z/OS

C Curses

SA22-7820-00

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SA22-7820-00

Note!
Before using this information and the product it supports, be sure to read the general information under “Appendix. Notices” on page 215.

First Edition (March 2001)

This edition applies to Version 1 Release 1 of z/OS (5694-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

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About This Book

This manual describes the curses interface for application programs using the z/OS C language. Readers are expected to be experienced C language programmers and to be familiar with open systems standards or a UNIX operating system. This book also assumes that readers are somewhat familiar with MVS systems and with the information for MVS and its accompanying products. Readers also should have read *z/OS Introduction and Release Guide* which describes the services and the concepts of z/OS. This manual is organized as follows:

- "Chapter 1. The Curses Library" on page 1 gives an overview of Curses. It discusses the use of some of the key data types and gives general rules for important common concepts such as characters, renditions and window properties. It contains general rules for the common Curses operations and operating modes. This information is implicitly referenced by the interface definitions in Chapter 2. The chapter explains the system of naming the Curses functions and presents a table of function families. Finally, the chapter contains notes regarding use of macros and restrictions on block-mode terminals.
- "Chapter 15. Curses Interfaces" on page 51 defines the Curses functional interfaces.
- "Chapter 16. Headers" on page 163 defines the contents of headers, which declare constants, macros and data structures that are needed by programs using the services provided by "Chapter 17. Terminfo Source Format (ENHANCED CURSES)" on page 175.
- "Chapter 17. Terminfo Source Format (ENHANCED CURSES)" on page 175 discusses the terminfo database, which Curses uses to describe terminals. The chapter specifies the source format of a terminfo entry, using a formal grammar, an informal discussion, and an example. Boolean, numeric and string capabilities are presented in tabular form. The remainder of the chapter discusses the use of these capabilities by the writer of a terminfo entry to describe the characteristics of the terminal in use.
- The glossary contains definitions of terms used in this manual.

Typographical conventions

The following typographical conventions are used throughout this document:

- Bold font is used in text for options to commands, filenames, keywords, type names, data structures and their members.
- Italic strings are used for emphasis or to identify the first instance of a word requiring definition. Italics in text also denote:
  - Command operands, command option-arguments or variable names, for example, substitutable argument prototypes
  - Environment variables, which are also shown in capitals
  - Utility names
  - External variables, such as errno
  - Functions; these are shown as follows: name(); names without parentheses are C external variables, C function family names, utility names, command operands or command option-arguments.
- Normal font is used for the names of constants and literals.
- The notation <file.h> indicates a header file.

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- Names surrounded by braces, for example, {ARG_MAX}, represent symbolic limits or configuration values which may be declared in appropriate headers by means of the C #define construct.
- The notation [EABCD] is used to identify an error value EABCD.
- Syntax, code examples and user input in interactive examples are shown in fixed width font. Brackets shown in this font, [], are part of the syntax and do not indicate optional items. In syntax the | symbol is

  used to separate alternatives, and ellipses (...) are used to show that additional arguments are optional.
- Bold fixed width font is used to identify brackets that surround optional items in syntax, [], and to identify system output in interactive examples.
- Variables within syntax statements are shown in italic fixed width font.
- Ranges of values are indicated with parentheses or brackets as follows:
  - (a,b) means the range of all values from a to b, including neither a nor b
  - [a,b] means the range of all values from a to b, including a and b
  - [a,b) means the range of all values from a to b, including a, but not b
  - (a,b] means the range of all values from a to b, including b, but not a.

Notes:

- Symbolic limits are used in this document instead of fixed values for portability. The values of most of these constants are defined in <limits.h> or <unistd.h>.
- The values of errors are defined in <errno.h>.

Other documents

The following documents are referenced in this specification:

- ANSI standard X3.159-1989, Programming Language C.
- ISO 8859-1:1987, Information Processing - 8-bit Single-byte Coded Graphic Character Sets - Part 1: Latin Alphabet No. 1.
- ISO/IEC 646:1991, Information Processing - ISO 7-bit Coded Character Set for Information Interchange.
- ISO/IEC 9899:1990, Programming Languages - C (technically identical to ANSI standard X3.159-1989).
- System V Interface Definition (Spring 1986 - Issue 2).
- System Interface Definitions (1989 - 3rd Edition).
- System V Release 2.0
  - UNIX System V Release 2.0 Programmer's Reference Manual (April 1984 - Issue 2).
  - UNIX System V Release 2.0 Programming Guide (April 1984 - Issue 2).
- Operating System API Reference, UNIXO SVR4.2 (1992) (ISBN: 0-13-017658-3).

Where to find more information

Please see *z/OS Information Roadmap* for an overview of the documentation associated with z/OS, including the documentation available for z/OS Language Environment.

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Using LookAt to look up message explanations

LookAt is an online facility that allows you to look up explanations for z/OS messages and system abends.

Using LookAt to find information is faster than a conventional search because LookAt goes directly to the explanation.

LookAt can be accessed from the Internet or from a TSO command line.

You can use LookAt on the Internet at:
http://www.ibm.com/servers/eserver/zseries/zos/bkserv/lookat/lookat.html

To use LookAt as a TSO command, LookAt must be installed on your host system. You can obtain the LookAt code for TSO from the LookAt Web site by clicking on **News and Help** or from the *z/OS Collection*, SK3T-4269.

To find a message explanation from a TSO command line, simply enter: **lookat** *message-id* as in the following example:

```
lookat iec192i
```

This results in direct access to the message explanation for message IEC192I.

To find a message explanation from the LookAt Web site, simply enter the message ID. You can select the release if needed.

Note: Some messages have information in more than one book. For example, IEC192I has routing and descriptor codes listed in *z/OS MVS Routing and Descriptor Codes*. For such messages, LookAt prompts you to choose which book to open.

Summary of Changes

Summary of Changes
for SA22-7820-00
z/OS Version1 Release 1

This book contains information also presented in *OS/390 C Curses,* SC28-1907-01.

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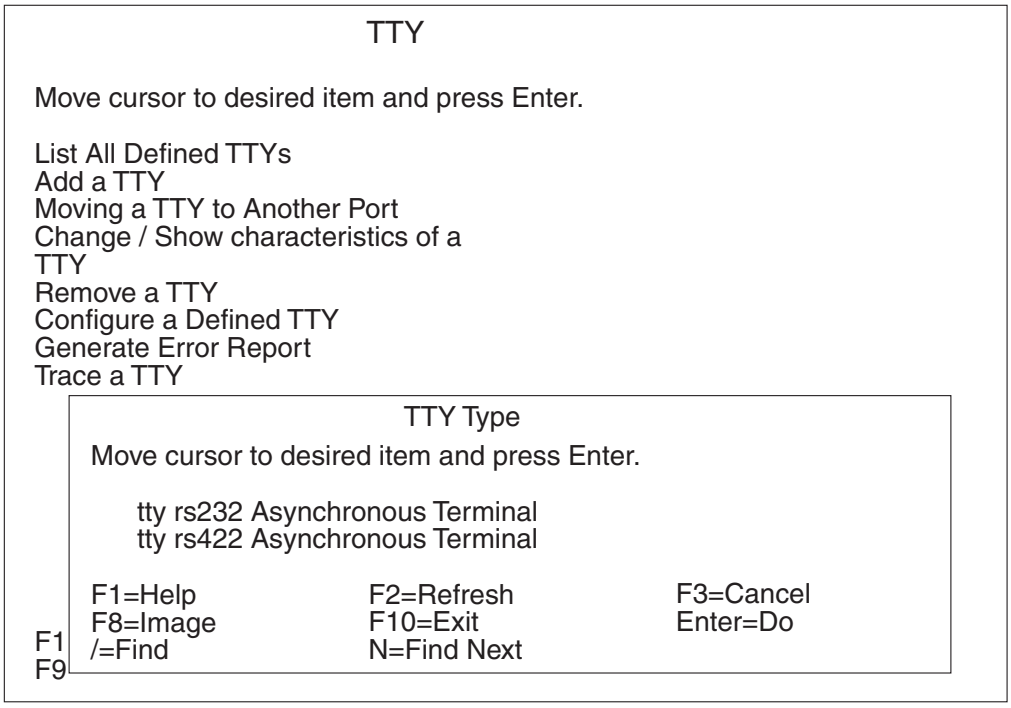
Chapter 1. The Curses Library

The Curses library provides a set of functions that enable you to manipulate a terminal's display regardless of the terminal type. Throughout this documentation, the Curses library is referred to as curses. The basis of curses programming is the window data structure. Using this structure, you can manipulate data on a terminal's display. You can instruct curses to treat the entire terminal display as one large window or you can create multiple windows on the display. The windows can be different sizes and can overlap one another. The following figure shows a typical curses application with a single large window and one subwindow



Each window on a terminal's display has its own window data structure. This structure keeps state information about the window such as its size and where it is located on the display. Curses uses the window data structure to obtain relevant information it needs to carry out your instructions.

Terminology

When programming with curses, you should be familiar with the following terms:

Term Definition

current character
The character that the logical cursor is currently on.

current line
The line that the logical cursor is currently on.

curscr
A virtual default window provided by curses. The curscr (current screen) is an internal representation of what currently appears on the terminal's external display. You should not modify the curscr.

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display
A physical display connected to a workstation.

logical cursor
The cursor location within each window. The window data structure keeps track of the location of its logical cursor.

pad A type of window that is larger than the dimensions of the terminal's display. Unlike other windows, a pad is not associated with any particular portion of the display.

physical cursor
The cursor that appears on a display. The workstation uses this cursor to write to the display. There is only one physical cursor per display. To change the position of the physical cursor, you must do a refresh.

screen
The window that fills the entire display. The screen is synonymous with the stdscr (standard screen).

stdscr A virtual default window provided by curses that represents the entire display.

window
A pointer to a C data structure and the graphic representation of that data structure on the display. A window can be thought of as a two-dimensional array representing how all or part of the display looks at any point in time. Windows range in size from the entire display to a single character.

Naming Conventions

A single curses function can have two or more versions. Curses functions with multiple versions follow distinct naming conventions that identify the separate versions. These conventions add a prefix to a standard curses function and identify what arguments the function requires or what actions take place when the function is called. The different versions of curses function names use three prefixes:

Prefix	Description
w	Identifies a function that requires a window argument.
p	Identifies a function that requires a pad argument.
mv	Identifies a function that first performs a move to the program-supplied coordinates.

Some curses functions with multiple versions do not include one of the preceding prefixes. These functions use the curses default window stdscr (standard screen). The majority of functions that use the stdscr are functions created in the **/usr/include/curses.h** file using **#define** statements. The preprocessor replaces these statements at compilation time. As a result, these functions do not appear in the compiled assembly code, a trace, a debugger, or the curses source code.

If a curses function has only a single version, it does not necessarily use stdscr. For example, the **printw()** function prints a string to the stdscr. The **wprintw()** function prints a string to a specific window by supplying the Window argument. The **mvprintw()** function moves the specified coordinates to the stdscr and then performs the same function as the **printw()** function. Likewise, the **mvwprintw()** function moves the specified coordinates to the specified window and then performs the same function as the **wprintw()** function.

A function with the basic name is often provided for historical compatibility and operates only on single-byte characters. A function with the same name plus the *w* infix operates on wide (multi-byte) characters. A function with the same name plus the *_w* infix operates on complex characters and their renditions.

When a function with the same basic name operates on a single character, there is sometimes a function with the same name plus the *n* infix that operates on multiple characters. An *n* argument specifies the number of characters to process. The respective manual page specifies the outcome if the value of *n* is inappropriate.

Structure of a Curses Program

In general, a curses program has the following progression:

- Start curses.
- Check for color support (optional).
- Start color (optional).
- Create one or more windows.
- Manipulate windows.
- Destroy one or more windows window.
- Stop curses.

Your program does not have to follow this progression exactly.

Return Values

With a few exceptions, all curses functions return either the integer value ERR or the integer value OK. Subroutines that do not follow this convention are noted appropriately. Subroutines that return pointers always return a null pointer on an error.

Chapter 2. Initializing Curses

You must include the **curses.h** file at the beginning of any program that calls curses functions. To do this, use the following statement:

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

Before you can call functions that manipulate windows or screens, you must call the **initscr()** or **newterm()** function. These functions first save the terminal's settings. These functions then call the **setupterm()** function to establish a curses terminal.

Before exiting a curses program, you must call the **endwin()** function. The **endwin()** function restores tty modes, moves the cursor to the lower left corner of the screen, and resets the terminal into the proper nonvisual mode. You can also temporarily suspend curses. If you need to suspend curses, use a shell escape or system call for example. To resume after a temporary escape, you should call the **wrefresh()** or **doupdate()** function. The **isendwin()** function is helpful if, for optimization reasons, you don't want to call the **wrefresh()** function needlessly. You can determine if the **endwin()** function was called without any subsequent calls to the **wrefresh()** function by using the **isendwin()** function.

Most interactive, screen-oriented programs require character-at-a-time input without echoing the result to the screen. To establish your program with character-at-a-time input, call the **cbreak()** and **noecho()** functions after calling the initscr function. When accepting this type of input, programs should also call the following functions:

- **nonl()** function.
- **intrflush()** function with the Window parameter set to the stdscr and the Flag parameter set to **FALSE**. The Window parameter is required but ignored You can use stdscr as the value of the Window parameter, because stdscr is already created for you.
- **keypad()** function with the Window parameter set to the stdscr and the Flag parameter set to **TRUE**.

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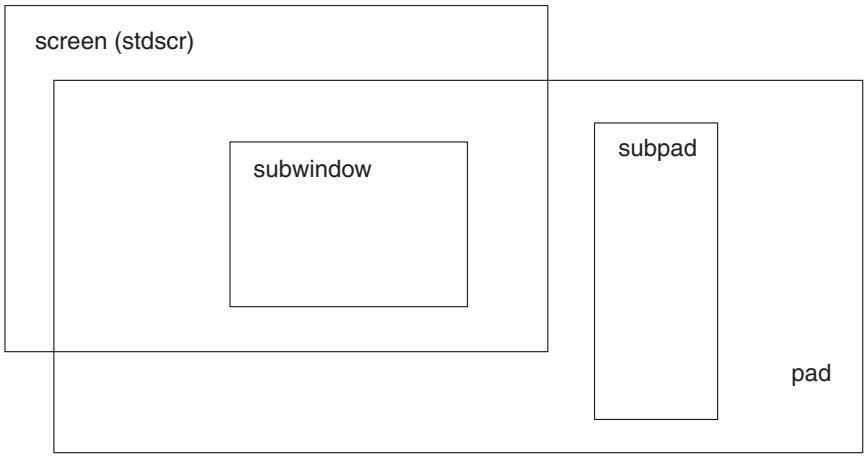
Chapter 3. Windows in the Curses Environment

A curses program manipulates windows that appear on a terminal's display. A window is a rectangular portion of the display. A window can be as large as the entire display or as small as a single character in length and height.

Note: Pads are the exception. A pad is a window that is not restricted by the size of the screen. For more information, see "Pads" on page 11.

The following figure shows the different types of windows that exist in the curses environment:



Within a curses program, windows are variables declared as type WINDOW. The WINDOW data type is defined in the **/usr/include/curses.h** file as a C data structure. You create a window by allocating a portion of a machine's memory for a window structure. This structure describes the characteristics of the window. When a program changes the window data internally in memory, it must use the **wrefresh()** function (or equivalent function) to update the external, physical screen to reflect the internal change in the appropriate window structure.

Curses supplies a default window when the Curses library is initialized. You can create your own windows known as user-defined windows. Except for the amount of memory available to a program, there is no limit to the number of windows you can create. A curses program can manipulate the default window, user-defined windows, or both.

The Default Window Structure

Curses provides a virtual default window called stdscr. The stdscr represents, in memory, the entire terminal display. The stdscr window structure is created automatically when the Curses library is initialized and it describes the display. When the library is initialized, the length and width variables are set to the length and width of the physical display.

In addition to the stdscr, you can define your own windows. These windows are known as user-defined windows to distinguish them from the stdscr. Like the stdscr, user-defined windows exist in machine memory as structures.

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Programs that use the stdscr first manipulate the stdscr and then call the **refresh()** function to refresh the external display so that it matches the stdscr window.

The Current Window Structure

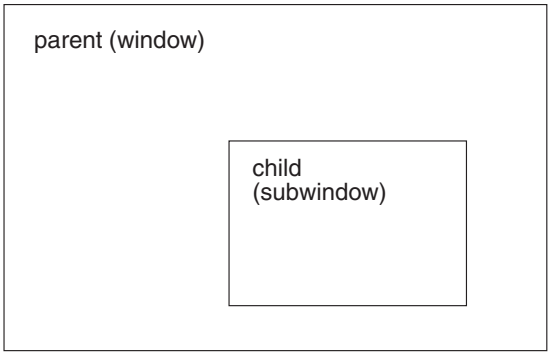
Curses also supports another virtual window called curscr (current screen). The curscr window is an internal representation of what currently appears on the terminal's external display.

When a program requires the external representation to match the internal representation, it must call a function, such as the **wrefresh()** function, to update the physical display (or the **refresh()** function if the program is working with the stdscr). When a refresh is called on an internal window, curses copies the changed portions of the window into the curscr and updates the physical display.

The curscr is reserved for internal use by curses. You should not manipulate the curscr.

Subwindows

Curses also allows you to construct subwindows. Subwindows are rectangular portions within other windows. A subwindow is also of type WINDOW. The window that contains a subwindow is known as the subwindow's parent and the subwindow is known as the containing window's child. The following figure demonstrates the parent child relationship.



Changes to either the parent window or the child window within the area overlapped by the subwindow are made to both windows. After modifying a subwindow, you should call the **touchline()** or **touchwin()** function on the parent window before refreshing it. The **touchline()** and **touchwin()** functions instruct curses to discard its optimization information for the parent window and to consider the window as having changed. A refresh called on the parent refreshes the children as well.

A subwindow can also be a parent window. The process of layering windows inside of windows is called nesting. The number of nested subwindows is limited to the amount of memory available up to the value of SHRT_MAX as defined in the **/usr/include/limits.h** file. Before you can delete a parent window, you must first delete all of its children using the **delwin()** function. Curses returns an error if you try to delete a window before removing all of its children.

Pads

A pad is a type of window that is not restricted by the terminal's display size or associated with a particular part of the display. You can use pads whenever your program requires a large window. Because a pad is usually larger than the physical display, only a portion of a pad is visible to the user at a given time.

Use pads when you have a large amount of related data that you want to keep all together in one window but you do not need to display all of the data at once.

Windows within pads are known as subpads. Subpads are positioned within a pad at coordinates relative to the parent pad. This placement differs from subwindows which are positioned using screen coordinates.

You should use the **prefresh()** function to show a portion of a pad on the display. Unlike other windows, scrolling or echoing of input does not automatically refresh a pad. Like subwindows, when changing the image of a subpad, you must call either the **touchline()** or **touchwin()** function on the parent pad before refreshing the parent. You can use all the curses function with pads except for the **newwin()**, **subwin()**, **wrefresh()**, and **wnoutrefresh()** functions. These functions are replaced with the **newpad()**, **subpad()**, **prefresh()**, and **pnoutrefresh()** functions.

Chapter 4. Manipulating Window Data with Curses

When curses is initialized, the stdscr is provided automatically. You can manipulate the stdscr using the curses function library or you can create your own, user-defined windows.

Creating Windows

A stdscr is provided by the Curses library when it is initialized. The size of the stdscr is determined by the dimensions of the terminal's display. You can also create your own window using the **newwin()** function.

Each time you call the **newwin()** function, curses allocates a new window structure in memory. This structure contains all the information associated with the new window. Curses does not put a limit on the number of windows you can create. The memory available to your program does restrict the number of windows you can create.

You can change windows without regard to the order in which they were created. For example, you can change a subwindow before changing its parent. Updates to the terminal's display occur through calls to the **wrefresh()** function.

Subwindows

The **subwin()** function creates a subwindow within an existing window. You must supply coordinates for the subwindow relative to the terminal's display. The subwindow must fit within the bounds of the parent window; otherwise, a null value is returned.

Pads

The **newpad()** function creates a pad data structure. A pad is not restricted by the size of a terminal's display. You can use the subpad function to create another window within a pad. The new **subpad()** is positioned relative to its parent.

Removing Windows, Pads, and Subwindows

To remove a window, pad, or subwindow, use the **delwin()** function. Before you can delete a window or pad, you must have already deleted its children; otherwise, the **delwin()** function returns an error.

Changing the Screen or Window Images

When curses functions change the appearance of a window, they are actually manipulating a window structure belonging to either the stdscr or a user-defined window. Changes are not sent immediately to the terminal's display. Instead, the internal representation of the window is updated while the display remains unchanged until the next call to the **wrefresh()** function.

The **wrefresh()** function uses the information in the window structure to update the display. During a refresh, the internal current screen structure is updated to match what is actually on the terminal's display.

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Refreshing Windows

Any time you write output to a window or pad structure, you must refresh the terminal's display to match the internal representation. A refresh does the following:

- Compares the contents of the curscr to the contents of the user-defined or stdscr.
- Updates the curscr structure to match the user-defined or stdscr.
- Redraws the portion of the physical display that changed.

The **wrefresh()** function updates a user-defined window. You use the **refresh()** function to update the stdscr. Both of these functions first call the **wnoutrefresh()** function to copy the window being refreshed to the current screen. They then call the **doupdate()** function to update the display.

If you need to refresh multiple windows at the same time, use one of the two available methods. You can use a series of calls to the **wrefresh()** function that result in alternating calls to the **wnoutrefresh()** and **doupdate()** functions. You can also call the **wnoutrefresh()** function once for each window and then call the **doupdate()** function once. With the second method, only one burst of save output is sent to the display.

Functions Used for Refreshing Pads

The **prefresh()** and **pnoutrefresh()** functions are similar to the **wrefresh()** and **wnoutrefresh()** functions. The **prefresh()** function updates both the current screen and the physical display to reflect changes made to a user-defined pad. The **pnoutrefresh()** function updates curscr to reflect changes made to a user-defined pad. Because pads instead of windows are involved, these functions require additional parameters to indicate which part of the pad and screen are involved.

Refreshing Areas that Have Not Changed

During a refresh, only those areas that have changed are redrawn on the display. It is possible to refresh areas of the display that have not changed using the **touchwin()** and **touchline()** functions.

The **touchwin()** function forces every character in the specified window to be refreshed during the next call to the **refresh()** or **wrefresh()** function. The **touchline()** function forces all the characters in a given range of lines to be refreshed at the next call to the **refresh()** or **wrefresh()** function.

Combining the **touchwin()** and **wrefresh()** functions is helpful when dealing with subwindows or overlapping windows. To bring a window forward from behind another window, call the **touchwin()** function followed by the **wrefresh()** function.

Garbled Displays

If text is sent to the terminal's display with a noncurses function, such as the **echo()** or **printf()** function, the external window can become garbled. In this case, the display changes, but the current screen is not updated to reflect these changes. Problems can arise when a refresh is called on the garbled screen because, after a screen is garbled, there is no difference between the window being refreshed and the current screen structure. As a result, spaces on the display caused by garbled text are not changed.

A similar problem can also occur when a window is moved. The characters sent to the display with the noncurses functions do not move with the window internally. If

the screen does become garbled, call the **wrefresh()** function on the curscr to update the display to reflect the current physical display.

Manipulating Window Content

After a window or subwindow is created, programs often must manipulate them in some way. The **mvwin()** function moves a window or subwindow. The **box()** function draws a box around the edge of a window or subwindow.

The **overlay()** and **overwrite()** functions copy text from one window or subwindow on top of another. To use these functions, the two windows must overlap. Also, be aware that the **overwrite()** function is destructive whereas the **overlay()** function is not. When text is copied from one window to another using the overwrite function, blank portions from the copied window overwrite any portions of the window copied to. The **overlay()** function is nondestructive because it does not copy blank portions from the copied window.

Similar to the **overlay()** and **overwrite()** functions, the **copywin()** function allows you to copy a portion of one window to another. Unlike **overlay()** and **overwrite()** functions, the windows do not have to overlap for you to use the **copywin()** function.

You can use the **ripoffline()** function to remove a line from the stdscr. If you pass this function a positive line argument, the specified number of lines is removed from the top of the stdscr. Otherwise, if you pass the function a negative line argument, the lines are removed from the bottom of the stdscr.

Support for Filters

The **filter()** function is provided for curses applications that are filters. This function causes curses to operate as if the stdscr was only a single line on the screen. When running with the **filter()** function, curses does not use any terminal capabilities that require knowledge of the line that curses is on.

Chapter 5. Controlling the Cursor

In the Curses library, there are two types of cursors:

logical cursor
The cursor location within each window. A window's data structure keeps track of the location of its logical cursor. Each window has a logical cursor.

physical cursor
The display cursor. The workstation uses this cursor to write to the display. There is only one physical cursor per display.

You can only add to or erase characters at the current cursor location in a window. The following functions are provided for controlling the cursor:

move Moves the logical cursor associated with the stdscr.

wmove
Moves the logical cursor associated with a user-defined window.

getbegyx
Places the beginning coordinates of the window in integer variables y and x.

getmaxyx
Places the size of the window in integer variables y and x.

getyx Returns the position of the logical cursor associated with a specified window.

leaveok
Controls physical cursor placement after a call to the **wrefresh()** function.

mvcur Moves the physical cursor.

After a call to the **refresh()** or **wrefresh()** function, curses places the physical cursor at the last updated character position in the window. To leave the physical cursor where it is and not move it after a refresh, call the **leaveok()** function with the Window parameter set to the desired window and the Flag parameter set to **TRUE**.

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Chapter 6. Manipulating Characters with Curses

You can add characters to a curses window by way of a keyboard or a curses application. This section provides an overview of the ways you can add, remove, or change characters that appear in a curses window.

Adding Characters to the Screen Image

The Curses library provides a number of functions that write text changes to a window and mark the area to be updated at the next call to the **wrefresh()** function. The following function families add text to windows:

- **waddch()**
- **waddstr()**
- **winsch()**
- **winsertln()**
- **wprintw()**

waddch Functions

The **waddch()** functions overwrite the character at the current logical cursor location with a specified character. After overwriting, the logical cursor is moved one space to the right. If the **waddch()** functions are called at the right margin, these functions also add an automatic newline character. Additionally, if you call one of these functions at the bottom of a scrolling region and scrollok is enabled, the region is scrolled up one line. For example, if you added a new line at the bottom line of a window, the window would scroll up one line.

If the character to add is a tab, newline, or backspace character, curses moves the cursor appropriately in the window to reflect the addition. Tabs are set at every eighth column. If the character is a newline, curses first uses the **wclrtoeol()** function to erase the current line from the logical cursor position to the end of the line before moving the cursor. The **waddch()** function family is made up of the following:

waddch() function
: Adds a character to the user-defined window.

addch() function
: Adds a character to the stdscr.

mvaddch() function
: Moves a character to the specified location before adding it to the stdscr.

mvwaddch() function
: Moves a character to the specified location before adding it to the user-defined window.

By using the **winch()** and **waddch()** function families together, you can copy text and video attributes from one place to another. Using the **winch()** function family, you can retrieve a character and its video attributes. You can then use one of the **waddch()** functions to add the character and its attributes to another location.

You can also use the **waddch()** functions to add control characters to a window. Control characters are drawn in the ^X notation.

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Note: Calling the **winch()** function on a position in the window containing a control character does not return the character. Instead, it returns one character of the control character representation.

Outputting Single, Noncontrol Characters

When outputting single, noncontrol characters, there is significant performance gain to using the **wechochar()** functions. These functions are functionally equivalent to a call to the corresponding **waddch()** function followed by the corresponding **wrefresh()** function. The **wechochar()** functions include the **wechochar()** function, the **echochar()** function, and the **pechochar()** function.

Line Graphics

You can use the following variables to add line-drawing characters to the screen with the **waddch()** function. When defined for the terminal, the variable will have the **A_ALTCHARSET** bit turned on. Otherwise, the default character listed in the following table will be stored in the variable.

