

NAME

del_curterm, mvcur, putp, restartterm, set_curterm, setupterm, tigetflag, tigetnum, tigetstr, tparm, tparm, tputs, vid_attr, vid_puts, vidattr, vidputs - curses interfaces to terminfo database

SYNOPSIS

```
#include <curses.h>
```

```
#include <term.h>
```

```
TERMINAL *cur_term;
```

```
const char * const boolnames[];
```

```
const char * const boolcodes[];
```

```
const char * const boolfnames[];
```

```
const char * const numnames[];
```

```
const char * const numcodes[];
```

```
const char * const numfnames[];
```

```
const char * const strnames[];
```

```
const char * const strcodes[];
```

```
const char * const strfnames[];
```

```
int setupterm(const char *term, int filedес, int *errret);
```

```
TERMINAL *set_curterm(TERMINAL *nterm);
```

```
int del_curterm(TERMINAL *oterm);
```

```
int restartterm(const char *term, int filedес, int *errret);
```

```
char *tparm(const char *str, ...);
```

```
int tputs(const char *str, int affcnt, int (*putc)(int));
```

```
int putp(const char *str);
```

```
int vidputs(chtype attrs, int (*putc)(int));
```

```
int vidattr(chtype attrs);
```

```
int vid_puts(attr_t attrs, short pair, void *opts, int (*putc)(int));
```

```
int vid_attr(attr_t attrs, short pair, void *opts);
```

```
int mvcur(int oldrow, int oldcol, int newrow, int newcol);
```

```
int tigetflag(const char *capname);
```

```
int tigetnum(const char *capname);
```

```
char *tigetstr(const char *capname);
```

```
char *tparm(const char *str, ...);
```

DESCRIPTION

These low-level routines must be called by programs that have to deal directly with the **terminfo** database to handle certain terminal capabilities, such as programming function keys. For all other functionality, **curses** routines are more suitable and their use is recommended.

None of these functions use (or are aware of) multibyte character strings such as UTF-8:

- ⊕ capability names use the POSIX portable character set
- ⊕ capability string values have no associated encoding; they are strings of 8-bit characters.

Initialization

Initially, **setupterm** should be called. The high-level curses functions **initscr** and **newterm** call **setupterm** to initialize the low-level set of terminal-dependent variables [listed in **terminfo(5)**].

Applications can use the terminal capabilities either directly (via header definitions), or by special functions. The header files **curses.h** and **term.h** should be included (in this order) to get the definitions for these strings, numbers, and flags.

The **terminfo** variables **lines** and **columns** are initialized by **setupterm** as follows:

- ⊕ If **use_env(FALSE)** has been called, values for **lines** and **columns** specified in **terminfo** are used.
- ⊕ Otherwise, if the environment variables **LINES** and **COLUMNS** exist, their values are used. If these environment variables do not exist and the program is running in a window, the current window size is used. Otherwise, if the environment variables do not exist, the values for **lines** and **columns** specified in the **terminfo** database are used.

Parameterized strings should be passed through **tparm** to instantiate them. All **terminfo** strings (including the output of **tparm**) should be printed with **tputs** or **putp**. Call **reset_shell_mode** to restore the tty modes before exiting [see **curs_kernel(3X)**].

Programs which use cursor addressing should

- ⊕ output **enter_ca_mode** upon startup and
- ⊕ output **exit_ca_mode** before exiting.

Programs which execute shell subprocesses should

- ⊕ call **reset_shell_mode** and output **exit_ca_mode** before the shell is called and
- ⊕ output **enter_ca_mode** and call **reset_prog_mode** after returning from the shell.

The **setupterm** routine reads in the **terminfo** database, initializing the **terminfo** structures, but does not set up the output virtualization structures used by **curses**. These are its parameters:

term is the terminal type, a character string. If *term* is null, the environment variable **TERM** is used.

filedes

is the file descriptor used for all output.

errret points to an optional location where an error status can be returned to the caller. If *errret* is not null, then **setupterm** returns **OK** or **ERR** and stores a status value in the integer pointed to by *errret*. A return value of **OK** combined with status of **1** in *errret* is normal.

If **ERR** is returned, examine *errret*:

1 means that the terminal is hardcopy, cannot be used for curses applications.

setupterm determines if the entry is a hardcopy type by checking the **hc (hardcopy)** capability.

