

**NAME**

signal – ANSI C signal handling

**SYNOPSIS**

```
#include <signal.h>
```

```
typedef void (*sighandler_t)(int);
```

```
sighandler_t signal(int signum, sighandler_t handler);
```

**DESCRIPTION**

The behavior of **signal()** varies across Unix versions, and has also varied historically across different versions of Linux. **Avoid its use:** use **sigaction(2)** instead. See *Portability* below.

**signal()** sets the disposition of the signal *signum* to *handler*, which is either **SIG\_IGN**, **SIG\_DFL**, or the address of a programmer-defined function (a "signal handler").

If the signal *signum* is delivered to the process, then one of the following happens:

- \* If the disposition is set to **SIG\_IGN**, then the signal is ignored.
- \* If the disposition is set to **SIG\_DFL**, then the default action associated with the signal (see **signal(7)**) occurs.
- \* If the disposition is set to a function, then first either the disposition is reset to **SIG\_DFL**, or the signal is blocked (see *Portability* below), and then *handler* is called with argument *signum*. If invocation of the handler caused the signal to be blocked, then the signal is unblocked upon return from the handler.

The signals **SIGKILL** and **SIGSTOP** cannot be caught or ignored.

**RETURN VALUE**

**signal()** returns the previous value of the signal handler, or **SIG\_ERR** on error.

**ERRORS****EINVAL**

*signum* is invalid.

**CONFORMING TO**

C89, C99, POSIX.1-2001.

**NOTES**

The effects of **signal()** in a multithreaded process are unspecified.

According to POSIX, the behavior of a process is undefined after it ignores a **SIGFPE**, **SIGILL**, or **SIGSEGV** signal that was not generated by **kill(2)** or **raise(3)**. Integer division by zero has undefined result. On some architectures it will generate a **SIGFPE** signal. (Also dividing the most negative integer by  $-1$  may generate **SIGFPE**.) Ignoring this signal might lead to an endless loop.

See **sigaction(2)** for details on what happens when **SIGCHLD** is set to **SIG\_IGN**.

See **signal(7)** for a list of the async-signal-safe functions that can be safely called from inside a signal handler.

The use of *sighandler\_t* is a GNU extension. Various versions of libc predefine this type; libc4 and libc5 define *SignalHandler*; glibc defines *sig\_t* and, when **\_GNU\_SOURCE** is defined, also *sighandler\_t*. Without use of such a type, the declaration of **signal()** is the somewhat harder to read:

```
void ( *signal(int signum, void (*handler)(int)) ) (int);
```

**Portability**

The only portable use of **signal()** is to set a signal's disposition to **SIG\_DFL** or **SIG\_IGN**. The semantics when using **signal()** to establish a signal handler vary across systems (and POSIX.1 explicitly permits this variation); **do not use it for this purpose**.

POSIX.1 solved the portability mess by specifying **sigaction(2)**, which provides explicit control of the semantics when a signal handler is invoked; use that interface instead of **signal()**.

In the original Unix systems, when a handler that was established using **signal()** was invoked by the delivery of a signal, the disposition of the signal would be reset to **SIG\_DFL**, and the system did not block delivery of further instances of the signal. System V also provides these semantics for **signal()**. This was bad because the signal might be delivered again before the handler had a chance to reestablish itself. Furthermore, rapid deliveries of the same signal could result in recursive invocations of the handler.

BSD improved on this situation by changing the semantics of signal handling (but, unfortunately, silently changed the semantics when establishing a handler with **signal()**). On BSD, when a signal handler is invoked, the signal disposition is not reset, and further instances of the signal are blocked from being delivered while the handler is executing.

The situation on Linux is as follows:

- \* The kernel's **signal()** system call provides System V semantics.
- \* By default, in glibc 2 and later, the **signal()** wrapper function does not invoke the kernel system call. Instead, it calls **sigaction(2)** using flags that supply BSD semantics. This default behavior is provided as long as the **\_BSD\_SOURCE** feature test macro is defined. By default, **\_BSD\_SOURCE** is defined; it is also implicitly defined if one defines **\_GNU\_SOURCE**, and can of course be explicitly defined.

On glibc 2 and later, if the **\_BSD\_SOURCE** feature test macro is not defined, then **signal()** provides System V semantics. (The default implicit definition of **\_BSD\_SOURCE** is not provided if one invokes **gcc(1)** in one of its standard modes (**-std=xxx** or **-ansi**) or defines various other feature test macros such as **\_POSIX\_SOURCE**, **\_XOPEN\_SOURCE**, or **\_SVID\_SOURCE**; see **feature\_test\_macros(7)**.)

- \* The **signal()** function in Linux libc4 and libc5 provide System V semantics. If one on a libc5 system includes **<bsd/signal.h>** instead of **<signal.h>**, then **signal()** provides BSD semantics.

## SEE ALSO

**kill(1)**, **alarm(2)**, **kill(2)**, **killpg(2)**, **pause(2)**, **sigaction(2)**, **signalfd(2)**, **sigpending(2)**, **sigprocmask(2)**, **sigqueue(2)**, **sigsuspend(2)**, **bsd\_signal(3)**, **raise(3)**, **siginterrupt(3)**, **sigsetops(3)**, **sigvec(3)**, **sysv\_signal(3)**, **feature\_test\_macros(7)**, **signal(7)**

## COLOPHON

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