

RTEMS POSIX 1003.1 Compliance Guide

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On-Line Applications Research Corporation

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Preface

This document lists the functions, constant, macros, feature flags, and types defined in the POSIX 1003.1 standard. Each section in this document corresponds to a section in the 1003.1 standard and the implementation status of the items required by the standard are listed.

RTEMS supports a number of POSIX process, user, and group oriented routines in what is referred to as a "SUSP" (Single-User, Single Process) manner. RTEMS supports a single process, multithreaded POSIX 1003.1b environment. In a pure world, there would be no reason to even include routines like `getpid()` when there can only be one process. But providing routines like `getpid()` and making them work in a sensible fashion for an embedded environment while not returning ENOSYS (for not implemented) makes it significantly easier to port code from a UNIX environment without modifying it.

1 General

1.1 Scope

1.2 Normative References

1.3 Conformance

NGROUPS_MAX, Feature Flag,
_POSIX_ASYNCHRONOUS_IO, Feature Flag,
_POSIX_CHOWN_RESTRICTED, Feature Flag,
_POSIX_FSYNC, Feature Flag,
_POSIX_JOB_CONTROL, Feature Flag,
_POSIX_MAPPED_FILES, Feature Flag,
_POSIX_MEMLOCK, Feature Flag,
_POSIX_MEMLOCK_RANGE, Feature Flag,
_POSIX_MEMORY_PROTECTION, Feature Flag,
_POSIX_MESSAGE_PASSING, Feature Flag,
_POSIX_PRIORITIZED_IO, Feature Flag,
_POSIX_PRIORITY_SCHEDULING, Feature Flag,
_POSIX_REALTIME_SIGNALS, Feature Flag,
_POSIX_SEMAPHORES, Feature Flag,
_POSIX_SHARED_MEMORY_OBJECTS, Feature Flag,
_POSIX_SYNCHRONIZED_IO, Feature Flag,
_POSIX_TIMERS, Feature Flag,
_POSIX_THREAD_PRIO_INHERIT, Feature Flag,
_POSIX_THREAD_PRIORITY_SCHEDULING, Feature Flag,
_POSIX_THREADS, Feature Flag,
_POSIX_THREAD_SAFE_FUNCTIONS, Feature Flag,

2 Terminology and General Requirements

2.1 Conventions

2.2 Definitions

2.3 General Concepts

2.4 Error Numbers

E2BIG, Constant, Implemented
EACCES, Constant, Implemented
EAGAIN, Constant, Implemented
EBADF, Constant, Implemented
EBADMSG, Constant, Implemented
EBUSY, Constant, Implemented
ECANCELED, Constant, Unimplemented
ECHILD, Constant, Implemented
EDEADLK, Constant, Implemented
EDOM, Constant, Implemented
EEXIST, Constant, Implemented
EFAULT, Constant, Implemented
EFBIG, Constant, Implemented
EINPROGRESS, Constant, Implemented
EINTR, Constant, Implemented
EINVAL, Constant, Implemented
EIO, Constant, Implemented
EISDIR, Constant, Implemented
EMFILE, Constant, Implemented
EMLINK, Constant, Implemented
EMSGSIZE, Constant, Implemented
ENAMETOOLONG, Constant, Implemented
ENFILE, Constant, Implemented
ENODEV, Constant, Implemented
ENOENT, Constant, Implemented
ENOEXEC, Constant, Implemented
ENOLCK, Constant, Implemented
ENOMEM, Constant, Implemented
ENOSPC, Constant, Implemented
ENOSYS, Constant, Implemented
ENOTDIR, Constant, Implemented

ENOTEMPTY, Constant, Implemented
ENOTSUP, Constant, Implemented
ENOTTY, Constant, Implemented
ENXIO, Constant, Implemented
EPERM, Constant, Implemented
EPIPE, Constant, Implemented
ERANGE, Constant, Implemented
EROFS, Constant, Implemented
ESPIPE, Constant, Implemented
ESRCH, Constant, Implemented
ETIMEDOUT, Constant, Implemented
EXDEV, Constant, Implemented

2.5 Primitive System Types

dev_t, Type, Implemented
gid_t, Type, Implemented
ino_t, Type, Implemented
mode_t, Type, Implemented
nlink_t, Type, Implemented
off_t, Type, Implemented
pid_t, Type, Implemented
pthread_t, Type, Implemented
pthread_attr_t, Type, Implemented
pthread_mutex_t, Type, Implemented
pthread_mutex_attr_t, Type, Implemented
pthread_cond_t, Type, Implemented
pthread_cond_attr_t, Type, Implemented
pthread_key_t, Type, Implemented
pthread_once_t, Type, Implemented
size_t, Type, Implemented
ssize_t, Type, Implemented
time_t, Type, Implemented
uid_t, Type, Implemented

NOTE: time_t is not listed in this section but is used by many functions.

2.6 Environment Description

2.7 C Language Definitions

2.7.1 Symbols From the C Standard

NULL, Constant, Implemented

2.7.2 POSIX.1 Symbols

`_POSIX_C_SOURCE`, Feature Flag,

2.8 Numerical Limits

2.9 C Language Limits

`CHAR_BIT`, Constant, Implemented
`CHAR_MAX`, Constant, Implemented
`CHAR_MIN`, Constant, Implemented
`INT_MAX`, Constant, Implemented
`INT_MIN`, Constant, Implemented
`LONG_MAX`, Constant, Implemented
`LONG_MIN`, Constant, Implemented
`MB_LEN_MAX`, Constant, Implemented
`SCHAR_MAX`, Constant, Implemented
`SCHAR_MIN`, Constant, Implemented
`SHRT_MAX`, Constant, Implemented
`SHRT_MIN`, Constant, Implemented
`UCHAR_MAX`, Constant, Implemented
`UINT_MAX`, Constant, Implemented
`ULONG_MAX`, Constant, Implemented
`USHRT_MAX`, Constant, Implemented

NOTE: These are implemented in GCC's `limits.h` file.

2.9.1 Minimum Values

`_POSIX_AIO_LISTIO_MAX`, Constant, Implemented
`_POSIX_AIO_MAX`, Constant, Implemented
`_POSIX_ARG_MAX`, Constant, Implemented
`_POSIX_CHILD_MAX`, Constant, Implemented
`_POSIX_DELAYTIMER_MAX`, Constant, Implemented
`_POSIX_LINK_MAX`, Constant, Implemented
`_POSIX_LOGIN_NAME_MAX`, Constant, Implemented
`_POSIX_MAX_CANON`, Constant, Implemented
`_POSIX_MAX_INPUT`, Constant, Implemented
`_POSIX_MQ_OPEN_MAX`, Constant, Implemented
`_POSIX_MQ_PRIO_MAX`, Constant, Implemented
`_POSIX_NAME_MAX`, Constant, Implemented
`_POSIX_NGROUPS_MAX`, Constant, Implemented
`_POSIX_OPEN_MAX`, Constant, Implemented
`_POSIX_PATH_MAX`, Constant, Implemented
`_POSIX_PIPE_BUF`, Constant, Implemented

_POSIX_RTSIG_MAX, Constant, Implemented
 _POSIX_SEM_NSEMS_MAX, Constant, Implemented
 _POSIX_SEM_VALUE_MAX, Constant, Implemented
 _POSIX_SIGQUEUE_MAX, Constant, Implemented
 _POSIX_SSIZE_MAX, Constant, Implemented
 _POSIX_STREAM_MAX, Constant, Implemented
 _POSIX_THREAD_DESTRUCTOR_ITERATIONS, Constant, Implemented
 _POSIX_THREAD_KEYS_MAX, Constant, Implemented
 _POSIX_THREAD_THREADS_MAX, Constant, Implemented
 _POSIX_TTY_NAME_MAX, Constant, Implemented
 _POSIX_TIME_MAX, Constant, Unimplemented
 _POSIX_TZNAME_MAX, Constant, Implemented