0 means that the terminal could not be found, or that it is a generic type, having too little information for curses applications to run.

setupterm determines if the entry is a generic type by checking the **gn (generic)** capability.

-1 means that the **terminfo** database could not be found.

If *errret* is null, **setupterm** prints an error message upon finding an error and exits. Thus, the simplest call is:

```
setupterm((char *)0, 1, (int *)0);
```

which uses all the defaults and sends the output to **stdout**.

The Terminal State

The **setupterm** routine stores its information about the terminal in a **TERMINAL** structure pointed to by the global variable **cur_term**. If it detects an error, or decides that the terminal is unsuitable (hardcopy or generic), it discards this information, making it not available to applications.

If **setupterm** is called repeatedly for the same terminal type, it will reuse the information. It maintains only one copy of a given terminal's capabilities in memory. If it is called for different terminal types, **setupterm** allocates new storage for each set of terminal capabilities.

The **set_curterm** routine sets **cur_term** to *nterm*, and makes all of the **terminfo** boolean, numeric, and string variables use the values from *nterm*. It returns the old value of **cur_term**.

The **del_curterm** routine frees the space pointed to by *oterm* and makes it available for further use. If *oterm* is the same as **cur_term**, references to any of the **terminfo** boolean, numeric, and string variables thereafter may refer to invalid memory locations until another **setupterm** has been called.

The **restartterm** routine is similar to **setupterm** and **initscr**, except that it is called after restoring memory to a previous state (for example, when reloading a game saved as a core image dump). **restartterm** assumes that the windows and the input and output options are the same as when memory was saved, but the terminal type and baud rate may be different. Accordingly, **restartterm** saves various tty state bits, calls **setupterm**, and then restores the bits.

Formatting Output

The **tparm** routine instantiates the string *str* with parameters *pi*. A pointer is returned to the result of *str* with the parameters applied. Application developers should keep in mind these quirks of the interface:

- ⊕ Although **tparm**'s actual parameters may be integers or strings, the prototype expects **long** (integer) values.
- ⊕ Aside from the **set_attributes (sgr)** capability, most terminal capabilities require no more than one or two parameters.

tiparm is a newer form of **tparm** which uses *<stdarg.h>* rather than a fixed-parameter list. Its numeric parameters are integers (int) rather than longs.

Output Functions

The **tputs** routine applies padding information to the string *str* and outputs it:

- ⊕ The *str* parameter must be a terminfo string variable or the return value from **tparm**, **tiparm**, **tgetstr**, or **tgoto**.

The **tgetstr** and **tgoto** functions are part of the *termcap* interface, which happens to share this function name with the *terminfo* interface.

- ⊕ *affcnt* is the number of lines affected, or 1 if not applicable.
- ⊕ *putc* is a **putchar**-like routine to which the characters are passed, one at a time.

The **putp** routine calls **tputs(str, 1, putchar)**. The output of **putp** always goes to **stdout**, rather than the *filedes* specified in **setupterm**.

The **vidputs** routine displays the string on the terminal in the video attribute mode *attrs*, which is any combination of the attributes listed in **curses(3X)**. The characters are passed to the **putchar**-like routine *putc*.

The **vidattr** routine is like the **vidputs** routine, except that it outputs through **putchar**.

The **vid_attr** and **vid_puts** routines correspond to *vidattr* and *vidputs*, respectively. They use a set of arguments for representing the video attributes plus color, i.e.,

- ⊕ *attrs* of type **attr_t** for the attributes and
- ⊕ *pair* of type **short** for the color-pair number.

The **vid_attr** and **vid_puts** routines are designed to use the attribute constants with the *WA_* prefix.

X/Open Curses reserves the *opts* argument for future use, saying that applications must provide a null pointer for that argument. As an extension, this implementation allows *opts* to be used as a pointer to **int**, which overrides the *pair* (**short**) argument.

The **mvcur** routine provides low-level cursor motion. It takes effect immediately (rather than at the next refresh).

While **putp** and **mvcur** are low-level functions which do not use the high-level curses state, they are declared in **<curses.h>** because SystemV did this (see **HISTORY**).