Variable Name	Default Character	Glyph Description
ACS_ULCORNER	+	upper left corner
ACS_LLCORNER	+	lower left corner
ACS_URCORNER	+	upper right corner
ACS_LRCORNER	+	lower right corner
ACS_RTEE	+	right tee (-)
ACS_LTEE	+	left tee (-)
ACS_BTEE	+	bottom tee ( )
ACS_TTEE	+	top tee ({)
ACS_HLINE	#	horizontal line
ACS_VLINE	¦	vertical line
ACS_PLUS	+	plus
ACS_S1	#	scan line 1
ACS_S9	_	scan line 9
ACS_DIAMOND	+	diamond
ACS_CKBOARD	:	checker board (stipple)
ACS_DEGREE	'	degree symbol
ACS_PLMINUS	#	plus/minus
ACS_BULLET	o	bullet
ACS_LARROW	<	arrow pointing left
ACS_RARROW	>	arrow pointing right
ACS_DARROW	!	arrow pointing down
ACS_UARROW	ì	arrow pointing up
ACS_BOARD	#	board of squares
ACS_LANTERN	#	lantern symbol
ACS_BLOCK	#	solid square block

waddstr Functions

The **waddstr()** functions add a null-terminated character string to a window, starting with the current character. Calling an **waddstr()** function is equivalent to calling the corresponding **waddch()** function once for each character in the string. If you are adding a single character, use the **waddch()** function. Otherwise, use the **waddstr()** function. The following are part of the **waddstr()** function family:

waddstr() function
Adds a character string to a user-defined window.

addstr() function
Adds a character string to the stdscr.

mvaddstr() function
Moves the logical cursor to a specified location before adding a character string to the stdscr.

mvwaddstr() function
Moves the logical cursor to a specified location before adding a character string to a user-defined window.

winsch Functions

The **winsch()** functions insert a specified character before the current character in a window. All characters to the right of the inserted character are moved one space to the right. As a result, the rightmost character on the line may be lost. The positions of the logical and physical cursors do not change after the move. The **winsch()** functions include the following:

winsch() function
Inserts a character in a user-defined window.

insch() function
Inserts a character in the stdscr.

mvinsch() function
Moves the logical cursor to a specified location in the stdscr before inserting a character.

mvwinsch() function
Moves the logical cursor to a specified location in a user-defined window before inserting a character.

winsertln Functions

The **winsertln()** functions insert a blank line above the current line in a window. The **insertln()** function inserts a line in the stdscr. The bottom line of the window is lost. The **winsertln()** function performs the same action in a user-defined window.

wprintw Functions

The **wprintw()** functions replace a series of characters (starting with the current character) with formatted output. The format is the same as for the **printf()** command. The **wprintw()** performs the same action as the **printw()** function but in a user-defined window. The following functions belong to the **printw()** family:

wprintw() function
Replaces a series of characters in a user-defined window.

printw() function
Replaces a series of characters in the stdscr.

mvprintw() function
Moves the logical cursor to a specified location in the stdscr before replacing any characters.

mvwprintw() function
Moves the logical cursor to a specified location in a user-defined window before replacing any characters.

The **wprintw()** functions make calls to the **waddch()** function to replace characters.

unctrl Function

The **unctrl()** function returns a printable representation of the specified character. Control characters are displayed in the ^X notation. The **unctrl()** function returns print characters as is.

Enabling Text Scrolling

Scrolling occurs when a program or user moves a cursor off a window's bottom edge. For scrolling to occur, you must first use the **scrollok()** function to enable scrolling for a window. A window is scrolled if scrolling is enabled and if any of the following occur:

- The cursor is moved off the edge of a window.
- A new-line character is encountered on the last line.
- After a character is inserted in the last position of the last line.

When a window is scrolled, curses will update both the window and the display. However, to get the physical scrolling effect on the terminal, you must call the **idlok()** function with the Flag parameter set to **TRUE**. If scrolling is disabled, the cursor is left on the bottom line at the location where the character was entered.

When scrolling is enabled for a window, you can use the **setscrreg()** function to create a software scrolling region inside the window. You pass the **setscrreg()** function values for the top line and bottom line of the region. If setscrreg is enabled for the region and scrolling is enabled for the window, any attempt to move off the specified bottom line causes all the lines in the region to scroll up one line. You can use the **setscrreg()** function to define a scrolling region in the stdscr. Otherwise, you use the **wsetscrreg()** function to define scrolling regions in user-defined windows.

Note: Unlike the **idlok()** function, the **setscrreg()** function has nothing to do with the use of the physical scrolling region capability that the terminal may or may not have.

Deleting Characters

You can delete text by replacing it with blank spaces or by removing characters from a character array and sliding the rest of the characters on the line one space to the left. Use the following function families to delete text:

- **werase()**
- **wclear()**
- **wdelch()**
- **wdeleteln()**

werase Functions

The **erase()** function copies blank space to every position in the stdscr. The **werase()** function puts a blank space at every position in a user-defined window. To delete a single character in a window, use the **wdelch()** function.

wclear Functions

The **wclear()** functions are similar to the **werase()** functions. However, in addition to putting a blank space at every position of a window, the **wclear()** functions also call the **wclearok()** function. As a result, the screen is cleared on the next call to the **wrefresh()** function.

The **wclear()** function family contains the **wclear()** function, the clear function, and the **clearok()** function. The **clear()** function puts a blank at every position in the stdscr. The **clearok()** function causes the next call to the **refresh()** function to clear and redraw the entire window.

wclrtoeol Functions

The **clrtoeol()** function erases from the right of the cursor to the end of the current line in the stdscr. The **wclrtoeol()** function performs the same action within a user-defined window.

wclrtobot Functions

The **clrtobot()** function erases from the right of the cursor to the end of the stdscr. The **wclrtobot()** performs the same action in a user-defined window.

wdelch Functions

The **wdelch()** functions delete the current character and move all the characters to the right of the current character on the current line one position to the left. The last character in the line is filled with a blank. The **delch()** function family consists of the following functions:

wdelch() function
Deletes the current character in a user-defined window.

delch() function
Deletes the current character from the stdscr.

mvdelch() function
Moves the logical cursor before deleting a character from the stdscr.

mvwdelch() function
Moves the logical cursor before deleting a character from a user-defined window.

wdeleteln Functions

The **wdeleteln()** functions delete the current line and move all lines below the current line up one line. This clears the window's bottom line. The **deleteln()** function deletes lines within the stdscr. The **wdeleteln()** function deletes lines in a user-defined window.

Getting Characters

Your program can retrieve characters from the keyboard or from the display. The **wgetch()** functions retrieve characters from the keyboard. The **winch()** functions retrieve characters from the display.

wgetch Functions

The **wgetch()** functions read characters from the keyboard attached to the terminal associated with the window. Before getting a character, these functions call the **wrefresh()** functions if anything in the window has changed: for example, if the cursor has moved or text has changed. If the **wgetch()** function encounters a Ctrl-D key sequence during processing, it returns.

The following belong to the **wgetch()** function family:

wgetch() function
Gets a character from a user-defined window.

getch() function
Gets a character from the stdscr.

mvgetch() function
Moves the cursor before getting a character from the default window.

mvwgetch() function
Moves the cursor before getting a character from a user-defined window.

To place a character previously obtained by a call to the **wgetch()** function back in the input queue, use the **ungetch()** function. The character is retrieved by the next call to the **wgetch()** function.

The Importance of Terminal Modes The output of the **wgetch()** functions is, in part, determined by the mode of the terminal. The following list describes the action of the **wgetch()** functions in each type of terminal mode:

Mode Action of wgetch() Functions

NODELAY
Returns a value of ERR if there is no input waiting.

DELAY
Stops reading until the system passes text through the program. If CBREAK mode is also set, the program stops after one character. If CBREAK mode is not set (NOCBREAK mode), the **wgetch()** function stops reading after the first new-line character. If ECHO is set, the character is also echoed to the window.

HALF-DELAY
Stops reading until a character is typed or a specified timeout is reached. If ECHO mode is set, the character is also echoed to the window.

Note: When you use the **wgetch()** functions do not set both the NOCBREAK mode and the ECHO mode at the same time. Setting both modes can cause undesirable results depending on the state of the tty driver when each character is typed.

Function Keys Function keys are defined in the **curses.h** file. Function keys can be returned by the **wgetch()** function if the keypad is enabled. A terminal may not support all of the function keys. To see if a terminal supports a particular key, check

its **terminfo** database definition. The following table lists the function keys defined in the **curses.h** file:

Name	Key Name
KEY_BREAK	Break key (unreliable).
KEY_DOWN	Down arrow key.
KEY_UP	Up arrow key.
KEY_LEFT	Left arrow key.
KEY_RIGHT	Right arrow key.
KEY_HOME	Home key (upward + left arrow).
KEY_BACKSPACE	Backspace (unreliable).
KEY F0	Function keys. Space for 64 keys is reserved.
KEYF(n)	Formula for fn.
KEY_DL	Delete line.
KEY_IL	Insert line.
KEY_DC	Delete character.
KEY_IC	Insert character or enter insert mode.
KEY_EIC	Exit insert character mode.
KEY_CLEAR	Clear screen.
KEY_EOS	Clear to end of screen.
KEY_EOL	Clear to end of line.
KEY_SF	Scroll 1 line forward.
KEY_SR	Scroll 1 line backwards (reverse).
KEY_NPAGE	Next page.
KEY_PPAGE	Previous page.
KEY_STAB	Set tab.
KEY_CTAB	Clear tab.
KEY_CATAB	Clear all tabs.
KEY_ENTER	Enter or send.
KEY_SRESET	Soft (partial) reset.
KEY_RESET	Reset or hard reset.
KEY_PRINT	Print or copy.
KEY_IL	Home down or bottom (lower left) keypad.
KEY_A1	Upper left of keypad.
KEY_A3	Upper right of keypad.
KEY_B2	Center of keypad.
KEY_C1	Lower left of keypad.
KEY_C3	Lower right of keypad.
KEY_BTAB	Back tab key.
KEY_BEG	Beginning key.
KEY_CANCEL	Cancel key.
KEY-CLOSE	Close key.
KEY_COMMAND	Command key.

Name	Key Name
KEY_COPY	Copy key.
KEY_CREATE	Create key.
KEY_END	End key.
KEY_EXIT	Exit key.
KEY_FIND	Find key.
KEY_HELP	Help key.
KEY_MARK	Mark key.
KEY_MESSAGE	Message key.
KEY_MOVE	Move key.
KEY_NEXT	Next object key.
KEY_OPEN	Open key.
KEY_OPTIONS	Options key.
KEY_PREVIOUS	Previous object key.
KEY_REDO	Redo key.
KEY_REFERENCE	Reference key.
KEY_REFRESH	Refresh key.
KEY_REPLACE	Replace key.
KEY_RESTART	Restart key.
KEY_RESUME	Resume key.
KEY_SAVE	Save key.
KEY_SBEG	Shifted beginning key.
KEY_SCANCEL	Shifted cancel key.
KEY_SCOMMAND	Shifted command key.
KEY_SCOPY	Shifted copy key.
KEY_SCREATE	Shifted create key.
KEY_SDC	Shifted delete-character key.
KEY_SDL	Shifted delete-line key.
KEY_SELECT	Select key.
KEY_SEND	Shifted end key.
KEY_SEOL	Shifted clear-line key.
KEY_SEXIT	Shifted exit key.
KEY_SFIND	Shifted find key.
KEY_SHELP	Shifted help key.
KEY_SHOME	Shifted home key.
KEY_SIC	Shifted input key.
KEY_SLEFT	Shifted left arrow key.
KEY_SMESSAGE	Shifted message key.
KEY_SMOVE	Shifted move key.
KEY_SNEXT	Shifted next key.
KEY_SOPTIONS	Shifted options key.
KEY_SPREVIOUS	Shifted previous key.

Name	Key Name
KEY_SPRINT	Shifted print key.
KEY_SREDO	Shifted redo key.
KEY_SREPLACE	Shifted replace key.
KEY_SRIGHT	Shifted right arrow key.
KEY_SRSUME	Shifted resume key.
KEY_SSAVE	Shifted save key.
KEY_SSUSPEND	Shifted suspend key.
KEY_SUNDO	Shifted undo key.
KEY_SUSPEND	Suspend key.
KEY_UNDO	Undo key.

Getting Function Keys

If your program enables the keyboard with the **keypad()** function, and the user presses a function key, the token for that function key is returned instead of raw characters. The possible function keys are defined in the **/usr/include/curses.h** file. Each define statement begins with a **KEY_** prefix and the keys are defined as integers beginning with the value 03510.

If a character is received that could be the beginning of a function key (such as an Escape character), curses sets a timer. If the remainder of the sequence is not received before the timer expires, the character is passed through. Otherwise, the function key's value is returned. For this reason, after a user presses the escape key there is a delay before the escape is returned to the program. You should avoid using the escape key where possible when you call a single-character function such as the **wgetch()** function.

To prevent the **wgetch()** function from setting a timer, call the **notimeout()** function. If notimeout is set to TRUE, curses does not distinguish between function keys and characters when retrieving data.

keyname Subroutine

The **keyname()** function returns a pointer to a character string containing a symbolic name for the Key argument. The Key argument can be any key returned from the **wgetch()**, **getch()**, **mvgetch()**, or **mvwgetch()** function.

winch Functions

The **winch()** functions retrieve the character at the current position. If any attributes are set for the position, the attribute values are ORed into the value returned. You can use the **winch()** functions to extract only the character or its attributes. To do this, use the predefined constants **A_CHARTEXT** and **A_ATTRIBUTES** with the logical & (ampersand) operator. These constants are defined in the **curses.h** file. The following are the **inch()** functions:

winch() function
Gets the current character from a user-defined window.

inch() function
Gets the current character from the stdscr.

mvinch() function
Moves the logical cursor before calling the **inch()** function on the stdscr.

mvwinch() function
Moves the logical cursor before calling the **winch()** function in the user-defined window.

wscanw Functions

The **wscanw()** functions read character data, interpret it according to a conversion specification, and store the converted results into memory. The **wscanw()** functions use the **wgetstr()** functions to read the character data. The following are the **wscanw()** functions:

wscanw() function
Scans a user-defined window.

scanw() function
Scans the stdscr.

mvscanw() function
Moves the logical cursor before scanning the stdscr.

mvwscanw() function
Moves the logical cursor in the user-defined window before scanning.

The **vwscanw()** function scans a window using a variable argument list. For information about manipulating variable argument lists, see the **varargs** functions.

Chapter 7. Understanding Terminals

The capabilities of your program are limited, in part, by the capabilities of the terminal on which it runs. This section provides information about initializing terminals and identifying their capabilities.

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Chapter 8. Manipulating Multiple Terminals

With curses, you can use one or more terminals for input and output. The terminal functions enable you to establish new terminals, to switch input and output processing, and to retrieve terminal capabilities.

You can start curses on a single default screen using the **initscr()** function. This should be sufficient for most applications. However, if your application sends output to more than one terminal, you should use the **newterm()** function. Call this function for each terminal. If your application wants an indication of error conditions so that it can continue to run in a line-oriented mode if the terminal cannot support a screen-oriented program, you should also use the **newterm()** function.

When it completes, a program must call the **endwin()** function for each terminal it used. If you call the **newterm()** function more than once for the same terminal, the first terminal referred to must be the last one for which you call the **endwin()** function.

The **set_term()** function switches input and output processing between different terminals.

Determining Terminal Capabilities

Curses supplies the following functions to help you determine the capabilities of a terminal:

- **longname()**
- **has_il()**

The **longname()** function returns a pointer to a static area containing a verbose description of the current terminal. This area is defined only after a call to the **initscr()** or **newterm()** function. If you intend to use the **longname()** function with multiple terminals, you should know that each call to the **newterm()** function overwrites this area. Calls to the **set_term()** function do not restore the value. Instead, save this area between calls to the **newterm()** function.

The **has_ic()** function returns TRUE if the terminal has insert and delete character capabilities.

The **has_il()** function returns TRUE if the terminal has insert and delete line capabilities or can simulate the capabilities using scrolling regions. Use the **has_il()** function to check whether it is appropriate to turn on physical scrolling using the **scrollok()** or **idlok()** functions.

Setting Terminal Input and Output Modes

The functions that control input and output determine how your application retrieves and displays data to users.

The **raw()** function puts the terminal into RAW mode. In RAW mode, characters typed by the user are immediately available to the program. Additionally, the interrupt, quit, suspend, and flow-control characters are passed uninterpreted instead of generating a signal as they do in CBREAK mode. The **noraw()** function takes the terminal out of RAW mode.

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The **cbreak()** function performs a subset of the functions performed by the **raw()** function. The **cbreak()** function puts the terminal into CBREAK mode. In CBREAK mode, characters typed by the user are immediately available to the program and erase or kill character processing is not done. Unlike RAW mode, interrupt and flow characters are acted upon. Otherwise, the tty driver buffers the characters typed until a newline or carriage return is typed.

Note: CBREAK mode disables translation by the tty driver.

The **nocbreak()** function takes the terminal out of CBREAK mode.

The **echo()** function puts the terminal into ECHO mode. In ECHO mode, curses writes characters typed by the user to the terminal at the physical cursor position. The **noecho()** function takes the terminal out of ECHO mode.

The **delay_output()** function sets the output delay to the specified number of milliseconds. You should not use this function extensively because it uses padding characters instead of a processor pause.

The **nl()** and **nonl()** functions, respectively, control whether curses translates new lines into carriage returns and line feeds on output, and whether curses translates carriage returns into new lines on input. Initially, these translations do occur. By disabling these translations, the curses function library has more control over the line-feed capability, resulting in faster cursor motion.

Using the terminfo and termcap Files

When curses is initialized, it checks the **TERM** environment variable to identify the terminal type. Then, curses looks for a definition explaining the capabilities of the terminal. Usually this information is kept in a local directory specified by the **TERMINFO** environment variable or in the /usr/share/lib/terminfo directory. All curses programs first check to see if the **TERMINFO** environment variable is defined. If this variable is not defined, the **/usr/share/lib/terminfo** directory is checked.

For example, if the **TERM** variable is set to vt100 and the **TERMINFO** variable is set to the **/usr/mark/myterms** file, curses checks for the **/usr/mark/myterms/v/vt100** file. If this file does not exist, curses checks the **/usr/share/lib/terminfo/v/vt100** file. For an explanation of the **terminfo** database, see the **terminfo** file format.

Additionally, the **LINES** and **COLUMNS** environment variables can be set to override the terminal description.

Writing Programs That Use the terminfo Functions

Use the **terminfo** functions when your program needs to deal directly with the **terminfo** database. For example, use these functions to program function keys. In all other cases, curses functions are more suitable and their use is recommended.

Initializing Terminals

Your program should begin by calling the **setupterm()** function. Normally, this function is called indirectly by a call to the **initscr()** or **newterm()** function. The **setupterm()** function reads the terminal-dependent variables defined in the **terminfo** database. The **terminfo** database includes boolean, numeric, and string

variables. After reading the database, the **setupterm()** function initializes the **cur_term** variable with the terminal definition. When working with multiple terminals, you can use the **set_curterm()** function to set the **cur_term()** variable to a specific terminal. All of **terminfo** boolean, numeric, and string variables use the values defined for the specified terminal.

Another function, **restartterm()**, is similar to the **setupterm()** function. However, it is called after memory is restored to a previous state. For example, you would call the **restartterm()** function after a call to the **scr_restore()** function. The **restartterm()** function assumes that the input and output options are the same as when memory was saved, but that the terminal type and baud rate may differ.

The **del_curterm()** function frees the space containing the capability information for a specified terminal.

These files contain the definitions for the strings, numbers, and flags in the **terminfo** database.

Handling Terminal Capabilities

Pass all parameterized strings through the **tparm()** function to instantiate them. You should print all **terminfo** strings and the output of the **tparm()** function with the **tputs()** or **putp()** function.

Use the following functions to obtain and pass terminal capabilities:

tigetflag
: Returns the value of a specified boolean capability. If the capability is not boolean, a -1 is returned.

tigetnum
: Returns the value of a specified numeric capability. If the capability is not numeric, a -2 is returned.

tigetstr
: Returns the value of a specified string capability. If the capability specified is not a string, the tigetstr function returns the value of (char *) -1.

Exiting the Program

When your program exits you should restore the tty modes to their original state. To do this, call the **reset_shell_mode()** function. If your program uses cursor addressing, it should output the enter_ca_mode string at startup and the exit_ca_mode string when it exits.

Programs that use shell escapes should call the **reset_shell_mode()** function and output the exit_ca_mode string before calling the shell. After returning from the shell, the program should output the enter_ca_mode string and call the **reset_prog_mode()** function. This process differs from standard curses operations which call the **endwin()** function on exit.

Low-Level Screen Functions

Use the following functions for low-level screen manipulations:

scr_restore
: Restores the virtual screen to the contents of a previously dumped file.

scr_dump
Dumps the contents of the virtual screen to the specified file.

scr_init
Initializes the curses data structures from a specified file.

ripoffline
Strips a single line from the stdscr.

termcap Functions

If your program uses the termcap file for terminal information, the termcap functions are included as a conversion aid. The parameters are the same for the termcap functions. Curses emulates the functions using the terminfo database. The following termcap functions are supplied:

tgetent
Emulates the **setupterm()** function.

tgetflag
Returns the boolean entry for a termcap identifier.

tgetnum
Returns the numeric entry for a termcap identifier.

tgetstr
Returns the string entry for a termcap identifier.

tgoto Duplicates the **tparm()** function. The output from the **tgoto()** function should be passed to the **tputs()** function.

Converting termcap Descriptions to terminfo Descriptions

The **captoinfo** command converts termcap descriptions to terminfo descriptions. The following example illustrates how the **captoinfo** command works:

```
captoinfo /usr/lib/libtermcap/termcap.src
```

This command converts the **/usr/lib/libtermcap/termcap.src** file to terminfo source. The **captoinfo** command writes the output to standard output and preserves comments and other information in the file. For more information, see the **captoinfo** command.

Manipulating TTYs

The following functions save and restore the state of terminal modes:

savetty
Saves the state of the tty modes.

resetty
Restores the state of the tty modes to what they were the last time the **savetty()** function was called.

Chapter 9. Working with Color

If a terminal supports color, you can use the color manipulation functions to include color in your curses program. Before manipulating colors, you should test whether a terminal supports color. To do this, you can use either the **has_colors()** function or the **can_change_color()** function. The **can_change_color()** function also checks to see if a program can change the terminal's color definitions. Neither of these functions require an argument.

Once you have determined that the terminal supports color, you must call the **start_color()** function before calling other color functions. It is a good practice to call this function right after the initscr function and after a successful color test. **The start_color()** function initializes the eight basic colors and two global variables, **COLORS** and **COLOR_PAIRS**. The **COLORS** global variable defines the maximum number of colors the terminal supports. The **COLOR_PAIRS** global variable defines the maximum number of color pairs the terminal supports.

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Chapter 10. Manipulating Video Attributes

Your program can manipulate a number of video attributes. The following sections provide information on video attributes and the functions that affect them.

Video Attributes, Bit Masks, and the Default Colors

Curses enables you to control the following attributes:

A_STANDOUT
Terminal's best highlighting mode.

A_UNDERLINE
Underline.

A_REVERSE
Reverse video.

A_BLINK
Blinking.

A_DIM
Half-bright.

A_BOLD
Extra bright or bold.

A_ALTCHARSET
Alternate character set.

A_NORMAL
Normal attributes.

COLOR_PAIR(Number)
Displays the color pair represented by Number. You must have already initialized the color pair using the init_pair function.

These attributes are defined in the **curses.h** file. You can pass attributes to the **wattron()**, **wattroff()**, and **wattrset()** functions or you can OR them with the characters passed to the waddch function. The C logical OR operator is a | (pipe symbol). The following bit masks are also provided:

A_NORMAL
Turns all video attributes off.

A_CHARTEXT
Extracts a character.

A_ATTRIBUTES
Extracts attributes.

A_COLOR
Extracts color-pair field information.

Two functions are provided for working with color pairs: **COLOR_PAIR**(Number) and **PAIR_NUMBER**(Attribute). The **COLOR_PAIR**(Number) function and the A_COLOR mask are used by the **PAIR_NUMBER**(Attribute) function to extract the color-pair number found in the attributes specified by the *Attribute* parameter.

If your program uses color, the **curses.h** file defines a number of functions that identify default colors. These colors are the following:

Color	Integer Value
COLOR_BLACK	0
COLOR_BLUE	1
COLOR_GREEN	2
COLOR_CYAN	3
COLOR_RED	4

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COLOR_MAGENTA	5
COLOR_YELLOW	6
COLOR_WHITE	7

Curses assumes that the default background color for all terminals is 0 **(COLOR_BLACK)**.

Setting Video Attributes

The current window attributes are applied to all characters written into the window with the **addch()** functions. These attributes remain as a property of the characters. The characters retain these attributes during terminal operations.

The **attrset()** function sets the current attributes of the default screen. The **wattrset()** function sets the current attributes of the user-defined window.

Use the **attron()** and **attroff()** functions to turn on and off the specified attributes in the stdscr without affecting any others. The **wattron()** and **wattroff()** functions perform the same actions in user-defined windows.

The **standout()** function is the same as a call to the **atttron()** function with the **A_STANDOUT** attribute. It puts the stdscr into the terminal's best highlight mode. The **wstandout()** function is the same as a call to the **wattron**(*Window,* **A_STANDOUT**) function. It puts the user-defined window into the terminal's best highlight mode. The **standend()** function is the same as a call to the **attrset(0)** function. It turns off all attributes for stdscr. The **wstandend()** function is the same as a call to the **wattrset**(*Window*,0) function. It turns off all attributes for the specified window.

The **vidputs()** function outputs a string that puts the terminal in the specified attribute mode. Characters are output through the **putc()** function. The **vidattr()** function is the same as the **vidputs()** function except that characters are output through the **putchar()** function.

Working with Color Pairs

The **COLOR_PAIR**(*Number*) function is defined in the **curses.h** file so you can manipulate color attributes as you would any other attributes. You must initialize a color pair with the **init_pair()** function before you use it. The **init_pair()** function has three parameters Pair, Foreground, and Background. The Pair parameter must be between 1 and **COLOR_PAIRS-1**. The Foreground and Background parameters must be between 0 and **COLORS-1**. For example, to initialize color pair 1 to a foreground of black with a background of cyan, you would use the following:

```
init_pair(1, COLOR_BLACK, COLOR_CYAN);
```

You could then set the attributes for the window as:

```
wattrset(win, COLOR_PAIR(1));
```

If you then write the string "Let's add Color to the terminal," the string appears as black characters on a cyan background.

Extracting Attributes

You can use the results from the call to the **winch()** function to extract attribute information, including the color-pair number. The following example uses the value returned by a call to the **winch()** function with the C logical AND operator (&); and the **A_ATTRIBUTES** bit mask to extract the attributes assigned to the current

position in the window. The results from this operation are used with the **PAIR_NUMBER()** function to extract the color-pair number, and the number 1 is printed on the screen.

```
win = newwin(10, 10, 0, 0);
init_pair(1, COLOR_RED, COLOR_YELLOW);
wattrset(win, COLOR_PAIR(1));
waddstr(win, "apple");

number = PAIR_NUMBER((mvwinch(win, 0, 0) & A_ATTRIBUTES));
wprintw(win, "%d\n", number);
wrefresh(win);
```

Lights and Whistles

The **beep()** function sounds an audible alarm on the terminal to signal the user. The **flash()** function displays a visible alarm on the terminal to signal the user.

Setting Curses Options

All curses options are initially turned off. It is not necessary to turn these options off before calling the **endwin()** function. The following functions allow you to set various options with curses:

curs_set
: Sets the cursor visibility to invisible, normal, or very visible.

idlok
: Specifies whether curses can use the hardware insert and delete line features of terminals so equipped.

intrflush
: Specifies whether an interrupt key (interrupt, quit, or suspend) flushes all output in the tty driver. This option's default is inherited from the tty driver.

keypad
: Specifies whether curses retrieves the information from the terminal's keypad. If enabled, the user can press a function key (such as an arrow key) and the **wgetch()** function returns a single value representing that function key. If disabled, curses will not treat the function keys specially and your program must interpret the escape sequences. For a list of these function keys, see the **wgetch()** function.

typeahead
: Instructs curses to check for type ahead in an alternative file descriptor.

