the strings that *a* and *b* match. For example, supposing that ‘|’ is the alternation operator, then ‘foo|bar|quux’ would match any of ‘foo’, ‘bar’ or ‘quux’.

The alternation operator operates on the *largest* possible surrounding regular expressions. (Put another way, it has the lowest precedence of any regular expression operator.) Thus, the only way you can delimit its arguments is to use grouping. For example, if ‘(’ and

‘)’ are the open and close-group operators, then ‘fo(o|b)ar’ would match either ‘fooar’ or ‘fobar’. (‘foo|bar’ would match ‘foo’ or ‘bar’.)

The matcher usually tries all combinations of alternatives so as to match the longest possible string. For example, when matching ‘(fooq|foo)\*(qbarquux|bar)’ against ‘fooqbarquux’, it cannot take, say, the first (“depth-first”) combination it could match, since then it would be content to match just ‘fooqbar’.

Note that since the default behavior is to return the leftmost longest match, when more than one of a series of alternatives matches the actual match will be the longest matching alternative, not necessarily the first in the list.

### 18.3.6 List Operators ([ . . . ] and [^ . . . ])

*Lists*, also called *bracket expressions*, are a set of one or more items. An *item* is a character, a collating symbol, an equivalence class expression, a character class expression, or a range expression. The syntax bits affect which kinds of items you can put in a list. We explain the last four items in subsections below. Empty lists are invalid.

A *matching list* matches a single character represented by one of the list items. You form a matching list by enclosing one or more items within an *open-matching-list operator* (represented by ‘[’) and a *close-list operator* (represented by ‘]’).

For example, ‘[ab]’ matches either ‘a’ or ‘b’. ‘[ad]\*’ matches the empty string and any string composed of just ‘a’s and ‘d’s in any order. Regex considers invalid a regular expression with a ‘[’ but no matching ‘]’.

*Nonmatching lists* are similar to matching lists except that they match a single character *not* represented by one of the list items. You use an *open-nonmatching-list operator* (represented by ‘[^’<sup>2</sup>) instead of an open-matching-list operator to start a nonmatching list.

For example, ‘[^ab]’ matches any character except ‘a’ or ‘b’.

If the syntax bit RE\_HAT\_LISTS\_NOT\_NEWLINE is set, then nonmatching lists do not match a newline.

Most characters lose any special meaning inside a list. The special characters inside a list follow.

- ‘]’ ends the list if it’s not the first list item. So, if you want to make the ‘]’ character a list item, you must put it first.
- ‘\’ quotes the next character if the syntax bit RE\_BACKSLASH\_ESCAPE\_IN\_LISTS is set.
- ‘[.’ represents the open-collating-symbol operator (see Section 18.3.6.1 [Collating Symbol Operators], page 823).
- ‘.]’ represents the close-collating-symbol operator.
- ‘[=’ represents the open-equivalence-class operator (see Section 18.3.6.2 [Equivalence Class Operators], page 823).
- ‘=]’ represents the close-equivalence-class operator.

<sup>2</sup> Regex therefore doesn’t consider the ‘^’ to be the first character in the list. If you put a ‘^’ character first in (what you think is) a matching list, you’ll turn it into a nonmatching list.

- ‘[:’ represents the open-character-class operator (see Section 18.3.6.3 [Character Class Operators], page 823) if the syntax bit `RE_CHAR_CLASSES` is set and what follows is a valid character class expression.
- ‘:]’ represents the close-character-class operator if the syntax bit `RE_CHAR_CLASSES` is set and what precedes it is an open-character-class operator followed by a valid character class name.
- ‘-’ represents the range operator (see Section 18.3.6.4 [Range Operator], page 824) if it’s not first or last in a list or the ending point of a range.

All other characters are ordinary. For example, ‘[.\*]’ matches ‘.’ and ‘\*’.

### 18.3.6.1 Collating Symbol Operators ([. . . .])

Collating symbols can be represented inside lists. You form a *collating symbol* by putting a collating element between an *open-collating-symbol operator* and a *close-collating-symbol operator*. ‘[.]’ represents the open-collating-symbol operator and ‘. ]’ represents the close-collating-symbol operator. For example, if ‘11’ is a collating element, then ‘[[.11.] ]’ would match ‘11’.

### 18.3.6.2 Equivalence Class Operators ([= . . . =])

Regex recognizes equivalence class expressions inside lists. A *equivalence class expression* is a set of collating elements which all belong to the same equivalence class. You form an equivalence class expression by putting a collating element between an *open-equivalence-class operator* and a *close-equivalence-class operator*. ‘[=’ represents the open-equivalence-class operator and ‘=]’ represents the close-equivalence-class operator. For example, if ‘a’ and ‘A’ were an equivalence class, then both ‘[[=a=] ]’ and ‘[[=A=] ]’ would match both ‘a’ and ‘A’. If the collating element in an equivalence class expression isn’t part of an equivalence class, then the matcher considers the equivalence class expression to be a collating symbol.

### 18.3.6.3 Character Class Operators ([: . . . :])

If the syntax bit `RE_CHAR_CLASSES` is set, then Regex recognizes character class expressions inside lists. A *character class expression* matches one character from a given class. You form a character class expression by putting a character class name between an *open-character-class operator* (represented by ‘[:’) and a *close-character-class operator* (represented by ‘:]’). The character class names and their meanings are:

<code>alnum</code>	letters and digits
<code>alpha</code>	letters
<code>blank</code>	system-dependent; for GNU, a space or tab
<code>cntrl</code>	control characters (in the ASCII encoding, code 0177 and codes less than 040)
<code>digit</code>	digits
<code>graph</code>	same as <code>print</code> except omits space
<code>lower</code>	lowercase letters
<code>print</code>	printable characters (in the ASCII encoding, space tilde—codes 040 through 0176)

<code>punct</code>	neither control nor alphanumeric characters
<code>space</code>	space, carriage return, newline, vertical tab, and form feed
<code>upper</code>	uppercase letters
<code>xdigit</code>	hexadecimal digits: 0–9, a–f, A–F

These correspond to the definitions in the C library's `<ctype.h>` facility. For example, `[:alpha:]` corresponds to the standard facility `isalpha`. Regex recognizes character class expressions only inside of lists; so `[[[:alpha:]]]` matches any letter, but `[:alpha:]` outside of a bracket expression and not followed by a repetition operator matches just itself.

### 18.3.6.4 The Range Operator (-)

Regex recognizes *range expressions* inside a list. They represent those characters that fall between two elements in the current collating sequence. You form a range expression by putting a *range operator* between two of any of the following: characters, collating elements, collating symbols, and equivalence class expressions. The starting point of the range and the ending point of the range don't have to be the same kind of item, e.g., the starting point could be a collating element and the ending point could be an equivalence class expression. If a range's ending point is an equivalence class, then all the collating elements in that class will be in the range.<sup>3</sup> '-' represents the range operator. For example, 'a-f' within a list represents all the characters from 'a' through 'f' inclusively.

If the syntax bit `RE_NO_EMPTY_RANGES` is set, then if the range's ending point collates less than its starting point, the range (and the regular expression containing it) is invalid. For example, the regular expression `[z-a]` would be invalid. If this bit isn't set, then Regex considers such a range to be empty.

Since '-' represents the range operator, if you want to make a '-' character itself a list item, you must do one of the following:

- Put the '-' either first or last in the list.
- Include a range whose starting point collates strictly lower than '-' and whose ending point collates equal or higher. Unless a range is the first item in a list, a '-' can't be its starting point, but *can* be its ending point. That is because Regex considers '-' to be the range operator unless it is preceded by another '-'. For example, in the ASCII encoding, ')', '\*', '+', ',', '-', '.', and '/' are contiguous characters in the collating sequence. You might think that `[D-+--/]` has two ranges: `)-+` and `--/`. Rather, it has the ranges `)-+` and `+--`, plus the character `/`, so it matches, e.g., ',', not '.'.
- Put a range whose starting point is '-' first in the list.

For example, `[-a-z]` matches a lowercase letter or a hyphen (in English, in ASCII).

### 18.3.7 Grouping Operators (( ... ) or \ ( ... \))

A *group*, also known as a *subexpression*, consists of an *open-group operator*, any number of other operators, and a *close-group operator*. Regex treats this sequence as a unit, just as mathematics and programming languages treat a parenthesized expression as a unit.

<sup>3</sup> You can't use a character class for the starting or ending point of a range, since a character class is not a single character.

Therefore, using *groups*, you can:

- delimit the argument(s) to an alternation operator (see Section 18.3.5 [Alternation Operator], page 821) or a repetition operator (see Section 18.3.4 [Repetition Operators], page 820).
- keep track of the indices of the substring that matched a given group. See Section 18.6.1.8 [Using Registers], page 833, for a precise explanation. This lets you:
  - use the back-reference operator (see Section 18.3.8 [Back-reference Operator], page 825).
  - use registers (see Section 18.6.1.8 [Using Registers], page 833).

If the syntax bit `RE_NO_BK_PARENS` is set, then `'(` represents the open-group operator and `)'` represents the close-group operator; otherwise, `'\('` and `'\)'` do.

If the syntax bit `RE_UNMATCHED_RIGHT_PAREN_ORD` is set and a close-group operator has no matching open-group operator, then Regex considers it to match `)'`.

### 18.3.8 The Back-reference Operator (`\digit`)

If the syntax bit `RE_NO_BK_REF` isn't set, then Regex recognizes back-references. A back-reference matches a specified preceding group. The back-reference operator is represented by `'\digit'` anywhere after the end of a regular expression's *digit*-th group (see Section 18.3.7 [Grouping Operators], page 824).

*digit* must be between `'1'` and `'9'`. The matcher assigns numbers 1 through 9 to the first nine groups it encounters. By using one of `'\1'` through `'\9'` after the corresponding group's close-group operator, you can match a substring identical to the one that the group does.