2.9.2 Run-Time Inceasable Values

_POSIX_NGROUPS_MAX, Constant, Implemented

2.9.3 Run-Time Invariant Values (Possible Indeterminate)

AIO_LISTIO_MAX, Constant, Implemented
 AIO_MAX, Constant, Implemented
 AIO_PRIO_DELTA_MAX, Constant, Implemented
 ARG_MAX, Constant, Implemented
 CHILD_MAX, Constant, Implemented
 DELAYTIMER_MAX, Constant, Implemented
 LOGIN_NAME_MAX, Constant, Implemented
 MQ_OPEN_MAX, Constant, Implemented
 OPEN_MAX, Constant, Implemented
 PAGESIZE, Constant, Implemented
 PTHREAD_DESTRUCTOR_ITERATIONS, Constant, Implemented
 PTHREAD_KEYS_MAX, Constant, Implemented
 PTHREAD_STACK_MIN, Constant, Implemented
 PTHJREAD_THREADS_MAX, Constant, Implemented
 RTSIG_MAX, Constant, Implemented
 SEM_NSEMS_MAX, Constant, Implemented
 SEM_VALUE_MAX, Constant, Implemented
 SIGQUEUE_MAX, Constant, Implemented
 STREAM_MAX, Constant, Implemented
 TIMER_MAX, Constant, Implemented
 TTY_NAME_MAX, Constant, Implemented
 TZNAME_MAX, Constant, Implemented

2.9.4 Pathname Variable Values

LINK_MAX, Constant, Implemented
 MAX_CANON, Constant, Implemented

MAX_INPUT, Constant, Implemented
NAME_MAX, Constant, Implemented
PATH_MAX, Constant, Implemented
PIPE_BUF, Constant, Implemented

2.9.5 Invariant Values

SSIZE_MAX, Constant, Implemented

2.9.6 Maximum Values

_POSIX_CLOCKRES_MIN, Constant, Implemented

2.10 Symbolic Constants

2.10.1 Symbolic Constants for the access Function

R_OK, Constant, Implemented
W_OK, Constant, Implemented
X_OK, Constant, Implemented
F_OK, Constant, Implemented

2.10.2 Symbolic Constants for the lseek Function

SEEK_SET, Constant, Implemented
SEEK_CUR, Constant, Implemented
SEEK_END, Constant, Implemented

2.10.3 Compile-Time Symbolic Constants for Portability Specifications

_POSIX_ASYNCHRONOUS_IO, Feature Flag,
_POSIX_FSYNC, Feature Flag,
_POSIX_JOB_CONTROL, Feature Flag,
_POSIX_MAPPED_FILES, Feature Flag,
_POSIX_MEMLOCK, Feature Flag,
_POSIX_MEMLOCK_RANGE, Feature Flag,
_POSIX_MEMORY_PROTECTION, Feature Flag,
_POSIX_MESSAGE_PASSING, Feature Flag,
_POSIX_PRIORITIZED_IO, Feature Flag,
_POSIX_PRIORITY_SCHEDULING, Feature Flag,
_POSIX_REALTIME_SIGNALS, Feature Flag,
_POSIX_SAVED_IDS, Feature Flag,
_POSIX_SEMAPHORES, Feature Flag,

`_POSIX_SHARED_MEMORY_OBJECTS`, Feature Flag,
`_POSIX_SYNCHRONIZED_IO`, Feature Flag,
`_POSIX_THREADS`, Feature Flag,
`_POSIX_THREAD_ATTR_STACKADDR`, Feature Flag,
`_POSIX_THREAD_ATTR_STACKSIZE`, Feature Flag,
`_POSIX_THREAD_PRIORITY_SCHEDULING`, Feature Flag,
`_POSIX_THREAD_PRIO_INHERIT`, Feature Flag,
`_POSIX_THREAD_PRIO_CEILING`, Feature Flag,
`_POSIX_THREAD_PROCESS_SHARED`, Feature Flag,
`_POSIX_THREAD_SAFE_FUNCTIONS`, Feature Flag,
`_POSIX_TIMERS`, Feature Flag,
`_POSIX_VERSION`, Feature Flag,

2.10.4 Execution-Time Symbolic Constants for Portability Specifications

`_POSIX_ASYNC_IO`, Feature Flag,
`_POSIX_CHOWN_RESTRICTED`, Feature Flag,
`_POSIX_NO_TRUNC`, Feature Flag,
`_POSIX_PRIO_IO`, Feature Flag,
`_POSIX_SYNC_IO`, Feature Flag,
`_POSIX_VDISABLE`, Feature Flag,

3 Process Primitives

3.1 Process Creation and Execution

3.1.1 Process Creation

`fork()`, Function, Unimplementable, Requires Processes

3.1.2 Execute a File

`execl()`, Function, Unimplementable, Requires Processes

`execv()`, Function, Unimplementable, Requires Processes

`execle()`, Function, Unimplementable, Requires Processes

`execve()`, Function, Unimplementable, Requires Processes

`execlp()`, Function, Unimplementable, Requires Processes

`execvp()`, Function, Unimplementable, Requires Processes

3.1.3 Register Fork Handlers

`pthread_atfork()`, Function, Unimplementable, Requires Processes

3.2 Process Termination

3.2.1 Wait for Process Termination

`wait()`, Function, Unimplementable, Requires Processes

`waitpid()`, Function, Unimplementable, Requires Processes

`WNOHANG`, Constant, Unimplementable, Requires Processes

`WUNTRACED`, Constant, Unimplementable, Requires Processes

`WIFEXITED()`, Function, Unimplementable, Requires Processes

`WEXITSTATUS()`, Function, Unimplementable, Requires Processes

`WIFSIGNALED()`, Function, Unimplementable, Requires Processes

`WTERMSIG()`, Function, Unimplementable, Requires Processes

`WIFSTOPPED()`, Function, Unimplementable, Requires Processes

`WSTOPSIG()`, Function, Unimplementable, Requires Processes

3.2.2 Terminate a Process

`_exit()`, Function, Implemented

3.3 Signals

3.3.1 Signal Concepts

3.3.1.1 Signal Names

sigset_t, Type, Implemented
SIG_DFL, Constant, Implemented
SIG_IGN, Constant, Implemented
SIG_ERR, Constant, Implemented
SIGABRT, Constant, Implemented
SIGALRM, Constant, Implemented
SIGFPE, Constant, Implemented
SIGHUP, Constant, Implemented
SIGILL, Constant, Implemented
SIGINT, Constant, Implemented
SIGKILL, Constant, Implemented
SIGPIPE, Constant, Implemented
SIGQUIT, Constant, Implemented
SIGSEGV, Constant, Implemented
SIGTERM, Constant, Implemented
SIGUSR1, Constant, Implemented
SIGUSR2, Constant, Implemented
SIGCHLD, Constant, Unimplemented
SIGCONT, Constant, Unimplemented
SIGSTOP, Constant, Unimplemented
SIGTSTP, Constant, Unimplemented
SIGTTIN, Constant, Unimplemented
SIGTTOU, Constant, Unimplemented
SIGBUS, Constant, Implemented
SIGRTMIN, Constant, Implemented
SIGRTMAX, Constant, Implemented

NOTE: SIG_ERR is technically an extension to the C Library which is not documented anywhere else according to the index.