See the **wgetch()** function and "Setting Terminal Input and Output Modes" on page 29 for descriptions of additional curses options.

Chapter 11. Manipulating Soft Labels

Curses provides functions for manipulating soft function-key labels. These labels appear at the bottom of the screen and give applications, such as editors, a more user-friendly look. To use soft labels, you must call the **slk_init()** function before calling the **initscr()** or **newterm()** functions.

To manage soft labels, curses reduces the size of the default screen (stdscr) by one line. It reserves this line for use by the soft-label functions. This reservation means that the environment variable **LINES** is also reduced. Many terminals support built-in soft labels. If built-in soft labels are supported, curses uses them. Otherwise, curses simulates the soft-labels with software.

Because many terminals that support soft labels have 8 labels, curses follows the same standard. A label string is restricted to 8 characters. Curses arranges labels in one of two patterns: 3-2-3 (3 left, 2 center, 3 right) or 4-4 (4 left, 4 right).

To specify a string for a particular label, call the **slk_set()** function. This function also instructs curses as to left-justify, right-justify, or center the string on the label. If you wish to obtain a label name before it was justified by the **slk_set()** function, use the **slk_label()** function. The **slk_clear()** and **slk_restore()** functions clear and restore soft labels respectively. Normally, to update soft labels, your program should call the **slk_noutrefresh()** function for each label and then use a single call to the **slk_refresh()** function to perform the actual output. To output all the soft labels on the next call to the **slk_noutrefresh()** function, use the **slk_touch()** function.

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Chapter 12. Obsolete Curses Functions

Several functions are obsolete in the AIX Version 4.1 of curses. These obsolete functions are emulated as indicated in the following list:

Obsolete	Replaced by
crmode	cbreak()
fixterm	reset_prog_mode()
getcap	tgetstr()
nocrmode	nocbreak()
resetterm	reset_shell_mode()
saveterm	def_prog_mode()
setterm	setupterm()

The **touchoverlap()**, **flushok()**, and **_showstring()** functions are obsolete and there are no direct replacements. The **gettmode()** function is available as a no-op.

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Chapter 13. AIX Version 3.2 Curses Compatibility

In this version of AIX, curses is compatible with AT&T System V Release 3.2 curses. The older AIX curses has been kept in a form useful for supporting existing binaries only. This change was done to provide support for color and to increase application portability to AIX systems.

Applications already running under AIX will still operate using the old curses. Applications compiled, rebound, or relinked on AIX Version 4.1 may need source code changes for compatibility with the newer version of curses. The newer curses library does not have or use AIX extended curses functions. Applications requiring multibyte support may still compile and link with extended curses. However, because the extended curses library may be removed in the future, use of the extended curses library is discouraged except for applications that require multibyte support.

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Chapter 14. List of Curses Functions

Starting and Stopping Curses

endwin
Terminates the curses function libraries and their data structures.

initscr Initializes the curses function library and its data structures.

Manipulating Windows

box Draws a box in or around a window.

copywin
Provides more precise control over the **overlay()** and **overwrite()** function.

delwin
Removes a window data structure.

getbegyx
Places the beginning coordinates of the window in integer variables y and x.

getmaxyx
Places the size of the window in integer variables y and x.

isendwin
Returns TRUE if the **endwin()** function has been called without any subsequent calls to the **wrefresh()** function.

mvwin
Moves a window or subwindow to a new location.

newpad
Creates a new pad data structure.

newwin
Creates a new window data structure.

overlay or overwrite
Copies one window on top of another.

prefresh or pnoutrefresh
Updates the terminal and curscr to reflect changes made to a pad.

refresh, or wrefresh
Updates the terminal and curscr to reflect changes made to a window.

scr_dump
Writes the current contents of the virtual screen to the specified file.

scr_init
Uses the contents of a specified file to initialize the curses data structures.

scr_restore
Sets the virtual screen to the contents of the specified file.

subpad
Creates and returns a pointer to a subpad within a pad.

subwin
Creates a subwindow of an existing window.

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touchline
Forces a range of lines to be refreshed at the next call to the **wrefresh()** function.

touchwin
Forces every character in a window's character array to be refreshed at the next call of the **wrefresh()** function. The **touchwin()** function does not save optimization information. This function is useful with overlapping windows.

wnoutrefresh or doupdate
Updates the designated windows and outputs them all at once to the terminal. These functions are useful for faster response when there are multiple updates.

Controlling the Cursor

getyx Returns the coordinates of the cursor in the specified window.

leaveok
Controls cursor placement after a call to the **wrefresh()** function.

move or wmove
Moves the logical cursor.

mvcur Moves the physical cursor.

Manipulating Characters

addch, mvaddch, mvwaddch, or waddch
Adds a character to a window.

addstr, waddstr, mvaddstr, or mvwaddstr
Adds a string of characters to a window.

clear, or wclear
Clears the screen and sets a clear flag for the next refresh.

clearok
Determines whether curses clears a window on the next call to the **refresh()** or **wrefresh()** function.

clrtobot or wclrtobot
Erases the lines below and to the right of the logical cursor.

clrtoeol or wclrtoeol
Erases the current line to the right of the logical cursor.

delch, mvdelch, mvwdelch, or wdelch
Deletes the character at the logical cursor location.

deleteln or wdeleteln
Deletes the current line.

echochar, wechochar, or pechochar
Functionally equivalent to a call to the **addch()** (or **waddch()** function) followed by a call to the **refresh()** (or **wrefresh()**) function.

erase or werase
Copies blank spaces to every position in a window.

flushinp
Flushes any type-ahead characters typed by the user but not yet read by the program.

getch, wgetch, mvgetch, or mvwgetch
Gets a character from standard input.

getstr, wgetstr, mvgetstr, or mvwgetstr
Gets a string from standard input.

inch, winch, mvinch, or mvwinch
Returns the character at the current cursor location.

insch, winsch, mvinsch, or mvwinsch
Inserts a character in a window.

insertln or winsertln
Inserts a blank line in a window.

keyname
Returns a pointer to a character string containing a symbolic name for the Key parameter.

meta Determines whether 8-bit character return for the wgetch function is allowed.

nodelay
Causes a call to the wgetch function to be a nonblocking call. If no input is ready, the wgetch function returns ERR.

printw, wprintw, mvprintw, or mvwprintw
Performs a formatted print on a window.

scanw, wscanw, mvscanw, or mvwscanw
Calls the scanf function on a window and uses the resulting line as input for that scan.

scroll Scrolls a window up one line.

scrollok
Enables a window to scroll when the cursor is moved off the right edge of the last line of a window.

setscrreg or wsetscrreg
Sets a software scrolling region within a window.

unctrl Returns the printable representation of a character. Control characters are punctuated with a ^ (caret).

ungetch
Places a character back in the input queue.

vwprintw
Performs the same operation as the wprintw function but takes a variable list of arguments.

vwscanw
Performs the same operation as the wscanw function but takes a variable list of arguments.

Manipulating Terminals

cbreak or nocbreak
Puts the terminal into or takes it out of CBREAK mode.

def_prog_mode
Identifies the current terminal mode as the in-curses mode.

def_shell_mode
Saves the current terminal mode as the not-in-curses mode.

del_curterm
Frees the space pointed to by the oterm variable.

delay_output
Sets the output delay in milliseconds.

echo or noecho
Controls echoing of typed characters to the screen.

halfdelay
Returns ERR if no input was typed after blocking for a specified amount of time.

has_ic
Determines whether a terminal has the insert-character capability.

has_il Determines whether a terminal has the insert-line capability.

longname
Returns the verbose name of the terminal.

newterm
Sets up a new terminal.

nl or nonl
Determines whether curses translates a new line into a carriage return and line feed on output, and translates a return into a new line on input.

notimeout
Prevents the **wgetch()** function from setting a timer when interpreting an input escape sequence.

pechochar
Equivalent to a call to the **waddch()** function followed by a call to the **prefresh()** function.

putp Provides a shortcut to the **tputs()** function.

raw or noraw
Places the terminal into or out of RAW mode.

reset_prog_mode
Restores the terminal into the in-curses program mode.

reset_shell_mode
Restores the terminal to shell mode (out-of-curses mode). The **endwin()** function does this automatically.

resetty
Restores the state of the tty modes.

restartterm
Sets up a TERMINAL structure for use by curses. This function is similar to the **setupterm()** function. Call the **restartterm()** function after restoring memory to a previous state. For example, call this function after a call to the **scr_restore()** function.

ripoffline
Removes a line from the default screen.

setupterm
Sets up the TERMINAL structure for use by curses.

tgetent
Looks up the **termcap** entry for a terminal.

tgetflag
Returns the boolean entry for a **termcap** identifier.

tgetnum
Returns the numeric entry for a **termcap** identifier.

tgetstr
Returns the string entry for a **termcap** identifier.

tgoto Instantiates the parameters into the given capability. This function is provided for compatibility with applications that use the **termcap** file.

tigetflag
Returns the value of the specified boolean capability.

tigetnum
Returns the value of the specified numeric capability.

tigetstr
Returns the value of the string capability.

tparm Instantiates a string with parameters.

tputs Applies padding information to the given string and outputs it.

Manipulating Color

can_change_color
Checks to see if the terminal supports colors and changing of the color definition.

color_content
Returns the composition of a color.

has_colors
Checks that the terminal supports colors.

init_color
Changes a color to the desired composition.

init_pair
Initializes a color pair to the specified foreground and background colors.

pair_content
Returns the foreground and background colors for a specified color-pair number.

Setting Video Attributes and Curses Options

attroff or wattroff
Turns off attributes.

attron or wattron
Turns on attributes.

attrset or wattrset
Sets the current attributes of a window.

beep Sounds the audible alarm on the terminal.

curs_set
Sets the cursor state.

flash Causes the terminal's display to flash.

idlok Allows curses to use the hardware insert/delete line feature.

intrflush
Allows an interrupt to flush all output in the tty driver queue.

keypad
Enables function keys to be interpreted by the **wgetch()** function.

standout, wstandout, standend, or wstandend
Puts a window into and out of the terminal's best highlight mode.

typeahead
Sets the file descriptor for a type-ahead check.

vidputs or vidattr
Outputs a string that puts the terminal in a video-attribute mode.

Manipulating Soft Labels

slk_clear
Clears soft labels from the screen.

slk_init
Initializes soft function key labels.

slk_label
Returns the current label.

slk_noutrefresh
Refreshs soft labels. This function is functionally equivalent to the **wnoutrefresh()** function.

slk_refresh
Refreshs soft labels. This function is functionally equivalent to the **refresh()** function.

slk_restore
Restores the soft labels to the screen after a call to the **slk_clear()** function.

slk_set
Sets a soft label.

slk_touch
Updates soft labels on the next call to the **slk_noutrefresh()** function.

Miscellaneous Utilities

baudrate
Queries the current terminal and returns its output speed.

erasechar
Returns the erase character chosen by the user.

killchar
Returns the line-kill character chosen by the user.

filter Sets the size of the terminal screen to 1-line.

Chapter 15. Curses Interfaces

This chapter describes the Curses functions, macros and external variables to support application portability at the C-language source level. The interface definitions are collated as though any underscore characters were not present.

addch()

Name

addch, mvaddch, mvwaddch, waddch - add a single-byte character and rendition to a window and advance the cursor

Synopsis

```
#include <curses.h>

int addch(const chtype ch);

int mvaddch(int y, int x, const chtype ch);

int mvwaddch(WINDOW *win, int y, int x, const chtype ch);

int waddch(WINDOW *win, const chtype ch);
```

Description

The *addch()*, *mvaddch()*, *mvwaddch()* and *waddch()* functions place *ch* into the current or specified window at the current or specified position, and then advance the window's cursor position. These functions perform wrapping. These functions perform special-character processing.

Return Value

Upon successful completion, these functions return OK. Otherwise they return ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

add_wch(), *attroff()*, *doupdate()*, **<curses.h>**.

addchstr()

Name

addchstr, addchnstr, mvaddchstr, mvaddchnstr, mvwaddchstr, mvwaddchnstr waddchstr, waddchnstr - add string of single-byte characters and renditions to a window

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Synopsis

```
#include <curses.h>

int addchstr(const chtype *chstr);

int addchnstr(const chtype *chstr, int n);

int mvaddchstr(int y, int x, const chtype *chstr);

int mvaddchnstr(int y, int x, const chtype *chstr, int n);

int mvwaddchstr(WINDOW *win, int y, int x, const chtype *chstr);

int mvwaddchnstr(WINDOW *win, int y, int x, const chtype *chstr,
                 int n);

int waddchstr(WINDOW *win, const chtype *chstr);

int waddchnstr(WINDOW *win, const chtype *chstr, int n);
```

Description

These functions overlay the contents of the current or specified window, starting at the current or specified position, with the contents of the array pointed to by *chstr* until a null *chtype* is encountered in the array pointed to by *chstr*.

These functions do not change the cursor position. These functions do not perform special-character processing. These functions do not perform wrapping.

The *addchnstr()*, *mvaddchnstr()*, *mvwaddchnstr()* and *waddchnstr()* functions copy at most *n* items, but no more than will fit on the line. If *n* is -1 then the whole string is copied, to the maximum number that fit on the line.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

addch(), *add_wch()*, *add_wchstr()*, **<curses.h>**.

---

addnstr()

Name

addnstr, addstr, mvaddnstr, mvaddstr, mvwaddnstr, mvwaddstr waddnstr, waddstr - add a string of multi-byte characters without rendition to a window and advance cursor

Synopsis

```
#include <curses.h>

int addnstr(const char *str, int n);

int addstr(const char *str);

int mvaddnstr(int y, int x, const char *str, int n);

int mvaddstr(int y, int x, const char *str);

int mvwaddnstr(WINDOW *win, int y, int x, char *const str, int n);

int mvwaddstr(WINDOW *win, int y, int x, char *const str);

int waddnstr(WINDOW *win, const char *str, int n);

int waddstr(WINDOW *win, const char *str);
```

Description

These functions write the characters of the string *str* on the current or specified window starting at the current or specified position using the background rendition.

These functions advance the cursor position. These functions perform special character processing. These functions perform wrapping.

The *addstr()*, *mvaddstr()*, *mvwaddstr()* and *waddstr()* functions are similar to calling *mbstowcs()* on *str*, and then calling *addwstr()*, *mvaddwstr()*, *mvwaddwstr()* and *waddwstr()*, respectively.

The *addnstr()*, *mvaddnstr()*, *mvwaddnstr()* and *waddnstr()* functions use at most *n* bytes from *str*. These functions add the entire string when *n* is -1. These functions are similar to calling *mbstowcs()* on the first *n* bytes of *str*, and then calling *addwstr()*, *mvaddwstr()*, *mvwaddwstr()* and *waddwstr()*, respectively.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

addnwstr(), *mbstowcs()*, **<curses.h>**.

---

addnwstr()

Name

addnwstr, addwstr, mvaddnwstr, mvaddwstr, mvwaddnwstr, mvwaddwstr, waddnwstr, waddwstr - add a wide-character string to a window and advance the cursor

Synopsis

```
#include <curses.h>

int addnwstr(const wchar_t *wstr, int n);
```

```
int addwstr(const wchar_t *wstr);

int mvaddnwstr(int y, int x, const wchar_t *wstr, int n);

int mvaddwstr(int y, int x, const wchar_t *wstr);

int mvwaddnwstr(WINDOW *win, int y, int x, const wchar_t *wstr, int n);

int mvwaddwstr(WINDOW *win, int y, int x, const wchar_t *wstr);

int waddnwstr(WINDOW *win, const wchar_t *wstr, int n);

int waddwstr(WINDOW *win, const wchar_t *wstr);
```

Description

These functions write the characters of the wide character string *wstr* on the current or specified window at that window's current or specified cursor position.

These functions advance the cursor position. These functions perform special character processing. These functions perform wrapping.

The effect is similar to building a cchar_t from the wchar_t and the background rendition and calling wadd_wch(), once for each wchar_t character in the string. The cursor movement specified by the mv functions occurs only once at the start of the operation.

The addnwstr(), mvaddnwstr(), mvwaddnwstr() and waddnwstr() functions write at most *n* wide characters. If *n* is -1, then the entire string will be added.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

add_wch(), **<curses.h>**

---

add_wch()

Name

add_wch, mvadd_wch, mvwadd_wch, wadd_wch - add a complex character and rendition to a window

Synopsis

```
#include <curses.h>

int add_wch(cchar_t *const wch);

int wadd_wch(WINDOW *win, cchar_t *const wch);

int mvadd_wch(int y, int x, cchar_t *const wch);

int mvwadd_wch(WINDOW *win, int y, int x, cchar_t *const wch);
```

Description

These functions add information to the current or specified window at the current or specified position, and then advance the cursor. These functions perform wrapping. These functions perform special-character processing.

- If *wch* refers to a spacing character, then any previous character at that location is removed, a new character specified by *wch* is placed at that location with rendition specified by *wch*; then the cursor advances to the next spacing character on the screen.
- If *wch* refers to a non-spacing character, all previous characters at that location are preserved, the non-spacing characters of *wch* are added to the spacing complex character, and the rendition specified by wch is ignored.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

addch(), **<curses.h>**.

---

add_wchnstr()

Name

add_wchnstr, add_wchstr, mvadd_wchnstr, mvadd_wchstr, mvwadd_wchnstr, mvwadd_wchstr, wadd_wchnstr, wadd_wchstr - add an array of complex characters and renditions to a window

Synopsis

```
#include <curses.h>

int add_wchnstr(const cchar_t *wchstr, int n);

int add_wchstr(const cchar_t *wchstr);

int wadd_wchnstr(WINDOW *win, const cchar_t *wchstr, int n);

int wadd_wchstr(WINDOW *win, const cchar_t *wchstr);

int mvadd_wchnstr(int y, int x, const cchar_t *wchstr, int n);

int mvadd_wchstr(int y, int x, const cchar_t *wchstr);

int mvwadd_wchnstr(WINDOW *win, int y, int x, const cchar_t *wchstr,
                   int n);

int mvwadd_wchstr(WINDOW *win, int y, int x, const cchar_t *wchstr);
```

Description

These functions write the array of cchar_t specified by *wchstr* into the current or specified window starting at the current or specified cursor position.

These functions do not advance the cursor. The results are unspecified if *wchstr* contains any special characters.

The functions end successfully on encountering a null cchar_t. The functions also end successfully when they fill the current line. If a character cannot completely fit at the end of the current line, those columns are filled with the background character and rendition.

The add_wchnstr(), mvadd_wchnstr(), mvwadd_wchnstr() and wadd_wchnstr() functions end successfully after writing *n* cchar_ts (or the entire array of cchar_ts, if *n* is -1).

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

attroff()

Name

attroff, attron, attrset, wattroff, wattron, wattrset - restricted window attribute control functions

Synopsis

```
#include <curses.h>

int attroff(int attrs);

int attron(int attrs);

int attrset(int attrs);

int wattroff(WINDOW *win, int attrs);

int wattron(WINDOW *win, int attrs);

int wattrset(WINDOW *win, int attrs);
```

Description

These functions manipulate the window attributes of the current or specified window.

The attroff() and wattroff() functions turn off *attrs* in the current or specified window without affecting any others.

The attron() and wattron() functions turn on *attrs* in the current or specified window without affecting any others.

The attrset() and wattrset() functions set the background attributes of the current or specified window to *attrs*.

It is unspecified whether these functions can be used to manipulate attributes other than A_BLINK, A_BOLD, A_DIM, A_REVERSE, A_STANDOUT and A_UNDERLINE.

Return Value

These functions always return either OK or 1.

Errors

No errors are defined.

See Also

attr_get(), *standend()*, **<curses.h>**.

---

attr_get()

Name

attr_get, attr_off, attr_on, attr_set, color_set, wattr_get, wattr_off, wattr_on, wattr_set, wcolor_set -- window attribute control functions

Synopsis

```
#include <curses.h>

int attr_get(attr_t *atttrs, short *color_pair_number, void *opts);

int attr_off(attr_t attrs, void *opts);

int attr_on(attr_t attrs, void *opts);

int attr_set(attr_t attrs, short color_pair_number, void *opts);

int color_set(short color_pair_number, void *opts);

in wattr_get (WINDOW *win, attr_t *attrs, short *color_pair_number,
              void *opts);

int wattr_off(WINDOW *win, attr_t attrs, void *opts);

int wattr_on(WINDOW *win, attr_t attrs, void *opts);

int wattr_set(WINDOW *win, attr_t attrs, short color_pair_number,
              void *opts);

int wcolor_set(WINDOW *win, short color_pair_number, void *opts);
```

Description

These functions manipulate the attributes and color of the window rendition of the current or specified window.

The attr_get() and wattr_get() functions obtain the current rendition of a window. If *attrs* or *color_pair_number* is a null pointer, no information will be obtained on the corresponding rendition information and this is not an error.

The attr_off() and wattr_off() functions turn off *attrs* in the current or specified window without affecting any others.

The attr_on() and wattr_on() functions turn on *attrs* in the current or specified window without affecting any others.

The attr_set() and wattr_set() functions set the window rendition of the current or specified window to *attrs* and *color_pair_number*.

The color_set() and wcolor_set functions set the window color of the current or specified window to *color_pair_number*.

Return Value

The attr_get() and wattr_get() functions return the current window attributes for the current or specified window.

The other functions always return OK.

Errors

No errors are defined.

See Also

attroff(), **<curses.h>**.

---

baudrate()

Name

baudrate - get terminal baud rate

Synopsis

```
#include <curses.h>

int baudrate(void);
```

Description

The baudrate() function extracts the output speed of the terminal in bits per second.

Return Value

The baudrate() function returns the output speed of the terminal.

Errors

No errors are defined.

See Also

tcgetattr(), **<curses.h>**.

---

beep()

Name

beep - audible signal

Synopsis

```
#include <curses.h>

int beep(void);
```

Description

The beep() function alerts the user. It sounds the audible alarm on the terminal, or if that is not possible, it flashes the screen (visible bell). If neither signal is possible, nothing happens.

Return Value

The beep() function always returns OK.

Errors

No errors are defined.

Application Usage

Nearly all terminals have an audible alarm, but only some can flash the screen.

See Also

flash(), **<curses.h>**.

---

bkgd()

Name

bkgd, bkgdset, getbkgd, wbkgd, wbkgdset - turn off the previous background attributes, OR the requested attributes into the window rendition, and set or get background character and rendition using a single-byte character.

Synopsis

```
#include <curses.h>

int bkgd(chtype ch);

void bkgdset(chtype ch);

chtype getbkgd(WINDOW *win);

int wbkgd(WINDOW *win, chtype ch);

void wbkgdset(WINDOW *win, chtype ch);
```

Description

The bkgdset() and wbkgdset() functions turn off the previous background attributes, OR the requested attributes into the window rendition, and set the background attributes of the current or specified window based on the information in *ch*. If *ch* refers to a multi-column character, the results are undefined.

The bkgd() and wbkgd() functions turn off the previous background attributes, OR the requested attributes into the window rendition, and set the background property of the current or specified window and then apply this setting to every character position in that window:

- The rendition of every character on the screen is changed to the new background rendition.
- Wherever the former background character appears, it is changed to the new background character.

The getbkgd() function extracts the specified window's background character and rendition.

Return Value

Upon successful completion, bkgd() and wbkgd() return OK. Otherwise, they return ERR.

The bkgdset() and wbkgdset() functions do not return a value.

Upon successful completion, getbkgd() returns the specified window's background character and rendition. Otherwise, it returns (chtype) ERR.

---

bkgd()

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

<curses.h>.

---

bkgrnd()

Name

bkgrnd, bkgrndset, getbkgrnd, wbkgrnd, wbkgrndset, wgetbkgrnd — turn off the previous background attributes, OR the requested attributes into the window rendition, and set or get background character and rendition using a complex complex character

Synopsis

```
#include <curses.h>

int bkgrnd(const cchar_t *wch);

void bkgrndset(const cchar_t *wch);

int getbkgrnd(cchar_t *wch);

int wbkgrnd(WINDOW *win, const cchar_t *wch);

void wbkgrndset(WINDOW *win, const cchar_t *wch);

int wgetbkgrnd(WINDOW *win, cchar_t *wch);
```

Description

The bkgrndset() and wbkgrndset() functions turn off the previous background attributes, OR the requested attributes into the window rendition, and set the background property of the current or specified window based on the information in *wch*.

The bkgrnd() and wbkgrnd() functions turn off the previous background attributes, OR the requested attributes into the window rendition, and set the background property of the current or specified window and then apply this setting to every character position in that window:

- The rendition of every character on the screen is changed to the new background rendition.
- Wherever the former background character appears, it is changed to the new background character.

If *wch* refers to a non-spacing complex character for bkgrnd(), bkgrndset(), wbkgrnd() and wbkgrndset(), then *wch* is added to the existing spacing complex character that is the background character. If *wch* refers to a multi-column character, the results are unspecified.

The getbkgrnd() and wgetbkgrnd() functions store, into the area pointed to by *wch*, the value of the window's background character and rendition.

Return Value

The bkgrndset() and wbkgrndset() functions do not return a value.

Upon successful completion, the other functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

border()

Name

border, wborder - draw borders from single-byte characters and renditions

Synopsis

```
#include <curses.h>

int border(chtype ls, chtype rs, chtype ts, chtype bs, chtype tl,
           chtype tr, chtype bl, chtype br);

int wborder(WINDOW *win, chtype ls, chtype rs, chtype ts, chtype bs,
            chtype tl, chtype tr, chtype bl, chtype br);
```

Description

The border() and wborder() functions draw a border around the edges of the current or specified window. These functions do not advance the cursor position. These functions do not perform special character processing. These functions do not perform wrapping.

The arguments in the left-hand column of the following table contain single-byte characters with renditions, which have the following uses in drawing the border:

Argument Name	Usage	Default Value
ls	Starting-column side	ACS_VLINE
rs	Ending-column side	ACS_VLINE
ts	First-line side	ACS_HLINE
bs	Last-line side	ACS_HLINE
tl	Corner of the first line and the starting column	ACS_ULCORNER
tr	Corner of the first line and the ending column	ACS_URCORNER
bl	Corner of the last line and the starting column	ACS_BLCORNER
br	Corner of the last line and the ending column	ACS_BRCORNER

If the value of any argument in the left-hand column is 0, then the default value in the right-hand column is used. If the value of any argument in the left-hand column is a multi-column character, the results are undefined.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

border_set(), *box()*, *hline()*, **<curses.h>**.

---

border_set()

Name

border_set, wborder_set, - draw borders from complex characters and renditions

Synopsis

```
#include <curses.h>

int border_set(const cchar_t *ls, const cchar_t *rs, const cchar_t *ts,
               const cchar_t *bs, const cchar_t *tl, const cchar_t *tr,
               const cchar_t *bl, const cchar_t *br);

int wborder_set(WINDOW *win, const cchar_t *ls, const cchar_t *rs,
                const cchar_t *ts, const cchar_t *bs,
                const cchar_t *tl, const cchar_t *tr,
                const cchar_t *bl, const cchar_t *br);
```

Description

The border_set() and wborder_set() functions draw a border around the edges of the current or specified window. These functions do not advance the cursor position. These functions do not perform special character processing. These functions do not perform wrapping.

The arguments in the left-hand column of the following table contain spacing complex characters with renditions, which have the following uses in drawing the border:

Argument Name	Usage	Default Value
ls	Starting-column side	WACS_VLINE
rs	Ending-column side	WACS_VLINE
ts	First-line side	WACS_HLINE
bs	Last-line side	WACS_HLINE
tl	Corner of the first line and the starting column	WACS_ULCORNER
tr	Corner of the first line and the ending column	WACS_URCORNER
bl	Corner of the last line and the starting column	WACS_BLCORNER
br	Corner of the last line and the ending column	WACS_BRCORNER

If the value of any argument in the left-hand column is a null pointer, then the default value in the right-hand column is used. If the value of any argument in the left-hand column is a multi-column character, the results are undefined.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

box_set(), *hline_set()*, **<curses.h>**.

box()

Name

box - draw borders from single-byte characters and renditions

Synopsis

```
#include <curses.h>

int box(WINDOW *win, chtype verch, chtype horch);
```

Description

The box() function draws a border around the edges of the specified window. This function does not advance the cursor position. This function does not perform special character processing. This function does not perform wrapping.