Back-references match according to the following (in all examples below, `'(` represents the open-group, `)'` the close-group, `'{'` the open-interval and `'}'` the close-interval operator):

- If the group matches a substring, the back-reference matches an identical substring. For example, `'(a)\1'` matches `'aa'` and `'(bana)na\1bo\1'` matches `'banabanabobana'`. Likewise, `'(.*)\1'` matches any (newline-free if the syntax bit `RE_DOT_NEWLINE` isn't set) string that is composed of two identical halves; the `'(.*)'` matches the first half and the `'\1'` matches the second half.
- If the group matches more than once (as it might if followed by, e.g., a repetition operator), then the back-reference matches the substring the group *last* matched. For example, `'((a*)b)*\1\2'` matches `'aabababa'`; first group 1 (the outer one) matches `'aab'` and group 2 (the inner one) matches `'aa'`. Then group 1 matches `'ab'` and group 2 matches `'a'`. So, `'\1'` matches `'ab'` and `'\2'` matches `'a'`.
- If the group doesn't participate in a match, i.e., it is part of an alternative not taken or a repetition operator allows zero repetitions of it, then the back-reference makes the whole match fail. For example, `'(one()|two())-and-(three\2|four\3)'` matches `'one-and-three'` and `'two-and-four'`, but not `'one-and-four'` or `'two-and-three'`. For example, if the pattern matches `'one-and-'`, then its group 2 matches the empty string and its group 3 doesn't participate in the match. So, if it then matches `'four'`, then when it tries to back-reference group 3—which it will attempt to do because `'\3'` follows the `'four'`—the match will fail because group 3 didn't participate in the match.

You can use a back-reference as an argument to a repetition operator. For example, `(a(b))\2*` matches `a` followed by two or more `b`'s. Similarly, `(a(b))\2{3}` matches `abbbb`.

If there is no preceding *digit*-th subexpression, the regular expression is invalid.

Back-references can greatly slow down matching, as they can generate exponentially many matching possibilities that can consume both time and memory to explore. Also, the POSIX specification for back-references is at times unclear. Furthermore, many regular expression implementations have back-reference bugs that can cause programs to return incorrect answers or even crash, and fixing these bugs has often been low-priority: for example, as of 2020 the GNU C library bug database (<https://sourceware.org/bugzilla/>) contained back-reference bugs 52, 10844, 11053, 24269 and 25322, with little sign of forthcoming fixes. Luckily, back-references are rarely useful and it should be little trouble to avoid them in practical applications.

### 18.3.9 Anchoring Operators

These operators can constrain a pattern to match only at the beginning or end of the entire string or at the beginning or end of a line.

#### 18.3.9.1 The Match-beginning-of-line Operator (^)

This operator can match the empty string either at the beginning of the string or after a newline character. Thus, it is said to *anchor* the pattern to the beginning of a line.

In the cases following, `^` represents this operator. (Otherwise, `^` is ordinary.)

- It (the `^`) is first in the pattern, as in `^foo`.
- The syntax bit `RE_CONTEXT_INDEP_ANCHORS` is set, and it is outside a bracket expression.
- It follows an open-group or alternation operator, as in `a\(^b\)` and `a\|^b`. See Section 18.3.7 [Grouping Operators], page 824, and Section 18.3.5 [Alternation Operator], page 821.

These rules imply that some valid patterns containing `^` cannot be matched; for example, `foo^bar` if `RE_CONTEXT_INDEP_ANCHORS` is set.

If the `not_bol` field is set in the pattern buffer (see Section 18.6.1.1 [GNU Pattern Buffers], page 828), then `^` fails to match at the beginning of the string. This lets you match against pieces of a line, as you would need to if, say, searching for repeated instances of a given pattern in a line; it would work correctly for patterns both with and without match-beginning-of-line operators.

#### 18.3.9.2 The Match-end-of-line Operator (\$)

This operator can match the empty string either at the end of the string or before a newline character in the string. Thus, it is said to *anchor* the pattern to the end of a line.

It is always represented by `$`. For example, `foo$` usually matches, e.g., `foo` and, e.g., the first three characters of `foo\nbar`.

Its interaction with the syntax bits and pattern buffer fields is exactly the dual of `^`'s; see the previous section. (That is, `^^` becomes `$$`, `beginning` becomes `end`, `next` becomes `previous`, `after` becomes `before`, and `not_bol` becomes `not_eol`.)

## 18.4 GNU Operators

The following are operators that GNU defines (and POSIX doesn't) that you can use unless the syntax bit `RE_NO_GNU_OPS` is set.

### 18.4.1 Word Operators

The operators in this section require Regex to recognize parts of words. Characters that are part of words, which are called *word-constituent*, are letters, digits, and the underscore (`'_'`); more precisely, any character in the POSIX class `alnum` in the current locale, or underscore.

#### 18.4.1.1 The Match-word-boundary Operator (`\b`)

This operator (represented by `'\b'`) matches the empty string at either the beginning or the end of a word. For example, `'\brat\b'` matches the separate word `'rat'`.

#### 18.4.1.2 The Match-within-word Operator (`\B`)

This operator (represented by `'\B'`) matches the empty string within a word. For example, `'c\Brat\Be'` matches `'crate'`, but `'dirty \Brat'` doesn't match `'dirty rat'`.

#### 18.4.1.3 The Match-beginning-of-word Operator (`\<`)

This operator (represented by `'\<'`) matches the empty string at the beginning of a word.

#### 18.4.1.4 The Match-end-of-word Operator (`\>`)

This operator (represented by `'\>'`) matches the empty string at the end of a word.

#### 18.4.1.5 The Match-word-constituent Operator (`\w`)

This operator (represented by `'\w'`) matches any word-constituent character.

#### 18.4.1.6 The Match-non-word-constituent Operator (`\W`)

This operator (represented by `'\W'`) matches any character that is not word-constituent.

### 18.4.2 Space Operators

#### 18.4.2.1 The Match-space Operator (`\s`)

This operator (represented by `'\s'`) matches any space character (that is, in the POSIX class `[:space:]`).

#### 18.4.2.2 The Match-non-space Operator (`\S`)

This operator (represented by `'\S'`) matches any character that is not a space (that is, in the POSIX class `[:space:]`).

### 18.4.3 Whole-string Operators

Following are operators which work on the whole string.

#### 18.4.3.1 The Match-beginning-of-string Operator (`\^`)

This operator (represented by `'\^'`) matches the empty string at the beginning of the string.



### 18.4.3.2 The Match-end-of-string Operator (`\'`)

This operator (represented by `'\'`) matches the empty string at the end of the string.

## 18.5 What Gets Matched?

Regex usually matches strings according to the “leftmost longest” rule; that is, it chooses the longest of the leftmost matches. This does not mean that for a regular expression containing subexpressions that it simply chooses the longest match for each subexpression, left to right; the overall match must also be the longest possible one.

For example, `'(ac*)(c*d[ac]*)\1'` matches `'acdacaaa'`, not `'acdac'`, as it would if it were to choose the longest match for the first subexpression.

## 18.6 Programming with Regex

Here we describe how you use the Regex data structures and functions in C programs. Regex has three interfaces: one designed for GNU, one compatible with POSIX (as specified by POSIX, draft 1003.2/D11.2), and one compatible with Berkeley Unix. The POSIX interface is not documented here; see the documentation of GNU libc, or the POSIX man pages. The Berkeley Unix interface is documented here for convenience, since its documentation is not otherwise readily available on GNU systems.

### 18.6.1 GNU Regex Functions

If you're writing code that doesn't need to be compatible with either POSIX or Berkeley Unix, you can use these functions. They provide more options than the other interfaces.

#### 18.6.1.1 GNU Pattern Buffers

To compile, match, or search for a given regular expression, you must supply a pattern buffer. A *pattern buffer* holds one compiled regular expression.<sup>4</sup>

You can have several different pattern buffers simultaneously, each holding a compiled pattern for a different regular expression.

`regex.h` defines the pattern buffer `struct` with the following public fields:

```
unsigned char *buffer;
unsigned long allocated;
char *fastmap;
char *translate;
size_t re_nsub;
unsigned no_sub : 1;
unsigned not_bol : 1;
unsigned not_eol : 1;
```

#### 18.6.1.2 GNU Regular Expression Compiling

In GNU, you can both match and search for a given regular expression. To do either, you must first compile it in a pattern buffer (see Section 18.6.1.1 [GNU Pattern Buffers], page 828).

---

<sup>4</sup> Regular expressions are also referred to as “patterns,” hence the name “pattern buffer.”

Regular expressions match according to the syntax with which they were compiled; with GNU, you indicate what syntax you want by setting the variable `re_syntax_options` (declared in `regex.h`) before calling the compiling function, `re_compile_pattern` (see below). See Section 18.2.1 [Syntax Bits], page 814, and Section 18.2.2 [Predefined Syntaxes], page 816.

You can change the value of `re_syntax_options` at any time. Usually, however, you set its value once and then never change it.

`re_compile_pattern` takes a pattern buffer as an argument. You must initialize the following fields:

`translate` initialization

`translate`

Initialize this to point to a translate table if you want one, or to zero if you don't. We explain translate tables in Section 18.6.1.7 [GNU Translate Tables], page 832.

`fastmap` Initialize this to nonzero if you want a fastmap, or to zero if you don't.

`buffer`

`allocated`

If you want `re_compile_pattern` to allocate memory for the compiled pattern, set both of these to zero. If you have an existing block of memory (allocated with `malloc`) you want Regex to use, set `buffer` to its address and `allocated` to its size (in bytes).

`re_compile_pattern` uses `realloc` to extend the space for the compiled pattern as necessary.

To compile a pattern buffer, use:

```
char *
re_compile_pattern (const char *regex, const int regex_size,
                  struct re_pattern_buffer *pattern_buffer)
```

`regex` is the regular expression's address, `regex_size` is its length, and `pattern_buffer` is the pattern buffer's address.

If `re_compile_pattern` successfully compiles the regular expression, it returns zero and sets `*pattern_buffer` to the compiled pattern. It sets the pattern buffer's fields as follows:

`buffer` to the compiled pattern.

`syntax` to the current value of `re_syntax_options`.

`re_nsub` to the number of subexpressions in `regex`.

If `re_compile_pattern` can't compile `regex`, it returns an error string corresponding to a POSIX error code.

### 18.6.1.3 GNU Matching

Matching the GNU way means trying to match as much of a string as possible starting at a position within it you specify. Once you've compiled a pattern into a pattern buffer (see Section 18.6.1.2 [GNU Regular Expression Compiling], page 828), you can ask the matcher to match that pattern against a string using:

```
int
```

```

re_match (struct re_pattern_buffer *pattern_buffer,
          const char *string, const int size,
          const int start, struct re_registers *regs)

```

*pattern\_buffer* is the address of a pattern buffer containing a compiled pattern. *string* is the string you want to match; it can contain newline and null characters. *size* is the length of that string. *start* is the string index at which you want to begin matching; the first character of *string* is at index zero. See Section 18.6.1.8 [Using Registers], page 833, for an explanation of *regs*; you can safely pass zero.

