RTEMS POSIX 1003.1 Compliance Guide

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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 Increasable 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

```
aio_read(), Function, Dummy Implementation
```

6.7.3 Asynchronous Write

```
aio_write(), 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

```
aio_error(), Function, Dummy Implementation
```

6.7.6 Retrieve Return Status of Asynchronous I/O Operation

```
aio_return(), Function, Dummy Implementation
```

6.7.7 Cancel Asynchronous I/O Request

```
aio_cancel(), Function, Dummy Implementation
```

6.7.8 Wait for Asynchronous I/O Request

```
aio_suspend(), 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 - MIN > 0 and TIME > 0

Case B - MIN > 0 and TIME = 0

Case C - MIN = 0 and TIME > 0

Case D - MIN = 0 and 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

```
tcgetprgrp(), 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_settime(), 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.