3.3.1.2 Signal Generation and Delivery

struct sigevent, Type, Implemented
union sigval, Type, Implemented
SIGEV_NONE, Constant, Implemented
SIGEV_SIGNAL, Constant, Implemented
SIGEV_THREAD, Constant, Implemented

3.3.1.3 Signal Actions

siginfo_t, Type, Implemented
SI_USER, Constant, Implemented
SI_QUEUE, Constant, Implemented
SI_TIMER, Constant, Implemented
SI_ASYNCIO, Constant, Implemented
SI_MESGQ, Constant, Implemented

3.3.2 Send a Signal to a Process

kill(), Function, Implemented

3.3.3 Manipulate Signal Sets

sigemptyset(), Function, Implemented
sigfillset(), Function, Implemented
sigaddset(), Function, Implemented
sigdelset(), Function, Implemented
sigismember(), Function, Implemented

3.3.4 Examine and Change Signal Action

sigaction(), Function, Implemented
sigaction, Type, Implemented
SA_NOCLDSTOP, Constant, Implemented
SA_SIGINFO, Constant, Implemented

3.3.5 Examine and Change Blocked Signals

pthread_sigmask(), Function, Implemented
sigprocmask(), Function, Implemented
SIG_BLOCK, Constant, Implemented
SIG_UNBLOCK, Constant, Implemented
SIG_SETMASK, Constant, Implemented

3.3.6 Examine Pending Signals

sigpending(), Function, Implemented

3.3.7 Wait for a Signal

sigsuspend(), Function, Implemented

3.3.8 Synchronously Accept a Signal

`sigwait()`, Function, Implemented
`sigwaitinfo()`, Function, Implemented
`sigtimedwait()`, Function, Implemented

3.3.9 Queue a Signal to a Process

`sigqueue()`, Function, Implemented

3.3.10 Send a Signal to a Thread

`pthread_kill()`, Function, Implemented

3.4 Timer Operations

3.4.1 Schedule Alarm

`alarm()`, Function, Implemented

3.4.2 Suspend Process Execution

`pause()`, Function, Implemented

3.4.3 Delay Process Execution

`sleep()`, Function, Implemented

4 Process Environment

4.1 Process Identification

4.1.1 Get Process and Parent Process IDs

`getpid()`, Function, Implemented, SUSP Functionality
`getppid()`, Function, Implemented, SUSP Functionality

4.2 User Identification

4.2.1 Get Real User Effective User Real Group and Effective Group IDs

`getuid()`, Function, Implemented, SUSP Functionality
`geteuid()`, Function, Implemented, SUSP Functionality
`getgid()`, Function, Implemented, SUSP Functionality
`getegid()`, Function, Implemented, SUSP Functionality

4.2.2 Set User and Group IDs

`setuid()`, Function, Implemented, SUSP Functionality
`setgid()`, Function, Implemented, SUSP Functionality

4.2.3 Get Supplementary Group IDs

`getgroups()`, Function, Implemented, SUSP Functionality

4.2.4 Get User Name

`getlogin()`, Function, Implemented, SUSP Functionality
`getlogin_r()`, Function, Implemented, SUSP Functionality

4.3 Process Groups

4.3.1 Get Process Group ID

`getpgrp()`, Function, Implemented, SUSP Functionality

4.3.2 Create Session and Set Process Group ID

`setsid()`, Function, Implemented, SUSP Functionality

4.3.3 Set Process Group ID for Job Control

`setpgid()`, Function, Dummy Implementation

4.4 System Identification

4.4.1 Get System Name

`struct utsname`, Type, Implemented
`uname()`, Function, Implemented

4.5 Time

4.5.1 Get System Time

`time()`, Function, Implemented

4.5.2 Get Process Times

`struct tms`, Type, Implemented
`times()`, Function, Implemented

NOTE: `times` always returns 0 for `tms_stime`, `tms_cutime`, and `tms_cstime` fields of the `struct tms` returned.

4.6 Environment Variables

4.6.1 Environment Access

`getenv()`, Function, Implemented

4.7 Terminal Identification

4.7.1 Generate Terminal Pathname

`ctermid()`, Function, Implemented

4.7.2 Determine Terminal Device Name

ttyname(), Function, Implemented, untested
 ttyname_r(), Function, Implemented, untested
 isatty(), Function, Implemented

4.8 Configurable System Variables

4.8.1 Get Configurable System Variables

sysconf(), Function, Dummy Implementation
 _SC_AIO_LISTIO_MAX, Constant, Implemented
 _SC_AIO_MAX, Constant, Implemented
 _SC_AIO_PRIO_DELTA_MAX, Constant, Implemented
 _SC_ARG_MAX, Constant, Implemented
 _SC_CHILD_MAX, Constant, Implemented
 _SC_CLK_TCK, Constant, Implemented
 CLK_TCK, Constant, Implemented
 _SC_DELAYTIMER_MAX, Constant, Implemented
 _SC_GETGR_R_SIZE_MAX, Constant, Implemented
 _SC_GETPW_R_SIZE_MAX, Constant, Implemented
 _SC_LOGIN_NAME_MAX, Constant, Implemented
 _SC_MQ_OPEN_MAX, Constant, Implemented
 _SC_MQ_PRIO_MAX, Constant, Implemented
 _SC_NGROUPS_MAX, Constant, Implemented
 _SC_OPEN_MAX, Constant, Implemented
 _SC_PAGESIZE, Constant, Implemented
 _SC_RTSIG_MAX, Constant, Implemented
 _SC_SEM_NSEMS_MAX, Constant, Implemented
 _SC_SEM_VALUE_MAX, Constant, Implemented
 _SC_SIGQUEUE_MAX, Constant, Implemented
 _SC_STREAM_MAX, Constant, Implemented
 _SC_THREAD_DESTRUCTOR_ITERATIONS, Constant, Implemented
 _SC_THREAD_KEYS_MAX, Constant, Implemented
 _SC_THREAD_STACK_MIN, Constant, Implemented
 _SC_THREAD_THREADS_MAX, Constant, Implemented
 _SC_TIMER_MAX, Constant, Implemented
 _SC_TTY_NAME_MAX, Constant, Implemented
 _SC_TZNAME_MAX, Constant, Implemented
 _SC_ASYNCHRONOUS_IO, Constant, Implemented
 _SC_FSYNC, Constant, Implemented
 _SC_JOB_CONROL, Constant, Implemented
 _SC_MAPPED_FILES, Constant, Implemented
 _SC_MEMLOCK, Constant, Implemented
 _SC_MEMLOCK_RANGE, Constant, Implemented

_SC_MEMORY_PROTECTION, Constant, Implemented
_SC_MESSAGE_PASSING, Constant, Implemented
_SC_PRIORITIZED_IO, Constant, Implemented
_SC_PRIORITY_SCHEDULING, Constant, Unimplemented
_SC_REALTIME_SIGNALS, Constant, Implemented
_SC_SAVED_IDS, Constant, Implemented
_SC_SEMAPHORES, Constant, Implemented
_SC_SHARED_MEMORY_OBJECTS, Constant, Implemented
_SC_SYNCHRONIZED_IO, Constant, Implemented
_SC_TIMERS, Constant, Implemented
_SC_THREADS, Constant, Implemented
_SC_THREAD_ATTR_STACKADDR, Constant, Implemented
_SC_THREAD_ATTR_STACKSIZE, Constant, Implemented
_SC_THREAD_PRIORITY_SCHEDULING, Constant, Implemented
_SC_THREAD_PRIO_INHERIT, Constant, Implemented
_SC_THREAD_PRIO_PROTECT, Constant, Unimplemented
_SC_THREAD_PROCESS_SHARED, Constant, Implemented
_SC_THREAD_SAFE_FUNCTIONS, Constant, Implemented
_SC_VERSION, Constant, Implemented

5 Files and Directories

5.1 Directories

5.1.1 Format of Directory Entries

5.1.2 Directory Operations

```
struct dirent, Type, Implemented
opendir(), Function, Implemented
readdir(), Function, Implemented
readdir_r(), Function, Implemented
rewinddir(), Function, Implemented
closedir(), Function, Implemented
```

5.2 Working Directory

5.2.1 Change Current Working Directory

```
chdir(), Function, Implemented
```

5.2.2 Get Working Directory Pathname

```
getcwd(), Function, Implemented
```

5.3 General File Creation

5.3.1 Open a File

```
open(), Function, Implemented
O_RDONLY, Constant, Implemented
O_WRONLY, Constant, Implemented
O_RDWR, Constant, Implemented
O_APPEND, Constant, Implemented
O_CREAT, Constant, Implemented
O_DSYNC, Constant, Unimplemented
O_EXCL, Constant, Implemented
O_NOCTTY, Constant, Implemented
O_NONBLOCK, Constant, Implemented
```

`O_RSYNC`, Constant, Unimplemented
`O_SYNC`, Constant, Implemented
`O_TRUNC`, Constant, Implemented

NOTE: In the newlib `fcntl.h`, `O_SYNC` is defined only if `_POSIX_SOURCE` is not defined. This seems wrong.