`re_match` matches the regular expression in *pattern\_buffer* against the string *string* according to the syntax of *pattern\_buffer*. (See Section 18.6.1.2 [GNU Regular Expression Compiling], page 828, for how to set it.) The function returns  $-1$  if the compiled pattern does not match any part of *string* and  $-2$  if an internal error happens; otherwise, it returns how many (possibly zero) characters of *string* the pattern matched.

An example: suppose *pattern\_buffer* points to a pattern buffer containing the compiled pattern for `'a*'`, and *string* points to `'aaaaab'` (whereupon *size* should be 6). Then if *start* is 2, `re_match` returns 3, i.e., `'a*'` would have matched the last three `'a'`s in *string*. If *start* is 0, `re_match` returns 5, i.e., `'a*'` would have matched all the `'a'`s in *string*. If *start* is either 5 or 6, it returns zero.

If *start* is not between zero and *size*, then `re_match` returns  $-1$ .

#### 18.6.1.4 GNU Searching

*Searching* means trying to match starting at successive positions within a string. The function `re_search` does this.

Before calling `re_search`, you must compile your regular expression. See Section 18.6.1.2 [GNU Regular Expression Compiling], page 828.

Here is the function declaration:

```

int
re_search (struct re_pattern_buffer *pattern_buffer,
          const char *string, const int size,
          const int start, const int range,
          struct re_registers *regs)

```

whose arguments are the same as those to `re_match` (see Section 18.6.1.3 [GNU Matching], page 829) except that the two arguments *start* and *range* replace `re_match`'s argument *start*.

If *range* is positive, then `re_search` attempts a match starting first at index *start*, then at *start* + 1 if that fails, and so on, up to *start* + *range*; if *range* is negative, then it attempts a match starting first at index *start*, then at *start* - 1 if that fails, and so on.

If *start* is not between zero and *size*, then `re_search` returns  $-1$ . When *range* is positive, `re_search` adjusts *range* so that *start* + *range* - 1 is between zero and *size*, if necessary; that way it won't search outside of *string*. Similarly, when *range* is negative, `re_search` adjusts *range* so that *start* + *range* + 1 is between zero and *size*, if necessary.

If the `fastmap` field of *pattern\_buffer* is zero, `re_search` matches starting at consecutive positions; otherwise, it uses `fastmap` to make the search more efficient. See Section 18.6.1.6 [Searching with Fastmaps], page 831.

If no match is found, `re_search` returns `-1`. If a match is found, it returns the index where the match began. If an internal error happens, it returns `-2`.

### 18.6.1.5 Matching and Searching with Split Data

Using the functions `re_match_2` and `re_search_2`, you can match or search in data that is divided into two strings.

The function:

```
int
re_match_2 (struct re_pattern_buffer *buffer,
            const char *string1, const int size1,
            const char *string2, const int size2,
            const int start,
            struct re_registers *regs,
            const int stop)
```

is similar to `re_match` (see Section 18.6.1.3 [GNU Matching], page 829) except that you pass *two* data strings and sizes, and an index `stop` beyond which you don't want the matcher to try matching. As with `re_match`, if it succeeds, `re_match_2` returns how many characters of *string* it matched. Regard *string1* and *string2* as concatenated when you set the arguments `start` and `stop` and use the contents of `regs`; `re_match_2` never returns a value larger than `size1 + size2`.

The function:

```
int
re_search_2 (struct re_pattern_buffer *buffer,
            const char *string1, const int size1,
            const char *string2, const int size2,
            const int start, const int range,
            struct re_registers *regs,
            const int stop)
```

is similarly related to `re_search`.

### 18.6.1.6 Searching with Fastmaps

If you're searching through a long string, you should use a fastmap. Without one, the searcher tries to match at consecutive positions in the string. Generally, most of the characters in the string could not start a match. It takes much longer to try matching at a given position in the string than it does to check in a table whether or not the character at that position could start a match. A *fastmap* is such a table.

More specifically, a fastmap is an array indexed by the characters in your character set. Under the ASCII encoding, therefore, a fastmap has 256 elements. If you want the searcher to use a fastmap with a given pattern buffer, you must allocate the array and assign the array's address to the pattern buffer's `fastmap` field. You either can compile the fastmap yourself or have `re_search` do it for you; when `fastmap` is nonzero, it automatically compiles a fastmap the first time you search using a particular compiled pattern.

By setting the buffer's `fastmap` field before calling `re_compile_pattern`, you can reuse a buffer data structure across multiple searches with different patterns, and allocate the

fastmap only once. Nonetheless, the fastmap must be recompiled each time the buffer has a new pattern compiled into it.

To compile a fastmap yourself, use:

```
int
re_compile_fastmap (struct re_pattern_buffer *pattern_buffer)
```

*pattern\_buffer* is the address of a pattern buffer. If the character *c* could start a match for the pattern, `re_compile_fastmap` makes `pattern_buffer->fastmap[c]` nonzero. It returns 0 if it can compile a fastmap and `-2` if there is an internal error. For example, if `|` is the alternation operator and *pattern\_buffer* holds the compiled pattern for `'a|b'`, then `re_compile_fastmap` sets `fastmap['a']` and `fastmap['b']` (and no others).

`re_search` uses a fastmap as it moves along in the string: it checks the string's characters until it finds one that's in the fastmap. Then it tries matching at that character. If the match fails, it repeats the process. So, by using a fastmap, `re_search` doesn't waste time trying to match at positions in the string that couldn't start a match.

If you don't want `re_search` to use a fastmap, store zero in the `fastmap` field of the pattern buffer before calling `re_search`.

Once you've initialized a pattern buffer's `fastmap` field, you need never do so again—even if you compile a new pattern in it—provided the way the field is set still reflects whether or not you want a fastmap. `re_search` will still either do nothing if `fastmap` is null or, if it isn't, compile a new fastmap for the new pattern.

### 18.6.1.7 GNU Translate Tables

If you set the `translate` field of a pattern buffer to a translate table, then the GNU Regex functions to which you've passed that pattern buffer use it to apply a simple transformation to all the regular expression and string characters at which they look.

A *translate table* is an array indexed by the characters in your character set. Under the ASCII encoding, therefore, a translate table has 256 elements. The array's elements are also characters in your character set. When the Regex functions see a character *c*, they use `translate[c]` in its place, with one exception: the character after a `\` is not translated. (This ensures that, the operators, e.g., `\B` and `\b`, are always distinguishable.)

For example, a table that maps all lowercase letters to the corresponding uppercase ones would cause the matcher to ignore differences in case.<sup>5</sup> Such a table would map all characters except lowercase letters to themselves, and lowercase letters to the corresponding uppercase ones. Under the ASCII encoding, here's how you could initialize such a table (we'll call it `case_fold`):

```
for (i = 0; i < 256; i++)
    case_fold[i] = i;
for (i = 'a'; i <= 'z'; i++)
    case_fold[i] = i - ('a' - 'A');
```

You tell Regex to use a translate table on a given pattern buffer by assigning that table's address to the `translate` field of that buffer. If you don't want Regex to do any translation, put zero into this field. You'll get weird results if you change the table's contents anytime

<sup>5</sup> A table that maps all uppercase letters to the corresponding lowercase ones would work just as well for this purpose.

between compiling the pattern buffer, compiling its fastmap, and matching or searching with the pattern buffer.

### 18.6.1.8 Using Registers

A group in a regular expression can match a (possibly empty) substring of the string that regular expression as a whole matched. The matcher remembers the beginning and end of the substring matched by each group.

To find out what they matched, pass a nonzero *regs* argument to a GNU matching or searching function (see Section 18.6.1.3 [GNU Matching], page 829, and Section 18.6.1.4 [GNU Searching], page 830), i.e., the address of a structure of this type, as defined in `regex.h`:

```
struct re_registers
{
    unsigned num_regs;
    regoff_t *start;
    regoff_t *end;
};
```

Except for (possibly) the *num\_regs*'th element (see below), the *i*th element of the `start` and `end` arrays records information about the *i*th group in the pattern. (They're declared as C pointers, but this is only because not all C compilers accept zero-length arrays; conceptually, it is simplest to think of them as arrays.)

The `start` and `end` arrays are allocated in one of two ways. The simplest and perhaps most useful is to let the matcher (re)allocate enough space to record information for all the groups in the regular expression. If `re_set_registers` is not called before searching or matching, then the matcher allocates two arrays each of  $1 + re_nsub$  elements (*re\_nsub* is another field in the pattern buffer; see Section 18.6.1.1 [GNU Pattern Buffers], page 828). The extra element is set to  $-1$ . Then on subsequent calls with the same pattern buffer and *regs* arguments, the matcher reallocates more space if necessary.

The function:

```
void
re_set_registers (struct re_pattern_buffer *buffer,
                 struct re_registers *regs,
                 size_t num_regs,
                 regoff_t *starts, regoff_t *ends)
```

sets *regs* to hold *num\_regs* registers, storing them in *starts* and *ends*. Subsequent matches using *buffer* and *regs* will use this memory for recording register information. *starts* and *ends* must be allocated with `malloc`, and must each be at least  $num\_regs * sizeof(regoff\_t)$  bytes long.

If *num\_regs* is zero, then subsequent matches should allocate their own register data.

Unless this function is called, the first search or match using *buffer* will allocate its own register data, without freeing the old data.

The following examples illustrate the information recorded in the `re_registers` structure. (In all of them, '(' represents the open-group and ')' the close-group operator. The first character in the string *string* is at index 0.)

- If the regular expression has an  $i$ -th group that matches a substring of *string*, then the function sets `regs->start[i]` to the index in *string* where the substring matched by the  $i$ -th group begins, and `regs->end[i]` to the index just beyond that substring's end. The function sets `regs->start[0]` and `regs->end[0]` to analogous information about the entire pattern.

For example, when you match `'((a)(b))'` against `'ab'`, you get:

- 0 in `regs->start[0]` and 2 in `regs->end[0]`
  - 0 in `regs->start[1]` and 2 in `regs->end[1]`
  - 0 in `regs->start[2]` and 1 in `regs->end[2]`
  - 1 in `regs->start[3]` and 2 in `regs->end[3]`
- If a group matches more than once (as it might if followed by, e.g., a repetition operator), then the function reports the information about what the group *last* matched.