The function box (win, verch, horch) has an effect equivalent to:

```
wborder(win, verch, verch, horch, horch, 0, 0, 0, 0);
```

Return Value

Upon successful completion, box() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

border(), *box_set()*, *hline()*, **<curses.h>**.

box_set()

Name

box_set - draw borders from complex characters and renditions

Synopsis

```
#include <curses.h>

int box_set(WINDOW *win, const cchar_t *verch, const cchar_t *horch);
```

Description

The box_set() function draws a border around the edges of the specified window. This function does not advance the cursor position. This function does not perform special character processing. This function does not perform wrapping.

The function box_set(win, verch, horch) has an effect equivalent to:

```
wborder_set(win, verch, verch, horch, horch,
  NULL, NULL, NULL, NULL);
```

Return Value

Upon successful completion, this function returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

border_set(), *hline_set()*, **<curses.h>**.

---

can_change_color()

Name

can_change_color, color_content, has_colors, init_color, init_pair, start_color, pair_content — color manipulation functions

Synopsis

```
#include <curses.h>

bool can_change_color(void);

int color_content(short color, short *red, short *green, short *blue);

int COLOR_PAIR(int n);

bool has_colors(void);

int init_color(short color, short red, short green, short blue);

int init_pair(short pair, short f, short b);

int pair_content(short pair, short *f, short *b);

int PAIR_NUMBER(int value);

int start_color(void);

extern int COLOR_PAIRS;

extern int COLORS;
```

Description

These functions manipulate color on terminals that support color.

Querying Capabilities

The has_colors() function indicates whether the terminal is a color terminal. The can_change_color() function indicates whether the terminal is a color terminal on which colors can be redefined.

Initialization

The start_color() function must be called in order to enable use of colors and before any color manipulation function is called. The function initializes eight basic colors (black, blue, green, cyan, red, magenta, yellow, and white) that can be specified by the color macros (such as COLOR_BLACK) defined in **<curses.h>**. The initial appearance of these eight colors is not specified.

The function also initializes two global external variables:

- COLORS defines the number of colors that the terminal supports. (See Color Identification below.) If COLORS is 0, the terminal does not support redefinition of colors (and can_change_color() will return FALSE).
- COLOR_PAIRS defines the maximum number of color-pairs that the terminal supports. (See User-Defined Color Pairs below.)

The start_color() function also restores the colors on the terminal to terminal-specific initial values. The initial background color is assumed to be black for all terminals.

Color Identification

The init_color() function redefines color number color, on terminals that support the redefinition of colors, to have the red, green, and blue intensity components specified by *red*, *green*, and *blue*, respectively. Calling init_color() also changes all occurrences of the specified color on the screen to the new definition.

The color_content() function identifies the intensity components of color number color. It stores the red, green, and blue intensity components of this color in the addresses pointed to by *red*, *green*, and *blue*, respectively.

For both functions, the color argument must be in the range from 0 to and including COLORS-1. Valid intensity values range from 0 (no intensity component) up to and including 1000 (maximum intensity in that component).

User-Defined Color Pairs

Calling init_pair() defines or redefines color-pair number pair to have foreground color *f* and background color *b*. Calling init_pair() changes any characters that were displayed in the color pair's old definition to the new definition and refreshes the screen.

After defining the color pair, the macro COLOR_PAIR(n) returns the value of color pair *n*. This value is the color attribute as it would be extracted from a chtype. Conversely, the macro PAIR_NUMBER(value) returns the color pair number associated with the color attribute value.

The pair_content() function retrieves the component colors of a color-pair number pair. It stores the foreground and background color numbers in the variables pointed to by *f* and *b*, respectively.

With init_pair() and pair_content(), the value of pair must be in a range from 0 to and including COLOR_PAIRS-1. (There may be an implementation-specific lower limit on the valid value of pair, but any such limit is at least 63.) Valid values for *f* and *b* are the range from 0 to and including COLORS-1.

Return Value

The has_colors() function returns TRUE if the terminal can manipulate colors; otherwise, it returns FALSE.

The can_change_color() function returns TRUE if the terminal supports colors and can change their definitions; otherwise, it returns FALSE.

Upon successful completion, the other functions return OK; otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

To use these functions, start_color() must be called, usually right after initscr().

The can_change_color() and has_colors() functions facilitate writing terminal-independent programs. For example, a programmer can use them to decide whether to use color or some other video attribute.

On color terminals, a typical value of COLORS is 8 and the macros such as COLOR_BLACK return a value within the range from 0 to and including 7. However, applications cannot rely on this to be true.

See Also

attroff(), *delscreen()*, **<curses.h>**.

---

cbreak()

Name

cbreak, nocbreak, noraw, raw - input mode control functions

Synopsis

```
#include <curses.h>

int cbreak(void);

int nocbreak(void);

int noraw(void);

int raw(void);
```

Description

The cbreak() function sets the input mode for the current terminal to cbreak mode and overrides a call to raw().

The nocbreak() function sets the input mode for the current terminal to Cooked Mode without changing the state of ISIG and IXON.

The noraw() function sets the input mode for the current terminal to Cooked Mode and sets the ISIG and IXON flags.

The raw() function sets the input mode for the current terminal to Raw Mode.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

If the application is not certain what the input mode of the process was at the time it called initscr(), it should use these functions to specify the desired input mode.

See Also

<curses.h>.

---

chgat()

Name

chgat, mvchgat, mvwchgat, wchgat - change renditions of characters in a window

Synopsis

```
#include <curses.h>

int chgat(int n, attr_t attr, short color, const void *opts);

int mvchgat(int y, int x, int n, attr_t attr, short color,
            const void *opts);

int mvwchgat(WINDOW *win, int y, int x, int n, attr_t attr,
             short color, const void *opts);

int wchgat(WINDOW *win, int n, attr_t attr, short color,
           const void *opts);
```

Description

These functions change the renditions of the next *n* characters in the current or specified window (or of the remaining characters on the line, if *n* is -1), starting at the current or specified cursor position. The attributes and colors are specified by attr and color as for setcchar().

These functions do not update the cursor. These functions do not perform wrapping.

A value of *n* that is greater than the remaining characters on a line is not an error.

The *opts* argument is reserved for definition in a future edition of this document. Currently, the application must provide a null pointer as *opts*.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

setcchar(), **<curses.h>**

clear()

Name

clear, erase, wclear, werase - clear a window

Synopsis

```
#include <curses.h>

int clear(void);

int erase(void);

int wclear(WINDOW *win);

int werase(WINDOW *win);
```

Description

The clear(), erase(), wclear() and werase() functions clear every position in the current or specified window.

The clear() and wclear() functions also achieve the same effect as calling clearok(), so that the window is cleared completely on the next call to wrefresh() for the window and is redrawn in its entirety.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

clearok(), *doupdate()*, **<curses.h>**.

clearok()

Name

clearok, idlok, leaveok, scrollok, setscrreg, wsetscrreg - terminal output control functions

Synopsis

```
#include <curses.h>

int clearok(WINDOW *win, bool bf);

int idlok(WINDOW *win, bool bf);

int leaveok(WINDOW *win, bool bf);

int scrollok(WINDOW *win, bool bf);

int setscrreg(int top, int bot);

int wsetscrreg(WINDOW *win, int top, int bot);
```

Description

These functions set options that deal with output within Curses.

The clearok() function assigns the value of *bf* to an internal flag in the specified window that governs clearing of the screen during a refresh. If, during a refresh operation on the specified window, the flag in curscr is TRUE or the flag in the specified window is TRUE, then the implementation clears the screen, redraws it in its entirety, and sets the flag to FALSE in curscr and in the specified window. The initial state is unspecified.

The idlok() function specifies whether the implementation may use the hardware insert-line, delete-line, and scroll features of terminals so equipped. If *bf* is TRUE, use of these features is enabled. If *bf* is FALSE, use of these features is disabled and lines are instead redrawn as required. The initial state is FALSE.

The leaveok() function controls the cursor position after a refresh operation. If *bf* is TRUE, refresh operations on the specified window may leave the terminal's cursor at an arbitrary position. If *bf* is FALSE, then at the end of any refresh operation, the terminal's cursor is positioned at the cursor position contained in the specified window. The initial state is FALSE.

The scrollok() function controls the use of scrolling. If *bf* is TRUE, then scrolling is enabled for the specified window. If *bf* is FALSE, scrolling is disabled for the specified window. The initial state is FALSE.

The setscrreg() and wsetscrreg() functions define a software scrolling region in the current or specified window. The *top* and *bot* arguments are the line numbers of the first and last line defining the scrolling region. (Line 0 is the top line of the window.) If this option and scrollok() are enabled, an attempt to move off the last line of the margin causes all lines in the scrolling region to scroll one line in the direction of the first line. Only characters in the window are scrolled. If a software scrolling region is set and scrollok() is not enabled, an attempt to move off the last line of the margin does not reposition any lines in the scrolling region.

Return Value

Upon successful completion, setscrreg() and wsetscrreg() return OK. Otherwise, they return ERR.

The other functions always return OK.

Errors

No errors are defined.

Application Usage

The only reason to enable the idlok() feature is to use scrolling to achieve the visual effect of motion of a partial window, such as for a screen editor. In other cases, the feature can be visually annoying.

The leaveok() option provides greater efficiency for applications that do not use the cursor.

See Also

clear(), *delscreen()*, *doupdate()*, *scrl()*, **<curses.h>**

clrtobot()

Name

clrtobot, wclrtobot - clear from cursor to end of window

Synopsis

```
#include <curses.h>

int clrtobot(void);

int wclrtobot(WINDOW *win);
```

Description

The clrtobot() and wclrtobot() functions erase all lines following the cursor in the current or specified window, and erase the current line from the cursor to the end of the line, inclusive.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

doupdate(), **<curses.h>**.

clrtoeol()

Name

clrtoeol, wclrtoeol - clear from cursor to end of line

Synopsis

```
#include <curses.h>

int clrtoeol(void);

int wclrtoeol(WINDOW *win);
```

Description

The clrtoeol() and wclrtoeol() functions erase the current line from the cursor to the end of the line, inclusive, in the current or specified window.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

doupdate(), **<curses.h>**.

---

color_content()

Name

color_content - identify red/green/blue intensity of a color

Synopsis

```
#include <curses.h>

int color_content(short color, short *red, short *green, short *blue);
```

Description

Refer to *can_change_color()*

COLOR_PAIRS

Name

COLOR_PAIRS, COLORS - external variables for color support

Synopsis

```
#include <curses.h>

extern int COLOR_PAIRS;

extern int COLORS;
```

Description

Refer to *can_change_color()*.

COLS

Name

COLS - number of columns on terminal screen

Synopsis

```
#include <curses.h>

extern int COLS;
```

Description

The external variable *COLS* indicates the number of columns on the terminal screen.

See Also

initscr(), **<curses.h>**.

copywin()

Name

copywin - copy a region of a window

Synopsis

```
#include <curses.h>

int copywin(const WINDOW *srcwin, WINDOW *dstwin, int sminrow,
            int smincol, int dminrow, int dmincol, int dmaxrow,
            int dmaxcol, int overlay);
```

Description

The copywin() function provides a finer granularity of control over the overlay() and overwrite() functions. As in the prefresh() function, a rectangle is specified in the destination window, (*dminrow*, *dmincol*) and (*dmaxrow*, *dmaxcol*), and the upper-left-corner coordinates of the source window, (*sminrow*, *smincol*). If *overlay* is TRUE, then copying is non-destructive, as in overlay(). If *overlay* is FALSE, then copying is destructive, as in overwrite().

Return Value

Upon successful completion, copywin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

newpad(), *overlay()*, **<curses.h>**.

curscr

Name

curscr - current window

Synopsis

```
#include <curses.h>

extern WINDOW *curscr;
```

Description

The external variable curscr points to an internal data structure. It can be specified as an argument to certain functions, such as clearok(), where permitted in this specification.

See Also

clearok(), **<curses.h>**.

curs_set()

Name

curs_set - set the cursor mode

Synopsis

```
#include <curses.h>

int curs_set(int visibility);
```

Description

The curs_set() function sets the appearance of the cursor based on the value of *visibility*:

Value of visibility	Appearance of Cursor
0	Invisible
1	Terminal-specific normal mode
2	Terminal-specific high visibility mode

The terminal does not necessarily support all the above values.

Return Value

If the terminal supports the cursor mode specified by *visibility*, then curs_set() returns the previous cursor state. Otherwise, the function returns ERR.

Errors

No errors are defined.

See Also

<curses.h>.

cur_term()

Name

cur_term - current terminal information

Synopsis

```
#include <term.h>

extern TERMINAL *cur_term;
```

Description

The external variable *cur_term* identifies the record in the terminfo database associated with the terminal currently in use.

See Also

set_curterm(), *tigetflag()*, **<term.h>**.

def_prog_mode()

Name

def_prog_mode, def_shell_mode, reset_prog_mode, reset_shell_mode - save/restore program or shell terminal modes

Synopsis

```
#include <curses.h>

int def_prog_mode(void);

int def_shell_mode(void);

int reset_prog_mode(void);

int reset_shell_mode(void);
```

Description

The def_prog_mode() function saves the current terminal modes as the “program” (in Curses) state for use by reset_prog_mode().

The def_shell_mode() function saves the current terminal modes as the “shell” (not in Curses) state for use by reset_shell_mode().

The reset_prog_mode() function restores the terminal to the “program” (in Curses) state.

The reset_shell_mode() function restores the terminal to the “shell” (not in Curses) state.

These functions affect the mode of the terminal associated with the current screen.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

The initscr() function achieves the effect of calling def_shell_mode() to save the prior terminal settings so they can be restored during the call to endwin(), and of calling def_prog_mode() to specify an initial definition of the program terminal mode.

Applications normally do not need to refer to the shell terminal mode. Applications may find it useful to save and restore the program terminal mode.

See Also

doupdate(), *endwin()*, *initscr()*, **<curses.h>**.

delay_output()

Name

delay_output - delay output

Synopsis

```
#include <curses.h>

int delay_output(int ms);
```

Description

On terminals that support pad characters, delay_output() pauses the output for at least *ms* milliseconds. Otherwise, the length of the delay is unspecified.

Return Value

Upon successful completion, delay_output() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

Whether or not the terminal supports pad characters, the delay_output() function is not a precise method of timekeeping.

See Also

napms(), **<curses.h>**.

delch()

Name

delch, mvdelch, mvwdelch, wdelch - delete a character from a window.

Synopsis

```
#include <curses.h>

int delch(void);

int mvdelch(int y, int x);

int mvwdelch(WINDOW *win, int y, int x);

int wdelch(WINDOW *win);
```

Description

These functions delete the character at the current or specified position in the current or specified window. This function does not change the cursor position.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

del_curterm()

Name

del_curterm, restartterm, set_curterm, setupterm - interfaces to the terminfo database

Synopsis

```
#include <term.h>

int del_curterm(TERMINAL *oterm);

int restartterm(char *term, int fildes, int *errret);

TERMINAL *set_curterm(TERMINAL *nterm);

int setupterm(char *term, int fildes, int *errret);

extern TERMINAL *cur_term;
```

Description

These functions retrieve information from the terminfo database.

To gain access to the terminfo database, setupterm() must be called first. It is automatically called by initscr() and newterm(). The setupterm() function initializes the other functions to use the terminfo record for a specified terminal (which depends on whether use_env() was called). It sets the *cur_term* external variable to a TERMINAL structure that contains the record from the terminfo database for the specified terminal.

The terminal type is the character string term; if term is a null pointer, the environment variable TERM is used. If TERM is not set or if its value is an empty string, then ″unknown″ is used as the terminal type. The application must set *fildes* to a file descriptor, open for output, to the terminal device, before calling setupterm(). If *errret* is not null, the integer it points to is set to one of the following values to report the function outcome:

-1 The terminfo database was not found (function fails).
0 The entry for the terminal was not found in terminfo (function fails).
1 Success.

If setupterm() detects an error and *errret* is a null pointer, setupterm() writes a diagnostic message and exits.

A simple call to setupterm() that uses all the defaults and sends the output to stdout is:

```
setupterm((char *)0, fileno(stdout), (int *)0);
```

The set_curterm() function sets the variable *cur_term* to *nterm*, and makes all of the terminfo boolean, numeric, and string variables use the values from *nterm*.

The del_curterm() function 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 setupterm() is called again.

The restartterm() function assumes a previous call to setupterm() (perhaps from initscr() or newterm()). It lets the application specify a different terminal type in *term* and updates the information returned by baudrate() based on *fildes*, but does not destroy other information created by initscr(), newterm() or setupterm().

Return Value

Upon successful completion, set_curterm() returns the previous value of cur_term. Otherwise, it returns a null pointer.

Upon successful completion, the other functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

An application would call setupterm() if it required access to the terminfo database but did not otherwise need to use Curses.

See Also

baudrate(), *erasechar()*, *has_ic()*, *longname()*, *putc()*, *termattrs()*, *termname()*, *tgetent()*, *tigetflag()*, *use_env()*, **<term.h>**.

---

deleteln()

Name

deleteln, wdeleteln - delete lines in a window

Synopsis

```
#include <curses.h>

int deleteln(void);

int wdeleteln(WINDOW *win);
```

Description

The deleteln() and wdeleteln() functions delete the line containing the cursor in the current or specified window and move all lines following the current line one line toward the cursor. The last line of the window is cleared. The cursor position does not change.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

insdelln(), **<curses.h>**.

---

delscreen()

Name

delscreen - free storage associated with a screen

Synopsis

```
#include <curses.h>

void delscreen(SCREEN *sp);
```

Description

The delscreen() function frees storage associated with the SCREEN pointed to by *sp*.

Return Value

The delscreen() function does not return a value.

Errors

No errors are defined.

See Also

endwin(), *initscr()*, **<curses.h>**.

---

delwin()

Name

delwin - delete a window

Synopsis

```
#include <curses.h>

int delwin(WINDOW *win);
```

Description

The delwin() function deletes *win*, freeing all memory associated with it. The application must delete subwindows before deleting the main window.

Return Value

Upon successful completion, delwin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

derwin(), *dupwin()*, **<curses.h>**.

---

derwin()

Name

derwin, newwin, subwin - window creation functions

Synopsis

```
#include <curses.h>

WINDOW *derwin(WINDOW *orig, int nlines, int ncols, int begin_y,
               int begin_x);

WINDOW *newwin(int nlines, int ncols, int begin_y, int begin_x);

WINDOW *subwin(WINDOW *orig, int nlines, int ncols, int begin_y,
               int begin_x);
```

Description

The derwin() function is the same as subwin(), except that *begin_y* and *begin_x* are relative to the origin of the window orig rather than absolute screen positions.

The newwin() function creates a new window with *nlines* lines and *ncols* columns, positioned so that the origin is (*begin_y*, *begin_x*). If *nlines* is zero, it defaults to LINES - *begin_y*; if *ncols* is zero, it defaults to COLS - *begin_x*.

The subwin() function creates a new window with *nlines* lines and *ncols* columns, positioned so that the origin is at (*begin_y*, *begin_x*). (This position is an absolute screen position, not a position relative to the window *orig*.) If any part of the new window is outside *orig*, the function fails and the window is not created.

Return Value

Upon successful completion, these functions return a pointer to the new window. Otherwise, they return a null pointer.

Errors

No errors are defined.

Application Usage

Before performing the first refresh of a subwindow, portable applications should call touchwin() or touchline() on the parent window.

Each window maintains internal descriptions of the screen image and status. The screen image is shared among all windows in the window hierarchy. Refresh operations rely on information on what has changed within a window, which is private to each window.

Refreshing a window, when updates were made to a different window, may fail to perform needed updates because the windows do not share this information.

A new full-screen window is created by calling:

```
newwin(0, 0, 0, 0);
```

See Also

delwin(), *is_linetouched()*, *doupdate()*, **<curses.h>.**

---

doupdate()

Name

doupdate, refresh, wnoutrefresh, wrefresh - refresh windows and lines

Synopsis

```
#include <curses.h>

int doupdate(void);

int refresh(void);

int wnoutrefresh(WINDOW *win);

int wrefresh(WINDOW *win);
```

Description

The refresh() and wrefresh() functions refresh the current or specified window. The functions position the terminal's cursor at the cursor position of the window, except that if the leaveok() mode has been enabled, they may leave the cursor at an arbitrary position.

The wnoutrefresh() function determines which parts of the terminal may need updating. The doupdate() function sends to the terminal the commands to perform any required changes.

Return Value

Upon successful completion, these functions return OK. Otherwise they return ERR.

Errors

No errors are defined.

Application Usage

Refreshing an entire window is typically more efficient than refreshing several subwindows separately. An efficient sequence is to call wnoutrefresh() on each subwindow that has changed, followed by a call to doupdate(), which updates the terminal.

The refresh() or wrefresh() function (or wnoutrefresh() followed by doupdate()) must be called to send output to the terminal, as other Curses functions merely manipulate data structures.

See Also

clearok(), *redrawwin()*, **<curses.h>**.

dupwin()

Name

dupwin - duplicate a window

Synopsis

```
#include <curses.h>

WINDOW *dupwin(WINDOW *win);
```

Description

The dupwin() function creates a duplicate of the window *win*.

Return Value

Upon successful completion, dupwin() returns a pointer to the new window. Otherwise, it returns a null pointer.

Errors

No errors are defined.

See Also

derwin(), *doupdate()*, **<curses.h>**.

echo()

Name

echo, noecho -- enable/disable terminal echo

Synopsis

```
#include <curses.h>

int echo(void);

int noecho(void);
```

Description

The echo() function enables Echo mode for the current screen. The noecho() function disables Echo mode for the current screen. Initially, curses software Echo mode for the current screen is enabled and hardware echo mode of the tty driver is disabled. echo() and noecho() control software echo only. Hardware echo must remain disabled for the duration of the application, else the behavior is undefined.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

getch(), **<curses.h>**.

---

echochar()

Name

echochar, wechochar - echo single-byte character and rendition to a window and refresh

Synopsis

```
#include <curses.h>

int echochar(const chtype ch);

int wechochar(WINDOW *win, const chtype ch);
```

Description

The echochar() function is equivalent to a call to addch() followed by a call to refresh().

The wechochar() function is equivalent to a call to waddch() followed by a call to wrefresh().

Return Value

Upon successful completion, these functions return OK. Otherwise they return ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

addch(), *doupdate()*, *echo_wchar()*, **<curses.h>**.

---

echo_wchar()

Name

echo_wchar, wecho_wchar - write a complex character and immediately refresh the window

Synopsis

```
#include <curses.h>

int echo_wchar(const cchar_t *wch);

int wecho_wchar(WINDOW *win, const cchar_t *wch);
```

Description

The echo_wchar() function is equivalent to calling add_wch() and then calling refresh().

The wecho_wchar() function is equivalent to calling wadd_wch() and then calling wrefresh().

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

addch(), *add_wch()*, *doupdate()*, **<curses.h>**.

---

endwin()

Name

endwin - suspend Curses session

Synopsis

```
#include <curses.h>

int endwin(void);
```

Description

The endwin() function restores the terminal after Curses activity by at least restoring the saved shell terminal mode, flushing any output to the terminal and moving the cursor to the first column of the last line of the screen. Refreshing a window resumes program mode. The application must call endwin() for each terminal being used before exiting. If newterm() is called more than once for the same terminal, the first screen created must be the last one for which endwin() is called.

Return Value

Upon successful completion, endwin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The endwin() function does not free storage associated with a screen, so delscreen() should be called after endwin() if a particular screen is no longer needed.

To leave Curses mode temporarily, portable applications should call endwin(). Subsequently, to return to Curses mode, they should call doupdate(), refresh() or wrefresh().

See Also

delscreen(), *doupdate()*, *initscr()*, *isendwin()*, **<curses.h>**.

---

erase()

Name

erase, werase - clear a window

Synopsis

```
#include <curses.h>

int erase(void);

int werase(WINDOW *win);
```

Description

Refer to clear().

---

erasechar()

Name

erasechar, erasewchar, killchar, killwchar - terminal environment query functions

Synopsis

```
#include <curses.h>

char erasechar(void);

int erasewchar(wchar_t *ch);

char killchar(void);


int killwchar(wchar_t *ch);
```

Description

The erasechar() function returns the current erase character. The erasewchar() function stores the current erase character in the object pointed to by *ch*. If no erase character has been defined, the function will fail and the object pointed to by *ch* will not be changed.

The killchar() function returns the current line kill character. The killwchar() function stores the current line kill character in the object pointed to by ch. If no line kill character has been defined, the function will fail and the object pointed to by ch will not be changed.

Return Value

The erasechar() function returns the erase character and killchar() returns the line kill character. The return value is unspecified when these characters are multi-byte characters.

Upon successful completion, erasewchar() and killwchar() return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

The erasechar() and killchar() functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix. Moreover, they do not reliably indicate cases in which when the erase or line kill character, respectively, has not been defined. The erasewchar() and killwchar() functions overcome these limitations.

See Also

clearok(), *delscreen()*, *tcgetattr()*, **<curses.h>**.

---

filter()

Name

filter - disable use of certain terminal capabilities

Synopsis

```
#include <curses.h>

void filter(void);
```

Description

The filter() function changes the algorithm for initializing terminal capabilities that assume that the terminal has more than one line. A subsequent call to initscr() or newterm() performs the following additional actions:

- Disable use of clear, cud, cud1, cup, cuu1 and vpa
- Set the value of the home string to the value of the cr string
- Set lines equal to 1.

Any call to filter() must precede the call to initscr() or newterm().

Return Value

The filter() function does not return a value.

Errors

No errors are defined.

See Also

initscr(), **<curses.h>**.

---

flash()

Name

flash - flash the screen

Synopsis

```
#include <curses.h>

int flash(void);
```

Description

The flash() function alerts the user. It flashes the screen, or if that is not possible, it sounds the audible alarm on the terminal. If neither signal is possible, nothing happens.

Return Value

The flash() function always returns OK.

Errors

No errors are defined.

Application Usage

Nearly all terminals have an audible alarm, but only some can flash the screen.

See Also

beep(), **<curses.h>**

---

flushinp()

Name

flushinp - discard input

Synopsis

```
#include <curses.h>

int flushinp(void);
```

Description

The flushinp() function discards (flushes) any characters in the input buffer associated with the current screen.

Return Value

The flushinp() function always returns OK.

Errors

No errors are defined.

See Also

<curses.h>.

---

getbegyx()

Name

getbegyx, getmaxyx, getparyx, getyx - get cursor and window coordinates

Synopsis

```
#include <curses.h>

void getbegyx(WINDOW *win, int y, int x);

void getmaxyx(WINDOW *win, int y, int x);

void getparyx(WINDOW *win, int y, int x);

void getyx(WINDOW *win, int y, int x);
```

Description

The getyx() macro stores the cursor position of the specified window in *y* and *x*.

The getparyx() macro, if the specified window is a subwindow, stores in *y* and *x* the coordinates of the window's origin relative to its parent window. Otherwise, -1 is stored in *y* and *x*.

The getbegyx() macro stores the absolute screen coordinates of the specified window's origin in *y* and *x*.

The getmaxyx() macro stores the number of rows of the specified window in *y* and stores the window's number of columns in *x*.

Return Value

No return values are defined.

Errors

No errors are defined.

