



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

\$ man random.3

random(3) Library Functions Manual random(3)

NAME

random, srand, initstate, setstate - random number generator

LIBRARY

Standard C library (libc, -lc)

SYNOPSIS

```
#include <stdlib.h>

long random(void);

void srand(unsigned int seed);

char *initstate(size_t n;
               unsigned int seed, char state[n], size_t n);

char *setstate(char *state);
```

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

random(), srand(), initstate(), setstate():

```
_XOPEN_SOURCE >= 500

/* glibc >= 2.19: */ _DEFAULT_SOURCE

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

DESCRIPTION

The random() function uses a nonlinear additive feedback random number generator employing a default table of size 31 long integers to return successive pseudo-random numbers in the range from 0 to $2^{31} - 1$. The period of this random number generator is very large, approximately $16 * ((2^{31}) - 1)$.

The srand() function sets its argument as the seed for a new sequence of pseudo-random in?

tegers to be returned by `random()`. These sequences are repeatable by calling `srandom()` with the same seed value. If no seed value is provided, the `random()` function is automatically seeded with a value of 1.

The `initstate()` function allows a state array `state` to be initialized for use by `random()`.

The size of the state array `n` is used by `initstate()` to decide how sophisticated a random number generator it should use?the larger the state array, the better the random numbers will be. Current "optimal" values for the size of the state array `n` are 8, 32, 64, 128, and 256 bytes; other amounts will be rounded down to the nearest known amount. Using less than 8 bytes results in an error. `seed` is the seed for the initialization, which specifies a starting point for the random number sequence, and provides for restarting at the same point.

The `setstate()` function changes the state array used by the `random()` function. The state array `state` is used for random number generation until the next call to `initstate()` or `setstate()`. `state` must first have been initialized using `initstate()` or be the result of a previous call of `setstate()`.

RETURN VALUE

The random() function returns a value between 0 and $(2^{31}) - 1$. The srand() function re-initializes the random number generator with the seed value. If the same seed is supplied, it will produce the same sequence of random numbers. If no seed is supplied, it turns no value.

The `initstate()` function returns a pointer to the previous state array. On failure, it returns `NULL`, and `errno` is set to indicate the error.

On success, `setstate()` returns a pointer to the previous state array. On failure, it returns `NULL`, and `errno` is set to indicate the error.

ERRORS

EINVAL The state argument given to setstate() was NULL.

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

ATTRIBUTES

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

[illegible]

?	Interface	?	Attribute	?	Value	?
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[illegible]

? random(), srandom(), initstate(), setstate() ? Thread safety ? MT-Safe ?

[illegible]

STANDARDS

POSIX.1-2008.

HISTORY

POSIX.1-2001, 4.3BSD.

NOTES

Random-number generation is a complex topic. Numerical Recipes in C: The Art of Scientific Computing (William H. Press, Brian P. Flannery, Saul A. Teukolsky, William T. Vetterling; New York: Cambridge University Press, 2007, 3rd ed.) provides an excellent discussion of practical random-number generation issues in Chapter 7 (Random Numbers).

For a more theoretical discussion which also covers many practical issues in depth, see Chapter 3 (Random Numbers) in Donald E. Knuth's The Art of Computer Programming, volume 2 (Seminumerical Algorithms), 2nd ed.; Reading, Massachusetts: Addison-Wesley Publishing Company, 1981.

CAVEATS

The `random()` function should not be used in multithreaded programs where reproducible behavior is required. Use `random_r(3)` for that purpose.

BUGS

According to POSIX, `initstate()` should return NULL on error. In the glibc implementation, `errno` is (as specified) set on error, but the function does not return NULL.

SEE ALSO

`getrandom(2)`, `drand48(3)`, `rand(3)`, `random_r(3)`, `srand(3)`

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2026-02-08

`random(3)`