5.3.2 Create a New File or Rewrite an Existing One

`creat()`, Function, Implemented

5.3.3 Set File Creation Mask

`umask()`, Function, Implemented

5.3.4 Link to a File

`link()`, Function, Implemented

5.4 Special File Creation

5.4.1 Make a Directory

`mkdir()`, Function, Implemented

5.4.2 Make a FIFO Special File

`mkfifo()`, Function, Untested Implementation

NOTE: `mkfifo()` is implemented but no filesystem supports FIFOs.

5.5 File Removal

5.5.1 Remove Directory Entries

`unlink()`, Function, Implemented

5.5.2 Remove a Directory

`rmdir()`, Function, Implemented

5.5.3 Rename a File

`rename()`, Function, Implemented

5.6 File Characteristics

5.6.1 File Characteristics Header and Data Structure

struct stat, Type, Implemented

5.6.1.1 <sys/stat.h> File Types

S_ISBLK(), Function, Implemented
S_ISCHR(), Function, Implemented
S_ISDIR(), Function, Implemented
S_ISFIFO(), Function, Implemented
S_ISREG(), Function, Implemented
S_TYPEISMQ(), Function, Unimplemented
S_TYPEISSEM(), Function, Unimplemented
S_TYPEISSHM(), Function, Unimplemented

5.6.1.2 <sys/stat.h> File Modes

S_IRWXU, Constant, Implemented
S_IRUSR, Constant, Implemented
S_IWUSR, Constant, Implemented
S_IXUSR, Constant, Implemented
S_IRWXG, Constant, Implemented
S_IRGRP, Constant, Implemented
S_IWGRP, Constant, Implemented
S_IXGRP, Constant, Implemented
S_IRWXO, Constant, Implemented
S_IROTH, Constant, Implemented
S_IWOTH, Constant, Implemented
S_IXOTH, Constant, Implemented
S_ISUID, Constant, Implemented
S_ISGID, Constant, Implemented

5.6.1.3 <sys/stat.h> Time Entries

5.6.2 Get File Status

stat(), Function, Implemented
fstat(), Function, Implemented

5.6.3 Check File Accessibility

access(), Function, Implemented

5.6.4 Change File Modes

`chmod()`, Function, Implemented
`fchmod()`, Function, Implemented

5.6.5 Change Owner and Group of a File

`chown()`, Function, Implemented

5.6.6 Set File Access and Modification Times

`struct utimbuf`, Type, Implemented
`utime()`, Function, Implemented

5.6.7 Truncate a File to a Specified Length

`ftruncate()`, Function, Implemented

5.7 Configurable Pathname Variable

5.7.1 Get Configurable Pathname Variables

`pathconf()`, Function, Implemented
`fpathconf()`, Function, Implemented
`_PC_LINK_MAX`, Constant, Implemented
`_PC_MAX_CANON`, Constant, Implemented
`_PC_MAX_INPUT`, Constant, Implemented
`_PC_MAX_INPUT`, Constant, Implemented
`_PC_NAME_MAX`, Constant, Implemented
`_PC_PATH_MAX`, Constant, Implemented
`_PC_PIPE_BUF`, Constant, Implemented
`_PC_ASYNC_IO`, Constant, Implemented
`_PC_CHOWN_RESTRICTED`, Constant, Implemented
`_PC_NO_TRUNC`, Constant, Implemented
`_PC_PRIO_IO`, Constant, Implemented
`_PC_SYNC_IO`, Constant, Implemented
`_PC_VDISABLE`, Constant, Implemented

NOTE: The newlib `unistd.h` and `sys/unistd.h` are installed and the include search patch is used to get the right one. There are conflicts between the newlib `unistd.h` and RTEMS' version.

6 Input and Output Primitives

6.1 Pipes

6.1.1 Create an Inter-Process Channel

`pipe()`, Function, Dummy Implementation

NOTE: `pipe()` returns `ENOSYS`.

6.2 File Descriptor Manipulation

6.2.1 Duplicate an Open File Descriptor

`dup()`, Function, Implemented

`dup2()`, Function, Implemented

6.3 File Descriptor Deassignment

6.3.1 Close a File

`close()`, Function, Implemented

6.4 Input and Output

6.4.1 Read from a File

`read()`, Function, Implemented

6.4.2 Write to a File

`write()`, Function, Implemented

6.5 Control Operations on Files

6.5.1 Data Definitions for File Control Operations

6.5.2 File Control

```

struct flock, Type, Implemented
fcntl(), Function, Implemented
F_DUPFD, Constant, Implemented
F_GETFD, Constant, Implemented
F_GETLK, Constant, Implemented
F_SETFD, Constant, Implemented
F_GETFL, Constant, Implemented
F_SETFL, Constant, Implemented
F_SETLK, Constant, Implemented
F_SETLKW, Constant, Implemented
FD_CLOEXEC, Constant, Implemented
F_RDLCK, Constant, Implemented
F_UNLCK, Constant, Implemented
F_WRLCK, Constant, Implemented
O_ACCMODE, Constant, Implemented

```

NOTE: A number of constants are used by both `open` and `fcntl`. `O_CREAT`, `O_EXCL`, `O_NOCTTY`, `O_TRUNC`, `O_APPEND`, `O_DSYNC`, `O_NONBLOCK`, `O_RSYNC`, `O_SYNC`, `O_RDONLY`, `O_RDWR`, and `O_WRONLY` are also included in another section. See [Section 5.3.1 \[Open a File\]](#), page 19.

6.5.3 Reposition Read/Write File Offset

```

lseek(), Function, Implemented
SEEK_SET, Constant, Implemented
SEEK_CUR, Constant, Implemented
SEEK_END, Constant, Implemented

```

6.6 File Synchronization

6.6.1 Synchronize the State of a File

```

fsync(), Function, Implemented

```

6.6.2 Synchronize the Data of a File

```

fdatasync(), Function, Implemented

```

6.7 Asynchronous Input and Output

6.7.1 Data Definitions for Asynchronous Input and Output

6.7.1.1 Asynchronous I/O Control Block

`struct aiocb`, Type, Untested Implementation

6.7.1.2 Asynchronous I/O Manifest Constants

`AIO_CANCELED`, Constant, Implemented
`AIO_NOTCANCELED`, Constant, Implemented
`AIO_ALLDONE`, Constant, Implemented
`LIO_WAIT`, Constant, Implemented
`LIO_NOWAIT`, Constant, Implemented
`LIO_READ`, Constant, Implemented
`LIO_WRITE`, Constant, Implemented
`LIO_NOP`, Constant, Implemented

6.7.2 Asynchronous Read

`aioread()`, Function, Dummy Implementation

6.7.3 Asynchronous Write

`aiowrite()`, Function, Dummy Implementation

6.7.4 List Directed I/O

`lio_listio()`, Function, Dummy Implementation

6.7.5 Retrieve Error Status of Asynchronous I/O Operation

`aioreaderr()`, Function, Dummy Implementation

6.7.6 Retrieve Return Status of Asynchronous I/O Operation

`aioreadnerr()`, Function, Dummy Implementation

6.7.7 Cancel Asynchronous I/O Request

`aiocancel()`, Function, Dummy Implementation

6.7.8 Wait for Asynchronous I/O Request

`aiosuspend()`, Function, Dummy Implementation

6.7.9 Asynchronous File Synchronization

`aio_fsync()`, Function, Dummy Implementation

7 Device- and Class-Specific Functions

7.1 General Terminal Interface

7.1.1 Interface Characteristics

7.1.1.1 Opening a Terminal Device File

7.1.1.2 Process Groups (TTY)

7.1.1.3 The Controlling Terminal

7.1.1.4 Terminal Access Control

7.1.1.5 Input Processing and Reading Data

7.1.1.6 Canonical Mode Input Processing

7.1.1.7 Noncanonical Mode Input Processing

Case A - $\text{MIN} > 0$ and $\text{TIME} > 0$

Case B - $\text{MIN} > 0$ and $\text{TIME} = 0$

Case C - $\text{MIN} = 0$ and $\text{TIME} > 0$

Case D - $\text{MIN} = 0$ and $\text{TIME} = 0$

7.1.1.8 Writing Data and Output Processing

7.1.1.9 Special Characters

INTR, Constant, Implemented
QUIT, Constant, Implemented
ERASE, Constant, Implemented
KILL, Constant, Implemented
EOF, Constant, Implemented
NL, Constant, Implemented
EOL, Constant, Implemented
SUSP, Constant, Implemented
STOP, Constant, Implemented
START, Constant, Implemented
CR, Constant, Implemented