Terminal Capability Functions

The **tigetflag**, **tigetnum** and **tigetstr** routines return the value of the capability corresponding to the **terminfo** *capname* passed to them, such as **xenl**. The *capname* for each capability is given in the table column entitled *capname* code in the capabilities section of **terminfo(5)**.

These routines return special values to denote errors.

The **tigetflag** routine returns

- 1 if *capname* is not a boolean capability, or
- 0 if it is canceled or absent from the terminal description.

The **tigetnum** routine returns

- 2 if *capname* is not a numeric capability, or
- 1 if it is canceled or absent from the terminal description.

The **tigetstr** routine returns

- (char *)-1 if *capname* is not a string capability, or
- 0 if it is canceled or absent from the terminal description.

Terminal Capability Names

These null-terminated arrays contain

- ⊕ the short terminfo names ("codes"),
- ⊕ the **termcap** names ("names"), and
- ⊕ the long terminfo names ("fnames")

for each of the predefined **terminfo** variables:

```
const char *boolnames[], *boolcodes[], *boolfnames[]
const char *numnames[], *numcodes[], *numfnames[]
const char *strnames[], *strcodes[], *strfnames[]
```

RETURN VALUE

Routines that return an integer return **ERR** upon failure and **OK** (SVr4 only specifies "an integer value other than **ERR**") upon successful completion, unless otherwise noted in the preceding routine descriptions.

Routines that return pointers always return **NULL** on error.

X/Open defines no error conditions. In this implementation

del_curterm

returns an error if its terminal parameter is null.

putp calls **tputs**, returning the same error-codes.

restartterm

returns an error if the associated call to **setupterm** returns an error.

setupterm

returns an error if it cannot allocate enough memory, or create the initial windows (stdscr, curscr, newscr). Other error conditions are documented above.

tputs returns an error if the string parameter is null. It does not detect I/O errors: X/Open states that **tputs** ignores the return value of the output function *putc*.

Compatibility macros

This implementation provides a few macros for compatibility with systems before SVr4 (see **HISTORY**). Those include **crmode**, **fixterm**, **gettmode**, **nocrmode**, **resetterm**, **saveterm**, and **setterm**.

In SVr4, those are found in `<curses.h>`, but except for **setterm**, are likewise macros. The one function, **setterm**, is mentioned in the manual page. The manual page notes that the **setterm** routine was replaced by **setupterm**, stating that the call:

```
setupterm(term, 1, (int *)0)
```

provides the same functionality as **setterm**(*term*), and is not recommended for new programs. This implementation provides each of those symbols as macros for BSD compatibility,

HISTORY

SVr2 introduced the terminfo feature. Its programming manual mentioned these low-level functions:

Function Description

```
-----
fixterm  restore tty to "in curses"
         state
gettmode establish current tty
```

modes
 mvcur low level cursor
 motion
 putp utility function that uses **tputs** to send characters via **putchar**.
 resetterm set tty modes to "out of curses" state
 resetty reset tty flags to stored value
 saveterm save current modes as "in curses" state
 savetty store current tty flags
 setterm establish terminal with given type
 setupterm establish terminal with given type
 tparm instantiate a string expression with parameters
 tputs apply padding information to a string
 vidattr like **vidputs**, but outputs through **putchar**
 vidputs output a string to put terminal in a specified video attribute mode

The programming manual also mentioned functions provided for termcap compatibility (commenting that they "may go away at a later date"):

FunctionDescription

tgetent look up termcap entry for given *name*
 tgetflag get boolean entry for given *id*
 tgetnum get numeric entry for given *id*
 tgetstr get string entry for given *id*
 tgoto apply parameters to given capability

`tputs` apply padding to capability, calling a function to put characters

Early terminfo programs obtained capability values from the **TERMINAL** structure initialized by **setupterm**.

SVr3 extended terminfo by adding functions to retrieve capability values (like the termcap interface), and reusing `tgoto` and `tputs`:

FunctionDescription

`tigetflag` get boolean entry for given

id

`tigetnumget` numeric entry for given *id*

`tigetstr` get string entry for given

id

SVr3 also replaced several of the SVr2 terminfo functions which had no counterpart in the termcap interface, documenting them as obsolete:

Function Replaced

by

`crmode` `cbreak`

`fixterm` `reset_prog_mode`

`gettmode` N/A

`nocrmodenocbreak`

`resetterm` `reset_shell_mode`

`saveterm` `def_prog_mode`

`setterm` `setupterm`

SVr3 kept the **mvcur**, **vidattr** and **vidputs** functions, along with **putp**, **tparm** and **tputs**. The latter were needed to support padding, and handling functions such as **vidattr** (which used more than the two parameters supported by **tgoto**).