For example, when you match the pattern `'(a)*'` against the string `'aa'`, you get:

- 0 in `regs->start[0]` and 2 in `regs->end[0]`
  - 1 in `regs->start[1]` and 2 in `regs->end[1]`
- If the  $i$ -th group does not participate in a successful match, e.g., it is an alternative not taken or a repetition operator allows zero repetitions of it, then the function sets `regs->start[i]` and `regs->end[i]` to `-1`.

For example, when you match the pattern `'(a)*b'` against the string `'b'`, you get:

- 0 in `regs->start[0]` and 1 in `regs->end[0]`
  - `-1` in `regs->start[1]` and `-1` in `regs->end[1]`
- If the  $i$ -th group matches a zero-length string, then the function sets `regs->start[i]` and `regs->end[i]` to the index just beyond that zero-length string.

For example, when you match the pattern `'(a*)b'` against the string `'b'`, you get:

- 0 in `regs->start[0]` and 1 in `regs->end[0]`
  - 0 in `regs->start[1]` and 0 in `regs->end[1]`
- If an  $i$ -th group contains a  $j$ -th group in turn not contained within any other group within group  $i$  and the function reports a match of the  $i$ -th group, then it records in `regs->start[j]` and `regs->end[j]` the last match (if it matched) of the  $j$ -th group.

For example, when you match the pattern `'((a*)b)*'` against the string `'abb'`, group 2 last matches the empty string, so you get what it previously matched:

- 0 in `regs->start[0]` and 3 in `regs->end[0]`
- 2 in `regs->start[1]` and 3 in `regs->end[1]`
- 2 in `regs->start[2]` and 2 in `regs->end[2]`

When you match the pattern `'((a)*b)*'` against the string `'abb'`, group 2 doesn't participate in the last match, so you get:

- 0 in `regs->start[0]` and 3 in `regs->end[0]`
- 2 in `regs->start[1]` and 3 in `regs->end[1]`
- 0 in `regs->start[2]` and 1 in `regs->end[2]`

- If an  $i$ -th group contains a  $j$ -th group in turn not contained within any other group within group  $i$  and the function sets `regs->start[i]` and `regs->end[i]` to  $-1$ , then it also sets `regs->start[j]` and `regs->end[j]` to  $-1$ .

For example, when you match the pattern `'((a)*b)*c'` against the string `'c'`, you get:

- 0 in `regs->start[0]` and 1 in `regs->end[0]`
- $-1$  in `regs->start[1]` and  $-1$  in `regs->end[1]`
- $-1$  in `regs->start[2]` and  $-1$  in `regs->end[2]`

### 18.6.1.9 Freeing GNU Pattern Buffers

To free any allocated fields of a pattern buffer, use the POSIX function `regfree`:

```
void
regfree (regex_t *preg)
```

`preg` is the pattern buffer whose allocated fields you want freed; this works because since the type `regex_t`—the type for POSIX pattern buffers—is equivalent to the type `re_pattern_buffer`.

`regfree` also sets `preg`'s `allocated` field to zero. After a buffer has been freed, it must have a regular expression compiled in it before passing it to a matching or searching function.

## 18.6.2 BSD Regex Functions

If you're writing code that has to be Berkeley Unix compatible, you'll need to use these functions whose interfaces are the same as those in Berkeley Unix.

### 18.6.2.1 BSD Regular Expression Compiling

With Berkeley Unix, you can only search for a given regular expression; you can't match one. To search for it, you must first compile it. Before you compile it, you must indicate the regular expression syntax you want it compiled according to by setting the variable `re_syntax_options` (declared in `regex.h`) to some syntax (see Section 18.2 [Regular Expression Syntax], page 813).

To compile a regular expression use:

```
char *
re_comp (char *regex)
```

`regex` is the address of a null-terminated regular expression. `re_comp` uses an internal pattern buffer, so you can use only the most recently compiled pattern buffer. This means that if you want to use a given regular expression that you've already compiled—but it isn't the latest one you've compiled—you'll have to recompile it. If you call `re_comp` with the null string (*not* the empty string) as the argument, it doesn't change the contents of the pattern buffer.

If `re_comp` successfully compiles the regular expression, it returns zero. If it can't compile the regular expression, it returns an error string. `re_comp`'s error messages are identical to those of `re_compile_pattern` (see Section 18.6.1.2 [GNU Regular Expression Compiling], page 828).



### 18.6.2.2 BSD Searching

Searching the Berkeley Unix way means searching in a string starting at its first character and trying successive positions within it to find a match. Once you've compiled a pattern using `re_comp` (see Section 18.6.2.1 [BSD Regular Expression Compiling], page 835), you can ask `Regex` to search for that pattern in a string using:

```
int
re_exec (char *string)
```

`string` is the address of the null-terminated string in which you want to search.

`re_exec` returns either 1 for success or 0 for failure. It automatically uses a GNU fastmap (see Section 18.6.1.6 [Searching with Fastmaps], page 831).

## 18.7 Regular expression syntaxes

Gnlib supports many different types of regular expressions; although the underlying features are the same or identical, the syntax used varies. The descriptions given here for the different types are generated automatically.

### 18.7.1 'awk' regular expression syntax

The character `'.'` matches any single character except the null character.

<code>'+'</code>	indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
<code>'?'</code>	indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
<code>'\+'</code>	matches a <code>'+'</code>
<code>'\?'</code>	matches a <code>'?'</code> .

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example `'[z-a]'`, are invalid. Within square brackets, `'\'` can be used to quote the following character. Character classes are supported; for example `'[:digit:]'` will match a single decimal digit.

GNU extensions are not supported and so `'\w'`, `'\W'`, `'\<'`, `'\>'`, `'\b'`, `'\B'`, `'\^'`, and `'\'` match `'w'`, `'W'`, `'<'`, `'>'`, `'b'`, `'B'`, `'^'`, and `''` respectively.

Grouping is performed with parentheses `'()'`. An unmatched `'()'` matches just itself. A backslash followed by a digit matches that digit.

The alternation operator is `'|'`.

The characters `'^'` and `'$'` always represent the beginning and end of a string respectively, except within square brackets. Within brackets, `'^'` can be used to invert the membership of the character class being specified.

`'*'`, `'+'` and `'?'` are special at any point in a regular expression except:

1. At the beginning of a regular expression
2. After an open-group, signified by `'('`
3. After the alternation operator `'|'`

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.2 ‘egrep’ regular expression syntax

The character ‘.’ matches any single character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[digit:]]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\^’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘^’ and ‘\$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

The characters ‘\*’, ‘+’ and ‘?’ are special anywhere in a regular expression.

Intervals are specified by ‘{’ and ‘}’. Invalid intervals are treated as literals, for example ‘a{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.3 ‘ed’ regular expression syntax

The character ‘.’ matches any single character except the null character.

- ‘\+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘\?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘+ and ?’ match themselves.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[:digit:]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘\(', ‘\)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘\('.

The alternation operator is ‘\|’.

The character ‘^’ only represents the beginning of a string when it appears:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('
3. After the alternation operator ‘\|’

The character ‘\$’ only represents the end of a string when it appears:

1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’
3. Before the alternation operator ‘\|’

‘\\*’, ‘\+’ and ‘\?’ are special at any point in a regular expression except:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('
3. After the alternation operator ‘\|’

Intervals are specified by ‘\{’ and ‘\}’. Invalid intervals such as ‘a\{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.4 ‘emacs’ regular expression syntax

The character ‘.’ matches any single character except newline.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are ignored. Within square brackets, ‘\’ is taken literally. Character classes are not supported, so for example you would need to use ‘[0-9]’ instead of ‘[[:digit:]]’.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘\(', ‘\)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘\('.

The alternation operator is ‘\|’.

The character ‘^’ only represents the beginning of a string when it appears:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('
3. After the alternation operator ‘\|’

The character ‘\$’ only represents the end of a string when it appears:

1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’
3. Before the alternation operator ‘\|’

‘\*’, ‘+’ and ‘?’ are special at any point in a regular expression except:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('
3. After the alternation operator ‘\|’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.5 ‘gnu-awk’ regular expression syntax

The character ‘.’ matches any single character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ can be used to quote the following character. Character classes are supported; for example ‘[[[:digit:]]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘^’ and ‘\$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘\*’, ‘+’ and ‘?’ are special at any point in a regular expression except:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘(’
3. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals are treated as literals, for example ‘a{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.6 ‘grep’ regular expression syntax

The character ‘.’ matches any single character.

‘\+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.

‘\?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.

‘+ and ?’ match themselves.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[:digit:]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘\(', ‘\)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘\('.

The alternation operator is ‘\|’.

The character ‘^’ only represents the beginning of a string when it appears:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('
3. After a newline
4. After the alternation operator ‘\|’

The character ‘\$’ only represents the end of a string when it appears:

1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’
3. Before a newline
4. Before the alternation operator ‘\|’

‘\\*’, ‘\+’ and ‘\?’ are special at any point in a regular expression except:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('

3. After a newline
4. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals such as ‘a\{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.7 ‘posix-awk’ regular expression syntax

The character ‘.’ matches any single character except the null character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ can be used to quote the following character. Character classes are supported; for example ‘[:digit:]’ will match a single decimal digit.

GNU extensions are not supported and so ‘\w’, ‘\W’, ‘\<’, ‘\>’, ‘\b’, ‘\B’, ‘\~’, and ‘\’ match ‘w’, ‘W’, ‘<’, ‘>’, ‘b’, ‘B’, ‘~’, and ‘’ respectively.

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘^’ and ‘\$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘\*’, ‘+’ and ‘?’ are special at any point in a regular expression except the following places, where they are not allowed:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘(’
3. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals are treated as literals, for example ‘a{1’ is treated as ‘a\{1’

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.8 ‘posix-basic’ regular expression syntax

This is a synonym for ed.

### 18.7.9 ‘posix-egrep’ regular expression syntax

This is a synonym for egrep.

### 18.7.10 ‘posix-extended’ regular expression syntax

The character ‘.’ matches any single character except the null character.

- ‘+’ indicates that the regular expression should match one or more occurrences of the previous atom or regexp.
- ‘?’ indicates that the regular expression should match zero or one occurrence of the previous atom or regexp.
- ‘\+’ matches a ‘+’
- ‘\?’ matches a ‘?’.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[[digit:]]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\`’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with parentheses ‘()’. An unmatched ‘)’ matches just itself. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘(’.

The alternation operator is ‘|’.

