

NAME

ncurses - CRT screen handling and optimization package

SYNOPSIS

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

DESCRIPTION

The **ncurses** library routines give the user a terminal-independent method of updating character screens with reasonable optimization. This implementation is "new curses" (ncurses) and is the approved replacement for 4.4BSD classic curses, which has been discontinued. This describes **ncurses** version 6.2 (patch 20210220).

The **ncurses** library emulates the curses library of System V Release 4 UNIX, and XPG4 (X/Open Portability Guide) curses (also known as XSI curses). XSI stands for X/Open System Interfaces Extension. The **ncurses** library is freely redistributable in source form. Differences from the SVr4 curses are summarized under the **EXTENSIONS** and **PORTABILITY** sections below and described in detail in the respective **EXTENSIONS**, **PORTABILITY** and **BUGS** sections of individual man pages.

The **ncurses** library also provides many useful extensions, i.e., features which cannot be implemented by a simple add-on library but which require access to the internals of the library.

A program using these routines must be linked with the **-lncurses** option, or (if it has been generated) with the debugging library **-lncurses_g**. (Your system integrator may also have installed these libraries under the names **-lncurses** and **-lncurses_g**.) The **ncurses_g** library generates trace logs (in a file called 'trace' in the current directory) that describe curses actions. See also the section on **ALTERNATE CONFIGURATIONS**.

The **ncurses** package supports: overall screen, window and pad manipulation; output to windows and pads; reading terminal input; control over terminal and **curses** input and output options; environment query routines; color manipulation; use of soft label keys; terminfo capabilities; and access to low-level terminal-manipulation routines.

Initialization

The library uses the locale which the calling program has initialized. That is normally done with **setlocale**:

```
setlocale(LC_ALL, "");
```

If the locale is not initialized, the library assumes that characters are printable as in ISO-8859-1, to work with certain legacy programs. You should initialize the locale and not rely on specific details of

the library when the locale has not been setup.

The function **initscr** or **newterm** must be called to initialize the library before any of the other routines that deal with windows and screens are used. The routine **endwin(3X)** must be called before exiting.

To get character-at-a-time input without echoing (most interactive, screen oriented programs want this), the following sequence should be used:

```
initscr(); cbreak(); noecho();
```

Most programs would additionally use the sequence:

```
intrflush(stdscr, FALSE);  
keypad(stdscr, TRUE);
```

Before a **curses** program is run, the tab stops of the terminal should be set and its initialization strings, if defined, must be output. This can be done by executing the **tput init** command after the shell environment variable **TERM** has been exported. **tset(1)** is usually responsible for doing this. [See **terminfo(5)** for further details.]

Datatypes

The **ncurses** library permits manipulation of data structures, called *windows*, which can be thought of as two-dimensional arrays of characters representing all or part of a CRT screen. A default window called **stdscr**, which is the size of the terminal screen, is supplied. Others may be created with **newwin**.

Note that **curses** does not handle overlapping windows, that's done by the **panel(3X)** library. This means that you can either use **stdscr** or divide the screen into tiled windows and not using **stdscr** at all. Mixing the two will result in unpredictable, and undesired, effects.

Windows are referred to by variables declared as **WINDOW ***. These data structures are manipulated with routines described here and elsewhere in the **ncurses** manual pages. Among those, the most basic routines are **move** and **addch**. More general versions of these routines are included with names beginning with **w**, allowing the user to specify a window. The routines not beginning with **w** affect **stdscr**.

After using routines to manipulate a window, **refresh(3X)** is called, telling **curses** to make the user's CRT screen look like **stdscr**. The characters in a window are actually of type **chtype**, (character and attribute data) so that other information about the character may also be stored with each character.

Special windows called *pads* may also be manipulated. These are windows which are not constrained

to the size of the screen and whose contents need not be completely displayed. See **curs_ pad**(3X) for more information.

In addition to drawing characters on the screen, video attributes and colors may be supported, causing the characters to show up in such modes as underlined, in reverse video, or in color on terminals that support such display enhancements. Line drawing characters may be specified to be output. On input, **curses** is also able to translate arrow and function keys that transmit escape sequences into single values. The video attributes, line drawing characters, and input values use names, defined in **<curses.h>**, such as **A_REVERSE**, **ACS_HLINE**, and **KEY_LEFT**.

Environment variables

If the environment variables **LINES** and **COLUMNS** are set, or if the program is executing in a window environment, line and column information in the environment will override information read by *terminfo*. This would affect a program running in an AT&T 630 layer, for example, where the size of a screen is changeable (see **ENVIRONMENT**).

If the environment variable **TERMINFO** is defined, any program using **curses** checks for a local terminal definition before checking in the standard place. For example, if **TERM** is set to **att4424**, then the compiled terminal definition is found in

/usr/share/misc/terminfo/a/att4424.

(The **a** is copied from the first letter of **att4424** to avoid creation of huge directories.) However, if **TERMINFO** is set to **\$HOME/myterms**, **curses** first checks

\$HOME/myterms/a/att4424,

and if that fails, it then checks

/usr/share/misc/terminfo/a/att4424.

This is useful for developing experimental definitions or when write permission in **/usr/share/misc/terminfo** is not available.

The integer variables **LINES** and **COLS** are defined in **<curses.h>** and will be filled in by **initscr** with the size of the screen. The constants **TRUE** and **FALSE** have the values **1** and **0**, respectively.

The **curses** routines also define the **WINDOW** * variable **curscr** which is used for certain low-level operations like clearing and redrawing a screen containing garbage. The **curscr** can be used in only a few routines.

Routine and Argument Names

Many **curses** routines have two or more versions. The routines prefixed with **w** require a window argument. The routines prefixed with **p** require a pad argument. Those without a prefix generally use **stdscr**.

The routines prefixed with **mv** require a *y* and *x* coordinate to move to before performing the appropriate action. The **mv** routines imply a call to **move** before the call to the other routine. The coordinate *y* always refers to the row (of the window), and *x* always refers to the column. The upper left-hand corner is always (0,0), not (1,1).

The routines prefixed with **mvw** take both a window argument and *x* and *y* coordinates. The window argument is always specified before the coordinates.

In each case, *win* is the window affected, and *pad* is the pad affected; *win* and *pad* are always pointers to type **WINDOW**.

Option setting routines require a Boolean flag *bf* with the value **TRUE** or **FALSE**; *bf* is always of type **bool**. Most of the data types used in the library routines, such as **WINDOW**, **SCREEN**, **bool**, and **chtype** are defined in `<curses.h>`. Types used for the terminfo routines such as **TERMINAL** are defined in `<term.h>`.