Application Usage

These interfaces are macros and '&' cannot be used before the y and x arguments. Traditional implementations have often defined the following macros:

```
void getbegx(WINDOW *win, int x);
void getbegy(WINDOW *win, int y);
void getmaxx(WINDOW *win, int x);
void getmaxy(WINDOW *win, int y);
void getparx(WINDOW *win, int x);
void getpary(WINDOW *win, int y);
```

Although getbegyx(), getmaxyx() and getparyx() provide the required functionality, this does not preclude applications from defining these macros for their own use. For example, to implement `void getbegx(WINDOW *win, int x);` the macro would be

```
#define getbegx(_win,_x);   /
{                           /
    int _y;                 /
                            /
    getbegyx(_win,_y,_x);
}
```

See Also

<curses.h>

getbkgd()

Name

getbkgd - get background character and rendition using a single-byte character

Synopsis

```
#include <curses.h>

chtype getbkgd(WINDOW *win);
```

Description

Refer to bkgd().

getbkgrnd()

Name

getbkgrnd - get background character and rendition

Synopsis

```
#include <curses.h>

int getbkgrnd(cchar_t *ch);
```

Description

Refer to bkgrnd().

getcchar()

Name

getcchar - get a wide character string and rendition from a cchar_t

Synopsis

```
#include <curses.h>

int getcchar(const cchar_t *wcval, wchar_t *wch, attr_t *attrs,
             short *color_pair, void *opts);
```

Description

When *wch* is not a null pointer, the getcchar() function extracts information from a cchar_t defined by *wcval*, stores the character attributes in the object pointed to by *attrs*, stores the color pair in the object pointed to by *color_pair*, and stores the wide character string referenced by *wcval* into the array pointed to by *wch*.

When *wch* is a null pointer, getcchar() obtains the number of wide characters in the object pointed to by *wcval* and does not change the objects pointed to by *attrs* or *color_pair*.

The *opts* argument is reserved for definition in a future edition of this document. Currently, the application must provide a null pointer as *opts*.

Return Value

When *wch* is a null pointer, getcchar() returns the number of wide characters referenced by *wcval*, including the null terminator.

When *wch* is not a null pointer, getcchar() returns OK upon successful completion, and ERR otherwise.

Errors

No errors are defined.

Application Usage

The *wcval* argument may be a value generated by a call to setcchar() or by a function that has a cchar_t output argument. If *wcval* is constructed by any other means, the effect is unspecified.

See Also

attroff(), *can_change_color()*, *setcchar()*, **<curses.h>**.

---

getch()

Name

getch, wgetch, mvgetch, mvwgetch - get a single-byte character from the terminal

Synopsis

```
#include <curses.h>

int getch(void);

int mvgetch(int y, int x);

int mvwgetch(WINDOW *win, int y, int x);

int wgetch(WINDOW *win);
```

Description

These functions read a single-byte character from the terminal associated with the current or specified window. The results are unspecified if the input is not a single-byte character. If keypad() is enabled, these functions respond to the pressing of a function key by returning the corresponding KEY_ value defined in **<curses.h>**.

If echoing is enabled, then the character is echoed as though it were provided as an input argument to addch(), except for the following characters:

<backspace>, <left-arrow> and the current erase character:	The input is interpreted and then the character at the resulting cursor position is deleted as though delch() were called, except that if the cursor was originally in the first column of the line, then the user is alerted as though beep() were called.
Function keys	The user is alerted as though beep() were called. Information concerning the function keys is not returned to the caller.

If the current or specified window is not a pad, and it has been moved or modified since the last refresh operation, then it will be refreshed before another character is read.

Return Value

Upon successful completion, **getch**(), **mvgetch**, **mvwgetch**() and **wgetch()** return the single-byte character, KEY_ value, or ERR. When in the nodelay mode and no data is available, ERR is returned.

Errors

No errors are defined.

Application Usage

Applications should not define the escape key by itself as a single-character function.

When using these functions, nocbreak mode (nocbreak()) and echo mode (echo()) should not be used at the same time. Depending on the state of the terminal when each character is typed, the program may produce undesirable results.

See Also

cbreak(), *doupdate()*, *insch()*, **<curses.h>**.

---

getmaxyx()

Name

getmaxyx - get size of a window

Synopsis

```
#include <curses.h>

void getmaxyx(WINDOW *win, int y, int x);
```

Description

Refer to getbegyx().

---

getnstr()

Name

getnstr, getstr, mvgetnstr, mvgetstr, mvwgetnstr, mvwgetstr, wgetstr, wgetnstr - get a multi-byte character string from the terminal

Synopsis

```
#include <curses.h>

int getnstr(char *str, int n);

int getstr(char *str);

int mvgetnstr(int y, int x, char *str, int n);

int mvgetstr(int y, int x, char *str);
```

```
int mvwgetnstr(WINDOW *win, int y, int x, char *str, int n);

int mvwgetstr(WINDOW *win, int y, int x, char *str);

int wgetnstr(WINDOW *win, char *str, int n);

int wgetstr(WINDOW *win, char *str);
```

Description

The effect of getstr() is as though a series of calls to getch() were made, until a newline or carriage return is received. The resulting value is placed in the area pointed to by *str*. The string is then terminated with a null byte. The getnstr(), mvgetnstr(), mvwgetnstr() and wgetnstr() functions read at most *n* bytes, thus preventing a possible overflow of the input buffer. The user's erase and kill characters are interpreted, as well as any special keys (such as function keys, home key, clear key, and so on).

The mvgetstr() function is identical to getstr() except that it is as though it is a call to move() and then a series of calls to getch(). The mvwgetstr() function is identical to getstr() except it is as though a call to wmove() is made and then a series of calls to wgetch(). The mvgetnstr() function is identical to getnstr() except that it is as though it is a call to move() and then a series of calls to getch(). The mvwgetnstr() function is identical to getnstr() except it is as though a call to wmove() is made and then a series of calls to wgetch().

The getnstr(), wgetnstr(), mvgetnstr() and mvwgetnstr() functions will only return the entire multi-byte sequence associated with a character. If the array is large enough to contain at least one character, the functions fill the array with complete characters. If the array is not large enough to contain any complete characters, the function fails.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Reading a line that overflows the array pointed to by *str* with getstr(), mvgetstr(), mvwgetstr() or wgetstr() causes undefined results. The use of getnstr(), mvgetnstr(), mvwgetnstr() or wgetnstr(), respectively, is recommended.

See Also

beep(), *getch()*, **<curses.h>**.

---

getn_wstr()

Name

getn_wstr, get_wstr, mvgetn_wstr, mvget_wstr, mvwgetn_wstr, mvwget_wstr, wgetn_wstr, wget_wstr - get an array of wide characters and function key codes from a terminal

Synopsis

```
#include <curses.h>

int getn_wstr(wint_t *wstr, int n);

int get_wstr(wint_t *wstr);

int mvgetn_wstr(int y, int x, wint_t *wstr, int n);

int mvget_wstr(int y, int x, wint_t *wstr);

int mvwgetn_wstr(WINDOW *win, int y, int x, wint_t *wstr, int n);

int mvwget_wstr(WINDOW *win, int y, int x, wint_t *wstr);

int wgetn_wstr(WINDOW *win, wint_t *wstr, int n);

int wget_wstr(WINDOW *win, wint_t *wstr);
```

Description

The effect of get_wstr() is as though a series of calls to get_wch() were made, until a newline character, end-of-line character, or end-of-file character is processed. An end-of-file character is represented by WEOF, as defined in <wchar.h>. A newline or end-of-line is represented as its wchar_t value. In all instances, the end of the string is terminated by a null wchar_t. The resulting values are placed in the area pointed to by *wstr*.

The user's erase and kill characters are interpreted and affect the sequence of characters returned.

The effect of wget_wstr() is as though a series of calls to wget_wch() were made.

The effect of mvget_wstr() is as though a call to move() and then a series of calls to get_wch() were made. The effect of mvwget_wstr() is as though a call to wmove() and then a series of calls to wget_wch() were made. The effect of mvget_nwstr() is as though a call to move() and then a series of calls to get_wch() were made. The effect of mvwget_nwstr() is as though a call to wmove() and then a series of calls to wget_wch() were made.

The getn_wstr(), mvgetn_wstr(), mvwgetn_wstr() and wgetn_wstr() functions read at most *n* characters, letting the application prevent overflow of the input buffer.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Reading a line that overflows the array pointed to by wstr with get_wstr(), mvget_wstr(), mvwget_wstr() or wget_wstr() causes undefined results. The use of getn_wstr(), mvgetn_wstr(), mvwgetn_wstr() or wgetn_wstr(), respectively, is recommended.

These functions cannot return KEY_ values as there is no way to distinguish a KEY_ value from a valid wchar_t value.

See Also

get_wch(), *getstr()*, **<curses.h>**, *<wchar.h>*.

---

getparyx()

Name

getparyx - get subwindow origin coordinates

Synopsis

```
#include <curses.h>

void getparyx(WINDOW *win, int y, int x);
```

Description

Refer to getbegyx().

---

getstr()

Name

getstr - get a multi-byte character string from the terminal

Synopsis

```
#include <curses.h>

int getstr(char *str);
```

Description

Refer to getnstr().

---

get_wch()

Name

get_wch, mvget_wch, mvwget_wch, wget_wch - get a wide character from a terminal

Synopsis

```
#include <curses.h>

int get_wch(wint_t *ch);

int mvget_wch(int y, int x, wint_t *ch);

int mvwget_wch(WINDOW *win, int y, int x, wint_t *ch);

int wget_wch(WINDOW *win, wint_t *ch);
```

Description

These functions read a character from the terminal associated with the current or specified window. If keypad() is enabled, these functions respond to the pressing of a function key by setting the object pointed to by *ch* to the corresponding KEY_ value defined in **<curses.h>** and returning KEY_CODE_YES.

Processing of terminal input is subject to the general rules.

If echoing is enabled, then the character is echoed as though it were provided as an input argument to add_wch(), except for the following characters:

<backspace>, <left-arrow> and the current erase character:	The input is interpreted and then the character at the resulting cursor position is deleted as though delch() were called, except that if the cursor was originally in the first column of the line, then the user is alerted as though beep() were called.
Function keys	The user is alerted as though beep() were called. Information concerning the function keys is not returned to the caller.

If the current or specified window is not a pad, and it has been moved or modified since the last refresh operation, then it will be refreshed before another character is read.

Return Value

When these functions successfully report the pressing of a function key, they return KEY_CODE_YES. When they successfully report a wide character, they return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Applications should not define the escape key by itself as a single-character function.

When using these functions, nocbreak mode and echo mode should not be used at the same time. Depending on the state of the terminal when each character is typed, the application may produce undesirable results.

See Also

beep(), *cbreak()*, *ins_wch()*, *keypad()*, *move()*, **<curses.h>**, **<wchar.h>**.

---

getwin()

Name

getwin, putwin - dump window to, and reload window from, a file

Synopsis

```
#include <curses.h>

WINDOW *getwin(FILE *filep);

int putwin(WINDOW *win, FILE *filep);
```

Description

The getwin() function reads window-related data stored in the file by putwin(). The function then creates and initializes a new window using that data.

The putwin() function writes all data associated with *win* into the stdio stream to which *filep* points, using an unspecified format. This information can be retrieved later using getwin().

Return Value

Upon successful completion, getwin() returns a pointer to the window it created. Otherwise, it returns a null pointer.

Upon successful completion, putwin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

scr_dump(), **<curses.h>**.

---

get_wstr()

Name

get_wstr - get an array of wide characters and function key codes from a terminal

Synopsis

```
#include <curses.h>

int get_wstr(wint_t *wstr);
```

Description

Refer to getn_wstr().

---

getyx()

Name

getyx - get cursor coordinates

Synopsis

```
#include <curses.h>

void getyx(WINDOW *win, int y, int x);
```

Description

Refer to getbegyx().

halfdelay()

Name

halfdelay - control input character delay mode

Synopsis

```
#include <curses.h>

int halfdelay(int tenths);
```

Description

The halfdelay() function sets the input mode for the current window to Half-Delay Mode and specifies tenths of seconds as the half-delay interval. The *tenths* argument must be in a range from 1 up to and including 255.

Return Value

Upon successful completion, halfdelay() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The application can call nocbreak() to leave Half-Delay mode.

See Also

cbreak(), **<curses.h>**.

has_colors()

Name

has_colors - indicate whether terminal supports colors

Synopsis

```
#include <curses.h>

bool has_colors(void);
```

Description

Refer to can_change_color().

has_ic()

Name

has_ic, has_il - query functions for terminal insert and delete capability

Synopsis

```
#include <curses.h>

bool has_ic(void);

bool has_il(void);
```

Description

The has_ic() function indicates whether the terminal has insert- and delete-character capabilities.

The has_il() function indicates whether the terminal has insert- and delete-line capabilities, or can simulate them using scrolling regions.

Return Value

The has_ic() function returns TRUE if the terminal has insert- and delete-character capabilities. Otherwise, it returns FALSE.

The has_il() function returns TRUE if the terminal has insert- and delete-line capabilities. Otherwise, it returns FALSE.

Errors

No errors are defined.

Application Usage

The has_il() function may be used to determine if it would be appropriate to turn on physical scrolling using scrollok().

See Also

<curses.h>.

---

hline()

Name

hline, mvhline, mvvline, mvwhline, mvwvline, vline, whline, wvline - draw lines from single-byte characters and renditions

Synopsis

```
#include <curses.h>

int hline(chtype ch, int n);

int mvhline(int y, int x, chtype ch, int n);

int mvvline(int y, int x, chtype ch, int n);

int mvwhline(WINDOW *win, int y, int x, chtype ch, int n);

int mvwvline(WINDOW *win, int y, int x, chtype ch, int n);

int vline(chtype ch, int n);

int whline(WINDOW *win, chtype ch, int n);

int wvline(WINDOW *win, chtype ch, int n);
```

Description

These functions draw a line in the current or specified window starting at the current or specified position, using *ch*. The line is at most *n* positions long, or as many as fit into the window.

These functions do not advance the cursor position. These functions do not perform special character processing. These functions do not perform wrapping.

The hline(), mvhline(), mvwhline() and whline() functions draw a line proceeding toward the last column of the same line.

The vline(), mvvline(), mvwvline() and wvline() functions draw a line proceeding toward the last line of the window.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

---

hline()

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

border(), *box()*, *hline_set()*, **<curses.h>**.

---

hline_set()

Name

hline_set, mvhline_set, mvvline_set, mvwhline_set, mvwvline_set, vline_set, whline_set, wvline_set - draw lines from complex characters and renditions

Synopsis

```
#include <curses.h>

int hline_set(const cchar_t *wch, int n);

int mvhline_set(int y, int x, const cchar_t *wch, int n);

int mvvline_set(int y, int x, const cchar_t *wch, int n);

int mvwhline_set(WINDOW *win, int y, int x, const cchar_t *wch, int n);

int mvwvline_set(WINDOW *win, int y, int x, const cchar_t *wch, int n);

int vline_set(const cchar_t *wch, int n);
```

```
int whline_set(WINDOW *win, const cchar_t *wch, int n);

int wvline_set(WINDOW *win, cchar_t *const wch, int n);
```

Description

These functions draw a line in the current or specified window starting at the current or specified position, using *ch*. The line is at most *n* positions long, or as many as fit into the window.

These functions do not advance the cursor position. These functions do not perform special character processing. These functions do not perform wrapping.

The hline_set(), mvhline_set(), mvwhline_set() and whline_set() functions draw a line proceeding toward the last column of the same line.

The vline_set(), mvvline_set(), mvwvline_set() and wvline_set() functions draw a line proceeding toward the last line of the window.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

---

hline_set()

See Also

border_set(), **<curses.h>**.

---

idcok()

Name

idcok - enable or disable use of hardware insert- and delete-character features

Synopsis

```
#include <curses.h>

void idcok(WINDOW *win, bool bf);
```

Description

The idcok() function specifies whether the implementation may use hardware insert- and delete-character features in *win* if the terminal is so equipped. If *bf* is TRUE, use of these features in *win* is enabled. If *bf* is FALSE, use of these features in *win* is disabled. The initial state is TRUE.

Return Value

The idcok() function does not return a value.

Errors

No errors are defined.

See Also

clearok(), *doupdate()*, **<curses.h>**.

---

idlok()

Name

idlok - enable or disable use of terminal insert- and delete-line features

Synopsis

```
#include <curses.h>

int idlok(WINDOW *win, bool bf);
```

Description

Refer to clearok().

---

immedok()

Name

immedok - enable or disable immediate terminal refresh

Synopsis

```
#include <curses.h>

void immedok(WINDOW *win, bool bf);
```

Description

The immedok() function specifies whether the screen is refreshed whenever the window pointed to by *win* is changed. If *bf* is TRUE, the window is implicitly refreshed on each such change. If *bf* is FALSE, the window is not implicitly refreshed. The initial state is FALSE.

Return Value

The immedok() function does not return a value.

Errors

No errors are defined.

Application Usage

The immedok() function is useful for windows that are used as terminal emulators.

See Also

clearok(), *doupdate()*, **<curses.h>**.

---

inch()

Name

inch, mvinch, mvwinch, winch - input a single-byte character and rendition from a window

Synopsis

```
#include <curses.h>

chtype inch(void);

chtype mvinch(int y, int x);

chtype mvwinch(WINDOW *win, int y, int x);

chtype winch(WINDOW *win);
```

Description

These functions return the character and rendition, of type chtype, at the current or specified position in the current or specified window.

Return Value

Upon successful completion, the functions return the specified character and rendition. Otherwise, they return (chtype)ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

<curses.h>.

---

inchnstr()

Name

inchnstr, inchstr, mvinchnstr, mvinchstr, mvwinchnstr, mvwinchstr, winchnstr, winchstr - input an array of single-byte characters and renditions from a window

Synopsis

```
#include <curses.h>

int inchnstr(chtype *chstr, int n);

int inchstr(chtype *chstr);

int mvinchnstr(int y, int x, chtype *chstr, int n);

int mvinchstr(int y, int x, chtype *chstr);

int mvwinchnstr(WINDOW *win, int y, int x, chtype *chstr, int n);

int mvwinchstr(WINDOW *win, int y, int x, chtype *chstr);

int winchnstr(WINDOW *win, chtype *chstr, int n);

int winchstr(WINDOW *win, chtype *chstr);
```

Description

These functions place characters and renditions from the current or specified window into the array pointed to by *chstr*, starting at the current or specified position and ending at the end of the line.

The inchnstr(), mvinchnstr(), mvwinchnstr() and winchnstr() functions store at most *n* elements from the current or specified window into the array pointed to by *chstr*.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Reading a line that overflows the array pointed to by *chstr* with inchstr(), mvinchstr(), mvwinchstr() or winchstr() causes undefined results. The use of inchnstr(), mvinchnstr(), mvwinchnstr() or winchnstr(), respectively, is recommended.

See Also

inch(), **<curses.h>**.

---

init_color()

Name

init_color, init_pair - redefine specified color or color pair

Synopsis

```
#include <curses.h>

int init_color(short color, short red, short green, short blue);

int init_pair(short pair, short f, short b);
```

Description

Refer to can_change_color().

---

initscr()

Name

initscr, newterm - screen initialization functions

Synopsis

```
#include <curses.h>

WINDOW *initscr(void);

SCREEN *newterm(char *type, FILE *outfile, FILE *infile);
```

Description

The initscr() function determines the terminal type and initializes all implementation data structures. The TERM environment variable specifies the terminal type. The initscr() function also causes the first refresh operation to clear the screen. If errors occur, initscr() writes an appropriate error message to standard error and exits. The only functions that can be called before initscr() or newterm() are filter(), ripoffline(), slk_init(), use_env() and the functions whose prototypes are defined in <term.h>. Portable applications must not call initscr() twice.

The newterm() function can be called as many times as desired to attach a terminal device. The *type* argument points to a string specifying the terminal type, except that if *type* is a null pointer, the TERM environment variable is used. The *outfile* and *infile* arguments are file pointers for output to the terminal and input from the terminal, respectively. It is unspecified whether Curses modifies the buffering mode of these file pointers. The newterm() function should be called once for each terminal.

The initscr() function is equivalent to:

```
newterm(getenv("TERM"), stdout, stdin);
return stdscr;
```

If the current disposition for the signals SIGINT, SIGQUIT or SIGTSTP is SIGDFL, then initscr() may also install a handler for the signal, which may remain in effect for the life of the process or until the process changes the disposition of the signal.

The initscr() and newterm() functions initialize the *cur_term* external variable.

---

initscr()

Return Value

Upon successful completion, initscr() returns a pointer to stdscr. Otherwise, it does not return.

Upon successful completion, newterm() returns a pointer to the specified terminal. Otherwise, it returns a null pointer.

Errors

No errors are defined.

Application Usage

A program that outputs to more than one terminal should use newterm() for each terminal instead of initscr(). A program that needs an indication of error conditions, so it can continue to run in a line-oriented mode if the terminal cannot support a screen-oriented program, would also use this function.

Applications should perform any required handling of the SIGINT, SIGQUIT or SIGTSTP signals before calling initscr().

See Also

delscreen(), *doupdate()*, *del_curterm()*, *filter()*, *slk_attroff()*, *use_env()*, **<curses.h>**.

innstr()

Name

innstr, instr, mvinnstr, mvinstr, mvwinnstr, mvwinstr, winnstr, winstr - input a multi-byte character string from a window

Synopsis

```
#include <curses.h>

int innstr(char *str, int n);

int instr(char *str);

int mvinnstr(int y, int x, char *str, int n);

int mvinstr(int y, int x, char *str);

int mvwinnstr(WINDOW *win, int y, int x, char *str, int n);

int mvwinstr(WINDOW *win, int y, int x, char *str);

int winnstr(WINDOW *win, char *str, int n);

int winstr(WINDOW *win, char *str);
```

Description

These functions place a string of characters from the current or specified window into the array pointed to by *str*, starting at the current or specified position and ending at the end of the line.

The innstr(), mvinnstr(), mvwinnstr() and winnstr() functions store at most *n* bytes in the string pointed to by *str*.

The innstr(), mvinnstr(), mvwinnstr() and winnstr() functions will only store the entire multi-byte sequence associated with a character. If the array is large enough to contain at least one character the array is filled with complete characters. If the array is not large enough to contain any complete characters, the function fails.

Return Value

Upon successful completion, instr(), mvinstr(), mvwinstr() and winstr() return OK.

Upon successful completion, innstr(), mvinnstr(), mvwinnstr() and winnstr() return the number of characters actually read into the string. Otherwise, all these functions return ERR.

Errors

No errors are defined.

Application Usage

Since multi-byte characters may be processed, there might not be a one-to-one correspondence between the number of column positions on the screen and the number of bytes returned.

These functions do not return rendition information.

Enhanced Curses

Reading a line that overflows the array pointed to by *str* with instr(), mvinstr(), mvwinstr() or winstr() causes undefined results. The use of innstr(), mvinnstr(), mvwinnstr() or winnstr(), respectively, is recommended.

See Also

<curses.h>.

---

innwstr()

Name

innwstr, inwstr, mvinnwstr, mvinwstr, mvwinnwstr, mvwinwstr, winnwstr, winwstr - input a string of wide characters from a window

Synopsis

```
#include <curses.h>

int innwstr(wchar_t *wstr, int n);

int inwstr(wchar_t *wstr);

int mvinnwstr(int y, int x, wchar_t *wstr, int n);

int mvinwstr(int y, int x, wchar_t *wstr);

int mvwinnwstr(WINDOW *win, int y, int x, wchar_t *wstr, int n);

int mvwinwstr(WINDOW *win, int y, int x, wchar_t *wstr);

int winnwstr(WINDOW *win, wchar_t *wstr, int n);

int winwstr(WINDOW *win, wchar_t *wstr);
```

Description

These functions place a string of wchar_t characters from the current or specified window into the array pointed to by *wstr* starting at the current or specified cursor position and ending at the end of the line.

These functions will only store the entire wide character sequence associated with a spacing complex character. If the array is large enough to contain at least one complete spacing complex character, the array is filled with complete characters. If the array is not large enough to contain any complete characters this is an error.

The innwstr(), mvinnwstr(), mvwinnwstr() and winnwstr() functions store at most *n* characters in the array pointed to by *wstr*.

Return Value

Upon successful completion, inwstr(), mvinwstr(), mvwinwstr() and winwstr() return OK.

Upon successful completion, innwstr(), mvinnwstr(), mvwinnwstr() and winnwstr() return the number of characters actually read into the string. Otherwise, all these functions return ERR.

Errors

No errors are defined.

Application Usage

Reading a line that overflows the array pointed to by *wstr* with inwstr(), mvinwstr(), mvwinwstr() or winwstr() causes undefined results. The use of innwstr(), mvinnwstr(), mvwinnwstr() or winnwstr(), respectively, is recommended.

These functions do not return rendition information.

See Also

<curses.h>.

---

insch()

Name

insch, mvinsch, mvwinsch, winsch - insert a single-byte character and rendition into a window

Synopsis

```
#include <curses.h>

int insch(chtype ch);

int mvinsch(int y, int x, chtype ch);

int mvwinsch(WINDOW *win, int y, int x, chtype ch);

int winsch(WINDOW *win, chtype ch);
```

Description

These functions insert the character and rendition from *ch* into the current or specified window at the current or specified position.

These functions do not perform wrapping. These functions do not advance the cursor position. These functions perform special-character processing, with the exception that if a newline is inserted into the last line of a window and scrolling is not enabled, the behavior is unspecified.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

ins_wch() **<curses.h>**.

insdelln()

Name

insdelln, winsdelln - delete or insert lines into a window

Synopsis

```
#include <curses.h>

int insdelln(int n);

int winsdelln(WINDOW *win, int n);
```

Description

The insdelln() and winsdelln() functions perform the following actions:

- If *n* is positive, these functions insert *n* lines into the current or specified window before the current line. The *n* last lines are no longer displayed.
- If *n* is negative, these functions delete *n* lines from the current or specified window starting with the current line, and move the remaining lines toward the cursor. The last *n* lines are cleared.

The current cursor position remains the same.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

deleteln(), *insertln()*, **<curses.h>**.

insertln()

Name

insertln, winsertln - insert lines into a window

Synopsis

```
#include <curses.h>

int insertln(void);

int winsertln(WINDOW *win);
```

Description

The insertln() and winsertln() functions insert a blank line before the current line in the current or specified window. The bottom line is no longer displayed. The cursor position does not change.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

insdelln(), **<curses.h>**.

---

insnstr()

Name

insnstr, insstr, mvinsnstr, mvinsstr, mvwinsnstr, mvwinsstr, winsnstr, winsstr - insert a multi-byte character string into a window

Synopsis

```
#include <curses.h>

int insnstr(const char *str, int n);

int insstr(const char *str);

int mvinsnstr(int y, int x, const char *str, int n);

int mvinsstr(int y, int x, const char *str);

int mvwinsnstr(WINDOW *win, int y, int x, const char *str, int n);

int mvwinsstr(WINDOW *win, int y, int x, const char *str);

int winsnstr(WINDOW *win, const char *str, int n);

int winsstr(WINDOW *win, const char *str);
```

Description

These functions insert a character string (as many characters as will fit on the line) before the current or specified position in the current or specified window.

These functions do not advance the cursor position. These functions perform special-character processing. The innstr() and innwstr() functions perform wrapping. The instr() and () inswstr functions do not perform wrapping.

The insnstr(), mvinsnstr(), mvwinsnstr() and winsnstr() functions insert at most *n* bytes. If *n* is less than 1, the entire string is inserted.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Since the string may contain multi-byte characters, there might not be a one-to-one correspondence between the number of column positions occupied by the characters and the number of bytes in the string.

See Also

<curses.h>

---

ins_nwstr()

Name

ins_nwstr, ins_wstr, mvins_nwstr, mvins_wstr, mvwins_nwstr, mvwins_wstr, wins_nwstr, wins_wstr - insert a wide-character string into a window

Synopsis

```
#include <curses.h>

int ins_nwstr(const wchar_t *wstr, int n);

int ins_wstr(const wchar_t *wstr);

int mvins_nwstr(int y, int x, const wchar_t *wstr, int n);

int mvins_wstr(int y, int x, const wchar_t *wstr);

int mvwins_nwstr(WINDOW *win, int y, int x, const wchar_t *wstr, int n);

int mvwins_wstr(WINDOW *win, int y, int x, const wchar_t *wstr);

int wins_nwstr(WINDOW *win, const wchar_t *wstr, int n);

int wins_wstr(WINDOW *win, const wchar_t *wstr);
```

Description

These functions insert a wchar_t character string (as many wchar_t characters as will fit on the line) in the current or specified window immediately before the current or specified position.

Any non-spacing characters in the string are associated with the first spacing character in the string that precedes the non-spacing characters. If the first character in the string is a non-spacing character, these functions will fail.