SVr3 introduced the functions for switching between terminal descriptions, e.g., **set_curterm**. The various global variables such as **boolnames** were mentioned in the programming manual at this point.

SVr4 added the **vid_attr** and **vid_puts** functions.

There are other low-level functions declared in the curses header files on Unix systems, but none were documented. The functions marked "obsolete" remained in use by the Unix **vi** editor.

PORTABILITY

Legacy functions

X/Open notes that **vidattr** and **vidputs** may be macros.

The function **setterm** is not described by X/Open and must be considered non-portable. All other functions are as described by X/Open.

Legacy data

setupterm copies the terminal name to the array **ttytype**. This is not part of X/Open Curses, but is assumed by some applications.

Other implementations may not declare the capability name arrays. Some provide them without declaring them. X/Open does not specify them.

Extended terminal capability names, e.g., as defined by **tic -x**, are not stored in the arrays described here.

Output buffering

Older versions of **ncurses** assumed that the file descriptor passed to **setupterm** from **initscr** or **newterm** uses buffered I/O, and would write to the corresponding stream. In addition to the limitation that the terminal was left in block-buffered mode on exit (like System V curses), it was problematic because **ncurses** did not allow a reliable way to cleanup on receiving SIGTSTP.

The current version (**ncurses6**) uses output buffers managed directly by **ncurses**. Some of the low-level functions described in this manual page write to the standard output. They are not signal-safe. The high-level functions in **ncurses** use alternate versions of these functions using the more reliable buffering scheme.

Function prototypes

The X/Open Curses prototypes are based on the SVr4 curses header declarations, which were defined at the same time the C language was first standardized in the late 1980s.

- ⊕ X/Open Curses uses **const** less effectively than a later design might, in some cases applying it needlessly to values already constant, and in most cases overlooking parameters which normally would use **const**. Using constant parameters for functions which do not use **const** may prevent the program from compiling. On the other hand, *writable strings* are an obsolescent feature.

As an extension, this implementation can be configured to change the function prototypes to use the **const** keyword. The ncurses ABI 6 enables this feature by default.

- ⊕ X/Open Curses prototypes **tparm** with a fixed number of parameters, rather than a variable argument list.

This implementation uses a variable argument list, but can be configured to use the fixed-parameter list. Portable applications should provide 9 parameters after the format; zeroes are fine for this purpose.

In response to review comments by Thomas E. Dickey, X/Open Curses Issue 7 proposed the **tiparm** function in mid-2009.

Special TERM treatment

If configured to use the terminal-driver, e.g., for the MinGW port,

- ⊕ **setupterm** interprets a missing/empty TERM variable as the special value "unknown".
- ⊕ **setupterm** allows explicit use of the the windows console driver by checking if \$TERM is set to "#win32con" or an abbreviation of that string.

Other portability issues

In System V Release 4, **set_curterm** has an **int** return type and returns **OK** or **ERR**. We have chosen to implement the X/Open Curses semantics.

In System V Release 4, the third argument of **tputs** has the type **int (*putc)(char)**.

At least one implementation of X/Open Curses (Solaris) returns a value other than **OK/ERR** from **tputs**. That returns the length of the string, and does no error-checking.

X/Open notes that after calling **mvcur**, the curses state may not match the actual terminal state, and that an application should touch and refresh the window before resuming normal curses calls. Both **ncurses** and System V Release 4 curses implement **mvcur** using the SCREEN data allocated in either **initscr** or **newterm**. So though it is documented as a terminfo function, **mvcur** is really a curses function which is not well specified.

X/Open states that the old location must be given for **mvcur**. This implementation allows the caller to use -1's for the old ordinates. In that case, the old location is unknown.

SEE ALSO

`curl_terminfo(3X)`

`curl_terminfo(3X)`

**`curses(3X), curl_initscr(3X), curl_kernel(3X), curl_termcap(3X), curl_variables(3X),
term_variables(3X), putc(3), terminfo(5)`**

`curl_terminfo(3X)`