This manual page describes functions which may appear in any configuration of the library. There are two common configurations of the library:

ncurses

the "normal" library, which handles 8-bit characters. The normal (8-bit) library stores characters combined with attributes in **chtype** data.

Attributes alone (no corresponding character) may be stored in **chtype** or the equivalent **attr_t** data. In either case, the data is stored in something like an integer.

Each cell (row and column) in a **WINDOW** is stored as a **chtype**.

ncursesw

the so-called "wide" library, which handles multibyte characters (see the section on **ALTERNATE CONFIGURATIONS**). The "wide" library includes all of the calls from the "normal" library. It adds about one third more calls using data types which store multibyte characters:

cchar_t

corresponds to **chtype**. However it is a structure, because more data is stored than can fit into an integer. The characters are large enough to require a full integer value - and there may be more than one character per cell. The video attributes and color are stored in separate fields of the structure.

Each cell (row and column) in a **WINDOW** is stored as a **cchar_t**.

The **setcchar(3X)** and **getcchar(3X)** functions store and retrieve the data from a **cchar_t** structure.

wchar_t

stores a "wide" character. Like **chtype**, this may be an integer.

wint_t

stores a **wchar_t** or **WEOF** - not the same, though both may have the same size.

The "wide" library provides new functions which are analogous to functions in the "normal" library. There is a naming convention which relates many of the normal/wide variants: a "_w" is inserted into the name. For example, **waddch** becomes **wadd_wch**.

Routine Name Index

The following table lists the **curses** routines provided in the "normal" and "wide" libraries and the names of the manual pages on which they are described. Routines flagged with "*" are ncurses-specific, not described by XPG4 or present in SVr4.

curses Routine Name	Manual Page Name
=====	=====
COLOR_PAIR	 curs_color(3X)
PAIR_NUMBER	 curs_attr(3X)
add_wch	 curs_add_wch(3X)
add_wchnstr	 curs_add_wchstr(3X)
add_wchstr	 curs_add_wchstr(3X)
addch	 curs_addch(3X)
addchnstr	 curs_addchstr(3X)
addchstr	 curs_addchstr(3X)
addnstr	 curs_addstr(3X)
addnwstr	 curs_addwstr(3X)
addstr	 curs_addstr(3X)
addwstr	 curs_addwstr(3X)

alloc_pair	new_pair(3X)*
assume_default_colors	default_colors(3X)*
attr_get	 curs_attr(3X)
attr_off	 curs_attr(3X)
attr_on	 curs_attr(3X)
attr_set	 curs_attr(3X)
attroff	 curs_attr(3X)
attron	 curs_attr(3X)
attrset	 curs_attr(3X)
baudrate	 curs_termattrs(3X)
beep	 curs_beep(3X)
bkgd	 curs_bkgd(3X)
bkgdset	 curs_bkgd(3X)
bkgrnd	 curs_bkgrnd(3X)
bkgrndset	 curs_bkgrnd(3X)
border	 curs_border(3X)
border_set	 curs_border_set(3X)
box	 curs_border(3X)
box_set	 curs_border_set(3X)
can_change_color	 curs_color(3X)
cbreak	 curs_inopts(3X)
chgat	 curs_attr(3X)
clear	 curs_clear(3X)
clearok	 curs_outopts(3X)
clrtoebot	 curs_clear(3X)
clrtoeol	 curs_clear(3X)
color_content	 curs_color(3X)
color_set	 curs_attr(3X)
copywin	 curs_overlay(3X)
curs_set	 curs_kernel(3X)
curses_trace	 curs_trace(3X)*
curses_version	 curs_extend(3X)*
def_prog_mode	 curs_kernel(3X)
def_shell_mode	 curs_kernel(3X)
define_key	 define_key(3X)*
del_curterm	 curs_terminfo(3X)
delay_output	 curs_util(3X)
delch	 curs_delch(3X)
deleteln	 curs_deleteln(3X)
delscreen	 curs_initscr(3X)

delwin	 curs_window(3X)
derwin	 curs_window(3X)
douupdate	 curs_refresh(3X)
dupwin	 curs_window(3X)
echo	 curs_inopts(3X)
echo_wchar	 curs_add_wch(3X)
echochar	 curs_addch(3X)
endwin	 curs_initscr(3X)
erase	 curs_clear(3X)
erasechar	 curs_termattrs(3X)
erasewchar	 curs_termattrs(3X)
exit_curses	 curs_memleaks(3X)*
exit_terminfo	 curs_memleaks(3X)*
extended_color_content	 curs_color(3X)*
extended_pair_content	 curs_color(3X)*
extended_slk_color	 curs_slk(3X)*
filter	 curs_util(3X)
find_pair	 new_pair(3X)*
flash	 curs_beep(3X)
flushinp	 curs_util(3X)
free_pair	 new_pair(3X)*
get_wch	 curs_get_wch(3X)
get_wstr	 curs_get_wstr(3X)
getattrs	 curs_attr(3X)
getbegx	 curs_legacy(3X)*
getbegy	 curs_legacy(3X)*
getbegyx	 curs_getyx(3X)
getbkgd	 curs_bkgd(3X)
getbkgrnd	 curs_bkgrnd(3X)
getcchar	 curs_getcchar(3X)
getch	 curs_getch(3X)
getcurx	 curs_legacy(3X)*
getcury	 curs_legacy(3X)*
getmaxx	 curs_legacy(3X)*
getmaxy	 curs_legacy(3X)*
getmaxyx	 curs_getyx(3X)
getmouse	 curs_mouse(3X)*
getn_wstr	 curs_get_wstr(3X)
getnstr	 curs_getstr(3X)
getparx	 curs_legacy(3X)*

getpary	 curs_legacy(3X)*
getparyx	 curs_getyx(3X)
getstr	 curs_getstr(3X)
getsyx	 curs_kernel(3X)
getwin	 curs_util(3X)
getyx	 curs_getyx(3X)
halfdelay	 curs_inopts(3X)
has_colors	 curs_color(3X)
has_ic	 curs_termattrs(3X)
has_il	 curs_termattrs(3X)
has_key	 curs_getch(3X)*
has_mouse	 curs_mouse(3X)*
hline	 curs_border(3X)
hline_set	 curs_border_set(3X)
idcok	 curs_outopts(3X)
idlok	 curs_outopts(3X)
immedok	 curs_outopts(3X)
in_wch	 curs_in_wch(3X)
in_wchnstr	 curs_in_wchstr(3X)
in_wchstr	 curs_in_wchstr(3X)
inch	 curs_inch(3X)
inchnstr	 curs_inchstr(3X)
inchstr	 curs_inchstr(3X)
init_color	 curs_color(3X)
init_extended_color	 curs_color(3X)*
init_extended_pair	 curs_color(3X)*
init_pair	 curs_color(3X)
initscr	 curs_initscr(3X)
innstr	 curs_instr(3X)
innwstr	 curs_inwstr(3X)
ins_nwstr	 curs_ins_wstr(3X)
ins_wch	 curs_ins_wch(3X)
ins_wstr	 curs_ins_wstr(3X)
insch	 curs_insch(3X)
insdelln	 curs_deleteln(3X)
insertln	 curs_deleteln(3X)
insnstr	 curs_insstr(3X)
insstr	 curs_insstr(3X)
instr	 curs_instr(3X)
intrflush	 curs_inopts(3X)