The characters ‘^’ and ‘\$’ always represent the beginning and end of a string respectively, except within square brackets. Within brackets, ‘^’ can be used to invert the membership of the character class being specified.

‘\*’, ‘+’ and ‘?’ are special at any point in a regular expression except the following places, where they are not allowed:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘(’
3. After the alternation operator ‘|’

Intervals are specified by ‘{’ and ‘}’. Invalid intervals such as ‘a{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.



### 18.7.11 ‘posix-minimal-basic’ regular expression syntax

The character ‘.’ matches any single character except the null character.

Bracket expressions are used to match ranges of characters. Bracket expressions where the range is backward, for example ‘[z-a]’, are invalid. Within square brackets, ‘\’ is taken literally. Character classes are supported; for example ‘[:digit:]’ will match a single decimal digit.

GNU extensions are supported:

1. ‘\w’ matches a character within a word
2. ‘\W’ matches a character which is not within a word
3. ‘\<’ matches the beginning of a word
4. ‘\>’ matches the end of a word
5. ‘\b’ matches a word boundary
6. ‘\B’ matches characters which are not a word boundary
7. ‘\^’ matches the beginning of the whole input
8. ‘\’ matches the end of the whole input

Grouping is performed with backslashes followed by parentheses ‘\(', ‘\)’. A backslash followed by a digit acts as a back-reference and matches the same thing as the previous grouped expression indicated by that number. For example ‘\2’ matches the second group expression. The order of group expressions is determined by the position of their opening parenthesis ‘\('.

The character ‘^’ only represents the beginning of a string when it appears:

1. At the beginning of a regular expression
2. After an open-group, signified by ‘\('

The character ‘\$’ only represents the end of a string when it appears:

1. At the end of a regular expression
2. Before a close-group, signified by ‘\)’

Intervals are specified by ‘\{’ and ‘\}’. Invalid intervals such as ‘a\{1z’ are not accepted.

The longest possible match is returned; this applies to the regular expression as a whole and (subject to this constraint) to subexpressions within groups.

### 18.7.12 ‘sed’ regular expression syntax

This is a synonym for ed.

## 19 Build Infrastructure Modules

Gnulib has a couple of modules that don't provide code, but rather extend the GNU Build System. That is, they are convenience facilities for use with GNU Automake (in particular).

### 19.1 Searching for Libraries

The following macros check for the presence or location of certain C, C++, or Fortran library archive files.

#### Simple Library Tests

The macros `AC_CHECK_LIB`, `AC_SEARCH_LIBS` from GNU Autoconf check for the presence of certain C, C++, or Fortran library archive files. The libraries are looked up in the default linker path—a system dependent list of directories, that usually contains the `/usr/lib` directory—and those directories given by `-L` options in the `LDFLAGS` variable.

#### Locating Libraries

The following macros, defined in the Gnulib module `have-lib`, search for the location of certain C, C++, or Fortran library archive files and make the found location available to the compilation process and to further Autoconf tests.

`AC_LIB_LINKFLAGS(name, [dependencies])` [Macro]

Searches for `lib<name>` and the libraries corresponding to explicit and implicit dependencies. Sets and `AC_SUBST`s the `LIB<NAME>` and `LTLIB<NAME>` variables (with `<NAME>` in upper case) and augments the `CPPFLAGS` variable by `-I` options.

This macro should be used when `lib<name>` is expected to be found.

`AC_LIB_HAVE_LINKFLAGS(name, [dependencies], [includes], [testcode], [missing-message])` [Macro]

Searches for `lib<name>` and the libraries corresponding to explicit and implicit dependencies, together with the specified include files and the ability to compile and link the specified *testcode*. The *missing-message* defaults to `no` and may contain additional hints for the user. If found, it sets and `AC_SUBST`s `HAVE_LIB<NAME>=yes` and the `LIB<NAME>` and `LTLIB<NAME>` variables (with `<NAME>` in upper case) and augments the `CPPFLAGS` variable by `-I` options, and `#defines` `HAVE_LIB<NAME>` to 1. Otherwise, it sets and `AC_SUBST`s `HAVE_LIB<NAME>=no` and `LIB<NAME>` and `LTLIB<NAME>` to empty.

These macros assume that when a library is installed in *some\_directory/lib*, its include files are installed in *some\_directory/include*.

The complexities that `AC_LIB_LINKFLAGS` and `AC_LIB_HAVE_LINKFLAGS` deal with are the following:

- The library is not necessarily already in the search path (`CPPFLAGS` for the include file search path, `LDFLAGS` for the library search path). The macro provides a `'--with-lib<name>'` option. The user of the `'configure'` script can use this option to indicate the location of the library and its include files. If not provided, the `--prefix` directory is searched as well.

- The library is not necessarily already in the run time library search path. To avoid the need for setting an environment variable like `LD_LIBRARY_PATH`, the macro adds the appropriate run time search path options to the `LIB<NAME>` variable. This works on most systems. It can also be inhibited: The user of ‘`configure`’ can use the `--disable-rpath` option to force an installation that doesn’t contain hardcoded library search paths but instead may require the use of an environment variable like `LD_LIBRARY_PATH`.

The macros also set a variable `LTLIB<NAME>`, that should be used when linking with `libtool`. Both `LTLIB<NAME>` and `LIB<NAME>` contain essentially the same option, but where `LIB<NAME>` contains platform dependent flags like ‘`-Wl, -rpath`’, `LTLIB<NAME>` contains platform independent flags like ‘`-R`’.

If you, by mistake, use `LIB<NAME>` instead of `LTLIB<NAME>` when linking with `libtool`, you will observe that the binaries created in the build dir will prefer the shared libraries in the installation directories over the shared libraries in the build dir; this can lead to all sorts of build failures, test failures, or crashes!

If you, on the other hand, by mistake, use `LTLIB<NAME>` instead of `LIB<NAME>` when linking *without* `libtool`, you will observe build failures, because the ‘`-R`’ options contained in `LTLIB<NAME>` are not valid options to compilers such as `GCC`.

## Example of using `AC_LIB_LINKFLAGS`

Suppose you want to use `libz`, the compression library.

1. In `configure.ac` you add the line

```
AC_CONFIG_AUX_DIR([build-aux])
AC_LIB_LINKFLAGS([z])
```

Note that since the `AC_LIB_LINKFLAGS` invocation modifies the `CPPFLAGS`, it should precede all tests that check for header files, declarations, structures or types.

2. To the package’s `build-aux` directory you add the file `config.rpath`, also part of the `Gnulib havelib` module. (`gnulib-tool` will usually do this for you automatically.)
3. In `Makefile.in` you add `@LIBZ@` to the link command line of your program. Or, if you are using `Automake`, you add `$(LIBZ)` to the `LDADD` variable that corresponds to your program.

## Dependencies

The dependencies list is a space separated list of library names that `libname` is known to depend upon. Example: If `libfooy` depends on `libfoox`, and `libfoox` depends on `libfoox` and `libfooy`, you can write:

```
AC_LIB_LINKFLAGS([foox])
AC_LIB_LINKFLAGS([fooy], [foox])
AC_LIB_LINKFLAGS([fooz], [foox fooy])
```

Explicit dependencies are necessary if you cannot assume that a `.la` file, created by `libtool`, is installed. If you can assume that `libfooy.la` is installed by `libtool` (and has not been omitted by the package distributor!), you can omit the explicit dependency and just write

```
AC_LIB_LINKFLAGS([fooy])
```

This way, you don’t need to know in advance which libraries the needed library depends upon.

## Static vs. shared

The macros find the libraries regardless whether they are installed as shared or static libraries.

## CPPFLAGS vs. LDFLAGS

The macros determine the directories that should be added to the compiler preprocessor's search path and to the linker's search path. For the compiler preprocessor, `-I` options with the necessary directories are added to the `CPPFLAGS` variable, for use by the whole package. For the linker, appropriate options are added to the `LIB<NAME>` and `LTLIB<NAME>` variables, for use during linking by those programs and libraries that need the dependency on `lib<name>`. You need to use the value of `LIB<NAME>` or `LTLIB<NAME>` in the Makefiles. `LTLIB<NAME>` is for use with `libtool`, whereas `LIB<NAME>` is for when `libtool` is not involved in linking.

The macros do not check whether the include files and the library found match. If you want to verify this at configure time, one technique is to have a version number in the include files and a version number in the library, like this:

```
#define LIBNAME_VERSION 10203
extern int libname_version; /* initialized to LIBNAME_VERSION */
```

and use a test like

```
AC_TRY_RUN([int main () { return libname_version != LIBNAME_VERSION; }])
```

## Bi-arch systems

A bi-arch system is one where

- the processor has a 32-bit execution mode and a 64-bit execution mode (for example, `x86_64`, `ia64`, `sparc64`, `powerpc64`), and
- 32-bit mode libraries and executables and 64-bit mode libraries are both installed, and
- 32-bit mode libraries and object files cannot be mixed with 64-bit mode ones.

On several types of such systems, for historical reasons, the 32-bit libraries are installed in `prefix/lib`, whereas the 64-bit libraries are installed in

- `prefix/lib64` on many `glibc` systems,
- `prefix/lib/64` on Solaris systems.

On such systems, in 64-bit mode, `configure` will search for the libraries in `prefix/lib64` or `prefix/lib/64`, respectively, not in `prefix/lib`. A user can adhere to these system-wide conventions by using the `--libdir` option when installing packages. When a user has already installed packages in 64-bit mode using the GNU default `--libdir=prefix/lib`, he can make this directory adhere to the system-wide convention by placing a symbolic link:

On `glibc` systems:

```
ln -s lib prefix/lib64
```

On Solaris systems:

```
ln -s . prefix/lib/64
```

## 19.2 Controlling the Exported Symbols of Shared Libraries

The `lib-symbol-visibility` module allows precise control of the symbols exported by a shared library. This is useful because

- It prevents abuse of undocumented APIs of your library. Symbols that are not exported from the library cannot be used. This eliminates the problem that when the maintainer of the library changes internals of the library, maintainers of other projects cry “breakage”. Instead, these maintainers are forced to negotiate the desired API from the maintainer of the library.
- It reduces the risk of symbol collision between your library and other libraries. For example, the symbol `readline` is defined in several libraries, most of which don’t have the same semantics and the same calling convention as the GNU `readline` library.
- It reduces the startup time of programs linked to the library. This is because the dynamic loader has less symbols to process.
- It allows the compiler to generate better code. Within a shared library, a call to a function that is a global symbol costs a “call” instruction to a code location in the so-called PLT (procedure linkage table) which contains a “jump” instruction to the actual function’s code. (This is needed so that the function can be overridden, for example by a function with the same name in the executable or in a shared library interposed with `LD_PRELOAD`.) Whereas a call to a function for which the compiler can assume that it is in the same shared library is just a direct “call” instructions. Similarly for variables: A reference to a global variable fetches a pointer in the so-called GOT (global offset table); this is a pointer to the variable’s memory. So the code to access it is two memory load instructions. Whereas for a variable which is known to reside in the same shared library, it is just a direct memory access: one memory load instruction.