These functions do not perform wrapping. These functions do not advance the cursor position. These functions perform special-character processing.

The ins_nwstr(), mvins_nwstr(), mvwins_nwstr() and wins_nwstr() functions insert at most *n* wchar_t characters. If *n* is less than 1, then the entire string is inserted.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

insstr()

Name

insstr - insert a multi-byte character string into the current window

Synopsis

```
#include <curses.h>

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

Description

Refer to insnstr().

---

instr()

Name

instr - input a multi-byte character string from the current window

Synopsis

```
#include <curses.h>

int instr(char *str);
```

Description

Refer to innstr().

---

ins_wch()

Name

ins_wch, mvins_wch, mvwins_wch, wins_wch - insert a complex character and rendition into a window

Synopsis

```
#include <curses.h>

int ins_wch(const cchar_t *wch);

int wins_wch(WINDOW *win, const cchar_t *wch);

int mvins_wch(int y, int x, const cchar_t *wch);

int mvwins_wch(WINDOW *win, int y, int x, const cchar_t *wch);
```

Description

These functions insert the complex character *wch* with its rendition in the current or specified window at the current or specified cursor position.

Enhanced Curses

These functions do not perform wrapping. These functions do not advance the cursor position. These functions perform special-character processing.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

For non-spacing characters, add_wch() can be used to add the non-spacing characters to a spacing complex character already in the window.

See Also

add_wch(), **<curses.h>**.

---

ins_wstr()

Name

ins_wstr - insert a wide-character string into the current window

Synopsis

```
#include <curses.h>

int ins_wstr(const wchar_t *wstr);
```

Description

Refer to ins_nwstr().

---

intrflush()

Name

intrflush - enable or disable flush on interrupt

Synopsis

```
#include <curses.h>

int intrflush(WINDOW *win, bool bf);
```

Description

The intrflush() function specifies whether pressing an interrupt key (interrupt, suspend or quit) will flush the input buffer associated with the current screen. If *bf* is a boolean that specifies whether pressing an interrupt key (interrupt, suspend or quit) will flush the output buffer associated with the current screen. The default for the option is inherited from the display driver settings. The *win* argument is ignored.

Return Value

Upon successful completion, intrflush() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The same effect is achieved outside Curses using the NOFLSH local mode flag specified in the XBD specification (General Terminal Interface).

See Also

<curses.h>.

---

in_wch()

Name

in_wch, mvin_wch, mvwin_wch, win_wch - input a complex character and rendition from a window

Synopsis

```
#include <curses.h>

int in_wch(cchar_t *wcval);

int mvin_wch(int y, int x, cchar_t *wcval);

int mvwin_wch(WINDOW *win, int y, int x, cchar_t *wcval);

int win_wch(WINDOW *win, cchar_t *wcval);
```

Description

These functions extract the complex character and rendition from the current or specified position in the current or specified window into the object pointed to by *wcval*.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

in_wchnstr()

Name

in_wchnstr, in_wchstr, mvin_wchnstr, mvin_wchstr, mvwin_wchnstr, mvwin_wchstr, win_wchnstr, win_wchstr - input an array of complex characters and renditions from a window

Synopsis

```
#include <curses.h>

int in_wchnstr(cchar_t *wchstr, int n);

int in_wchstr(cchar_t *wchstr);

int mvin_wchnstr(int y, int x, cchar_t *wchstr, int n);

int mvin_wchstr(int y, int x, cchar_t *wchstr);

int mvwin_wchnstr(WINDOW *win, int y, int x, cchar_t *wchstr, int n);

int mvwin_wchstr(WINDOW *win, int y, int x, cchar_t *wchstr);

int win_wchnstr(WINDOW *win, cchar_t *wchstr, int n);

int win_wchstr(WINDOW *win, cchar_t *wchstr);
```

Description

These functions extract characters from the current or specified window, starting at the current or specified position and ending at the end of the line, and place them in the array pointed to by *wchstr*.

The in_wchnstr(), mvin_wchnstr(), mvwin_wchnstr() and win_wchnstr() fill the array with at most *n* cchar_t elements.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

Reading a line that overflows the array pointed to by *wchstr* with in_wchstr(), mvin_wchstr(), mvwin_wchstr() or win_wchstr() causes undefined results. The use of in_wchnstr(), mvin_wchnstr(), mvwin_wchnstr() or win_wchnstr(), respectively, is recommended.

See Also

in_wch(), **<curses.h>**.

---

inwstr()

Name

inwstr - input a string of wide characters from the current window

Synopsis

```
#include <curses.h>

int inwstr(wchar_t *wstr);
```

Description

Refer to innwstr().

---

isendwin()

Name

isendwin - determine whether a screen has been refreshed

Synopsis

```
#include <curses.h>

bool isendwin(void);
```

Description

The isendwin() function indicates whether the screen has been refreshed since the last call to endwin().

Return Value

The isendwin() function returns TRUE if endwin() has been called without any subsequent refresh. Otherwise, it returns FALSE.

Errors

No errors are defined.

See Also

endwin(), **<curses.h>**.

---

is_linetouched()

Name

is_linetouched, is_wintouched, touchline, touchwin, untouchwin, wtouchln - window refresh control functions

Synopsis

```
#include <curses.h>

bool is_linetouched(WINDOW *win, int line);

bool is_wintouched(WINDOW *win);

int touchline(WINDOW *win, int start, int count);

int touchwin(WINDOW *win);

int untouchwin(WINDOW *win);

int wtouchln(WINDOW *win, int y, int n, int changed);
```

Description

The touchwin() function touches the specified window (that is, marks it as having changed more recently than the last refresh operation). The touchline() function only touches *count* lines, beginning with line *start*.

The untouchwin() function marks all lines in the window as unchanged since the last refresh operation.

Calling wtouchln(), if changed is 1, touches *n* lines in the specified window, starting at line *y*. If changed is 0, wtouchln() marks such lines as unchanged since the last refresh operation.

The is_wintouched() function determines whether the specified window is touched. The is_linetouched() function determines whether line *line* of the specified window is touched.

Return Value

The is_linetouched() and is_wintouched() functions return TRUE if any of the specified lines, or the specified window, respectively, has been touched since the last refresh operation. Otherwise, they return FALSE.

Upon successful completion, the other functions return OK. Otherwise, they return ERR. Exceptions to this are noted in the preceding function descriptions.

Errors

No errors are defined.

Application Usage

Calling touchwin() or touchline() is sometimes necessary when using overlapping windows, since a change to one window affects the other window, but the records of which lines have been changed in the other window do not reflect the change.

See Also

doupdate(), **<curses.h>**.

---

keyname()

Name

keyname, key_name - get name of key

Synopsis

```
#include <curses.h>

char *keyname(int c);

char *key_name(wchar_t c);
```

Description

The keyname() and key_name() functions generate a character string whose value describes the key *c*. The *c* argument of keyname() can be an 8-bit character or a key code. The *c* argument of key_name() must be a wide character.

The string has a format according to the first applicable row in the following table:

Input	Format of Returned String
Visible character	The same character

Input	Format of Returned String
Control character	^X
Meta-character (keyname() only)	M-X
Key value defined in **<curses.h>** (keyname() only)	KEY_name
None of the above	UNKNOWN KEY

The meta-character notation shown above is used only if meta-characters are enabled.

Return Value

Upon successful completion, keyname() returns a pointer to a string as described above. Otherwise, it returns a null pointer.

Errors

No errors are defined.

Application Usage

The return value of keyname() and key_name() may point to a static area which is overwritten by a subsequent call to either of these functions.

Applications normally process meta-characters without storing them into a window. If an application stores meta-characters in a window and tries to retrieve them as wide characters, keyname() cannot detect meta-characters, since wide characters do not support meta-characters.

See Also

meta(), **<curses.h>**.

---

keypad()

Name

keypad - enable/disable abbreviation of function keys

Synopsis

```
#include <curses.h>

int keypad(WINDOW *win, bool bf);
```

Description

The keypad() function controls keypad translation. If *bf* is TRUE, keypad translation is turned on. If *bf* is FALSE, keypad translation is turned off. The initial state is FALSE.

This function affects the behavior of any function that provides keyboard input.

If the terminal in use requires a command to enable it to transmit distinctive codes when a function key is pressed, then after keypad translation is first enabled, the implementation transmits this command to the terminal before an affected input function tries to read any characters from that terminal.

Return Value

Upon successful completion, keypad() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

killchar()

Name

killchar, killwchar - terminal environment query functions

Synopsis

```
#include <curses.h>

char killchar(void);

int killwchar(wchar_t *ch);
```

Description

Refer to erasechar().

---

leaveok()

Name

leaveok - control cursor position resulting from refresh operations

Synopsis

```
#include <curses.h>

int leaveok(WINDOW *win, bool bf);
```

Description

Refer to clearok().

LINES

Name

LINES - number of lines on terminal screen

Synopsis

```
#include <curses.h>

extern int LINES;
```

Description

The external variable *LINES* indicates the number of lines on the terminal screen.

See Also

initscr(), **<curses.h>**.

---

longname()

Name

longname - get verbose description of current terminal

Synopsis

```
#include <curses.h>

char *longname(void);
```

Description

The longname() function generates a verbose description of the current terminal. The maximum length of a verbose description is 128 bytes. It is defined only after the call to initscr() or newterm().

Return Value

Upon successful completion, longname() returns a pointer to the description specified above. Otherwise, it returns a null pointer on error.

Errors

No errors are defined.

Application Usage

The return value of longname() may point to a static area which is overwritten by a subsequent call to newterm().

See Also

initscr(), **<curses.h>**.

---

meta()

Name

meta - enable/disable meta-keys

Synopsis

```
#include <curses.h>

int meta(WINDOW *win, bool bf);
```

Description

Initially, whether the terminal returns 7 or 8 significant bits on input depends on the control mode of the display driver (see the XBD specification, General Terminal Interface). To force 8 bits to be returned, invoke meta(*win*, TRUE). To force 7 bits to be returned, invoke meta(*win*, FALSE). The *win* argument is always ignored. If the terminfo capabilities *smm* (meta_on) and *rmm* (meta_off) are defined for the terminal, *smm* is sent to the terminal when meta(*win*, TRUE) is called and *rmm* is sent when meta(*win*, FALSE) is called.

Return Value

Upon successful completion, meta() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The same effect is achieved outside Curses using the CS7 or CS8 control mode flag specified in the XBD specification (General Terminal Interface).

The meta() function was designed for use with terminals with 7-bit character sets and a “meta” key that could be used to set the eighth bit.

See Also

getch(), **<curses.h>**.

---

move()

Name

move, wmove - window cursor location functions

Synopsis

```
#include <curses.h>

int move(int y, int x);

int wmove(WINDOW *win, int y, int x);
```

Description

The move() and wmove() functions move the cursor associated with the current or specified window to (*y*, *x*) relative to the window’s origin. This function does not move the terminal’s cursor until the next refresh operation.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

doupdate(), **<curses.h>**.

---

mv

Name

mv - pointer page for functions with mv prefix

Description

Most cases in which a Curses function has the mv prefix[1] indicate that the function takes y and x arguments and moves the cursor to that address as though move() were first called. (The corresponding functions without the mv prefix operate at the cursor position.)

The mv prefix is combined with a w prefix to produce Curses functions beginning with mvw.

The mv and mvw functions are discussed together with the corresponding functions that do not have these prefixes. They are found on the following entries:

Function		Refer to
mvaddch()	*mvwaddch()*	*addch()*
mvaddchnstr()	*mvwaddchnstr()*	*addchstr()*
mvaddchstr()	*mvwaddchstr()*	*addchstr()*
mvaddnstr()	*mvwaddnstr()*	*addnstr()*
mvaddstr()	*mvwaddstr()*	*addnstr()*
mvaddnwstr()	*mvwaddnwstr()*	*addnwstr()*
mvaddwstr()	*mvwaddwstr()*	*addnwstr()*
mvadd_wch()	*mvwadd_wch()*	*add_wch()*
mvadd_wchnstr()	*mvwadd_wchnstr()*	*add_wchnstr()*
mvadd_wchstr()	*mvwadd_wchstr()*	*add_wchnstr()*
mvchgat()	*mvwchgat()*	*chgat()*
mvdelch()	*mvwdelch()*	*delch()*
mvgetch()	*mvwgetch()*	*getch()*
mvgetnstr()	*mvwgetnstr()*	*getnstr()*
mvgetstr()	*mvwgetstr()*	*getnstr()*
mvgetn_wstr()	*mvwgetn_wstr()*	*getn_wstr()*
mvget_wch()	*mvwget_wch()*	*get_wch()*
mvget_wstr()	*mvwget_wstr()*	*getn_wstr()*
mvhline()	*mvwhline()*	*hline()*
mvhline_set()	*mvwhline_set()*	*hline_set()*
mvinch()	*mvwinch()*	*inch()*
mvinchnstr()	*mvwinchnstr()*	*inchnstr()*
mvinchstr()	*mvwinchstr()*	*inchnstr()*
mvinnstr()	*mvwinnstr()*	*innstr()*
mvinnwstr()	*mvwinnwstr()*	*innwstr()*
mvinsch()	*mvwinsch()*	*insch()*
mvinsnstr()	*mvwinsnstr()*	*insnstr()*
mvinsstr()	*mvwinsstr()*	*insnstr()*
mvinstr()	*mvwinstr()*	*innstr()*
mvins_nwstr()	*mvwins_nwstr()*	*ins_nwstr()*
mvins_wch()	*mvwins_wch()*	*ins_wch()*
mvins_wstr()	*mvwins_wstr()*	*ins_nwstr()*
mvinwstr()	*mvwinwstr()*	*innwstr()*
mvin_wch()	*mvwin_wch()*	*in_wch()*
mvin_wchnstr()	*mvwin_wchnstr()*	*in_wchnstr()*
mvin_wchstr()	*mvwin_wchstr()*	*in_wchnstr()*
mvprintw()	*mvwprintw()*	*amvprintw()*

1. The mvcur(), mvderwin() and mvwin() functions are exceptions to this rule, in that mv is not a prefix with the usual meaning and there are no corresponding functions without the mv prefix. These functions have entries under their own names.

   In the mvprintw() and mvscanw() functions, mv is a prefix with the usual meaning, but the functions have entries under their own names because the mv function is the first function in the family of functions in alphabetical order.

Function		Refer to
mvscanw()	*mvwscanw()*	*mvscanw()*
mvvline()	*mvwvline()*	*hline()*
mvvline_set()	*mvwvline_set()*	*hline_set()*

See Also

w.

---

mvcur()

Name

mvcur - output cursor movement commands to the terminal

Synopsis

```
#include <curses.h>

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

Description

The mvcur() function outputs one or more commands to the terminal that move the terminal's cursor to (*newrow*, *newcol*), an absolute position on the terminal screen. The (*oldrow*, *oldcol*) arguments specify the former cursor position. Specifying the former position is necessary on terminals that do not provide coordinate-based movement commands. On terminals that provide these commands, Curses may select a more efficient way to move the cursor based on the former position. If (*newrow*, *newcol*) is not a valid address for the terminal in use, mvcur() fails. If (*oldrow*, *oldcol*) is the same as (*newrow*, *newcol*), then mvcur() succeeds without taking any action. If mvcur() outputs a cursor movement command, it updates its information concerning the location of the cursor on the terminal.

Return Value

Upon successful completion, mvcur() returns OK.

Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

After use of mvcur(), the model Curses maintains of the state of the terminal might not match the actual state of the terminal. The application should touch and refresh the window before resuming conventional use of Curses.

See Also

doupdate(), *is_linetouched()*, **<curses.h>**.

mvderwin()

Name

mvderwin - define window coordinate transformation

Synopsis

```
#include <curses.h>

int mvderwin(WINDOW *win, int par_y, int par_x);
```

Description

The mvderwin() function specifies a mapping of characters. The function identifies a mapped area of the parent of the specified window, whose size is the same as the size of the specified window and whose origin is at (*par_y*, *par_x*) of the parent window.

- During any refresh of the specified window, the characters displayed in that window's display area of the terminal are taken from the mapped area.
- Any references to characters in the specified window obtain or modify characters in the mapped area.

That is, mvderwin() defines a coordinate transformation from each position in the mapped area to a corresponding position (same *y*, *x* offset from the origin) in the specified window.

Return Value

Upon successful completion, mvderwin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

derwin(), *doupdate()*, *dupwin()*, **<curses.h>**.

mvprintw()

Name

mvprintw, mvwprintw, printw, wprintw - print formatted output in window

Synopsis

```
#include <curses.h>

int mvprintw(int y, int x, char *fmt, ...);

int mvwprintw(WINDOW *win, int y, int x, char *fmt, ...);

int printw(char *fmt, ...);

int wprintw(WINDOW *win, char *fmt, ...);
```

Description

The mvprintw(), mvwprintw(), printw() and wprintw() functions are analogous to printf(). The effect of these functions is as though sprintf() were used to format the string, and then waddstr() were used to add that multi-byte string to the current or specified window at the current or specified cursor position.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

addnstr(), *fprintf()*, **<curses.h>**

---

mvscanw()

Name

mvscanw, mvwscanw, scanw, wscanw - convert formatted input from a window

Synopsis

```
#include <curses.h>

int mvscanw(int y, int x, char *fmt, ...);

int mvwscanw(WINDOW *win, int y, int x, char *fmt, ...);

int scanw(char *fmt, ...);

int wscanw(WINDOW *win, char *fmt, ...);
```

Description

These functions are similar to scanf(). Their effect is as though mvwgetstr() were called to get a multi-byte character string from the current or specified window at the current or specified cursor position, and then sscanf() were used to interpret and convert that string.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

getnstr(), *printw()*, *fscanf()*, *wcstombs()*, **<curses.h>**.

mvwin()

Name

mvwin - move window

Synopsis

```
#include <curses.h>

int mvwin(WINDOW *win, int y, int x);
```

Description

The mvwin() function moves the specified window so that its origin is at position (*y*, *x*). If the move would cause any portion of the window to extend past any edge of the screen, the function fails and the window is not moved.

Return Value

Upon successful completion, mvwin() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The application should not move subwindows by calling mvwin().

See Also

derwin(), *doupdate()*, *is_linetouched()*, **<curses.h>**.

napms()

Name

napms - suspend the calling process

Synopsis

```
#include <curses.h>

int napms(int ms);
```

Description

The napms() function takes at least *ms* milliseconds to return.

Return Value

The napms() function returns OK.

Errors

No errors are defined.

Application Usage

A more reliable method of achieving a timed delay is the usleep() function.

See Also

delay_output(), *usleep()* **<curses.h>**.

---

newpad()

Name

newpad, pnoutrefresh, prefresh, subpad - pad management functions

Synopsis

```
#include <curses.h>

WINDOW *newpad(int nlines, int ncols);

int pnoutrefresh(WINDOW *pad, int pminrow, int pmincol, int sminrow,
                 int smincol, int smaxrow, int smaxcol);

int prefresh(WINDOW *pad, int pminrow, int pmincol, int sminrow,
             int smincol, int smaxrow, int smaxcol);

WINDOW *subpad(WINDOW *orig, int nlines, int ncols, int begin_y,
               int begin_x);
```

Description

The newpad() function creates a specialized WINDOW data structure representing a pad with *nlines* lines and *ncols* columns. A pad is like a window, except that it is not necessarily associated with a viewable part of the screen. Automatic refreshes of pads do not occur.

The subpad() function creates a subwindow within a pad with *nlines* lines and *ncols* columns. Unlike subwin(), which uses screen coordinates, the window is at position (*begin_y*, *begin_x*) on the pad. The window is made in the middle of the window *orig*, so that changes made to one window affect both windows.

The prefresh() and pnoutrefresh() functions are analogous to wrefresh() and wnoutrefresh() except that they relate to pads instead of windows. The additional arguments indicate what part of the pad and screen are involved. The *pminrow* and *pmincol* arguments specify the origin of the rectangle to be displayed in the pad. The *sminrow*, *smincol*, *smaxrow* and *smaxcol* arguments specify the edges of the rectangle to be displayed on the screen. The lower right-hand corner of the rectangle to be displayed in the pad is calculated from the screen coordinates, since the rectangles must be the same size. Both rectangles must be entirely contained within their respective structures. Negative values of *pminrow*, *pmincol*, *sminrow* or *smincol* are treated as if they were zero.

Return Value

Upon successful completion, the newpad() and subpad() functions return a pointer to the pad data structure. Otherwise, they return a null pointer.

Upon successful completion, pnoutrefresh() and prefresh() return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

To refresh a pad, call prefresh() or pnoutrefresh(), not wrefresh(). When porting code to use pads from WINDOWS, remember that these functions require additional arguments to specify the part of the pad to be displayed and the location on the screen to be used for the display.

Although a subwindow and its parent pad may share memory representing characters in the pad, they need not share status information about what has changed in the pad. Therefore, after modifying a subwindow within a pad, it may be necessary to call touchwin() or touchline() on the pad before calling prefresh().

See Also

derwin(), *doupdate()*, *is_linetouched()*, **<curses.h>**.

---

newterm()

Name

newterm - screen initialization function

Synopsis

```
#include <curses.h>

SCREEN *newterm(char *type, FILE *outfile, FILE *infile);
```

Description

Refer to initscr().

---

newwin()

Name

newwin - create a new window

Synopsis

```
#include <curses.h>

WINDOW *newwin(int nlines, int ncols, int begin_y, int begin_x);
```

Description

Refer to derwin().

---

nl()

Name

nl, nonl - enable/disable newline translation

Synopsis

```
#include <curses.h>

int nl(void);

int nonl(void);
```

Description

The nl() function enables a mode in which carriage return is translated to newline on input. The nonl() function disables the above translation. Initially, the above translation is enabled.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

The default translation adapts the terminal to environments in which newline is the line termination character. However, by disabling the translation with nonl(), the application can sense the pressing of the carriage return key.

See Also

<curses.h>.

---

no

Name

no - pointer page for functions with no prefix

Description

The no prefix indicates that a Curses function disables a mode. (The corresponding functions without the no prefix enable the same mode.)

The no functions are discussed together with the corresponding functions that do not have these prefixes.[2] They are found on the following entries:

Function	Refer to
nocbreak()	*cbreak()*
noecho()	*echo()*
nonl()	*nl()*
noraw()	*cbreak()*

2. The nodelay() function has an entry under its own name because there is no corresponding delay() function.

   The noqiflush() and notimeout() functions have an entry under their own names because they precede the corresponding function without the no prefix in alphabetical order.

nodelay()

Name

nodelay - enable or disable block during read

Synopsis

```
#include <curses.h>

int nodelay(WINDOW *win, bool bf);
```

Description

The nodelay() function specifies whether Delay Mode or No Delay Mode is in effect for the screen associated with the specified window. If *bf* is TRUE, this screen is set to No Delay Mode. If *bf* is FALSE, this screen is set to Delay Mode. The initial state is FALSE.

Return Value

Upon successful completion, nodelay() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

getch(), *halfdelay()*, **<curses.h>**.

noqiflush()

Name

noqiflush, qiflush - enable/disable queue flushing

Synopsis

```
#include <curses.h>

void noqiflush(void);

void qiflush(void);
```

Description

The qiflush() function causes all output in the display driver queue to be flushed whenever an interrupt key (interrupt, suspend, or quit) is pressed. The noqiflush() causes no such flushing to occur. The default for the option is inherited from the display driver settings.

Return Value

These functions do not return a value.

Errors

No errors are defined.

Application Usage

Calling qiflush() provides faster response to interrupts, but causes Curses to have the wrong idea of what is on the screen. The same effect is achieved outside Curses using the NOFLSH local mode flag specified in the XBD specification (General Terminal Interface).

See Also

intrflush(), **<curses.h>**.

---

notimeout()

Name

notimeout, timeout, wtimeout - control blocking on input

Synopsis

```
#include <curses.h>

int notimeout(WINDOW *win, bool bf);

void timeout(int delay);

void wtimeout(WINDOW *win, int delay);
```

Description

The notimeout() function specifies whether Timeout Mode or No Timeout Mode is in effect for the screen associated with the specified window. If *bf* is TRUE, this screen is set to No Timeout Mode. If *bf* is FALSE, this screen is set to Timeout Mode. The initial state is FALSE.

The timeout() and wtimeout() functions set blocking or non-blocking read for the current or specified window based on the value of delay:

delay < 0	One or more blocking reads (indefinite waits for input) are used.
delay = 0	One or more non-blocking reads are used. Any Curses input function will fail if every character of the requested string is not immediately available.
delay > 0	Any Curses input function blocks for delay milliseconds and fails if there is still no input.

Return Value

Upon successful completion, the notimeout() function returns OK. Otherwise, it returns ERR.

The timeout() and wtimeout() functions do not return a value.

Errors

No errors are defined.

See Also

getch(), *halfdelay()*, *nodelay()*, **<curses.h>**.

overlay()

Name

overlay, overwrite - copy overlapped windows

Synopsis

```
#include <curses.h>

int overlay(const WINDOW *srcwin, WINDOW *dstwin);

int overwrite(const WINDOW *srcwin, WINDOW *dstwin);
```

Description

The overlay() and overwrite() functions overlay *srcwin* on top of *dstwin*. The *scrwin* and *dstwin* arguments need not be the same size; only text where the two windows overlap is copied.

The overwrite() function copies characters as though a sequence of win_wch() and wadd_wch() were performed with the destination window's attributes and background attributes cleared.

The overlay() function does the same thing, except that, whenever a character to be copied is the background character of the source window, overlay() does not copy the character but merely moves the destination cursor the width of the source background character.

If any portion of the overlaying window border is not the first column of a multi-column character then all the column positions will be replaced with the background character and rendition before the overlay is done. If the default background character is a multi-column character when this occurs, then these functions fail.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

copywin(), **<curses.h>**.

pair_content()

Name

pair_content, PAIR_NUMBER - get information on a color pair

Synopsis

```
#include <curses.h>

int pair_content(short pair, short *f, short *b);

int PAIR_NUMBER(int value);
```

Description

Refer to can_change_color().

---

pechochar()

Name

pechochar, pecho_wchar - write a character and rendition and immediately refresh the pad

Synopsis

```
#include <curses.h>

int pechochar(WINDOW *win, chtype ch);

int pecho_wchar(WINDOW *pad, const cchar_t *wch);
```

Description

The pechochar() and pecho_wchar() functions output one character to a *pad* and immediately refresh the *pad*. They are equivalent to a call to waddch() or wadd_wch(), respectively, followed by a call to prefresh(). The last location of the *pad* on the screen is reused for the arguments to prefresh().

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

The pechochar() function is only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

See Also

echochar(), *echo_char()*, *newpad()*, **<curses.h>**.

---

pnoutrefresh()

Name

pnoutrefresh, prefresh - refresh pads

Synopsis

```
#include <curses.h>

int pnoutrefresh(WINDOW *pad, int pminrow, int pmincol, int sminrow,
                 int smincol, int smaxrow, int smaxcol);

int prefresh(WINDOW *pad, int pminrow, int pmincol, int sminrow,
             int smincol, int smaxrow, int smaxcol);
```

Description

Refer to newpad().

---

printw()

Name

printw - print formatted output in the current window

Synopsis

```
#include <curses.h>

int printw(char *fmt, ...);
```

Description

Refer to mvprintw().