inwstr	 curs_inwstr(3X)
is_cleared	 curs_opaque(3X)*
is_idcok	 curs_opaque(3X)*
is_idlok	 curs_opaque(3X)*
is_immedok	 curs_opaque(3X)*
is_keypad	 curs_opaque(3X)*
is_leaveok	 curs_opaque(3X)*
is_linetouched	 curs_touch(3X)
is_nodelay	 curs_opaque(3X)*
is_notimeout	 curs_opaque(3X)*
is_pad	 curs_opaque(3X)*
is_scrollok	 curs_opaque(3X)*
is_subwin	 curs_opaque(3X)*
is_syncok	 curs_opaque(3X)*
is_term_resized	 resizeterm(3X)*
is_wintouched	 curs_touch(3X)
isendwin	 curs_initscr(3X)
key_defined	 key_defined(3X)*
key_name	 curs_util(3X)
keybound	 keybound(3X)*
keyname	 curs_util(3X)
keyok	 keyok(3X)*
keypad	 curs_inopts(3X)
killchar	 curs_termattrs(3X)
killwchar	 curs_termattrs(3X)
leaveok	 curs_outopts(3X)
longname	 curs_termattrs(3X)
mcprint	 curs_print(3X)*
meta	 curs_inopts(3X)
mouse_trafo	 curs_mouse(3X)*
mouseinterval	 curs_mouse(3X)*
mousemask	 curs_mouse(3X)*
move	 curs_move(3X)
mvadd_wch	 curs_add_wch(3X)
mvadd_wchnstr	 curs_add_wchstr(3X)
mvadd_wchstr	 curs_add_wchstr(3X)
mvaddch	 curs_addch(3X)
mvaddchnstr	 curs_addchstr(3X)
mvaddchstr	 curs_addchstr(3X)
mvaddnstr	 curs_addstr(3X)

mvaddnwstr	 curs_addwstr(3X)
mvaddstr	 curs_addstr(3X)
mvaddwstr	 curs_addwstr(3X)
mvchgat	 curs_attr(3X)
mvcur	 curs_terminfo(3X)
mvdelch	 curs_delch(3X)
mvderwin	 curs_window(3X)
mvget_wch	 curs_get_wch(3X)
mvget_wstr	 curs_get_wstr(3X)
mvgetch	 curs_getch(3X)
mvgetn_wstr	 curs_get_wstr(3X)
mvgetnstr	 curs_getstr(3X)
mvgetstr	 curs_getstr(3X)
mvhline	 curs_border(3X)
mvhline_set	 curs_border_set(3X)
mvin_wch	 curs_in_wch(3X)
mvin_wchnstr	 curs_in_wchstr(3X)
mvin_wchstr	 curs_in_wchstr(3X)
mvinch	 curs_inch(3X)
mvinchnstr	 curs_inchstr(3X)
mvinchstr	 curs_inchstr(3X)
mvinnstr	 curs_instr(3X)
mvinnwstr	 curs_inwstr(3X)
mvins_nwstr	 curs_ins_wstr(3X)
mvins_wch	 curs_ins_wch(3X)
mvins_wstr	 curs_ins_wstr(3X)
mvinsch	 curs_insch(3X)
mvinsnstr	 curs_insstr(3X)
mvinsstr	 curs_insstr(3X)
mvinstr	 curs_instr(3X)
mvinwstr	 curs_inwstr(3X)
mvprintw	 curs_printw(3X)
mvscanw	 curs_scanw(3X)
mvvline	 curs_border(3X)
mvvline_set	 curs_border_set(3X)
mvwadd_wch	 curs_add_wch(3X)
mvwadd_wchnstr	 curs_add_wchstr(3X)
mvwadd_wchstr	 curs_add_wchstr(3X)
mvwaddch	 curs_addch(3X)
mvwaddchnstr	 curs_addechstr(3X)

mvwaddchstr	curs_addchstr(3X)
mvwaddnstr	curs_addstr(3X)
mvwaddnwstr	curs_addwstr(3X)
mvwaddstr	curs_addstr(3X)
mvwaddwstr	curs_addwstr(3X)
mvwchgat	curs_attr(3X)
mvwdelch	curs_delch(3X)
mvwget_wch	curs_get_wch(3X)
mvwget_wstr	curs_get_wstr(3X)
mvwgetch	curs_getch(3X)
mvwgetn_wstr	curs_get_wstr(3X)
mvwgetnstr	curs_getstr(3X)
mvwgetstr	curs_getstr(3X)
mvwhline	curs_border(3X)
mvwhline_set	curs_border_set(3X)
mvwin	curs_window(3X)
mvwin_wch	curs_in_wch(3X)
mvwin_wchnstr	curs_in_wchstr(3X)
mvwin_wchstr	curs_in_wchstr(3X)
mvwinch	curs_inch(3X)
mvwinchnstr	curs_inchstr(3X)
mvwinchstr	curs_inchstr(3X)
mvwinnstr	curs_instr(3X)
mvwinnwstr	curs_inwstr(3X)
mvwins_nwstr	curs_ins_wstr(3X)
mvwins_wch	curs_ins_wch(3X)
mvwins_wstr	curs_ins_wstr(3X)
mvwinsch	curs_insch(3X)
mvwinsnstr	curs_insstr(3X)
mvwinsstr	curs_insstr(3X)
mvwinstr	curs_instr(3X)
mvwinwstr	curs_inwstr(3X)
mvwprintw	curs_printw(3X)
mvwscanw	curs_scanw(3X)
mvwvline	curs_border(3X)
mvwvline_set	curs_border_set(3X)
napms	curs_kernel(3X)
newpad	curs_pad(3X)
newterm	curs_initscr(3X)
newwin	curs_window(3X)