7.1.1.10 Modem Disconnect

7.1.1.11 Closing a Terminal Device File

7.1.2 Parameters That Can Be Set

7.1.2.1 termios Structure

tcflag_t, Type, Implemented
cc_t, Type, Implemented
struct termios, Type, Implemented

7.1.2.2 Input Modes

BRKINT, Constant, Implemented
ICRNL, Constant, Implemented
IGNBREAK, Constant, Unimplemented
IGNCR, Constant, Implemented
IGNPAR, Constant, Implemented
INLCR, Constant, Implemented
INPCK, Constant, Implemented
ISTRIP, Constant, Implemented
IXOFF, Constant, Implemented
IXON, Constant, Implemented
PARMRK, Constant, Implemented

7.1.2.3 Output Modes

OPOST, Constant, Implemented

7.1.2.4 Control Modes

CLOCAL, Constant, Implemented
CREAD, Constant, Implemented
CSIZE, Constant, Implemented
CS5, Constant, Implemented
CS6, Constant, Implemented
CS7, Constant, Implemented
CS8, Constant, Implemented
CSTOPB, Constant, Implemented
HUPCL, Constant, Implemented
PARENB, Constant, Implemented
PARODD, Constant, Implemented

7.1.2.5 Local Modes

ECHO, Constant, Implemented
ECHOE, Constant, Implemented
ECHOK, Constant, Implemented
ECHONL, Constant, Implemented
ICANON, Constant, Implemented
IEXTEN, Constant, Implemented
ISIG, Constant, Implemented
NOFLSH, Constant, Implemented
TOSTOP, Constant, Implemented

7.1.2.6 Special Control Characters

VEOF, Constant, Implemented
VEOL, Constant, Implemented
VERASE, Constant, Implemented
VINTR, Constant, Implemented
VKILL, Constant, Implemented
VQUIT, Constant, Implemented
VSUSP, Constant, Implemented
VSTART, Constant, Implemented
VSTOP, Constant, Implemented
VMIN, Constant, Implemented
VTIME, Constant, Implemented

7.1.3 Baud Rate Values

B0, Constant, Implemented
B50, Constant, Implemented
B75, Constant, Implemented
B110, Constant, Implemented

B134, Constant, Implemented
B150, Constant, Implemented
B200, Constant, Implemented
B300, Constant, Implemented
B600, Constant, Implemented
B1200, Constant, Implemented
B1800, Constant, Implemented
B2400, Constant, Implemented
B4800, Constant, Implemented
B9600, Constant, Implemented
B19200, Constant, Implemented
B38400, Constant, Implemented

7.1.3.1 Baud Rate Functions

cfgetospeed(), Function, Implemented
cfsetospeed(), Function, Implemented
cfgetispeed(), Function, Implemented
cfsetispeed(), Function, Implemented
TCIFLUSH, Constant, Implemented
TCOFLUSH, Constant, Implemented
TCIOFLUSH, Constant, Implemented
TCOOFF, Constant, Implemented
TCOON, Constant, Implemented
TCIOOFF, Constant, Implemented
TCIOON, Constant, Implemented

7.2 General Terminal Interface Control Functions

7.2.1 Get and Set State

tcgetattr(), Function, Implemented
tcsetattr(), Function, Implemented

7.2.2 Line Control Functions

tcsendbreak(), Function, Dummy Implementation
tcdrain(), Function, Implemented
tcflush(), Function, Dummy Implementation
tcflow(), Function, Dummy Implementation

7.2.3 Get Foreground Process Group ID

tcgetpgrp(), Function, Implemented, SUSP

7.2.4 Set Foreground Process Group ID

`tcsetprgrp()`, Function, Dummy Implementation

8 Language-Specific Services for the C Programming Language

8.1 Referenced C Language Routines

ANSI C Section 4.2 — Diagnostics

`assert()`, Function, Implemented

ANSI C Section 4.3 — Character Handling

`isalnum()`, Function, Implemented
`isalpha()`, Function, Implemented
`iscntrl()`, Function, Implemented
`isdigit()`, Function, Implemented
`isgraph()`, Function, Implemented
`islower()`, Function, Implemented
`isprint()`, Function, Implemented
`ispunct()`, Function, Implemented
`isspace()`, Function, Implemented
`isupper()`, Function, Implemented
`isxdigit()`, Function, Implemented
`tolower()`, Function, Implemented
`toupper()`, Function, Implemented

ANSI C Section 4.4 — Localization

`setlocale()`, Function, Implemented

ANSI C Section 4.5 — Mathematics

`acos()`, Function, Implemented
`asin()`, Function, Implemented
`atan()`, Function, Implemented
`atan2()`, Function, Implemented
`cos()`, Function, Implemented
`sin()`, Function, Implemented
`tan()`, Function, Implemented
`cosh()`, Function, Implemented
`sinh()`, Function, Implemented
`tanh()`, Function, Implemented
`exp()`, Function, Implemented
`frexp()`, Function, Implemented
`ldexp()`, Function, Implemented
`log()`, Function, Implemented
`log10()`, Function, Implemented
`modf()`, Function, Implemented
`pow()`, Function, Implemented
`sqrt()`, Function, Implemented
`ceil()`, Function, Implemented

`fabs()`, Function, Implemented
`floor()`, Function, Implemented
`fmod()`, Function, Implemented

ANSI C Section 4.6 — Non-Local Jumps

`setjmp()`, Function, Implemented
`longjmp()`, Function, Implemented

ANSI C Section 4.9 — Input/Output

`FILE`, Type, Implemented
`clearerr()`, Function, Implemented
`fclose()`, Function, Implemented
`feof()`, Function, Implemented
`ferror()`, Function, Implemented
`fflush()`, Function, Implemented
`fgetc()`, Function, Implemented
`fgets()`, Function, Implemented
`fopen()`, Function, Implemented
`fputc()`, Function, Implemented
`fputs()`, Function, Implemented
`fread()`, Function, Implemented
`freopen()`, Function, Implemented
`fseek()`, Function, Implemented
`ftell()`, Function, Implemented
`fwrite()`, Function, Implemented
`getc()`, Function, Implemented
`getchar()`, Function, Implemented
`gets()`, Function, Implemented
`perror()`, Function, Implemented
`printf()`, Function, Implemented
`fprintf()`, Function, Implemented
`sprintf()`, Function, Implemented
`putc()`, Function, Implemented
`putchar()`, Function, Implemented
`puts()`, Function, Implemented
`remove()`, Function, Implemented
`rewind()`, Function, Implemented
`scanf()`, Function, Implemented
`fscanf()`, Function, Implemented
`sscanf()`, Function, Implemented
`setbuf()`, Function, Implemented
`tmpfile()`, Function, Implemented
`tmpnam()`, Function, Implemented
`ungetc()`, Function, Implemented

NOTE: `rename` is also included in another section. [Section 5.5.3 \[Rename a File\]](#), page 20.