---

putp()

Name

putp, tputs - output commands to the terminal

Synopsis

```
#include <term.h>

int putp(const char *str);

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

Description

These functions output commands contained in the terminfo database to the terminal.

The putp() function is equivalent to tputs(*str*, 1, *putchar*). The output of putp() always goes to stdout, not to the *fildes* specified in setupterm().

The tputs() function outputs *str* to the terminal. The *str* argument must be a terminfo string variable or the return value from tgetstr(), tgoto(), tigetstr() or tparm(). The *affcnt* argument is the number of lines affected, or 1 if not applicable. If the terminfo database indicates that the terminal in use requires padding after any command in the generated string, tputs() inserts pad characters into the string that is sent to the terminal, at positions indicated by the terminfo database. The tputs() function outputs each character of the generated string by calling the user-supplied function *putfunc* (see below).

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The user-supplied function putfunc (specified as an argument to tputs()) is either putchar() or some other function with the same prototype. The tputs() function ignores the return value of *putfunc*.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

After use of any of these functions, the model Curses maintains of the state of the terminal might not match the actual state of the terminal. The application should touch and refresh the window before resuming conventional use of Curses.

Use of these functions requires that the application contain so much information about a particular class of terminal that it defeats the purpose of using Curses.

On some terminals, a command to change rendition conceptually occupies space in the screen buffer (with or without width). Thus, a command to set the terminal to a new rendition would change the rendition of some characters already displayed.

See Also

doupdate(), *is_linetouched()*, *putchar()*, *tgetent()*, *tigetflag()*, **<term.h>**.

---

putwin()

Name

putwin - dump window to a file

Synopsis

```
#include <curses.h>

int putwin(WINDOW *win, FILE *filep);
```

Description

Refer to getwin().

---

qiflush()

Name

qiflush - enable queue flushing

Synopsis

```
#include <curses.h>

void qiflush(void);
```

Description

Refer to noqiflush().

---

raw()

Name

raw - set Raw Mode

Synopsis

```
#include <curses.h>

int raw(void);
```

Description

Refer to cbreak().

---

redrawwin()

Name

redrawwin, wredrawln - line update status functions

Synopsis

```
#include <curses.h>

int redrawwin(WINDOW *win);

int wredrawln(WINDOW *win, int beg_line, int num_lines);
```

Description

The redrawwin() and wredrawln() functions inform the implementation that some or all of the information physically displayed for the specified window may have been corrupted. The redrawwin() function marks the entire window; wredrawln() marks only *num_lines* lines starting at line number *beg_line*. The functions prevent the next refresh operation on that window from performing any optimization based on assumptions about what is physically displayed there.

Return Value

Upon successful completion, these functions return OK. Otherwise they return ERR.

Errors

No errors are defined.

Application Usage

The redrawwin() and wredrawln() functions could be used in a text editor to implement a command that redraws some or all of the screen.

See Also

clearok(), *doupdate()*, **<curses.h>**.

refresh()

Name

refresh - refresh current window

Synopsis

```
#include <curses.h>

int refresh(void);
```

Description

Refer to doupdate().

reset_prog_mode()

Name

reset_prog_mode, reset_shell_mode - restore program or shell terminal modes

Synopsis

```
#include <curses.h>

int reset_prog_mode(void);

int reset_shell_mode(void);
```

Description

Refer to def_prog_mode().

resetty()

Name

resetty, savetty - save/restore terminal mode

Synopsis

```
#include <curses.h>

int resetty(void);

int savetty(void);
```

Description

The resetty() function restores the program mode as of the most recent call to savetty().

The savetty() function saves the state that would be put in place by a call to reset_prog_mode().

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

def_prog_mode(), **<curses.h>**.

---

restartterm()

Name

restartterm - change terminal type

Synopsis

```
#include <term.h>

int restartterm(char *term, int fildes, int *errret);
```

Description

Refer to del_curterm().

---

ripoffline()

Name

ripoffline - reserve a line for a dedicated purpose

Synopsis

```
#include <curses.h>

int ripoffline(int line, int (*init)(WINDOW *win, int columns));
```

Description

The ripoffline() function reserves a screen line for use by the application.

Any call to ripoffline() must precede the call to initscr() or newterm(). If *line* is positive, one line is removed from the beginning of stdscr; if *line* is negative, one line is removed from the end. Removal occurs during the subsequent call to initscr() or newterm(). When the subsequent call is made, the function pointed to by *init* is called with two arguments: a WINDOW pointer to the one-line window that has been allocated and an integer with the number of columns in the window. The initialization function cannot use the LINES and COLS external variables and cannot call wrefresh() or doupdate(), but may call wnoutrefresh().

Up to five lines can be ripped off. Calls to ripoffline() above this limit have no effect but report success.

Return Value

The ripoffline() function returns OK.

Errors

No errors are defined.

Application Usage

Calling slk_init() reduces the size of the screen by one line if initscr() eventually uses a line from stdscr to emulate the soft labels. If slk_init() rips off a line, it thereby reduces by one the number of lines an application can reserve by subsequent calls to ripoffline(). Thus, portable applications that use soft label functions should not call ripoffline() more than four times.

When initscr() or newterm() calls the initialization function pointed to by init, the implementation may pass NULL for the WINDOW pointer argument *win*. This indicates inability to allocate a one-line window for the line that the call to ripoffline() ripped off. Portable applications should verify that *win* is not NULL before performing any operation on the window it represents.

See Also

doupdate(), *initscr()*, *slk_attroff()*, **<curses.h>**.

---

savetty()

Name

savetty - save terminal mode

Synopsis

```
#include <curses.h>

int savetty(void);
```

Description

Refer to resetty().

---

scanw()

Name

scanw - convert formatted input from the current window

Synopsis

```
#include <curses.h>

int scanw(char *fmt, ...);
```

Description

Refer to mvscanw().

---

scr_dump()

Name

scr_dump, scr_init, scr_restore, scr_set - screen file input/output functions

Synopsis

```
#include <curses.h>

int scr_dump(const char *filename);

int scr_init(const char *filename);

int scr_restore(const char *filename);

int scr_set(const char *filename);
```

Description

The scr_dump() function writes the current contents of the virtual screen to the file named by *filename* in an unspecified format.

The scr_restore() function sets the virtual screen to the contents of the file named by *filename*, which must have been written using scr_dump(). The next refresh operation restores the screen to the way it looked in the dump file.

The scr_init() function reads the contents of the file named by *filename* and uses them to initialize the Curses data structures to what the terminal currently has on its screen. The next refresh operation bases any updates on this information, unless either of the following conditions is true:

- The terminal has been written to since the virtual screen was dumped to *filename*
- The terminfo capabilities *rmcup* and *nrrmc* are defined for the current terminal.

The scr_set() function is a combination of scr_restore() and scr_init(). It tells the program that the information in the file named by *filename* is what is currently on the screen, and also what the program wants on the screen. This can be thought of as a screen inheritance function.

Return Value

On successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

The scr_init() function is called after initscr() or a system() call to share the screen with another process that has done a scr_dump() after its endwin() call.

To read a window from a file, call getwin(); to write a window to a file, call putwin().

See Also

delscreen(), *doupdate()*, *endwin()*, *getwin()*, *open()*, *read()*, *write()*, **<curses.h>**

---

scrl()

Name

scrl, scroll, wscrl - scroll a Curses window

Synopsis

```
#include <curses.h>

int scrl(int n);

int scroll(WINDOW *win);

int wscrl(WINDOW *win, int n);
```

Description

The scroll() function scrolls win one line in the direction of the first line.

The scrl() and wscrl() functions scroll the current or specified window. If *n* is positive, the window scrolls *n* lines toward the first line. Otherwise, the window scrolls *-n* lines toward the last line.

These functions do not change the cursor position. If scrolling is disabled for the current or specified window, these functions have no effect.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

<curses.h>.

---

scrollok()

Name

scrollok - enable or disable scrolling on a window

Synopsis

```
#include <curses.h>

int scrollok(WINDOW *win, bool bf);
```

Description

Refer to clearok().

---

setcchar()

Name

setcchar - set cchar_t from a wide character string and rendition

Synopsis

```
#include <curses.h>

int setcchar(cchar_t *wcval, const wchar_t *wch, const attr_t attrs,
             short color_pair, const void *opts);
```

Description

The setcchar() function initializes the object pointed to by *wcval* according to the character attributes in *attrs*, the color pair in *color_pair* and the wide character string pointed to by *wch*.

The *opts* argument is reserved for definition in a future edition of this document. Currently, the application must provide a null pointer as *opts*.

Return Value

Upon successful completion, setcchar() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

attroff(), *can_change_color()*, *getcchar()*, **<curses.h>**.

---

set_curterm()

Name

set_curterm - set current terminal

Synopsis

```
#include <term.h>

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

Description

Refer to del_curterm().

---

setscrreg()

Name

setscrreg, wsetscrreg - define software scrolling region

Synopsis

```
#include <curses.h>

int setscrreg(int top, int bot);

int wsetscrreg(WINDOW *win, int top, int bot);
```

Description

Refer to clearok().

set_term()

Name

set_term - switch between screens

Synopsis

```
#include <curses.h>

SCREEN *set_term(SCREEN *new);
```

Description

The set_term() function switches between different screens. The *new* argument specifies the new current screen.

Return Value

Upon successful completion, set_term() returns a pointer to the previous screen. Otherwise, it returns a null pointer.

Errors

No errors are defined.

Application Usage

This is the only function that manipulates SCREEN pointers; all other functions affect only the current screen.

See Also

initscr(), **<curses.h>**.

setupterm()

Name

setupterm - access the terminfo database

Synopsis

```
#include <term.h>

int setupterm(char *term, int fildes, int *errret);
```

Description

Refer to del_curterm().

slk_attroff()

Name

slk_attroff, slk_attr_off, slk_attron, slk_attr_on, slk_attrset, slk_attr_set, slk_clear, slk_color, slk_init, slk_label, slk_noutrefresh, slk_refresh, slk_restore, slk_set, slk_touch, slk_wset - soft label functions

Synopsis

```
#include <curses.h>

int slk_attroff(const chtype attrs);

int slk_attr_off(const attr_t attrs, void *opts);

int slk_attron(const chtype attrs);

int slk_attr_on(const attr_t attrs, void *opts);

int slk_attrset(const chtype attrs);

int slk_attr_set(const attr_t attrs, short color_pair_number, void
*opts);

int slk_clear(void);

in slk_color(short color_pair_number);

int slk_init(int fmt);

char *slk_label(int labnum);

int slk_noutrefresh(void);

int slk_refresh(void);

int slk_restore(void);

int slk_set(int labnum, const char *label, int justify);

int slk_touch(void);

int slk_wset(int labnum, const wchar_t *label, int justify);
```

Description

The Curses interface manipulates the set of soft function-key labels that exist on many terminals. For those terminals that do not have soft labels, Curses takes over the bottom line of stdscr, reducing the size of stdscr and the value of the LINES external variable. There can be up to eight labels of up to eight display columns each.

To use soft labels, slk_init() must be called before initscr(), newterm() or ripoffline() is called. If initscr() eventually uses a line from stdscr to emulate the soft labels, then *fmt* determines how the labels are arranged on the screen. Setting *fmt* to 0 indicates a 3-2-3 arrangement of the labels; 1 indicates a 4-4 arrangement. Other values for *fmt* are unspecified.

The slk_init() function has the effect of calling ripoffline() to reserve one screen line to accommodate the requested format.

The slk_set() and slk_wset() functions specify the text of soft label number *labnum*, within the range from 1 to and including 8. The *label* argument is the string to be put on the label. With slk_set(), and slk_wset(), the width of the label is limited to eight column positions. A null string or a null pointer specifies a blank label. The justify argument can have the following values to indicate how to justify *label* within the space reserved for it:

0 Align the start of label with the start of the space
1 Center label within the space

2 Align the end of label with the end of the space

The slk_refresh() and slk_noutrefresh() functions correspond to the wrefresh() and wnoutrefresh() functions.

The slk_label() function obtains soft label number *labnum*.

The slk_clear() function immediately clears the soft labels from the screen.

The slk_restore() function immediately restores the soft labels to the screen after a call to slk_clear().

The slk_touch() function forces all the soft labels to be output the next time slk_noutrefresh() or slk_refresh() is called.

The slk_attron(), slk_attrset() and slk_attroff() functions correspond to attron(), attrset(), and attroff(). They have an effect only if soft labels are simulated on the bottom line of the screen.

The slk_attr_off(), slk_attr_on() and slk_attr_set(), and slk_color() functions correspond to slk_attroff(), slk_attron(), slk_attrset() and color_set() and thus support the attribute constants with WA_ prefix and color.

The *opts* argument is reserved for defintion in a future edition of this document. Currently, the application must provide a null pointer as *opts*.

Return Value

Upon successful completion, slk_label() returns the requested label with leading and trailing blanks stripped. Otherwise, it returns a null pointer.

Upon successful completion, the other functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

When using multi-byte character sets, applications should check the width of the string by calling mbstowcs() and then wcswidth() before calling slk_set(). When using wide characters, applications should check the width of the string by calling wcswidth() before calling slk_set().

Since the number of columns that a wide character string will occupy is codeset-specific, call wcwidth() and wcswidth() to check the number of column positions in the string before calling slk_wset().

Most applications would use slk_noutrefresh() because a wrefresh() is likely to follow soon.

See Also

attr_get(), *attroff()*, *delscreen()*, *mbstowcs()*, *ripoffline()*, *wcswidth()*, **<curses.h>**.

standend()

Name

standend, standout, wstandend, wstandout - set and clear window attributes

Synopsis

```
#include <curses.h>

int standend(void);

int standout(void);

int wstandend(WINDOW *win);

int wstandout(WINDOW *win);
```

Description

The standend() and wstandend() functions turn off all attributes of the current or specified window.

The standout() and wstandout() functions turn on the standout attribute of the current or specified window.

Return Value

These functions always return 1.

Errors

No errors are defined.

See Also

attroff(), *attr_get()*, **<curses.h>**.

start_color()

Name

start_color - initialize use of colors on terminal

Synopsis

```
#include <curses.h>

int start_color(void);
```

Description

Refer to can_change_color().

stdscr

Name

stdscr - default window

Synopsis

```
#include <curses.h>

extern WINDOW *stdscr;
```

Description

The external variable stdscr specifies the default window used by functions that do not specify a window using an argument of type WINDOW *. Other windows may be created using newwin().

See Also

derwin(), **<curses.h>**.

---

subpad()

Name

subpad - create a subwindow in a pad

Synopsis

```
#include <curses.h>

WINDOW *subpad(WINDOW *orig, int nlines, int ncols, int begin_y,
    int begin_x);
```

Description

Refer to newpad().

---

subwin()

Name

subwin - create a subwindow

Synopsis

```
#include <curses.h>

WINDOW *subwin(WINDOW *orig, int nlines, int ncols, int begin_y,
               int begin_x);
```

Description

Refer to derwin().

---

syncok()

Name

syncok, wcursyncup, wsyncdown, wsyncup - synchronise a window with its parents or children

Synopsis

```
#include <curses.h>

int syncok(WINDOW *win, bool bf);

void wcursyncup(WINDOW *win);

void wsyncdown(WINDOW *win);

void wsyncup(WINDOW *win);
```

Description

The syncok() function determines whether all ancestors of the specified window are implicitly touched whenever there is a change in the window. If *bf* is TRUE, such implicit touching occurs. If *bf* is FALSE, such implicit touching does not occur. The initial state is FALSE.

The wcursyncup() function updates the current cursor position of the ancestors of *win* to reflect the current cursor position of *win*.

The wsyncdown() function touches *win* if any ancestor window has been touched.

The wsyncup() function unconditionally touches all ancestors of *win*.

Return Value

Upon successful completion, syncok() returns OK. Otherwise, it returns ERR.

The other functions do not return a value.

Errors

No errors are defined.

Application Usage

Applications seldom call wsyncdown() because it is called by all refresh operations.

See Also

doupdate(), *is_linetouched(),* **<curses.h>**.

---

termattrs()

Name

termattrs - get supported terminal video attributes

Synopsis

```
#include <curses.h>

chtype termattrs(void);

attr_t term_attr(void);
```

Description

The termattrs() function extracts the video attributes of the current terminal which is supported by the chtype data type.

The term_attrs() function extracts information for the video attributes of the current terminal which is supported for a cchar_t.

Return Value

The termattrs() function returns a logical OR of A_values of all video attributes supported by the terminal. The term_attrs() function returns a logical OR of WA_ values of all video attributes supported by the terminal.

Errors

No errors are defined.

See Also

attroff(), *attr_get()*, **<curses.h>**.

---

termname()

Name

termname - get terminal name

Synopsis

```
#include <curses.h>

char *termname(void);
```

Description

The termname() function obtains the terminal name as recorded by setupterm().

Return Value

The termname() function returns a pointer to the terminal name.

Errors

No errors are defined.

See Also

del_curterm(), *getenv() initscr()*, **<curses.h>**.

---

tgetent()

Name

tgetent, tgetflag, tgetnum, tgetstr, tgoto - termcap database emulation (TO BE WITHDRAWN)

Synopsis

```
#include <term.h>

int tgetent(char *bp, const char *name);

int tgetflag(char id[2]);

int tgetnum(char id[2]);
```

```
char *tgetstr(char id[2], char **area);

char *tgoto(char *cap, int col, int row);
```

Description

The tgetent() function looks up the termcap entry for name. The emulation ignores the buffer pointer *bp*.

The tgetflag() function gets the boolean entry for *id*.

The tgetnum() function gets the numeric entry for *id*.

The tgetstr() function gets the string entry for *id*. If area is not a null pointer and does not point to a null pointer, tgetstr() copies the string entry into the buffer pointed to by **area* and advances the variable pointed to by area to the first byte after the copy of the string entry.

The tgoto() function instantiates the parameters *col* and *row* into capability *cap* and returns a pointer to the resulting string.

All of the information available in the terminfo database need not be available through these functions.

Return Value

Upon successful completion, functions that return an integer return OK. Otherwise, they return ERR.

Functions that return pointers return a null pointer on error.

Errors

No errors are defined.

Application Usage

These functions are included as a conversion aid for programs that use the termcap library. Their arguments are the same and the functions are emulated using the terminfo database.

These functions are only guaranteed to operate reliably on character sets in which each character fits into a single byte, whose attributes can be expressed using only constants with the A_ prefix.

Any terminal capabilities from the terminfo database that cannot be retrieved using these interfaces can be retrieved using the interfaces described on the tigetflag() page.

Portable applications must use tputs() to output the strings returned by tgetstr() and tgoto().

See Also

putc(), *setupterm()*, *tigetflg()*, **<term.h>**.

tigetflag()

Name

tigetflag, tigetnum, tigetstr, tparm - retrieve capabilities from the terminfo database

Synopsis

```
#include <term.h>

int tigetflag(char *capname);

int tigetnum(char *capname);

char *tigetstr(char *capname);

char *tparm(char *cap, long p1, long p2, long p3, long p4,
            long p5, long p6, long p7, long p8, long p9);
```

Description

The tigetflag(), tigetnum(), and tigetstr() functions obtain boolean, numeric and string capabilities, respectively, from the selected record of the terminfo database. For each capability, the value to use as *capname* appears in the Capname column.

The tparm() function takes as *cap* a string capability. If *cap* is parameterized, tparm() resolves the parameterization. If the parameterized string refers to parameters *%p1* through *%p9*, then tparm() substitutes the values of *p1* through *p9*, respectively.

Return Value

Upon successful completion, tigetflg(), tigetnum() and tigetstr() return the specified capability. The tigetflag() function returns -1 if *capname* is not a boolean capability. The tigetnum() function returns -2 if *capname* is not a numeric capability. The tigetstr() function returns (char *)-1 if *capname* is not a string capability.

Upon successful completion, tparm() returns *str* with parameterization resolved. Otherwise, it returns a null pointer.

Errors

No errors are defined.

Application Usage

For parameterized string capabilities, the application should pass the return value from tigetstr() to tparm(), as described above.

Applications intending to send terminal capabilities directly to the terminal (which should only be done using tputs() or putp()) instead of using Curses, normally should obey the following rules:

- Call reset_shell_mode() to restore the display modes before exiting.
- If using cursor addressing, output enter_ca_mode upon startup and output exit_ca_mode before exiting.
- If using shell escapes, output exit_ca_mode and call reset_shell_mode() before calling the shell; call reset_prog_mode() and output enter_ca_mode after returning from the shell.

All parameterized terminal capabilities defined in this document can be passed to tparm(). Some implementations create their own capabilities, create capabilities for non-terminal devices, and redefine the capabilities in this document. These practices are non-conforming because it may be that tparm() cannot parse these user-defined strings.

See Also

def_prog_mode(), *tgetent()*, *putp()*, **<term.h>**.

---

timeout()

Name

timeout - control blocking on input

Synopsis

```
#include <curses.h>

void timeout(int delay);
```

Description

Refer to notimeout().

---

touchline()

Name

touchline, touchwin - window refresh control functions

Synopsis

```
#include <curses.h>

int touchline(WINDOW *win, int start, int count);

int touchwin(WINDOW *win);
```

Description

Refer to is_linetouched().

---

tparm()

Name

tparm - retrieve capabilities from the terminfo database

Synopsis

```
#include <term.h>

char *tparm(char *cap, long p1, long p2, long p3, long p4,
            long p5, long p6, long p7, long p8, long p9);
```

Description

Refer to tigetflag().

tputs()

Name

tputs - output commands to the terminal

Synopsis

```
#include <curses.h>

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

Description

Refer to putp().

typeahead()

Name

typeahead - control checking for typeahead

Synopsis

```
#include <curses.h>

int typeahead(int fildes);
```

Description

The typeahead() function controls the detection of typeahead during a refresh, based on the value of *fildes*:

- If *fildes* is a valid file descriptor, typeahead is enabled during refresh; Curses periodically checks *fildes* for input and aborts the refresh if any character is available. (This is the initial setting, and the typeahead file descriptor corresponds to the input file associated with the screen created by initscr() or newterm().) The value of *fildes* need not be the file descriptor on which the refresh is occurring.
- If *fildes* is -1, Curses does not check for typeahead during refresh.

Return Value

Upon successful completion, typeahead() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

See Also

doupdate(), *getch()*, *initscr()*, **<curses.h>**.

unctrl()

Name

unctrl - generate printable representation of a character

Synopsis

```
#include <unctrl.h>

char *unctrl(chtype c);
```

Description

The unctrl() function generates a character string that is a printable representation of *c*. If *c* is a control character, it is converted to the ^X notation. If *c* contains rendition information, the effect is undefined.

Return Value

Upon successful completion, unctrl() returns the generated string. Otherwise, it returns a null pointer.

Errors

No errors are defined.

See Also

keyname(), *wunctrl()*, **<unctrl.h>**.

---

ungetch()

Name

ungetch, unget_wch - push a character onto the input queue

Synopsis

```
#include <curses.h>

int ungetch(int ch);

int unget_wch(const wchar_t wch);
```

Description

The ungetch() function pushes the single-byte character *ch* onto the head of the input queue.

The unget_wch() function pushes the wide character *wch* onto the head of the input queue.

One character of push-back is guaranteed. If these functions are called too many times without an intervening call to getch() or get_wch(), the operation may fail.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

See Also

getch(), *get_wch()*, **<curses.h>**.

untouchwin()

Name

untouchwin - window refresh control function

Synopsis

```
#include <curses.h>

int untouchwin(WINDOW *win);
```

Description

Refer to is_linetouched().

use_env()

Name

use_env - specify source of screen size information

Synopsis

```
#include <curses.h>

void use_env(bool boolval);
```

Description

The use_env() function specifies the technique by which the implementation determines the size of the screen. If *boolval* is FALSE, the implementation uses the values of lines and columns specified in the terminfo database. If *boolval* is TRUE, the implementation uses the *LINES* and *COLUMNS* environment variables. The initial value is TRUE.

Any call to use_env() must precede calls to initscr(), newterm() or setupterm().

Return Value

The function does not return a value.

Errors

No errors are defined.

See Also

del_curterm(), *initscr()*, **<curses.h>**.

vidattr()

Name

vidattr, vid_attr, vidputs, vid_puts - output attributes to the terminal

Synopsis

```
#include <curses.h>

int vidattr(chtype attr);

int vid_attr(attr_t attr, short color_pair_number, void *opt);

int vidputs(chtype attr,, int (*putfunc)(int));

int vid_puts(attr_t attr, short_pair_number, void *opt, int_t
     (*putfunc)(init_t));
```

Description

These functions output commands to the terminal that change the terminal's attributes.

If the terminfo database indicates that the terminal in use can display characters in the rendition specified by *attr*, then vidattr() outputs one or more commands to request that the terminal display subsequent characters in that rendition. The function outputs by calling putchar(). The vidattr() function neither relies on nor updates the model that Curses maintains of the prior rendition mode.

The vidputs() function computes the same terminal output string that vidattr() does, based on *attr*, but vidputs() outputs by calling the user-supplied function *putfunc*. The vid_attr() and vid_puts() functions correspond to vidattr() and vidputs() respectively, but take a set of arguments, one of type **attr_t** for the attributes, short for the *color_pair_number* and a *void** and thus support the attribute constants with the WA_ prefix.

The opts argument is reserved for definition in a future edition of this document. Currently, the application must provide a null pointer as opts.

The user-supplied function *putfunc* (specified as an argument to vidputs()) is either putchar() or some other function with the same prototype. The vidputs() function ignores the return value of *putfunc*.

The vid_attr() and vid_puts() functions correspond to vidattr() and vidputs(), respectively, but take an argument of type attr_t and thus support the attribute constants with the WA_ prefix.

The user-supplied function *putwfunc* (specified as an argument to vid_puts()) is either putwchar() or some other function with the same prototype. The vid_puts() function ignores the return value of *putwfunc*.

Return Value

Upon successful completion, these functions return OK. Otherwise, they return ERR.

Errors

No errors are defined.

Application Usage

After use of any of these functions, the model Curses maintains of the state of the terminal might not match the actual state of the terminal. The application should touch and refresh the window before resuming conventional use of Curses.

Use of these functions requires that the application contain so much information about a particular class of terminal that it defeats the purpose of using Curses.

On some terminals, a command to change rendition conceptually occupies space in the screen buffer (with or without width). Thus, a command to set the terminal to a new rendition would change the rendition of some characters already displayed.

See Also

doupdate(), *is_linetouched()*, *putchar()*), *putwchar()*, *tigetflag()*, **<curses.h>**.

---

vline()

Name

vline - draw vertical line

Synopsis

```
#include <curses.h>

int vline(chtype ch, int n);
```

Description

Refer to hline().

---

vline_set()

Name

vline_set - draw vertical line from complex character and rendition

Synopsis

```
#include <curses.h>

int vline_set(const cchar_t *ch, int n);
```

Description

Refer to hline_set().

---

vwprintw()

Name

vwprintw - print formatted output in window

Synopsis

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

int vwprintw(WINDOW *, char *, va_list varglist);
```

Description

The vwprintw() function achieves the same effect as wprintw() using a variable argument list. The third argument is a *va_list*, as defined in **<varargs.h>**.

Return Value

Upon successful completion, vwprintw() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The vwprintw() function is deprecated because it relies on deprecated functions in the XSH specification. The vw_printw() function is preferred. The use of the vwprintw() and the vw_printw() functions in the same file will not work, due to the requirments to include **varargs.h** and **stdarg.h** which both contain definitions of *va_list*.

See Also

mvprintw(), *fprintf()*, *vw_printw()*, **<curses.h>**, **<varargs.h>**.

---

vw_printw()

Name

vw_printw - print formatted output in window

Synopsis

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

int vw_printw(WINDOW *, char *, va_list varglist);
```

Description

The vw_printw() function achieves the same effect as wprintw() using a variable argument list. The third argument is a *va_list*, as defined in **<stdarg.h>**.

Return Value

Upon successful completion, vw_printw() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The vw_printw() function is preferred over vwprintw(). The use of the vwprintw() and the vw_printw() functions in the same file will not work, due to the requirement to include **varargs.h** and **stdarg.h** which both contain definitions of *va_list*.

See Also

mvprintw(), *fprintf()*, **<curses.h>**, **<stdarg.h>**.

---

vwscanw()

Name

vwscanw - convert formatted input from a window

Synopsis

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

int vwscanw(WINDOW *, char *, va_list varglist);
```

Description

The vwscanw() function achieves the same effect as wscanw() using a variable argument list. The third argument is a *va_list*, as defined in **<varargs.h>**.

Return Value

Upon successful completion, vwscanw() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The vwscanw() function is deprecated because it relies on deprecated functions in the XSH specification. The vw_scanw() function is preferred. The use of the vwscanw() and the vw_scanw() functions in the same file will not work, due to the requirement to include **varargs.h** and **stdarg.h** which both contain definitions of *va_list*.

See Also

fscanf(), *mvscanw()*, *vw_scanw()*, **<curses.h>**, **varargs.h>**.