nl	 curs_inopts(3X)
nocbreak	 curs_inopts(3X)
nodelay	 curs_inopts(3X)
noecho	 curs_inopts(3X)
nofilter	 curs_util(3X)*
nonl	 curs_inopts(3X)
noqiflush	 curs_inopts(3X)
noraw	 curs_inopts(3X)
notimeout	 curs_inopts(3X)
overlay	 curs_overlay(3X)
overwrite	 curs_overlay(3X)
pair_content	 curs_color(3X)
pecho_wchar	 curs_pad(3X)*
pechochar	 curs_pad(3X)
pnoutrefresh	 curs_pad(3X)
prefresh	 curs_pad(3X)
printw	 curs_printw(3X)
putp	 curs_terminfo(3X)
putwin	 curs_util(3X)
qiflush	 curs_inopts(3X)
raw	 curs_inopts(3X)
redrawwin	 curs_refresh(3X)
refresh	 curs_refresh(3X)
reset_color_pairs	 curs_color(3X)*
reset_prog_mode	 curs_kernel(3X)
reset_shell_mode	 curs_kernel(3X)
resetty	 curs_kernel(3X)
resize_term	 resizeterm(3X)*
resizeterm	 resizeterm(3X)*
restartterm	 curs_terminfo(3X)
ripoffline	 curs_kernel(3X)
savetty	 curs_kernel(3X)
scanw	 curs_scanw(3X)
scr_dump	 curs_scr_dump(3X)
scr_init	 curs_scr_dump(3X)
scr_restore	 curs_scr_dump(3X)
scr_set	 curs_scr_dump(3X)
sctl	 curs_scroll(3X)
scroll	 curs_scroll(3X)
scrollok	 curs_outopts(3X)

set_curterm	 curs_terminfo(3X)
set_term	 curs_initscr(3X)
setcchar	 curs_getcchar(3X)
setscreg	 curs_outopts(3X)
setsyx	 curs_kernel(3X)
setupterm	 curs_terminfo(3X)
slk_attr	 curs_slk(3X)*
slk_attr_off	 curs_slk(3X)
slk_attr_on	 curs_slk(3X)
slk_attr_set	 curs_slk(3X)
slk_attroff	 curs_slk(3X)
slk_atron	 curs_slk(3X)
slk_attrset	 curs_slk(3X)
slk_clear	 curs_slk(3X)
slk_color	 curs_slk(3X)
slk_init	 curs_slk(3X)
slk_label	 curs_slk(3X)
slk_noutrefresh	 curs_slk(3X)
slk_refresh	 curs_slk(3X)
slk_restore	 curs_slk(3X)
slk_set	 curs_slk(3X)
slk_touch	 curs_slk(3X)
slk_wset	 curs_slk(3X)*
standend	 curs_attr(3X)
standout	 curs_attr(3X)
start_color	 curs_color(3X)
subpad	 curs_pad(3X)
subwin	 curs_window(3X)
syncok	 curs_window(3X)
term_attrs	 curs_termattrs(3X)
termattrs	 curs_termattrs(3X)
termname	 curs_termattrs(3X)
tgetent	 curs_termcap(3X)
tgetflag	 curs_termcap(3X)
tgetnum	 curs_termcap(3X)
tgetstr	 curs_termcap(3X)
tgoto	 curs_termcap(3X)
tigetflag	 curs_terminfo(3X)
tigetnum	 curs_terminfo(3X)
tigetstr	 curs_terminfo(3X)

timeout	 curs_inopts(3X)
tiparm	 curs_terminfo(3X)*
touchline	 curs_touch(3X)
touchwin	 curs_touch(3X)
tparam	 curs_terminfo(3X)
tputs	 curs_termcap(3X)
tputs	 curs_terminfo(3X)
trace	 curs_trace(3X)*
typeahead	 curs_inopts(3X)
unctrl	 curs_util(3X)
unget_wch	 curs_get_wch(3X)
ungetch	 curs_getch(3X)
ungetmouse	 curs_mouse(3X)*
untouchwin	 curs_touch(3X)
use_default_colors	 default_colors(3X)*
use_env	 curs_util(3X)
use_extended_names	 curs_extend(3X)*
use_legacy_coding	 legacy_coding(3X)*
use_tioctl	 curs_util(3X)*
vid_attr	 curs_terminfo(3X)
vid_puts	 curs_terminfo(3X)
vidattr	 curs_terminfo(3X)
vidputs	 curs_terminfo(3X)
vline	 curs_border(3X)
vline_set	 curs_border_set(3X)
vw_printw	 curs_printw(3X)
vw_scanw	 curs_scanw(3X)
vwprintw	 curs_printw(3X)
vwscanw	 curs_scanw(3X)
wadd_wch	 curs_add_wch(3X)
wadd_wchnstr	 curs_add_wchstr(3X)
wadd_wchstr	 curs_add_wchstr(3X)
waddch	 curs_addch(3X)
waddchnstr	 curs_addchstr(3X)
waddchstr	 curs_addchstr(3X)
waddnstr	 curs_addstr(3X)
waddnwstr	 curs_addwstr(3X)
waddstr	 curs_addstr(3X)
waddwstr	 curs_addwstr(3X)
wattr_get	 curs_attr(3X)

wattr_off	curs_attr(3X)
wattr_on	curs_attr(3X)
wattr_set	curs_attr(3X)
wattroff	curs_attr(3X)
wattron	curs_attr(3X)
wattrset	curs_attr(3X)
wbkgd	curs_bkgd(3X)
wbkgdset	curs_bkgd(3X)
wbkgrnd	curs_bkgrnd(3X)
wbkgrndset	curs_bkgrnd(3X)
wborder	curs_border(3X)
wborder_set	curs_border_set(3X)
wchgat	curs_attr(3X)
wclear	curs_clear(3X)
wclrto bot	curs_clear(3X)
wclrtoeol	curs_clear(3X)
wcolor_set	curs_attr(3X)
wcursyncup	curs_window(3X)
wdelch	curs_delch(3X)
wdeleteln	curs_deleteln(3X)
wecho_wchar	curs_add_wch(3X)
wechochar	curs_addch(3X)
wenclose	curs_mouse(3X)*
werase	curs_clear(3X)
wget_wch	curs_get_wch(3X)
wget_wstr	curs_get_wstr(3X)
wgetbkgrnd	curs_bkgrnd(3X)
wgetch	curs_getch(3X)
wgetdelay	curs_opaque(3X)*
wgetn_wstr	curs_get_wstr(3X)
wgetnstr	curs_getstr(3X)
wgetparent	curs_opaque(3X)*
wgetscrreg	curs_opaque(3X)*
wgetstr	curs_getstr(3X)
whline	curs_border(3X)
whline_set	curs_border_set(3X)
win_wch	curs_in_wch(3X)
win_wchnstr	curs_in_wchstr(3X)
win_wchstr	curs_in_wchstr(3X)
winch	curs_inch(3X)

