

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 Increaseable 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

`PTHREAD_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.