ANSI C Section 4.10 — General Utilities

abs(), Function, Implemented
atof(), Function, Implemented
atoi(), Function, Implemented
atol(), Function, Implemented
rand(), Function, Implemented
srand(), Function, Implemented
calloc(), Function, Implemented
free(), Function, Implemented
malloc(), Function, Implemented
realloc(), Function, Implemented
abort(), Function, Implemented
exit(), Function, Implemented
bsearch(), Function, Implemented
qsort(), Function, Implemented

NOTE: `getenv` is also included in another section. [Section 4.6.1 \[Environment Access\]](#), [page 16](#).

ANSI C Section 4.11 — String Handling

strcpy(), Function, Implemented
strncpy(), Function, Implemented
strcat(), Function, Implemented
strncat(), Function, Implemented
strcmp(), Function, Implemented
strncmp(), Function, Implemented
 strchr(), Function, Implemented
strcspn(), Function, Implemented
strpbrk(), Function, Implemented
strrchr(), Function, Implemented
strspn(), Function, Implemented
strstr(), Function, Implemented
strtok(), Function, Implemented
strlen(), Function, Implemented

ANSI C Section 4.12 — Date and Time Handling

asctime(), Function, Implemented
ctime(), Function, Implemented
gmtime(), Function, Implemented
localtime(), Function, Implemented
mktime(), Function, Implemented
strftime(), Function, Implemented

NOTE: RTEMS has no notion of time zones.

NOTE: `time` is also included in another section. [Section 4.5.1 \[Get System Time\]](#), [page 16](#).

From Surrounding Text

EXIT_SUCCESS, Constant, Implemented

EXIT_FAILURE, Constant, Implemented

8.1.1 Extensions to Time Functions

8.1.2 Extensions to setlocale Function

LC_CTYPE, Constant, Implemented
LC_COLLATE, Constant, Implemented
LC_TIME, Constant, Implemented
LC_NUMERIC, Constant, Implemented
LC_MONETARY, Constant, Implemented
LC_ALL, Constant, Implemented

8.2 C Language Input/Output Functions

8.2.1 Map a Stream Pointer to a File Descriptor

fileno(), Function, Implemented
STDIN_FILENO, Constant, Implemented
STDOUT_FILENO, Constant, Implemented
STDERR_FILENO, Constant, Implemented

8.2.2 Open a Stream on a File Descriptor

fdopen(), Function, Implemented

8.2.3 Interactions of Other FILE-Type C Functions

8.2.4 Operations on Files - the remove Function

8.2.5 Temporary File Name - the tmpnam Function

8.2.6 Stdio Locking Functions

flockfile(), Function, Unimplemented
ftrylockfile(), Function, Unimplemented
funlockfile(), Function, Unimplemented

8.2.7 Stdio With Explicit Client Locking

`getc_unlocked()`, Function, Unimplemented
`getchar_unlocked()`, Function, Unimplemented
`putc_unlocked()`, Function, Unimplemented
`putchar_unlocked()`, Function, Unimplemented

8.3 Other C Language Functions

8.3.1 Nonlocal Jumps

`sigjmp_buf`, Type, Implemented
`sigsetjmp()`, Function, Implemented
`siglongjmp()`, Function, Implemented

8.3.2 Set Time Zone

`tzset()`, Function, Unimplemented

8.3.3 Find String Token

`strtok_r()`, Function, Implemented

8.3.4 ASCII Time Representation

`asctime_r()`, Function, Implemented

8.3.5 Current Time Representation

`ctime_r()`, Function, Implemented

8.3.6 Coordinated Universal Time

`gmtime_r()`, Function, Implemented

8.3.7 Local Time

`localtime_r()`, Function, Implemented

8.3.8 Pseudo-Random Sequence Generation Functions

`rand_r()`, Function, Implemented

9 System Databases

9.1 System Databases Section

9.2 Database Access

9.2.1 Group Database Access

```
struct group, Type, Implemented
getgrgid(), Function, Implemented
getgrgid_r(), Function, Implemented
getgrname(), Function, Implemented
getgrnam_r(), Function, Implemented
```

NOTE: Creates `/etc/group` if none exists.

9.2.2 User Database Access

```
struct passwd, Type, Implemented
getpwuid(), Function, Implemented
getpwuid_r(), Function, Implemented
getpwnam(), Function, Implemented
getpwnam_r(), Function, Implemented
```

NOTE: Creates `/etc/passwd` if none exists.

10 Data Interchange Format

10.1 Archive/Interchange File Format

10.1.1 Extended tar Format

tar format, Type, Unimplemented
TMAGIC, Constant, Unimplemented
TMAGLEN, Constant, Unimplemented
TVERSION, Constant, Unimplemented
TVERSLEN, Constant, Unimplemented
REGTYPE, Constant, Unimplemented
AREGTYPE, Constant, Unimplemented
LNKTYPE, Constant, Unimplemented
SYMTYPE, Constant, Unimplemented
CHRTYPE, Constant, Unimplemented
BLKTYPE, Constant, Unimplemented
DIRTYPE, Constant, Unimplemented
FIFOTYPE, Constant, Unimplemented
CONTTYPE, Constant, Unimplemented
TSUID, Constant, Unimplemented
TSGID, Constant, Unimplemented
TSVTX, Constant, Unimplemented
TUREAD, Constant, Unimplemented
TUWRITE, Constant, Unimplemented
TUEXEC, Constant, Unimplemented
TGREAD, Constant, Unimplemented
TGWRITE, Constant, Unimplemented
TGEXEC, Constant, Unimplemented
TOREAD, Constant, Unimplemented
TOWRITE, Constant, Unimplemented
TOEXEC, Constant, Unimplemented

NOTE: Requires <tar.h> which is not in newlib.

10.1.2 Extended cpio Format

cpio format, Type, Unimplemented
C_IRUSER, Constant, Unimplemented
C_IWUSER, Constant, Unimplemented
C_IXUSER, Constant, Unimplemented
C_IRGRP, Constant, Unimplemented
C_IWGRP, Constant, Unimplemented
C_IXGRP, Constant, Unimplemented

C_IROTH, Constant, Unimplemented
C_IWOTH, Constant, Unimplemented
C_IXOTH, Constant, Unimplemented
C_ISUID, Constant, Unimplemented
C_ISGID, Constant, Unimplemented
C_ISVTX, Constant, Unimplemented

NOTE: POSIX does not require a header file or structure. RedHat Linux 5.0 does not have a <cpio.h> although Solaris 2.6 does.

10.1.3 Multiple Volumes

11 Synchronization

11.1 Semaphore Characteristics

NOTE: Semaphores are implemented but only unnamed semaphores are currently tested.

`sem_t`, Type, Implemented

11.2 Semaphore Functions

11.2.1 Initialize an Unnamed Semaphore

`sem_init()`, Function, Implemented
`SEM_FAILED`, Constant, Implemented

11.2.2 Destroy an Unnamed Semaphore

`sem_destroy()`, Function, Implemented

11.2.3 Initialize/Open a Named Semaphore

`sem_open()`, Function, Implemented

11.2.4 Close a Named Semaphore

`sem_close()`, Function, Implemented

11.2.5 Remove a Named Semaphore

`sem_unlink()`, Function, Implemented

11.2.6 Lock a Semaphore

`sem_wait()`, Function, Implemented
`sem_trywait()`, Function, Implemented

11.2.7 Unlock a Semaphore

`sem_post()`, Function, Implemented

11.2.8 Get the Value of a Semaphore

`sem_getvalue()`, Function, Implemented

11.3 Mutexes

11.3.1 Mutex Initialization Attributes

pthread_mutexattr_init(), Function, Implemented
pthread_mutexattr_destroy(), Function, Implemented
pthread_mutexattr_getpshared(), Function, Implemented
pthread_mutexattr_setpshared(), Function, Implemented
PTHREAD_PROCESS_SHARED, Constant, Implemented
PTHREAD_PROCESS_PRIVATE, Constant, Implemented