winchnstr	 curs_inchstr(3X)
winchstr	 curs_inchstr(3X)
winnstr	 curs_instr(3X)
winnwstr	 curs_inwstr(3X)
wins_nwstr	 curs_ins_wstr(3X)
wins_wch	 curs_ins_wch(3X)
wins_wstr	 curs_ins_wstr(3X)
winsch	 curs_insch(3X)
winsdelln	 curs_deleteln(3X)
winsertln	 curs_deleteln(3X)
winsnstr	 curs_insstr(3X)
winsstr	 curs_insstr(3X)
winstr	 curs_instr(3X)
winwstr	 curs_inwstr(3X)
wmouse_trafo	 curs_mouse(3X)*
wmove	 curs_move(3X)
wnoutrefresh	 curs_refresh(3X)
wprintw	 curs_printw(3X)
wredrawln	 curs_refresh(3X)
wrefresh	 curs_refresh(3X)
wresize	 wresize(3X)*
wscanw	 curs_scanw(3X)
wscrl	 curs_scroll(3X)
wsetscrreg	 curs_outopts(3X)
wstandend	 curs_attr(3X)
wstandout	 curs_attr(3X)
wsyncdown	 curs_window(3X)
wsyncup	 curs_window(3X)
wtimeout	 curs_inopts(3X)
wtouchln	 curs_touch(3X)
wunctrl	 curs_util(3X)
wvline	 curs_border(3X)
wvline_set	 curs_border_set(3X)

Depending on the configuration, additional sets of functions may be available:

curs_memleaks(3X) - curses memory-leak checking

curs_sp_funcs(3X) - curses screen-pointer extension

curs_threads(3X) - curses thread support

curs_trace(3X) - curses debugging routines

RETURN VALUE

Routines that return an integer return **ERR** upon failure and an integer value other than **ERR** upon successful completion, unless otherwise noted in the routine descriptions.

As a general rule, routines check for null pointers passed as parameters, and handle this as an error.

All macros return the value of the **w** version, except **setscrreg**, **wsetscrreg**, **getyx**, **getbegyx**, and **getmaxyx**. The return values of **setscrreg**, **wsetscrreg**, **getyx**, **getbegyx**, and **getmaxyx** are undefined (i.e., these should not be used as the right-hand side of assignment statements).

Functions with a "mv" prefix first perform a cursor movement using **wmove**, and return an error if the position is outside the window, or if the window pointer is null. Most "mv"-prefixed functions (except variadic functions such as **mvprintw**) are provided both as macros and functions.

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

ENVIRONMENT

The following environment symbols are useful for customizing the runtime behavior of the **ncurses** library. The most important ones have been already discussed in detail.

CC command-character

When set, change occurrences of the `command_character` (i.e., the **cmdch** capability) of the loaded terminfo entries to the value of this variable. Very few terminfo entries provide this feature.

Because this name is also used in development environments to represent the C compiler's name, **ncurses** ignores it if it does not happen to be a single character.

BAUDRATE

The debugging library checks this environment variable when the application has redirected output to a file. The variable's numeric value is used for the baudrate. If no value is found, **ncurses** uses 9600. This allows testers to construct repeatable test-cases that take into account costs that depend on baudrate.

COLUMNS

Specify the width of the screen in characters. Applications running in a windowing environment usually are able to obtain the width of the window in which they are executing. If neither the

COLUMNS value nor the terminal's screen size is available, **ncurses** uses the size which may be specified in the terminfo database (i.e., the **cols** capability).

It is important that your application use a correct size for the screen. This is not always possible because your application may be running on a host which does not honor NAWS (Negotiations About Window Size), or because you are temporarily running as another user. However, setting **COLUMNS** and/or **LINES** overrides the library's use of the screen size obtained from the operating system.

Either **COLUMNS** or **LINES** symbols may be specified independently. This is mainly useful to circumvent legacy misfeatures of terminal descriptions, e.g., xterm which commonly specifies a 65 line screen. For best results, **lines** and **cols** should not be specified in a terminal description for terminals which are run as emulations.

Use the **use_env** function to disable all use of external environment (but not including system calls) to determine the screen size. Use the **use_tioctl** function to update **COLUMNS** or **LINES** to match the screen size obtained from system calls or the terminal database.

ESCDELAY

Specifies the total time, in milliseconds, for which **ncurses** will await a character sequence, e.g., a function key. The default value, 1000 milliseconds, is enough for most uses. However, it is made a variable to accommodate unusual applications.

The most common instance where you may wish to change this value is to work with slow hosts, e.g., running on a network. If the host cannot read characters rapidly enough, it will have the same effect as if the terminal did not send characters rapidly enough. The library will still see a timeout.

Note that xterm mouse events are built up from character sequences received from the xterm. If your application makes heavy use of multiple-clicking, you may wish to lengthen this default value because the timeout applies to the composed multi-click event as well as the individual clicks.

In addition to the environment variable, this implementation provides a global variable with the same name. Portable applications should not rely upon the presence of **ESCDELAY** in either form, but setting the environment variable rather than the global variable does not create problems when compiling an application.

HOME

Tells **ncurses** where your home directory is. That is where it may read and write auxiliary terminal descriptions:

```
$HOME/.termcap
```

\$HOME/.terminfo

LINES

Like COLUMNS, specify the height of the screen in characters. See COLUMNS for a detailed description.

MOUSE_BUTTONS_123

This applies only to the OS/2 EMX port. It specifies the order of buttons on the mouse. OS/2 numbers a 3-button mouse inconsistently from other platforms:

- 1 = left
- 2 = right
- 3 = middle.

This variable lets you customize the mouse. The variable must be three numeric digits 1-3 in any order, e.g., 123 or 321. If it is not specified, **ncurses** uses 132.

NCURSES_ASSUMED_COLORS

Override the compiled-in assumption that the terminal's default colors are white-on-black (see **default_colors(3X)**). You may set the foreground and background color values with this environment variable by providing a 2-element list: foreground,background. For example, to tell ncurses to not assume anything about the colors, set this to "-1,-1". To make it green-on-black, set it to "2,0". Any positive value from zero to the terminfo **max_colors** value is allowed.

NCURSES_CONSOLE2

This applies only to the MinGW port of ncurses.