There are traditionally three ways to specify the exported symbols of a shared library.

- The programmer specifies the list of symbols to be exported when the shared library is created. Usually a command-line option is passed to the linker, with the name of a file containing the symbols.

The upside of this approach is flexibility: it allows the same code to be used in different libraries with different export lists. The downsides are: 1. it’s a lot of maintenance overhead when the symbol list is platform dependent, 2. it doesn’t work well with C++, due to name mangling.

- The programmer specifies a “hidden” attribute for every variable and function that shall not be exported.

The drawbacks of this approach are: Symbols are still exported from the library by default. It’s a lot of maintenance work to mark every non- exported variable and function. But usually the exported API is quite small, compared to the internal API of the library. And it’s the wrong paradigm: It doesn’t force thinking when introducing new exported API.

- The programmer specifies a “hidden” attribute for all files that make up the shared library, and an “exported” attribute for those symbols in these files that shall be exported.

This is perfect: It burdens the maintainer only for exported API, not for library-internal API. And it keeps the annotations in the source code.

GNU libtool's `-export-symbols` option implements the first approach. The script `declared.sh` from Gnulib can help to produce the list of symbols.

This gnulib module implements the third approach. For this it relies on GNU GCC 4.0 or newer, namely on its `-fvisibility=hidden` command-line option and the “visibility” attribute. (The “visibility” attribute was already supported in GCC 3.4, but without the command line option, introduced in GCC 4.0, the third approach could not be used.)

More explanations on this subject can be found in <https://gcc.gnu.org/wiki/Visibility>, which contains more details on the GCC features and additional advice for C++ libraries, and in Ulrich Drepper's paper <https://www.akkadia.org/drepper/dsohowto.pdf>, which also explains other tricks for reducing the startup time impact of shared libraries.

The gnulib autoconf macro `gl_VISIBILITY` tests for GCC 4.0 or newer. It defines a Makefile variable `@CFLAG_VISIBILITY@` containing `-fvisibility=hidden` or nothing. It also defines as a C macro and as a substituted variable: `@HAVE_VISIBILITY@`. Its value is 1 when symbol visibility control is supported, and 0 otherwise.

As of 2022, symbol visibility control is supported on

- ELF platforms (glibc, Linux, \*BSD, Solaris) with GCC or clang,
- macOS,
- AIX with gcc or xlclang.

It is not supported on

- Other compilers on ELF platforms or AIX,
- Windows.

To use this module in a library, say `libfoo`, you will do these steps:

1. Add `@CFLAG_VISIBILITY@` or (in a `Makefile.am`) `$(CFLAG_VISIBILITY)` to the `CFLAGS` for the compilation of the sources that make up the library.
2. Add a C macro definition, say `-DBUILDING_LIBFOO`, to the `CPPFLAGS` for the compilation of the sources that make up the library.
3. Define a macro specific to your library like this.

```
#if HAVE_VISIBILITY && BUILDING_LIBFOO
# define LIBFOO_SHLIB_EXPORTED __attribute__((__visibility__("default")))
#else
# define LIBFOO_SHLIB_EXPORTED
#endif
```

This macro should be enabled in all public header files of your library.

4. Annotate all variable, function and class declarations in all public header files of your library with `'LIBFOO_SHLIB_EXPORTED'`. This annotation can occur at different locations: between the `'extern'` and the type or return type, or just before the entity being declared, or after the entire declarator. My preference is to put it right after `'extern'`, so that the declarations in the header files remain halfway readable.

Note that the precise control of the exported symbols will not work with other compilers than GCC  $\geq$  4.0, and will not work on systems where the assembler or linker lack the support of “hidden” visibility. Therefore, it's good if, in order to reduce the risk of collisions with symbols in other libraries, you continue to use a prefix specific to your library for all non-static variables and functions and for all C++ classes in your library.

Note about other compilers: MSVC support can be added easily, by extending the definition of the macro mentioned above, to something like this:

```
#if HAVE_VISIBILITY && BUILDING_LIBFOO
# define LIBFOO_SHLIB_EXPORTED __attribute__((__visibility__("default")))
#elif (defined _WIN32 && !defined __CYGWIN__) && @BUILDING_SHARED@ && BUILDING_LIBFOO
# if defined DLL_EXPORT
# define LIBFOO_SHLIB_EXPORTED __declspec(dllexport)
# else
# define LIBFOO_SHLIB_EXPORTED
# endif
#elif (defined _WIN32 && !defined __CYGWIN__) && @BUILDING_SHARED@
# define LIBFOO_SHLIB_EXPORTED __declspec(dllimport)
#else
# define LIBFOO_SHLIB_EXPORTED
#endif
```

Here `BUILDING_SHARED` is an Autoconf variable that you have to define. It ought to evaluate to 1 in a build configured with ‘`--enable-shared`’, or to 0 in a build configured with ‘`--disable-shared`’. You may use the following ‘`configure.ac`’ snippet:

```
if test "$enable_shared" = yes; then
  BUILDING_SHARED=1
else
  BUILDING_SHARED=0
fi
AC_SUBST([BUILDING_SHARED])
```

And `DLL_EXPORT` is defined by Libtool, on Windows platforms, when compiling for a shared library (called DLL under Windows). It is not defined when Libtool compiles an object file meant to be linked statically into some executable.

## 19.3 LD Version Scripts

The `lib-symbol-versions` module can be used to add shared library versioning support. Currently, only GNU LD and the Solaris linker supports this.

Version scripts provides information that can be used by GNU/Linux distribution packaging tools. For example, Debian has a tool `dpkg-shlibdeps` that can determine the minimal required version of each dependency (by looking at the symbol list) and stuff the information into the Debian specific packaging files.

For more information and other uses of version scripts, see Ulrich Drepper’s paper <https://www.akkadia.org/drepper/dsohowto.pdf>

You use the module by importing it to your library, and then add the following lines to the `Makefile.am` that builds the library:

```
if HAVE_LD_VERSION_SCRIPT
libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
endif
```

The version script file format is documented in the GNU LD manual, but a small example would be:

```
LIBFOO_1.0 {
  global:
    libfoo_init; libfoo_doit; libfoo_done;

  local:
    *;
```

```
};
```

If you target platforms that do not support linker scripts (i.e., all platforms that doesn't use GNU LD) you may want to consider a more portable but less powerful alternative: `libtool -export-symbols`. It will hide internal symbols from your library, but will not add ELF versioning symbols. Your usage would then be something like:

```
if HAVE_LD_VERSION_SCRIPT
libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
else
libfoo_la_LDFLAGS += -export-symbols $(srcdir)/libfoo.sym
endif
```

See the Libtool manual for the file syntax, but a small example would be:

```
libfoo_init
libfoo_doit
libfoo_done
```

To avoid the need for a `*.sym` file if your symbols are easily expressed using a regular expression, you may use `-export-symbols-regex`:

```
if HAVE_LD_VERSION_SCRIPT
libfoo_la_LDFLAGS += -Wl,--version-script=$(srcdir)/libfoo.map
else
libfoo_la_LDFLAGS += -export-symbols-regex '^libfoo_.*'
endif
```

For more discussions about symbol visibility, rather than shared library versioning, see the `visibility` module (see Section 19.2 [Exported Symbols of Shared Libraries], page 848).

## 19.4 configmake

The `configmake` module builds a C include file named `configmake.h` containing the usual installation directory values; for example, those specified by `--prefix` or `--libdir` to configure. Each variable is given a `#define` with an all-uppercase macro name, such as `PREFIX` and `LIBDIR`. (Automake cannot create this file directly because the user might override directory values at `make` time.)

Specifically, the module retrieves values of the variables through `configure` followed by `make`, not directly through `configure`, so that a user who sets some of these variables consistently on the `make` command line gets correct results.

One advantage of this approach, compared to the classical approach of adding `-DLIBDIR=\"$(libdir)\"` etc. to `AM_CPPFLAGS`, is that it protects against the use of undefined variables. That is, if, say, `$(libdir)` is not set in the Makefile, `LIBDIR` is not defined by this module, and code using `LIBDIR` gives a compilation error.

Another advantage is that `make` output is shorter.

For the complete list of variables which are `#defined` this way, see the file `gnulib/modules/configmake`, or inspect your resulting `gnulib` Makefile.

## 19.5 warnings

The `warnings` module allows to regularly build a package with more GCC warnings than the default warnings emitted by GCC. It is often used indirectly through the `manywarnings` module (see Section 19.6 [manywarnings], page 852).



It provides the following functionality:

- You can select some warning options, such as ‘-Wall’, to be enabled whenever building with a GCC version that supports these options. The user can choose to override these warning options by providing the opposite options in the CFLAGS variable at configuration time.
- You can make these warnings apply to selected directories only. In projects where subprojects are maintained by different people, or where parts of the source code are imported from external sources (for example from gnuilib), it is useful to apply different warning options to different directories.
- It lets you use ‘-Werror’ at ‘make distcheck’ time, to verify that on the maintainer’s system, no warnings remain. (Note that use of ‘-Werror’ in CFLAGS does not work in general, because it may break autoconfiguration.)
- Similarly, it lets you use ‘-Werror’ when the builder runs configure with an option such as --enable-gcc-warnings.

To use this module, you need the following:

1. In configure.ac, use for example
 

```
g1_WARN_ADD([-Wall], [WARN_CFLAGS])
g1_WARN_ADD([-Wpointer-arith], [WARN_CFLAGS])
```
2. In the directories which shall use WARN\_CFLAGS, use it in the definition of AM\_CFLAGS, like this:

```
AM_CFLAGS = $(WARN_CFLAGS)
```

Note that the AM\_CFLAGS is used in combination with CFLAGS and before CFLAGS in build rules emitted by Automake. This allows the user to provide CFLAGS that override the WARN\_CFLAGS.

