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Linux Ubuntu 26.04 Manual Pages on command 'initstate_r.3'

\$ man initstate_r.3

random_r(3) Library Functions Manual random_r(3)

NAME

random_r, srandom_r, initstate_r, setstate_r - reentrant random number generator

LIBRARY

Standard C library (libc, -lc)

SYNOPSIS

```
#include <stdlib.h>

int random_r(struct random_data *restrict buf,
             int32_t *restrict result);

int srandom_r(unsigned int seed, struct random_data *buf);

int initstate_r(unsigned int seed,
               char statebuf[restrict .statelen], size_t statelen,
               struct random_data *restrict buf);

int setstate_r(char *restrict statebuf,
               struct random_data *restrict buf);
```

Feature Test Macro Requirements for glibc (see feature_test_macros(7)):

```
random_r(), srandom_r(), initstate_r(), setstate_r():

/* glibc >= 2.19: */ _DEFAULT_SOURCE

|| /* glibc <= 2.19: */ _SVID_SOURCE || _BSD_SOURCE
```

DESCRIPTION

These functions are the reentrant equivalents of the functions described in random(3). They are suitable for use in multithreaded programs where each thread needs to obtain an independent, reproducible sequence of random numbers.

The `random_r()` function is like `random(3)`, except that instead of using state information maintained in a global variable, it uses the state information in the argument pointed to by `buf`, which must have been previously initialized by `initstate_r()`. The generated random number is returned in the argument `result`.

The `srandom_r()` function is like `srandom(3)`, except that it initializes the seed for the random number generator whose state is maintained in the object pointed to by `buf`, which must have been previously initialized by `initstate_r()`, instead of the seed associated with the global state variable.

The `initstate_r()` function is like `initstate(3)`, except that it initializes the state in the object pointed to by `buf`, rather than initializing the global state variable. Before calling this function, the `buf.state` field must be initialized to `NULL`. The `initstate_r()` function records a pointer to the `statebuf` argument inside the structure pointed to by `buf`. Thus, `statebuf` should not be deallocated so long as `buf` is still in use. (So, `statebuf` should typically be allocated as a static variable, or allocated on the heap using `malloc(3)` or similar.)

The `setstate_r()` function is like `setstate(3)`, except that it modifies the state in the object pointed to by `buf`, rather than modifying the global state variable. `state` must first have been initialized using `initstate_r()` or be the result of a previous call of `setstate_r()`.

RETURN VALUE

All of these functions return 0 on success. On error, -1 is returned, with errno set to indicate the error.

ERRORS

EINVAL A state array of less than 8 bytes was specified to `initstate_r()`.

EINVAL The statebuf or buf argument to setstate r() was NULL.

EINVAL The buf or result argument to random_r() was NULL.

ATTRIBUTES

For an explanation of the terms used in this section, see `attributes(7)`.

[illegible]

?	Interface	?	Attribute	?	Value	?

[illegible]

? random r(), srandom r(), initstate r(), setstate r() ? Thread safety ? MT-Safe race:buf ?

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STANDARDS

GNU.

BUGS

The `initstate_r()` interface is confusing. It appears that the `random_data` type is intended to be opaque, but the implementation requires the user to either initialize the `buf.state` field to `NULL` or zero out the entire structure before the call.

SEE ALSO

`drand48(3)`, `rand(3)`, `random(3)`

Linux man-pages 6.17

2026-02-08

`random_r(3)`