11.3.2 Initializing and Destroying a Mutex

pthread_mutex_init(), Function, Implemented
pthread_mutex_destroy(), Function, Implemented
PTHREAD_MUTEX_INITIALIZER, Constant, Implemented

11.3.3 Locking and Unlocking a Mutex

pthread_mutex_lock(), Function, Implemented
pthread_mutex_trylock(), Function, Implemented
pthread_mutex_unlock(), Function, Implemented

11.4 Condition Variables

11.4.1 Condition Variable Initialization Attributes

pthread_condattr_init(), Function, Implemented
pthread_condattr_destroy(), Function, Implemented
pthread_condattr_getpshared(), Function, Implemented
pthread_condattr_setpshared(), Function, Implemented

11.4.2 Initialization and Destroying Condition Variables

pthread_cond_init(), Function, Implemented
pthread_cond_destroy(), Function, Implemented
PTHREAD_COND_INITIALIZER, Constant, Implemented

11.4.3 Broadcasting and Signaling a Condition

pthread_cond_signal(), Function, Implemented
pthread_cond_broadcast(), Function, Implemented

11.4.4 Waiting on a Condition

`pthread_cond_wait()`, Function, Implemented

`pthread_cond_timedwait()`, Function, Implemented

12 Memory Management

12.1 Memory Locking Functions

12.1.1 Lock/Unlock the Address Space of a Process

mlockall(), Function, Unimplemented
munlockall(), Function, Unimplemented
MCL_CURRENT, Constant, Unimplemented
MCL_FUTURE, Constant, Unimplemented

12.1.2 Lock/Unlock a Rand of Process Address Space

mlock(), Function, Unimplemented
munlock(), Function, Unimplemented

12.2 Memory Mapping Functions

12.2.1 Map Process Addresses to a Memory Object

mmap(), Function, Unimplemented
PROT_READ, Constant, Unimplemented
PROT_WRITE, Constant, Unimplemented
PROT_EXEC, Constant, Unimplemented
PROT_NONE, Constant, Unimplemented
MAP_SHARED, Constant, Unimplemented
MAP_PRIVATE, Constant, Unimplemented
MAP_FIXED, Constant, Unimplemented

12.2.2 Unmap Previously Mapped Addresses

munmap(), Function, Unimplemented

12.2.3 Change Memory Protection

mprotect(), Function, Unimplemented

12.2.4 Memory Object Synchronization

msync(), Function, Unimplemented, Unimplemented
MS_ASYNC, Constant, Unimplemented

MS_SYNC, Constant, Unimplemented
MS_INVALIDATE, Constant, Unimplemented

12.3 Shared Memory Functions

12.3.1 Open a Shared Memory Object

shm_open(), Function, Unimplemented

12.3.2 Remove a Shared Memory Object

shm_unlink(), Function, Unimplemented

13 Execution Scheduling

13.1 Scheduling Parameters

`struct sched_param`, Type, Implemented

13.2 Scheduling Policies

`SCHED_FIFO`, Constant, Implemented

`SCHED_RR`, Constant, Implemented

`SCHED_OTHER`, Constant, Implemented

NOTE: RTEMS adds `SCHED_SPORADIC`.

13.2.1 SCHED_FIFO

13.2.2 SCHED_RR

13.2.3 SCHED_OTHER

13.3 Process Scheduling Functions

13.3.1 Set Scheduling Parameters

`sched_setparam()`, Function, Dummy Implementation

13.3.2 Get Scheduling Parameters

`sched_getparam()`, Function, Dummy Implementation

13.3.3 Set Scheduling Policy and Scheduling Parameters

`sched_setscheduler()`, Function, Dummy Implementation

13.3.4 Get Scheduling Policy

`sched_getscheduler()`, Function, Dummy Implementation

13.3.5 Yield Processor

`sched_yield()`, Function, Implemented

13.3.6 Get Scheduling Parameter Limits

`sched_get_priority_max()`, Function, Implemented

`sched_get_priority_min()`, Function, Implemented

`sched_get_priority_rr_get_interval()`, Function, Implemented

13.4 Thread Scheduling

13.4.1 Thread Scheduling Attributes

`PTHREAD_SCOPE_PROCESS`, Constant, Implemented

`PTHREAD_SCOPE_SYSTEM`, Constant, Implemented

13.4.2 Scheduling Contention Scope

13.4.3 Scheduling Allocation Domain

13.4.4 Scheduling Documentation

13.5 Thread Scheduling Functions

13.5.1 Thread Creation Scheduling Attributes

`pthread_attr_setscope()`, Function, Implemented

`pthread_attr_getscope()`, Function, Implemented

`pthread_attr_setinheritsched()`, Function, Implemented

`pthread_attr_getinheritsched()`, Function, Implemented

`pthread_attr_setschedpolicy()`, Function, Implemented

`pthread_attr_getschedpolicy()`, Function, Implemented

`pthread_attr_setschedparam()`, Function, Implemented

`pthread_attr_getschedparam()`, Function, Implemented

`PTHREAD_INHERIT_SCHED`, Constant, Implemented

`PTHREAD_EXPLICIT_SCHED`, Constant, Implemented

13.5.2 Dynamic Thread Scheduling Parameters Access

`pthread_setschedparam()`, Function, Implemented
`pthread_getschedparam()`, Function, Implemented

13.6 Synchronization Scheduling

13.6.1 Mutex Initialization Scheduling Attributes

`pthread_mutexattr_setprotocol()`, Function, Implemented
`pthread_mutexattr_getprotocol()`, Function, Implemented
`pthread_mutexattr_setprioceiling()`, Function, Implemented
`pthread_mutexattr_getprioceiling()`, Function, Implemented
`PTHREAD_PRIO_NONE`, Constant, Implemented
`PTHREAD_PRIO_INHERIT`, Constant, Implemented
`PTHREAD_PRIO_PROTECT`, Constant, Implemented

13.6.2 Change the Priority Ceiling of a Mutex

`pthread_mutex_setprioceiling()`, Function, Implemented
`pthread_mutex_getprioceiling()`, Function, Implemented

14 Clocks and Timers

14.1 Data Definitions for Clocks and Timers

14.1.1 Time Value Specification Structures

```
struct timespec, Type, Implemented  
struct itimerspec, Type, Implemented
```

14.1.2 Timer Event Notification Control Block

14.1.3 Type Definitions

```
clockid_t, Type, Implemented  
timerid_t, Type, Implemented
```

14.1.4 Timer Event Notification Manifest Constants

```
CLOCK_REALTIME, Constant, Implemented  
TIMER_ABSTIME, Constant, Implemented
```

14.2 Clock and Timer Functions

14.2.1 Clocks

```
clock_gettime(), Function, Partial Implementation  
clock_gettime(), Function, Partial Implementation  
clock_getres(), Function, Implemented
```

14.2.2 Create a Per-Process Timer

```
timer_create(), Function, Implemented
```

14.2.3 Delete a Per-Process Timer

```
timer_delete(), Function, Implemented
```

14.2.4 Per-Process Timers

`timer_settime()`, Function, Implemented
`timer_gettime()`, Function, Implemented
`timer_getoverrun()`, Function, Implemented

14.2.5 High Resolution Sleep

`nanosleep()`, Function, Implemented

15 Message Passing

15.1 Data Definitions for Message Queues

15.1.1 Data Structures

NOTE: Semaphores are implemented but only unnamed semaphores are currently tested.

```
mqd_t, Type, Implemented
struct mq_attr, Type, Implemented
```