The **Console2** program's handling of the Microsoft Console API call **CreateConsoleScreenBuffer** is defective. Applications which use this will hang. However, it is possible to simulate the action of this call by mapping coordinates, explicitly saving and restoring the original screen contents. Setting the environment variable **NCGDB** has the same effect.

NCURSES_GPM_TERMS

This applies only to ncurses configured to use the GPM interface.

If present, the environment variable is a list of one or more terminal names against which the **TERM** environment variable is matched. Setting it to an empty value disables the GPM interface; using the built-in support for xterm, etc.

If the environment variable is absent, ncurses will attempt to open GPM if **TERM** contains "linux".

NCURSES_NO_HARD_TABS

Ncurses may use tabs as part of the cursor movement optimization. In some cases, your terminal driver may not handle these properly. Set this environment variable to disable the feature. You can also adjust your **stty** settings to avoid the problem.

NCURSES_NO_MAGIC_COOKIE

Some terminals use a magic-cookie feature which requires special handling to make highlighting and other video attributes display properly. You can suppress the highlighting entirely for these terminals by setting this environment variable.

NCURSES_NO_PADDING

Most of the terminal descriptions in the terminfo database are written for real "hardware" terminals. Many people use terminal emulators which run in a windowing environment and use curses-based applications. Terminal emulators can duplicate all of the important aspects of a hardware terminal, but they do not have the same limitations. The chief limitation of a hardware terminal from the standpoint of your application is the management of dataflow, i.e., timing. Unless a hardware terminal is interfaced into a terminal concentrator (which does flow control), it (or your application) must manage dataflow, preventing overruns. The cheapest solution (no hardware cost) is for your program to do this by pausing after operations that the terminal does slowly, such as clearing the display.

As a result, many terminal descriptions (including the vt100) have delay times embedded. You may wish to use these descriptions, but not want to pay the performance penalty.

Set the `NCURSES_NO_PADDING` environment variable to disable all but mandatory padding. Mandatory padding is used as a part of special control sequences such as *flash*.

NCURSES_NO_SETBUF

This setting is obsolete. Before changes

- ⊕ started with 5.9 patch 20120825 and
- ⊕ continued though 5.9 patch 20130126

ncurses enabled buffered output during terminal initialization. This was done (as in SVr4 curses) for performance reasons. For testing purposes, both of **ncurses** and certain applications, this feature was made optional. Setting the `NCURSES_NO_SETBUF` variable disabled output buffering, leaving the output in the original (usually line buffered) mode.

In the current implementation, **ncurses** performs its own buffering and does not require this workaround. It does not modify the buffering of the standard output.

The reason for the change was to make the behavior for interrupts and other signals more robust. One drawback is that certain nonconventional programs would mix ordinary stdio calls with ncurses calls and (usually) work. This is no longer possible since ncurses is not using the buffered standard output but its own output (to the same file descriptor). As a special case, the low-level calls such as **putp** still use the standard output. But high-level curses calls do not.

NCURSES_NO_UTF8_ACS

During initialization, the **ncurses** library checks for special cases where VT100 line-drawing (and the corresponding alternate character set capabilities) described in the terminfo are known to be missing. Specifically, when running in a UTF-8 locale, the Linux console emulator and the GNU screen program ignore these. Ncurses checks the **TERM** environment variable for these. For other special cases, you should set this environment variable. Doing this tells ncurses to use Unicode values which correspond to the VT100 line-drawing glyphs. That works for the special cases cited, and is likely to work for terminal emulators.

When setting this variable, you should set it to a nonzero value. Setting it to zero (or to a nonnumber) disables the special check for "linux" and "screen".

As an alternative to the environment variable, ncurses checks for an extended terminfo capability **U8**. This is a numeric capability which can be compiled using **tic -x**. For example

```
# linux console, if patched to provide working
# VT100 shift-in/shift-out, with corresponding font.
linux-vt100|linux console with VT100 line-graphics,
    U8#0, use=linux,

# uxterm with vt100Graphics resource set to false
xterm-utf8|xterm relying on UTF-8 line-graphics,
    U8#1, use=xterm,
```

The name "U8" is chosen to be two characters, to permit it to be used by applications that use ncurses' termcap interface.

NCURSES_TRACE

During initialization, the **ncurses** debugging library checks the **NCURSES_TRACE** environment variable. If it is defined, to a numeric value, **ncurses** calls the **trace** function, using that value as the argument.

The argument values, which are defined in **curses.h**, provide several types of information. When running with traces enabled, your application will write the file **trace** to the current directory.

See **curs_trace**(3X) for more information.

TERM

Denotes your terminal type. Each terminal type is distinct, though many are similar.

TERM is commonly set by terminal emulators to help applications find a workable terminal description. Some of those choose a popular approximation, e.g., "ansi", "vt100", "xterm" rather than an exact fit. Not infrequently, your application will have problems with that approach, e.g., incorrect function-key definitions.

If you set **TERM** in your environment, it has no effect on the operation of the terminal emulator. It only affects the way applications work within the terminal. Likewise, as a general rule (**xterm** being a rare exception), terminal emulators which allow you to specify **TERM** as a parameter or configuration value do not change their behavior to match that setting.

TERMCAP

If the **ncurses** library has been configured with *termcap* support, **ncurses** will check for a terminal's description in termcap form if it is not available in the terminfo database.

The **TERMCAP** environment variable contains either a terminal description (with newlines stripped out), or a file name telling where the information denoted by the **TERM** environment variable exists. In either case, setting it directs **ncurses** to ignore the usual place for this information, e.g., */etc/termcap*.

TERMINFO

ncurses can be configured to read from multiple terminal databases. The **TERMINFO** variable overrides the location for the default terminal database. Terminal descriptions (in terminal format) are stored in terminal databases:

- ⊕ Normally these are stored in a directory tree, using subdirectories named by the first letter of the terminal names therein.

This is the scheme used in System V, which legacy Unix systems use, and the **TERMINFO** variable is used by *curses* applications on those systems to override the default location of the terminal database.

- ⊕ If **ncurses** is built to use hashed databases, then each entry in this list may be the path of a hashed database file, e.g.,

`/usr/share/terminfo.db`

rather than

```
/usr/share/terminfo/
```

The hashed database uses less disk-space and is a little faster than the directory tree. However, some applications assume the existence of the directory tree, reading it directly rather than using the terminfo library calls.