‘g1\_WARN\_ADD([-Werror])’ is intended for developers, and should be avoided in contexts where it would affect ordinary installation builds. The warnings emitted by GCC depend, to some extent, on the contents of the system header files, on the size and signedness of built-in types, etc. Use of ‘-Werror’ would cause frustration to all users on platforms that the maintainer has not tested before the release. It is better if ‘-Werror’ is off by default, and is enabled only by developers. For example, ‘-Werror’ could affect ‘make distcheck’ or ‘configure --enable-gcc-warnings’ as mentioned above.

## 19.6 manywarnings

The manywarnings module enables many GCC warnings for your package. Here is an example use:

```
AC_ARG_ENABLE([gcc-warnings],
  [AS_HELP_STRING([--enable-gcc-warnings[=TYPE]],
    [control generation of GCC warnings. The TYPE 'no' disables
    warnings; 'yes' (default) generates cheap warnings;
    'expensive' in addition generates expensive warnings.])])

AS_IF([test "$enable_gcc_warnings" != no],
  [
    # Set up the list of unwanted warning options.
    nw=
    if test "$enable_gcc_warnings" != expensive; then
```

```

    nw="$nw -fanalyzer"
fi
nw="$nw -Wbad-function-cast" # Casting a function's result is not more
                             # dangerous than casting any other value.
nw="$nw -Winline"           # It's OK to not inline.
nw="$nw -Wsign-compare"     # Too many false alarms.
nw="$nw -Wstrict-overflow"  # It's OK to optimize strictly.
nw="$nw -Wsystem-headers"   # Don't warn in system headers.

# Setup the list of meaningful warning options for the C compiler.
# The list comes from manywarnings.m4. Warning options that are not
# generally meaningful have already been filtered out (cf.
# build-aux/gcc-warning.spec).
gl_MANYWARN_ALL_GCC([possible_warning_options])

# Compute the list of warning options that are desired.
gl_MANYWARN_COMPLEMENT([desired_warning_options],
                       [$possible_warning_options], [$nw])
# Compute the list of remaining undesired warning options.
# Namely those, that were not in manywarnings.m4 because they were
# already listed in build-aux/gcc-warning.spec; this includes those
# that are implied by -Wall.
gl_MANYWARN_COMPLEMENT([remaining_undesired_warning_options],
                       [$nw], [$possible_warning_options])

# Add the desired warning options to WARN_CFLAGS.
for w in $desired_warning_options; do
    gl_WARN_ADD([$w])
done

# Add the opposites of the remaining undesired warning options to
# WARN_CFLAGS.
for w in `echo "$remaining_undesired_warning_options" | sed -e 's/-W/-Wno-/g`; do
    gl_WARN_ADD([$w])
done
})

```

This module sets up many GCC warning options.

When you use it for the first time, it is common practice to do it as follows:

- Start with the newest major release of GCC. This will save you time, because some warning options produce many false alarms with older versions of GCC (such as `-Wstrict-overflow` or `-Wunsafe-loop-optimizations`).
- Consider the platforms commonly used when enabling GCC warnings. This includes not only target architectures and operating systems, but also optimization options, which can greatly affect the warnings generated. Makefiles generated by `configure` default to `-O2` optimization. If you also commonly build with `-O0` or other optimization options, you can compile again with those options. Using more optimizations catches more bugs, because the compiler does a better static analysis of the program when optimizing more. Also, some warning options that diagnose suboptimal code generation, such as `-Winline`, are not effective when not optimizing. On the other hand, if it's frequent to build the package with warnings but without optimizations, for debugging purposes, then you don't want to see undesired warnings in these phases of development either.
- Compile the package with an empty `nw` value, that is, with all possible warnings enabled.

- Then you will go through the list of warnings. Since there are likely many warnings, the first time, it's a good idea to sort them by warning option first:

```
$ grep warning: make-output.log \
  | sed -e 's/^(.*) \[(-W.*)\]$/\2 \1/' | sort -k1
```

- You will likely deactivate warnings that occur often and don't point to mistakes in the code, by adding them to the 'nw' variable, then reconfiguring and recompiling. When warnings point to real mistakes and bugs in the code, you will of course not disable them but fix your code to silence the warning instead.

Many GCC warning options usually don't point to mistakes in the code; these warnings enforce a certain programming style. It is a project management decision whether you want your code to follow any of these styles. Note that some of these programming styles are conflicting. You cannot have them all; you have to choose among them.

When a warning option pinpoints real bugs occasionally, but it also whines about a few code locations which are fine, we recommend to leave the warning option enabled. Whether you then live with the remaining few warnings, or choose to disable them one-by-one through `#pragma GCC diagnostic ignored "option"` (see Section "Diagnostic Pragmas" in *Using the GNU Compiler Collection*, <https://gcc.gnu.org/onlinedocs/gcc/Diagnostic-Pragmas.html>), is again a project management decision.

When a new major version of GCC is released, the GnuLib maintainers add the newly available warning options into the `gl_MANYWARN_ALL_GCC` macro. You will then enjoy the benefits of the new warnings, simply by updating to the newest GnuLib. If some of the new warnings are undesired, you can add them to the 'nw' variable, as described above.

Comments on particular warning flags:

'-fanalyzer'

The `manywarnings` module by default uses GCC's `-fanalyzer` option, as this issues some useful warnings. (It can also help GCC generate better code.) However, `-fanalyzer` can greatly slow down compilation, and in programs with large modules it can be so slow as to be unusable, so it is common for `configure` to disable it unless `configure` is given an option like `--enable-gcc-warnings=expensive`.

'-fstrict-aliasing'

Although the `manywarnings` module does not enable GCC's `-fstrict-aliasing` option, it is enabled by default if you compile with `-O2` or higher optimization, and can help GCC generate better warnings.

'-Wanalyzer-malloc-leak'

The `-fanalyzer` option generates many false alarms about `malloc` leaks, which `manywarnings` suppresses by also using `-Wno-analyzer-malloc-leak`.

'-fstrict-flex-arrays'

The `manywarnings` module by default uses GCC's `-fstrict-flex-arrays` option if available, so that GCC can warn about nonportable usage of flexible array members. In a few cases this can help GCC generate better code, so it is not strictly a warning option.

‘-Wsign-compare’

GCC and Clang generate too many false alarms with `-Wsign-compare`, and we don’t recommend that warning. You can disable it by using `gl_WARN_ADD([-Wno-sign-compare])` as illustrated above. Programs using Gnulib generally don’t enable that warning when compiling Gnulib code. If you happen to find a real bug with that warning we’d like to know it.

## 19.7 Running self-tests under valgrind

For projects written in C or similar languages, running the self-tests under Valgrind can reveal hard to find memory issues. Gnulib supports two ways to make use of Valgrind: one that enables use of Valgrind at configure time, when `configure` found it to be present; and one at the discretion of the developer.

### 19.7.1 Using valgrind without developer intervention

The `valgrind-tests` module searches for Valgrind at configure time and declares the `LOG_VALGRIND` automake variable for use with automake’s `LOG_COMPILER`.

After importing the `valgrind-tests` module to your project, you use it by adding the following to the `Makefile.am` that runs the self-tests:

```
LOG_COMPILER = $(LOG_VALGRIND)
```

This will run all self-checks under valgrind.

Replace `LOG_COMPILER` with `TESTS_ENVIRONMENT` if you are using the old serial test harness. The parallel test harness has been the default in automake since version 1.11.3, but if you are using an older automake, or put ‘`serial-tests`’ in ‘`AM_INIT_AUTOMAKE`’/‘`AUTOMAKE_OPTIONS`’ you would still be using the serial test harness.

If you desire a project-wide decision that valgrind is not enabled by default, but still allow users to enable it with `--enable-valgrind-tests` you may put the following in `configure.ac` before `gl_INIT`.

```
gl_VALGRIND_TESTS_DEFAULT_NO
```

### 19.7.2 Valgrind options

The `VALGRIND` variable holds the name of the valgrind binary and some options passed to valgrind. You may provide additional options that are passed to valgrind using the ‘`VALGRINDFLAGS`’ variable, for example:

```
./configure VALGRINDFLAGS="--suppressions=~/local.supp"
```

Alternatively during build phase:

```
make check VALGRINDFLAGS="--suppressions=~/local.supp"
```

This is useful if you have a valgrind suppression files that are needed to avoid triggering errors for known errors, typically in system libraries.

The `VALGRIND` variable include options that are useful when valgrind is run non-interactively through the test harness. The default parameters are `-q` to silence the output, `--error-exitcode=1` to cause valgrind errors to be treated as fatal errors, and `--leak-check=full` to check for memory leaks.

These options can be controlled through the `DEFAULT_VALGRINDFLAGS` variable. For example, when configuring the package:

```
./configure DEFAULT_VALGRINDFLAGS="--quiet"
```

Alternatively, during the build phase:

```
make check DEFAULT_VALGRINDFLAGS="--quiet"
```

That would have the effect of removing `--error-exitcode=1` and `--leak-check=full` from the default options, thus causing any valgrind errors to be silently ignored, instead of causing fatal test failures.

As a developer you may use the variables in `configure.ac` before calling `gl_INIT`, like this if your program has deeply-nested call chains:

```
gl_EARLY
...
VALGRINDFLAGS="$VALGRINDFLAGS --num-callers=42"
...
gl_INIT
```

Note that any user-supplied `VALGRINDFLAGS` value is preserved, which is usually what you want.

Finally, as a developer you may want to provide additional per-directory options to valgrind and the `AM_VALGRINDFLAGS` variable can be used for this. For example:

```
AM_VALGRINDFLAGS = --suppressions=$(srcdir)/local-valgrind.supp
LOG_COMPILER = $(LOG_VALGRIND)
```

### 19.7.3 Using valgrind at the developer's discretion

In this approach, you define a `Makefile.am` variable 'VALGRIND' (or, more abstractly, 'CHECKER'), that is usually set to empty. When you have configured and built the package and you decide that you want to run the tests with valgrind, you do so by modifying the definition of 'VALGRIND' in the Makefile.

### 19.7.4 How to use Valgrind with shell scripts

It is not desirable to apply valgrind to shell scripts or other non-binaries, because

- It is wasteful, and you usually don't want to look for memory leaks in bash.
- On a bi-arch system, you may get an error message such as "valgrind: wrong executable class (eg. 32-bit instead of 64-bit)".