15.2 Message Passing Functions

15.2.1 Open a Message Queue

```
mq_open(), Function, Implemented
```

15.2.2 Close a Message Queue

```
mq_close(), Function, Implemented
```

15.2.3 Remove a Message Queue

```
mq_unlink(), Function, Implemented
```

15.2.4 Send a Message to a Message Queue

```
mq_send(), Function, Implemented
```

15.2.5 Receive a Message From a Message Queue

```
mq_receive(), Function, Implemented
```

15.2.6 Notify Process That a Message is Available on a Queue

```
mq_notify(), Function, Implemented
```

15.2.7 Set Message Queue Attributes

```
mq_setattr(), Function, Implemented
```

15.2.8 Get Message Queue Attributes

`mq_getattr()`, Function, Implemented

16 Thread Management

16.1 Threads

16.2 Thread Functions

16.2.1 Thread Creation Attributes

`pthread_attr_init()`, Function, Implemented
`pthread_attr_destroy()`, Function, Implemented
`pthread_attr_setstacksize()`, Function, Implemented
`pthread_attr_getstacksize()`, Function, Implemented
`pthread_attr_setstackaddr()`, Function, Implemented
`pthread_attr_getstackaddr()`, Function, Implemented
`pthread_attr_setdetachstate()`, Function, Implemented
`pthread_attr_getdetachstate()`, Function, Implemented
`PTHREAD_CREATE_JOINABLE`, Constant, Implemented
`PTHREAD_CREATE_DETACHED`, Constant, Implemented

16.2.2 Thread Creation

`pthread_create()`, Function, Implemented

16.2.3 Wait for Thread Termination

`pthread_join()`, Function, Implemented

16.2.4 Detaching a Thread

`pthread_detach()`, Function, Implemented

16.2.5 Thread Termination

`pthread_exit()`, Function, Implemented

16.2.6 Get Thread ID

`pthread_self()`, Function, Implemented

16.2.7 Compare Thread IDs

`pthread_equal()`, Function, Implemented

16.2.8 Dynamic Package Initialization

pthread_once(), Function, Implemented
PTHREAD_ONCE_INIT, Constant, Implemented

17 Thread-Specific Data

17.1 Thread-Specific Data Functions

17.1.1 Thread-Specific Data Key Creation

`pthread_key_create()`, Function, Implemented

17.1.2 Thread-Specific Data Management

`pthread_key_setspecific()`, Function, Implemented

`pthread_key_getspecific()`, Function, Implemented

17.1.3 Thread-Specific Data Key Deletion

`pthread_key_delete()`, Function, Implemented

18 Thread Cancellation

18.1 Thread Cancellation Overview

18.1.1 Cancelability States

PTHREAD_CANCEL_DISABLE, Constant, Implemented
PTHREAD_CANCEL_ENABLE, Constant, Implemented
PTHREAD_CANCEL_ASYNCHRONOUS, Constant, Implemented
PTHREAD_CANCEL_DEFERRED, Constant, Implemented

18.1.2 Cancellation Points

18.1.3 Thread Cancellation Cleanup Handlers

PTHREAD_CANCELED, Constant, Unimplemented

18.1.4 Async-Cancel Safety

18.2 Thread Cancellation Functions

18.2.1 Canceling Execution of a Thread

pthread_cancel(), Function, Implemented

18.2.2 Setting Cancelability State

pthread_setcancelstate(), Function, Implemented
pthread_setcanceltype(), Function, Implemented
pthread_testcancel(), Function, Implemented

18.2.3 Establishing Cancellation Handlers

pthread_cleanup_push(), Function, Implemented
pthread_cleanup_pop(), Function, Implemented

18.3 Language-Independent Cancellation Functionality

18.3.1 Requesting Cancellation

18.3.2 Associating Cleanup Code With Scopes

18.3.3 Controlling Cancellation Within Scopes

18.3.4 Defined Cancellation Sequence

18.3.5 List of Cancellation Points

19 Compliance Summary

19.1 General Chapter

Functions:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	21
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

FEATURE FLAG COUNTS DO NOT ADD UP!!

Constants:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.2 Terminology and General Requirements Chapter

Functions:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	19
Implemented	:	19
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	32
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

FEATURE FLAG COUNTS DO NOT ADD UP!!

Constants:

Total Number	:	126
Implemented	:	124
Unimplemented	:	2
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.3 Process Primitives Chapter

Functions:

Total Number	:	36
Implemented	:	20
Unimplemented	:	0
Unimplementable	:	16
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	5
Implemented	:	5
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	40
Implemented	:	32
Unimplemented	:	6
Unimplementable	:	2
Partial	:	0
Dummy	:	0
Untested	:	0

19.4 Process Environment Chapter

Functions:

Total Number	:	23
Implemented	:	21
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	2
Untested	:	0

Data Types:

Total Number	:	2
Implemented	:	2
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	53
Implemented	:	51
Unimplemented	:	2
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.5 Files and Directories Chapter

Functions:

Total Number	:	35
Implemented	:	30
Unimplemented	:	3
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	1

FUNCTION COUNTS DO NOT ADD UP!!

Data Types:

Total Number	:	3
Implemented	:	3
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	39
Implemented	:	37
Unimplemented	:	2
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.6 Input and Output Primitives Chapter

Functions:

Total Number	:	19
Implemented	:	9
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	9
Untested	:	0

FUNCTION COUNTS DO NOT ADD UP!!

Data Types:

Total Number	:	2
Implemented	:	1
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	1

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	24
Implemented	:	24
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.7 Device- and Class-Specific Functions Chapter

Functions:

Total Number	:	12
Implemented	:	8
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	4
Untested	:	0

Data Types:

Total Number	:	3
Implemented	:	3
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	77
Implemented	:	76
Unimplemented	:	1
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.8 Language-Specific Services for the C Programming Language Chapter

Functions:

Total Number	:	125
Implemented	:	117
Unimplemented	:	8
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	2
Implemented	:	2
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	11
Implemented	:	11
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.9 System Databases Chapter

Functions:

Total Number	:	8
Implemented	:	8
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	2
Implemented	:	2
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.10 Data Interchange Format Chapter

Functions:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	2
Implemented	:	0
Unimplemented	:	2
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	37
Implemented	:	0
Unimplemented	:	37
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.11 Synchronization Chapter

Functions:

Total Number	:	28
Implemented	:	28
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	1
Implemented	:	1
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	5
Implemented	:	5
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.12 Memory Management Chapter

Functions:

Total Number	:	10
Implemented	:	0
Unimplemented	:	10
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	12
Implemented	:	0
Unimplemented	:	12
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.13 Execution Scheduling Chapter

Functions:

Total Number	:	24
Implemented	:	20
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	4
Untested	:	0

Data Types:

Total Number	:	1
Implemented	:	1
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	10
Implemented	:	10
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.14 Clocks and Timers Chapter

Functions:

Total Number	:	9
Implemented	:	7
Unimplemented	:	0
Unimplementable	:	0
Partial	:	2
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	4
Implemented	:	4
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	2
Implemented	:	2
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.15 Message Passing Chapter

Functions:

Total Number	:	8
Implemented	:	8
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	2
Implemented	:	2
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.16 Thread Management Chapter

Functions:

Total Number	:	15
Implemented	:	15
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	3
Implemented	:	3
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.17 Thread-Specific Data Chapter

Functions:

Total Number	:	4
Implemented	:	4
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.18 Thread Cancellation Chapter

Functions:

Total Number	:	6
Implemented	:	6
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Data Types:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Feature Flags:

Total Number	:	0
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

Constants:

Total Number	:	5
Implemented	:	4
Unimplemented	:	1
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

19.19 Overall Summary

Functions:

Total Number	:	362
Implemented	:	301
Unimplemented	:	21
Unimplementable	:	16
Partial	:	2
Dummy	:	19
Untested	:	1

FUNCTION COUNTS DO NOT ADD UP!!

Data Types:

Total Number	:	48
Implemented	:	45
Unimplemented	:	2
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	1

Feature Flags:

Total Number	:	53
Implemented	:	0
Unimplemented	:	0
Unimplementable	:	0
Partial	:	0
Dummy	:	0
Untested	:	0

FEATURE FLAG COUNTS DO NOT ADD UP!!

Constants:

Total Number	:	444
Implemented	:	379
Unimplemented	:	63
Unimplementable	:	2
Partial	:	0
Dummy	:	0
Untested	:	0

Command and Variable Index

There are currently no Command and Variable Index entries.

Concept Index

There are currently no Concept Index entries.