- ⊕ If **ncurses** is built with a support for reading termcap files directly, then an entry in this list may be the path of a termcap file.
- ⊕ If the **TERMINFO** variable begins with "hex:" or "b64:", **ncurses** uses the remainder of that variable as a compiled terminal description. You might produce the base64 format using **infocmp(1M)**:

```
TERMINFO="$(infocmp -0 -Q2 -q)"
export TERMINFO
```

The compiled description is used if it corresponds to the terminal identified by the **TERM** variable.

Setting **TERMINFO** is the simplest, but not the only way to set location of the default terminal database. The complete list of database locations in order follows:

- ⊕ the last terminal database to which **ncurses** wrote, if any, is searched first
- ⊕ the location specified by the **TERMINFO** environment variable
- ⊕ **\$HOME/.terminfo**
- ⊕ locations listed in the **TERMINFO_DIRS** environment variable
- ⊕ one or more locations whose names are configured and compiled into the ncurses library, i.e.,
 - ⊕ **@TERMINFO_DIRS@** (corresponding to the **TERMINFO_DIRS** variable)
 - ⊕ **/usr/share/misc/terminfo** (corresponding to the **TERMINFO** variable)

TERMINFO_DIRS

Specifies a list of locations to search for terminal descriptions. Each location in the list is a terminal

database as described in the section on the **TERMINFO** variable. The list is separated by colons (i.e., ":") on Unix, semicolons on OS/2 EMX.

There is no corresponding feature in System V terminfo; it is an extension developed for **ncurses**.

TERMPATH

If **TERMCAP** does not hold a file name then **ncurses** checks the **TERMPATH** environment variable. This is a list of filenames separated by spaces or colons (i.e., ":") on Unix, semicolons on OS/2 EMX.

If the **TERMPATH** environment variable is not set, **ncurses** looks in the files

/etc/termcap, /usr/share/misc/termcap and \$HOME/.termcap,

in that order.

The library may be configured to disregard the following variables when the current user is the superuser (root), or if the application uses setuid or setgid permissions:

\$TERMINFO, \$TERMINFO_DIRS, \$TERMPATH, as well as \$HOME.

ALTERNATE CONFIGURATIONS

Several different configurations are possible, depending on the configure script options used when building **ncurses**. There are a few main options whose effects are visible to the applications developer using **ncurses**:

--disable-overwrite

The standard include for **ncurses** is as noted in **SYNOPSIS**:

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

This option is used to avoid filename conflicts when **ncurses** is not the main implementation of curses of the computer. If **ncurses** is installed disabling overwrite, it puts its headers in a subdirectory, e.g.,

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

It also omits a symbolic link which would allow you to use **-lcurses** to build executables.

--enable-widex

The configure script renames the library and (if the **--disable-overwrite** option is used) puts the

header files in a different subdirectory. All of the library names have a "w" appended to them, i.e., instead of

-lncurses

you link with

-lncursesw

You must also enable the wide-character features in the header file when compiling for the wide-character library to use the extended (wide-character) functions. The symbol which enables these features has changed since XSI Curses, Issue 4:

- ⊕ Originally, the wide-character feature required the symbol **_XOPEN_SOURCE_EXTENDED** but that was only valid for XPG4 (1996).
- ⊕ Later, that was deemed conflicting with **_XOPEN_SOURCE** defined to 500.
- ⊕ As of mid-2018, none of the features in this implementation require a **_XOPEN_SOURCE** feature greater than 600. However, X/Open Curses, Issue 7 (2009) recommends defining it to 700.
- ⊕ Alternatively, you can enable the feature by defining **NCURSES_WIDECHAR** with the caveat that some other header file than **curses.h** may require a specific value for **_XOPEN_SOURCE** (or a system-specific symbol).

The **curses.h** file which is installed for the wide-character library is designed to be compatible with the normal library's header. Only the size of the **WINDOW** structure differs, and very few applications require more than a pointer to **WINDOW**s.

If the headers are installed allowing overwrite, the wide-character library's headers should be installed last, to allow applications to be built using either library from the same set of headers.

--with-pthread

The configure script renames the library. All of the library names have a "t" appended to them (before any "w" added by **--enable-widect**).

The global variables such as **LINES** are replaced by macros to allow read-only access. At the same time, setter-functions are provided to set these values. Some applications (very few) may require changes to work with this convention.

--with-shared

--with-normal

--with-debug

--with-profile

The shared and normal (static) library names differ by their suffixes, e.g., **libncurses.so** and **libncurses.a**. The debug and profiling libraries add a "_g" and a "_p" to the root names respectively, e.g., **libncurses_g.a** and **libncurses_p.a**.

--with-termlib

Low-level functions which do not depend upon whether the library supports wide-characters, are provided in the tinfo library.

By doing this, it is possible to share the tinfo library between wide/normal configurations as well as reduce the size of the library when only low-level functions are needed.

Those functions are described in these pages:

- ⊕ **curs_extend(3X)** - miscellaneous curses extensions
- ⊕ **curs_inopts(3X)** - curses input options
- ⊕ **curs_kernel(3X)** - low-level curses routines
- ⊕ **curs_termattrs(3X)** - curses environment query routines
- ⊕ **curs_termcap(3X)** - curses emulation of termcap
- ⊕ **curs_terminfo(3X)** - curses interfaces to terminfo database
- ⊕ **curs_util(3X)** - miscellaneous curses utility routines

--with-trace

The **trace** function normally resides in the debug library, but it is sometimes useful to configure this in the shared library. Configure scripts should check for the function's existence rather than assuming it is always in the debug library.

FILES

/usr/share/tabset

directory containing initialization files for the terminal capability database

/usr/share/misc/terminfo terminal capability database

SEE ALSO

terminfo(5) and related pages whose names begin "curs_" for detailed routine descriptions.

curs_variables(3X)

user_caps(5) for user-defined capabilities

EXTENSIONS

The **ncurses** library can be compiled with an option (**-DUSE_GETCAP**) that falls back to the old-style `/etc/termcap` file if the terminal setup code cannot find a terminfo entry corresponding to **TERM**. Use of this feature is not recommended, as it essentially includes an entire termcap compiler in the **ncurses** startup code, at significant cost in core and startup cycles.

The **ncurses** library includes facilities for capturing mouse events on certain terminals (including `xterm`). See the **curs_mouse**(3X) manual page for details.

The **ncurses** library includes facilities for responding to window resizing events, e.g., when running in an `xterm`. See the **resizeterm**(3X) and **wresize**(3X) manual pages for details. In addition, the library may be configured with a **SIGWINCH** handler.

The **ncurses** library extends the fixed set of function key capabilities of terminals by allowing the application designer to define additional key sequences at runtime. See the **define_key**(3X) **key_defined**(3X), and **keyok**(3X) manual pages for details.