There are two ways to avoid this:

- Using the Automake `parallel-tests` feature, you can use the following instead:

```
TEST_EXTENSIONS = .pl .sh
LOG_COMPILER = $(LOG_VALGRIND)
```

Then valgrind will only be used for the non-`.sh` and non-`.pl` tests.

For old automake (before 1.11.3), you will need `AUTOMAKE_OPTIONS = parallel-tests` to enable the parallel test harness.

- You can make use of the `build-aux/run-test` script from Gnulib. Add these lines to your `Makefile.am`:

```
LOG_COMPILER += $(SHELL) $(top_srcdir)/build-aux/run-test '$(LOG_VALGRIND)'
```

Replace `LOG_COMPILER` with `TESTS_ENVIRONMENT` if you use the old serial test harness.

However, with this measure in place, binaries invoked through scripts will not be invoked under valgrind. This can be solved by defining environment variables in the `TESTS_ENVIRONMENT` variable that are then used by the shell scripts. For example, add the following:

```
TESTS_ENVIRONMENT = VALGRIND='$(LOG_VALGRIND)'
```

And then modify the shell scripts to invoke the binary prefixed with `$VALGRIND`.

## 19.8 VCS To ChangeLog

Gnulib provides the ‘vcs-to-changelog’ module to generate an output similar to the GNU ChangeLog format from metadata of source control software such as git. Here’s an example of using ‘vcs-to-changelog’:

```
build-aux/vcs-to-changelog.py <from_ref> <to_ref>
```

where <from\_ref> and <to\_ref> refer to the range of commits to generate the output.

VCS To ChangeLog currently recognises changes in C source code and can traverse commits in git. Additional source frontends and source control backends may be added to the module. ‘vcs-to-changelog’ takes the following optional arguments:

- `-d`: Run the parser debugger, used for debugging ‘vcs-to-changelog’
- `-q filename`: Load *filename* as the quirks file for the project.

The quirks file is a python module that must minimally implement a `get_project_quirks` function that returns an object of type `ProjectQuirks` or its subclass. The subclass may override the following members of `ProjectQuirks`:

- `repo`: Specify the project repo source control. The default value is `git`.
- `IGNORE_LIST`: A list of files to ignore in the changesets, either because they are not needed (such as the ChangeLog) or because they are not parseable. For example, the GNU C Library has a header file that is only assembly code, which breaks the C parser.
- `MACRO_QUIRKS`: A list of dictionary entries with indexes as `orig` and `sub` where `orig` is a Python regular expression pattern to match and `sub` is the substitution. These substitutions are used to work around C/C++ macros that are known to break parsing of C programs.
- `C_MACROS`: This is a list of C preprocessor macro definitions that are extensively used and are known to break parsing due to some characteristic, mainly the lack of a semi-colon at the end.

## 20 Build Infrastructure Files

Gnulib contains also a small number of files that are not part of modules. They are meant to be imported into packages by means of ‘gnulib-tool --copy-file’, not ‘gnulib-tool --import’. For example, the commands to import the files `config.guess` and `config.sub` are

```
for file in config.guess config.sub; do
  $GNULIB_TOOL --copy-file build-aux/$file \
  && chmod a+x build-aux/$file \
  || exit $?
done
```

Packages that don’t use Gnulib can get hold of these files through direct download from Gnulib’s git repository. The commands to do this look as follows:

```
for file in config.guess config.sub; do
  echo "$0: getting $file..."
  wget -q --timeout=5 -O build-aux/$file.tmp "https://git.savannah.gnu.org/gitweb/?p=gnulib.git;a=blob_plain;f=$file"
  && mv build-aux/$file.tmp build-aux/$file \
  && chmod a+x build-aux/$file
  retval=$?
  rm -f build-aux/$file.tmp
  test $retval -eq 0 || exit $retval
done
```

### 20.1 Recognizing platforms

`build-aux/config.guess`

`build-aux/config.sub`

These files are helper scripts, invoked by the ‘configure’ script. `config.guess` recognizes the platform on which the script is running, and produces a triplet of the form *cpu-type-vendor-operating\_system*. `config.sub` receives a possibly abbreviated triplet and produces a canonical triplet for a platform. For more information, see [https://www.gnu.org/prep/standards/html\\_node/Configuration.html](https://www.gnu.org/prep/standards/html_node/Configuration.html).

It is important that you always include the newest versions of these two files in your tarball, because people who work on emerging platforms otherwise have a hard time building your package.

### 20.2 Utilities for Makefiles

These programs can be used in Makefiles. Some of them are also described in [https://www.gnu.org/software/automake/manual/html\\_node/Auxiliary-Programs.html](https://www.gnu.org/software/automake/manual/html_node/Auxiliary-Programs.html).

`build-aux/ar-lib`

`build-aux/compile`

These two scripts are necessary for supporting portability to native Windows with the MSVC compiler. `compile` is a wrapper script that invokes the compiler and provides a command-line interface compatible with Unix compilers. Similarly, `ar-lib` is a wrapper script that provides a command-line interface compatible with Unix `ar`.

**build-aux/depcomp**

This is a helper script, used by Makefile rules generated by GNU Automake. It generates Makefile dependencies while compiling a file.

**build-aux/install-sh**

This is a helper script, used by Makefile rules generated by GNU Automake. It installs files during the `make install` phase. In the Makefile, don't use this file directly; always use `$(INSTALL_PROGRAM)` or `$(INSTALL_DATA)` instead.

**build-aux/mdate-sh**

This script determines the modification time of a file and pretty-prints it. The typical use is to add a "Last modified" line to the documentation.

**build-aux/mkinstalldirs**

This is a helper script, used by Makefile rules generated by GNU Automake. It creates directories during the `make install` phase. It is roughly equivalent to `'mkdir -p'` (except that the latter is not portable). In the Makefile, don't use this file directly; always use `$(MKDIR_P)` instead.

**build-aux/mktempd**

This script creates a temporary directory. It is roughly equivalent to `'mktemp -d'` (except that the latter is not portable).

**build-aux/move-if-change**

This script moves a freshly generated file to a destination file, with a special optimization for the case that both files are identical. In this case the freshly generated file is deleted, and the time stamp of the destination file is *not* changed. This is useful when updating a file that rarely actually changes and which many Makefile targets depend upon.

## 20.3 Programs for developing in Git checkouts

These programs can help when developing in a Git checkout. The maintainer of the package copies these programs into the version control of the package, so that co-developers can use these tools right away.

**top/gitsub.sh**

This program manages the subdirectories of a Git checkout that come from other packages, including Gnulib.

**top/bootstrap****top/autopull.sh****top/autogen.sh****top/bootstrap-funclib.sh**

This is a set of three programs and a function library, that manage the source directory of a package, preparing for the state where `'./configure'` can be used.

`autopull.sh` is a program for fetching dependencies that may require network accesses. It manages the Git submodules, including Gnulib – assuming that Gnulib is a Git submodule. It also can fetch the PO files for internationalized packages.



`autogen.sh` is a program that is meant to be run after `autopull.sh`. It generates all autogenerated files that are omitted from version control. Usually this means that it invokes `gnulib-tool` and `automake`, that generate files from other files.

`bootstrap` is a wrapper around both: `./bootstrap --pull` is equivalent to `./autopull.sh`, `./bootstrap --gen` is equivalent to `./autogen.sh`. Plain `./bootstrap` is equivalent to `./autopull.sh` immediately followed by `./autogen.sh`; however, because plain `./bootstrap` mixes version control management and generation of files in non-obvious ways, it has a number of usability issues for the advanced developer.

`bootstrap-funclib.sh` is a function library for these three programs. It is not meant to be used directly.

All three programs make use of a configuration file, called `bootstrap.conf`.

#### `build-aux/bootstrap`

This acts like `top/bootstrap`, except it does not need the companion files `autogen.sh`, `autopull.sh`, and `bootstrap-funclib.sh` so it avoids some clutter in your project's top level directory. With this approach, you update via `./bootstrap --pull` and `./bootstrap --gen` instead of via `./autopull.sh` and `./autogen.sh`. Otherwise this approach acts similarly, and uses the same `bootstrap.conf` file.

#### `build-aux/bootstrap.conf`

This is the template configuration file. After copying it into the top-level directory of your package, you need to customize it.

#### `build-aux/po/Makefile.in.in`

#### `build-aux/po/remove-potcdate.sin`

These are auxiliary files used by `bootstrap`. You don't have to copy them yourself; `bootstrap` will do that.

## 20.4 Utilities for building documentation

These are auxiliary files for building documentation.

#### `build-aux/texinfo.tex`

This file is needed for the conversion of Texinfo-format documentation to PDF, PostScript, or DVI formats. It implements the GNU Texinfo commands on top of plain TeX.

#### `build-aux/x-to-1.in`

This file, once processed, gives a program `x-to-1`, that produces a manual page for a program, by combining a skeleton with the program's `--help` output.

## 20.5 Utilities for building libraries

#### `build-aux/declared.sh`

This program extracts the declared global symbols of a C header file. It is useful when you want to control the set of symbols exported by a library. See Section 19.2 [Exported Symbols of Shared Libraries], page 848.

## 20.6 Utilities for running test suites

### `build-aux/run-test`

This file is a test driver that supports running a test under `valgrind`.

### `build-aux/test-driver.diff`

This is a patch, against Automake's test driver, that supports running a test suite on Android.

## 21 Release Management Files

Gnulib also contain a few scripts that are useful for the release management of a package. They can be used directly off the Gnulib checkout; they don't need to be copied first.

### 21.1 Tools for releasing packages with shared libraries

`build-aux/libtool-next-version`

This program is a wizard that helps a maintainer update the libtool version of a shared library, without making mistakes in this process. For background documentation, see [https://www.gnu.org/software/libtool/manual/html\\_node/Updating-version-info.html](https://www.gnu.org/software/libtool/manual/html_node/Updating-version-info.html).

### 21.2 Tools for uploading release tarballs

`build-aux/gnupload`

This program is a user-friendly way to upload a release tarball to one of the GNU servers (<ftp.gnu.org> or <alpha.gnu.org>). It implements the interface described in [https://www.gnu.org/prep/maintain/html\\_node/Automated-FTP-Uploads.html](https://www.gnu.org/prep/maintain/html_node/Automated-FTP-Uploads.html).

`build-aux/ncftpput-ftp`

This is a helper program that mimics the `ncftpput` program used by `gnupload`. If you want to use `gnupload` but don't have `ncftp` installed, copy this file into your `$PATH`, renaming it to `ncftpput`.

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