The **ncurses** library can exploit the capabilities of terminals which implement the ISO-6429 SGR 39 and SGR 49 controls, which allow an application to reset the terminal to its original foreground and background colors. From the users' perspective, the application is able to draw colored text on a background whose color is set independently, providing better control over color contrasts. See the **default_colors**(3X) manual page for details.

The **ncurses** library includes a function for directing application output to a printer attached to the terminal device. See the **curs_print**(3X) manual page for details.

PORTABILITY

The **ncurses** library is intended to be BASE-level conformant with XSI Curses. The EXTENDED XSI Curses functionality (including color support) is supported.

A small number of local differences (that is, individual differences between the XSI Curses and **ncurses**

calls) are described in **PORTABILITY** sections of the library man pages.

Error checking

In many cases, X/Open Curses is vague about error conditions, omitting some of the SVr4 documentation.

Unlike other implementations, this one checks parameters such as pointers to WINDOW structures to ensure they are not null. The main reason for providing this behavior is to guard against programmer error. The standard interface does not provide a way for the library to tell an application which of several possible errors were detected. Relying on this (or some other) extension will adversely affect the portability of curses applications.

Extensions versus portability

Most of the extensions provided by ncurses have not been standardized. Some have been incorporated into other implementations, such as PDCurses or NetBSD curses. Here are a few to consider:

- ⊕ The routine **has_key** is not part of XPG4, nor is it present in SVr4. See the **curs_getch(3X)** manual page for details.
- ⊕ The routine **slk_attr** is not part of XPG4, nor is it present in SVr4. See the **curs_slk(3X)** manual page for details.
- ⊕ The routines **getmouse**, **mousemask**, **ungetmouse**, **mouseinterval**, and **wenclose** relating to mouse interfacing are not part of XPG4, nor are they present in SVr4. See the **curs_mouse(3X)** manual page for details.
- ⊕ The routine **mcprint** was not present in any previous curses implementation. See the **curs_print(3X)** manual page for details.
- ⊕ The routine **wresize** is not part of XPG4, nor is it present in SVr4. See the **wresize(3X)** manual page for details.
- ⊕ The WINDOW structure's internal details can be hidden from application programs. See **curs_opaque(3X)** for the discussion of **is_scrollok**, etc.
- ⊕ This implementation can be configured to provide rudimentary support for multi-threaded applications. See **curs_threads(3X)** for details.
- ⊕ This implementation can also be configured to provide a set of functions which improve the ability to manage multiple screens. See **curs_sp_funcs(3X)** for details.

Padding differences

In historic curses versions, delays embedded in the capabilities **cr**, **ind**, **cub1**, **ff** and **tab** activated corresponding delay bits in the UNIX tty driver. In this implementation, all padding is done by sending NUL bytes. This method is slightly more expensive, but narrows the interface to the UNIX kernel significantly and increases the package's portability correspondingly.

Header files

The header file `<curses.h>` automatically includes the header files `<stdio.h>` and `<unctrl.h>`.

X/Open Curses has more to say, but does not finish the story:

The inclusion of `<curses.h>` may make visible all symbols from the headers `<stdio.h>`, `<term.h>`, `<termios.h>`, and `<wchar.h>`.

Here is a more complete story:

- ⊕ Starting with BSD curses, all implementations have included `<stdio.h>`.

BSD curses included `<curses.h>` and `<unctrl.h>` from an internal header "curses.ext" ("ext" was a short name for *externs*).

BSD curses used `<stdio.h>` internally (for **printw** and **scanw**), but nothing in `<curses.h>` itself relied upon `<stdio.h>`.

- ⊕ SVr2 curses added **newterm**(3X), which relies upon `<stdio.h>`. That is, the function prototype uses **FILE**.

SVr4 curses added **putwin** and **getwin**, which also use `<stdio.h>`.

X/Open Curses documents all three of these functions.

SVr4 curses and X/Open Curses do not require the developer to include `<stdio.h>` before including `<curses.h>`. Both document curses showing `<curses.h>` as the only required header.

As a result, standard `<curses.h>` will always include `<stdio.h>`.

- ⊕ X/Open Curses is inconsistent with respect to SVr4 regarding `<unctrl.h>`.

As noted in **curl_util**(3X), ncurses includes `<unctrl.h>` from `<curses.h>` (like SVr4).

- ⊕ X/Open's comments about `<term.h>` and `<termios.h>` may refer to HP-UX and AIX:

HP-UX curses includes `<term.h>` from `<curses.h>` to declare **setupterm** in `curses.h`, but `ncurses` (and Solaris curses) do not.

AIX curses includes `<term.h>` and `<termios.h>`. Again, `ncurses` (and Solaris curses) do not.

- ⊕ X/Open says that `<curses.h>` *may* include `<term.h>`, but there is no requirement that it do that.

Some programs use functions declared in both `<curses.h>` and `<term.h>`, and must include both headers in the same module. Very old versions of AIX curses required including `<curses.h>` before including `<term.h>`.

Because `ncurses` header files include the headers needed to define datatypes used in the headers, `ncurses` header files can be included in any order. But for portability, you should include `<curses.h>` before `<term.h>`.

- ⊕ X/Open Curses says "*may make visible*" because including a header file does not necessarily make all symbols in it visible (there are `ifdef`'s to consider).

For instance, in `ncurses` `<wchar.h>` *may* be included if the proper symbol is defined, and if `ncurses` is configured for wide-character support. If the header is included, its symbols may be made visible. That depends on the value used for `_XOPEN_SOURCE` feature test macro.

- ⊕ X/Open Curses documents one required header, in a special case: `<stdarg.h>` before `<curses.h>` to prototype the **vw_printw** and **vw_scanw** functions (as well as the obsolete the **vwprintw** and **vwscanw** functions). Each of those uses a **va_list** parameter.

The two obsolete functions were introduced in SVr3. The other functions were introduced in X/Open Curses. In between, SVr4 curses provided for the possibility that an application might include either `<varargs.h>` or `<stdarg.h>`. Initially, that was done by using **void*** for the **va_list** parameter. Later, a special type (defined in `<stdio.h>`) was introduced, to allow for compiler type-checking. That special type is always available, because `<stdio.h>` is always included by `<curses.h>`.

None of the X/Open Curses implementations require an application to include `<stdarg.h>` before `<curses.h>` because they either have allowed for a special type, or (like `ncurses`) include `<stdarg.h>` directly to provide a portable interface.

NOTES

If standard output from a **ncurses** program is re-directed to something which is not a tty, screen updates will be directed to standard error. This was an undocumented feature of AT&T System V Release 3 curses.

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