---

vw_scanw()

Name

vw_scanw - convert formatted input from a window

Synopsis

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

int vw_scanw(WINDOW *, char *, va_list varglist);
```

Description

The vw_scanw() function achieves the same effect as wscanw() using a variable argument list. The third argument is a *va_list*, as defined in **<stdarg.h>**.

Return Value

Upon successful completion, vw_scanw() returns OK. Otherwise, it returns ERR.

Errors

No errors are defined.

Application Usage

The vw_scanw() function is preferred over vwscanw(). The use of the vwscanw() and the vw_scanw() functions in the same file will not work, due to the requirement to include **varargs.h** and **stdarg.h** which both contain definitions of *va_list*.

See Also

fscanf(), *mvscanw()*, **<curses.h>**, **<stdarg.h>**.

---

w

Name

w - pointer page for functions with w prefix

Description

Most uses of the w prefix indicate that a Curses function takes a win argument that specifies the affected window.[3] (The corresponding functions without the w prefix operate on the current window.)

The w functions are discussed together with the corresponding functions without the w prefix. They are found on the following entries:

Function	Refer to
waddch()	*addch()*
waddchnstr()	*addchstr()*
waddchstr()	*addchstr()*
waddnstr()	*addnstr()*
waddstr()	*addnstr()*
waddnwstr()	*addnwstr()*
waddwstr()	*addnwstr()*
wadd_wch()	*add_wch()*
wadd_wchnstr()	*add_wchnstr()*
wadd_wchstr()	*add_wchnstr()*
wattroff()	*attroff()*
wattron()	*attroff()*
wattrset()	*attroff()*
wattr_get()	*attr_get()*
wattr_off()	*attr_get()*
wattr_on()	*attr_get()*
wattr_set()	*attr_get()*
wbkgd()	*bkgd()*
wbkgdset()	*bkgd()*
wbkgrnd()	*bkgrnd()*
wbkgrndset()	*bkgrnd()*
wborder()	*border()*
wborder_set()	*border_set()*
wchgat()	*chgat()*
wclear()	*clear()*
wclrtobot()	*clrtobot()*
wclrtoeol()	*clrtoeol()*
wcursyncup() *	*syncok()*
wdelch()	*delch()*

3. The wunctrl() function is an exception to this rule and has an entry under its own name.

Function	Refer to
wdeleteln()	*deleteln()*
wechochar()	*echochar()*
wecho_wchar()	*echo_wchar()*
werase()	*clear()*
wgetbkgrnd()	*bkgrnd()*
wgetch()	*getch()*
wgetnstr()	*getnstr()*
wgetn_wstr()	*getn_wstr()*
wgetstr()	*getnstr()*
wget_wch()	*get_wch()*
wget_wstr()	*getn_wstr()*
whline()	*hline()*
whline_set()	*hline_set()*
winch()	*inch()*
winchnstr()	*inchnstr()*
winchstr()	*inchnstr()*
winnstr()	*innstr()*
winnwstr()	*innwstr()*
winsch()	*insch()*
winsdelln()	*insdelln()*
winsertln()	*insertln()*
winsnstr()	*insnstr()*
winsstr()	*insnstr()*
winstr()	*innstr()*
wins_nwstr()	*ins_nwstr()*
wins_wch()	*ins_wch()*
wins_wstr()	*ins_nwstr()*
winwstr()	*innwstr()*
win_wch()	*in_wch()*
win_wchnstr()	*in_wchnstr()*
win_wchstr()	*in_wchnstr()*
wmove()	*move()*
wnoutrefresh()	*doupdate()*
wprintw()	*mvprintw()*
wredrawln()	*redrawln()*
wrefresh()	*doupdate()*
wscanw()	*mvscanw()*
wscrl()	*scrl()*
wsetscrreg()	*clearok()*
wstandend()	*standend()*
wstandout()	*standend()*
wsyncdown() *	*syncok()*
wsyncup() *	*syncok()*
wtimeout()	*notimeout()*
wtouchln() *	*is_linetouch()*
wvline()	*hline()*
wvline_set()	*hline_set()*

* There is no corresponding function without the w prefix.

wunctrl()

Name

wunctrl - generate printable representation of a wide character

Synopsis

```
#include <curses.h>

wchar_t *wunctrl(cchar_t *wc);
```

Description

The wunctrl() function generates a wide character string that is a printable representation of the wide character *wc*.

This function also performs the following processing on the input argument:

- Control characters are converted to the ^X notation.
- Any rendition information is removed.

Return Value

Upon successful completion, wunctrl() returns the generated string. Otherwise, it returns a null pointer.

Errors

No errors are defined.

See Also

keyname(), *unctrl()*, **<curses.h>**.

Chapter 16. Headers

This chapter describes the contents of headers used by the Curses functions, macros and external variables.

Headers contain the definition of symbolic constants, common structures, preprocessor macros and defined types. Each function in "Chapter 16. Headers" specifies the headers that an application must include in order to use that function. In most cases only one header is required. These headers are present on an application development system; they do not have to be present on the target execution system.

<cursesh>

Name

curses.h - definitions for screen handling and optimization functions

Synopsis

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

Description

Objects

The <curses.h> header provides a declaration for COLOR_PAIRS, COLORS, COLS, curscr, LINES and stdscr.

Constants

The following constants are defined:

EOF	Function return value for end-of-file
ERR	Function return value for failure
FALSE	Boolean false value
OK	Function return value for success
TRUE	Boolean true value
WEOF	Wide-character function return value for end-of-file, as defined in <wchar.h>.

The following constant is defined if the implementation supports the indicated revision of the X/Open Curses specification.

```
_XOPEN_CURSES X/Open Curses, Issue 4 Verson 2, May 1996, C610 <ISBN>
     (i.e. this document).
```

Data Types

The following data types are defined through **typedef**:

attr_t	An OR-ed set of attributes
bool	Boolean data type
chtype	A character, attributes and a color-pair
SCREEN	An opaque terminal representation
wchar_t	As described in <stddef.h>
wint_t	As described in <wchar.h>
cchar_t	References a string of wide characters

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WINDOW An opaque window representation

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

Attribute Bits

The following symbolic constants are used to manipulate objects of type **attr_t**:

WA_ ALTCHARSET	Alternate character set
WA_ BLINK	Blinking
WA_ BOLD	Extra bright or bold
WA_ DIM	Half bright
WA_ HORIZONTAL	Horizontal highlight
WA_ INVIS	Invisible
WA_ LEFT	Left highlight
WA_ LOW	Low highlight
WA_ PROTECT	Protected
WA_ REVERSE	Reverse video
WA_ RIGHT	Right highlight
WA_ STANDOUT	Best highlighting mode of the terminal
WA_ TOP	Top highlight
WA_ UNDERLINE	Underlining
WA_ VERTICAL	Vertical highlight

These attribute flags shall be distinct.

The following symbolic constants are used to manipulate attribute bits in objects of type **chtype**:

A_ALTCHARSET	Alternate character set
A_BLINK	Blinking
A_BOLD	Extra bright or bold
A_DIM	Half bright
A_INVIS	Invisible
A_PROTECT	Protected
A_REVERSE	Reverse video
A_STANDOUT	Best highlighting mode of the terminal
A_UNDERLINE	Underlining

These attribute flags need not be distinct except when _XOPEN_CURSES is defined and the application sets _XOPEN_SOURCE_EXTENDED to 1.

The following symbolic constants can be used as bit-masks to extract the components of a **chtype**:

A_ATTRIBUTES	Bit-mask to extract attributes
A_CHARTEXT	Bit-mask to extract a character
A_COLOR	Bit-mask to extract color-pair information

The following symbolic constants can be used as bit-masks to extract the components of a chtype:

A_ATTRIBUTES	Bit-mask to extract attributes
A_CHARTEXT	Bit-mask to extract a character
A_COLOR	Bit-mask to extract color-pair information

Line-Drawing Constants

The <curses.h> header defines the symbolic constants shown in the leftmost two columns of the following table for use in drawing lines. The symbolic constants that begin with ACS_ are char constants. The symbolic constants that begin with WACS_ are cchar_t constants for use with the wide-character interfaces that take a pointer to a cchar_t.

In the POSIX locale, the characters shown in the POSIX Locale Default column are used when the terminal database does not specify a value using the *acsc* capability.

char Constant	char_t Constant	POSIX Locale Default	Glyph Description
ACS_ULCORNER	WACS_ULCORNER	+	upper left-hand corner
ACS_LLCORNER	WACS_LLCORNER	+	lower left-hand corner
ACS_URCORNER	WACS_URCORNER	+	upper right-hand corner
ACS_LRCORNER	WACS_LRCORNER	+	lower right-hand corner
ACS_RTEE	WACS_RTEE	+	right tee (-|)
ACS_LTEE	WACS_LTEE	+	left tee (|-)
ACS_BTEE	WACS_BTEE	+	bottom tee (|)
ACS_TTEE	WACS_TTEE	+	top tee (|)
ACS_HLINE	WACS_HLINE	-	horizontal line
ACS_VLINE	WACS_VLINE	|	vertical line
ACS_PLUS	WACS_PLUS+	plus	
ACS_S1	WACS_S1	-	scan line 1
ACS_S9	WACS_S9	_	scan line 9
ACS_DIAMOND	WACS_DIAMOND	+	diamond
ACS_CKBOARD	WACS_CKBOARD	:	checker board (stipple)
ACS_DEGREE	WACS_DEGREE	'	degree symbol
ACS_PLMINUS	WACS_PLMINUS	#	plus/minus
ACS_BULLET	WACS_BULLET	o	bullet
ACS_LARROW	WACS_LARROW	<	arrow pointing left
ACS_RARROW	WACS_RARROW	>	arrow pointing right
ACS_DARROW	WACS_DARROW	v	arrow pointing down
ACS_UARROW	WACS_UARROW	^	arrow pointing up
ACS_BOARD	WACS_BOARD	#	board of squares
ACS_LANTERN	WACS_LANTERN	#	lantern symbol
ACS_BLOCK	WACS_BLOCK	#	solid square block

Color-Related Macros

The following color-related macros are defined:
COLOR_BLACK
COLOR_BLUE
COLOR_GREEN
COLOR_CYAN
COLOR_RED
COLOR_MAGENTA
COLOR_YELLOW
COLOR_WHITE

Coordinate-Related Macros

The following coordinate-related macros are defined:

```
void getbegyx(WINDOW *win, int y, int x);
void getmaxyx(WINDOW *win, int y, int x);
void getparyx(WINDOW *win, int y, int x);
void getyx(WINDOW *win, int y, int x);
```

Key Codes

The following symbolic constants representing function key values are defined:

Key Code	Description
KEY_CODE_YES	Used to indicate that a wchar_t variable contains a key code
KEY_BREAK	Break key
KEY_DOWN	Down arrow key
KEY_UP	Up arrow key
KEY_LEFT	Left arrow key
KEY_RIGHT	Right arrow key
KEY_HOME	Home key
KEY_BACKSPACE	Backspace
KEY_F0	Function keys; space for 64 keys is reserved
KEY_F(n)	For 0_<n_<63
KEY_DL	Delete line
KEY_IL	Insert line
KEY_DC	Delete character
KEY_IC	Insert char or enter insert mode
KEY_EIC	Exit insert char mode
KEY_CLEAR	Clear screen
KEY_EOS	Clear to end of screen
KEY_EOL	Clear to end of line
KEY_SF	Scroll 1 line forward
KEY_SR	Scroll 1 line backward (reverse)
KEY_NPAGE	Next page
KEY_PPAGE	Previous page
KEY_STAB	Set tab
KEY_CTAB	Clear tab
KEY_CATAB	Clear all tabs
KEY_ENTER	Enter or send
KEY_SRESET	Soft (partial) reset
KEY_RESET	Reset or hard reset
KEY_PRINT	Print or copy
KEY_LL	Home down or bottom
KEY_A1	Upper left of keypad
KEY_A3	Upper right of keypad
KEY_B2	Center of keypad
KEY_C1	Lower left of keypad
KEY_C3	Lower right of keypad

The virtual keypad is a 3-by-3 keypad arranged as follows:

A1	UP	A3
LEFT	B2	RIGHT
C1	DOWN	C3

Each legend, such as A1, corresponds to a symbolic constant for a key code from the preceding table, such as KEY_A1.

The following symbolic constants representing function key values are also defined:

Key Code	Description
KEY_BTAB	Back tab key
KEY_BEG	Beginning key
KEY_CANCEL	Cancel key

KEY_CLOSE	Close key
KEY_COMMAND	Cmd (command) key
KEY_COPY	Copy key
KEY_CREATE	Create key
KEY_END	End key
KEY_EXIT	Exit key
KEY_FIND	Find key
KEY_HELP	Help key
KEY_MARK	Mark key
KEY_MESSAGE	Message key
KEY_MOVE	Move key
KEY_NEXT	Next object key
KEY_OPEN	Open key
KEY_OPTIONS	Options key
KEY_PREVIOUS	Previous object key
KEY_REDO	Redo key
KEY_REFERENCE	Reference key
KEY_REFRESH	Refresh key
KEY_REPLACE	Replace key
KEY_RESTART	Restart key
KEY_RESUME	Resume key
KEY_SAVE	Save key
KEY_SBEG	Shifted beginning key
KEY_SCANCEL	Shifted cancel key
KEY_SCOMMAND	Shifted command key
KEY_SCOPY	Shifted copy key
KEY_SCREATE	Shifted create key
KEY_SDC	Shifted delete char key
KEY_SDL	Shifted delete line key
KEY_SELECT	Select key
KEY_SEND	Shifted end key
KEY_SEOL	Shifted clear line key
KEY_SEXIT	Shifted exit key
KEY_SFIND	Shifted find key
KEY_SHELP	Shifted help key
KEY_SHOME	Shifted home key
KEY_SIC	Shifted input key
KEY_SLEFT	Shifted left arrow key
KEY_SMESSAGE	Shifted message key
KEY_SMOVE	Shifted move key
KEY_SNEXT	Shifted next key
KEY_SOPTIONS	Shifted options key
KEY_SPREVIOUS	Shifted prev key
KEY_SPRINT	Shifted print key
KEY_SREDO	Shifted redo key
KEY_SREPLACE	Shifted replace key
KEY_SRIGHT	Shifted right arrow
KEY_SRSUME	Shifted resume key
KEY_SSAVE	Shifted save key
KEY_SSUSPEND	Shifted suspend key
KEY_SUNDO	Shifted undo key
KEY_SUSPEND	Suspend key
KEY_UNDO	Undo key

Function Prototypes

The following are declared as functions, and may also be defined as macros:

```
int    addch(const chtype);
int    addchstr(const chtype *, init);
int    addchnstr(chtype *const chstr, int n);
int    addchstr(const chtype *);
int    addnstr(const char *, init);
int    addnwstr(const wchar_t *, int);
int    addstr(const char *);
int    add_wch(const cchar_t *);
int    add_wchnstr(const cchar_t *, int);
int    add_wchstr(const cchar_t *);
int    addwstr(const wchar_t *);
int    attroff(int);
int    attron(int);
int    attrset(int);
int    attr_get(attr_t *, short *, void*);
int    attr_off(attr_t void *);
int    attr_on(attr_t, void *);
int    attr_set(attr_t, short, void *);
int    baudrate(void);
int    beep(void);
int    bkgd(chtype);
void   bkgdset(chtype);
ind    bkgrnd(const cchar_t *);
void   bkgrndset(const cchar_t *);
int    border(chtype, chtype, chtype, chtype, chtype,
              chtype, chtype, chtype);
int    border_set(const cchar_t *, const cchar_t *,
                  const cchar_t *, const cchar_t *,
                  const cchar_t *, const cchar_t *,
                  const cchar_t *, const cchar_t *);
int    box(WINDOW *, chtype, chtype);
int    box_set(WINDOW *, const cchar_t *, const cchar_t *);
bool   can_change_color(void);
int    cbreak(void);
int    chgat(int, attr_t, short, const void *);
int    clearok(WINDOW *, bool);
int    clear(void);
int    clrtobot(WINDOW *win, bool bf);
int    clrtoeol(void);
int    color_content(short, short *, short *, short *);
int    COLOR_PAIR(int);
int    Color_set(short,void *);
int    copywin(const WINDOW *, WINDOW *, int, int, int,
               int, int, int, int);
int    curs_set(int);
int    def_prog_mode(void);
int    def_shell_mode(void);
int    delay_output(int);
int    delch(void);
int    deleteln(void);
void   delscreen(SCREEN *);
int    delwin(WINDOW *);
WINDOW *derwin(WINDOW *, int, int, int, int);
int    doupdate(void);
WINDOW *dupwin(WINDOW *);
int    echo(void);
int    echochar(const chtype);
int    echo_wchar(const cchar_t *);
int    endwin(void);
char   erasechar(void);
int    erase(void);
int    erasewchar(wchar_t *);
void   filter(void);
int    flash(void);
int    flushinp(void);
chtype getbkgd(WINDOW *);
```

```
int    getbkgrnd(cchar_t *);
int    getcchar(const cchar_t *, wchar_t *, attr_t *,
               short *, void *);
int    getch(void);
int    getnstr(char *, int);
int    getn_wstr(wint_t *, int);
int    getstr(char *);
int    get_wch(wint_t *);
WINDOW *getwin(FILE *);
int    get_wstr(wint_t *);
int    halfdelay(int);
bool   has_colors(void);
bool   has_ic(void);
bool   has_il(void);
int    hline(chtype, int);
int    hline_set(const cchar_t *, int);
void   idcok(WINDOW *, bool);
int    idlok(WINDOW *win, bool bf);
void   immedok(WINDOW *, bool);
chtype inch(void);
int    inchnstr(chtype *, int);
int    inchstr(chtype *);
WINDOW *initscr(void);
int    init_color(short, short, short, short);
int    init_pair(short, short, short);
int    innstr(char *, int);
int    innwstr(wchar_t *, int);
int    insch(chtype);
int    insdelln(int;
int    insertln(void);
int    insnstr(cons char *, int);
int    insstr(char *const str);
int    ins_nwstr(const wchar_t *, int);
int    insstr(const char *);
int    instr(char *);
int    ins_wch(const cchar_t *);
int    ins_wchstr(const cchar_t *);
int    intrflush(WINDOW *, bool);
int    in_wch(cchar_t *);
int    in_wchnstr(cchar_t *, int);
int    in_wchstr(cchar_t *);
int    inwstr(wchar_t *);
bool   isendwin(void);
bool   is_linetouched(WINDOW *, int);
bool   is_wintouched(WINDOW *);
char  *keyname(int);
char  *key_name(wchar_t);
int    keypad(WINDOW *, bool);
char   killchar(void);
int    killwchar(wchar_t *);
int    leaveok(WINDOW *, bool);
char  *longname(void);
int    meta(WINDOW *, bool);
int    move(int, int);
int    mvaddch(int, int, const chtype);
int    mvaddchnstr(int, int, const chtype *, int);
int    mvaddchstr(int, int, const chtype *);
int    mvaddnstr(int, int, const char *, int);
int    mvaddnwstr(int, int, const wchar_t *, int);
int    mvaddstr(int, int, const char *);
int    mvadd_wch(int, int, const cchar_t *);
int    mvadd_wchnstr(int, int, const cchar_t *, int);
int    mvadd_wchstr(int, int, const cchar_t *);
int    mvaddwstr(int, int, const wchar_t *);
int    mvchgat(int, int, int, attr_t, short, const void *);
int    mvcur(int, int, int, int);
int    mvdelch(int, int);
```

```
int    mvderwin(WINDOW *, int, int);
int    mvgetch(int, int);
int    mvgetnstr(int, int, char *, int);
int    mvgetn_wstr(int, int, wint_t *, int);
int    mvgetstr(int, int, char *);
int    mvget_wch(int, int, wint_t *);
int    mvget_wstr(int, int, wint_t *);
int    mvhline(int, int, chtype, int);
int    mvhline_set(int, int, const cchar_t *, int);
chtype mvinch(int, int);
int    mvinchnstr(int, int, chtype *, int);
int    mvinchstr(int, int, chtype *);
int    mvinnstr(int, int, char *, int);
int    mvinnwstr(int, int, wchar_t *, int);
int    mvinsch(int, int, chtype);
int    mvinsnstr(int, int, const char *, int);
in     mvins_nwstr(int, int, const wchar_t *, int);
int    mvinsstr(int, int, const char *);
int    mvinstr(int, int, char *);
int    mvins_wch(int, int, const cchar_t *);
int    mvins_watr(int, int, const wchar_t *);
in     mvin_wch(int, int, cchar_t *);
int    mvin_wchnstr(int, int, cchar_t *,);
int    mvin_wchstr(int, int, cchar_t *);
int    mvinwstr(int, int, wchar_t *);
int    mvprintw(int, int, char *, ...);
int    mvscanw(int, int, char *, ...);
int    mvvline(int, int, chtype, int);
int    mvvline_set(int, int, const cchar_t *, int);
int    mvwaddch(WINDOW *, int, int, const chtype);
int    mvwaddchnstr(WINDOW *, int, int, const chtype *, init);
int    mvwaddchstr(WINDOW *, int, int, const chtype *);
int    mvwaddnstr(WINDOW *, int, int, const char *, int);
int    mvwaddnwstr(WINDOW *, int, int, const wchar_t *, int);
int    mvwaddstr(WINDOW *, int, int, const char *);
int    mvwadd_wch(WINDOW *, int, int, const cchar_t *);
int    mvwadd_wchnstr(WINDOW *, int, int, const cchar_t *, int);
int    mvwadd_wchnstr(WINDOW *, int, int, const cchar_t *);
int    mvwaddwstr(WINDOW *, int, int, const wchar_t *);
int    mvwchgat(WINDOW *, int, int, int, attr_t,
                short, const void *);
int    mvwdelch(WINDOW *, int, int);
int    mvwgetch(WINDOW *, int, int);
int    mvwgetnstr(WINDOW *, int, int, char *, int);
int    mvwgetn_wstr(WINDOW *, int, int, wint_t *, int);
int    mvwgetstr(WINDOW *, int, int, char *);
int    mvwget_wch(WINDOW *, int, int, wint_t *);
int    mvwget_wstr(WINDOW *, int, int, wint_t *);
int    mvwhline(WINDOW *, int, int, chtype, int);
int    mvwhline_set(WINDOW *, int, int, const cchar_t *, int);
int    mvwin(WINDOW *, int, int);
chtype mvwinch(WINDOW *, int, int);
int    mvwinchnstr(WINDOW *, int, int, chtype *, int);
int    mvwinchstr(WINDOW *, int, int, chtype *);
int    mvwinnstr(WINDOW *, int, int, char *, int);
int    mvwinnwstr(WINDOW *, int, int, wchar_t *, int);
int    mvwinsch(WINDOW *, int, int, chtype);
int    mvwinsnstr(WINDOW *, int, int, const char *, int);
int    mvwins_nwstr(WINDOW *, int, int, const wchar_t *, int);
int    mvwinsstr(WINDOW *, int, int, const char *);
int    mvwinstr(WINDOW *, int, int, char *);
int    mvwins_wch(WINDOW *, int, int, const cchar_t *);
int    mvwins_wstr(WINDOW *, int, int, const wchar_t *);
int    mvwin_wch(WINDOW *, int, int, cchar_t *);
int    mvwin_wchnstr(WINDOW *, int, int, cchar_t *, int);
int    mvwin_wchstr(WINDOW *, int, int, cchar_t *);
int    mvwinwstr(WINDOW *, int, int, wchar_t *);
```

```
int    mvwprintw(WINDOW *, int, int, char *, ...);
int    mvwscanw(WINDOW *, int, int, char *, ...);
int    mvwvline(WINDOW *, int, int, chtype, int);
int    mvwvline_set(WINDOW *, int, int, const cchar_t *, int);
int    napms(int);
WINDOW *newpad(int, int);
SCREEN *newterm(char *, FILE *, FILE *);
WINDOW *newwin(int, int, int, int);
int    nl(void);
int    nocbreak(void);
int    nodelay(WINDOW *, bool);
int    noecho(void);
int    nonl(void);
void   noqiflush(void);
int    noraw(void);
int    notimeout(WINDOW *, bool);
int    overlay(const WINDOW *, WINDOW *);
int    overwrite(const WINDOW *, WINDOW *);
int    pair_content(short, short *, short *);
int    PAIR_NUMBER(int);
int    pechochar(WINDOW *, chtype);
int    pecho_wchar(WINDOW *, const cchar_t *);
int    pnoutrefresh(WINDOW *, int, int, int, int, int, int);
int    prefresh(WINDOW *, int, int, int, int, int, int);
int    printw(char *, ...);
int    putp(const char *);
int    putwin(WINDOW *, FILE *);
void   qiflush(void);
int    raw(void);
int    redrawwin(WINDOW *);
int    refresh(void);
int    resetty(void);
int    reset_prog_mode(void);
int    reset_shell_mode(void);
int    resetty(void);
int    ripoffline(int, int (*)(WINDOW *, int));
int    savetty(void);
int    scanw(char *, ...);
int    scr_dump(const char *);
int    scr_init(const char *);
int    scrl(int);
int    scroll(WINDOW *);
int    scrollok(WINDOW *, bool);
int    scr_restore(const char *);
int    scr_set(const char *);
int    setcchar(cchar_t const wchar_t *, const attr_t,
               short, const void *);
int    setscrreg(int, int);
SCREEN *set_term(SCREEN *);
int    setupterm(char *, int, int *);
int    slk_attr_off(const attr_t void *);
int    slk_attroff(const chtype);
int    slk_attr_on(const attr_t void *);
int    slk_attron(const chtype);
int    slk_attr_set(const attr_t, short, void *);
int    slk_attrset(const chtype);
int    slk_clear(void);
int    slk_color(short);
int    slk_init(int);
char  *slk_label(int);
int    slk_noutrefresh(void);
int    slk_refresh(void);
int    slk_restore(void);
int    slk_set(int, const char *, int);
int    slk_touch(void);
int    slk_wset(int, const wchar_t *, int);
int    standend(void);
```

```
int    standout(void);
int    start_color(void);
WINDOW *subpad(WINDOW *, int, int, int, int);
WINDOW *subwin(WINDOW *, int, int, int, int);
int    syncok(WINDOW *, bool);
chtype termattrs(void);
attr_t term_attrs(void);
char  *termname(void);
int    tigetflag(char *);
int    tigetnum(char *);
char  *tigetstr(char *);
void   timeout(int);
int    touchline(WINDOW *, int, int);
int    touchwin(WINDOW *);
char  *tparm(char *, long, long, long, long, long, long,
             long, long, long);
int    typeahead(int);
int    ungetch(int);
int    unget_wch(const wchar_t);
int    untouchwin(WINDOW *);
void   use_env(bool);
int    vid_attr(attr_t short, void *);
int    vidattr(chtype);
int    vid_puts(attr_t attr, short, void *, int (*)(int);
int    vidputs(chtype, int (*)(int));
int    vline(chtype, int);
int    vline_set(const cchar_t *, int);
int    vwprintw(WINDOW *, char *, va_list *);
int    vw_printw(WINDOW *, char *, va_list *);
int    vwscanw(WINDOW *, char *, va_list *);
int    vw_scanw(WINDOW *, char *, va_list *);
int    waddch(WINDOW *, const chtype);
int    waddchnstr(WINDOW *, const chtype *, int);
int    waddchstr(WINDOW *, const chtype *);
int    waddnstr(WINDOW *, const char *, int);
int    waddnwstr(WINDOW *, const wchar_t *, int);
int    waddstr(WINDOW *, const char *);
int    wadd_wch(WINDOW *, const cchar_t *);
int    wadd_wchnstr(WINDOW *, const cchar_t *, int);
int    wadd_wchstr(WINDOW *, const cchar_t *);
int    waddwstr(WINDOW *, const wchar_t *);
int    wattroff(WINDOW *, int);
int    wattron(WINDOW *, int);
int    wattrset(WINDOW *, int);
int    wattr_get(WINDOW *, attr_t *, short *, void *);
int    wattr_off(WINDOW *, attr_t void);
int    wattr_on(WINDOW *, attr_t void);
int    wattr_set(WINDOW *, attr_t, short, void *);
int    wbkgd(WINDOW *, chtype);
void   wbkgdset(WINDOW *, chtype);
int    wbkgrnd(WINDOW *, const cchar_t *);
void   wbkgrndset(WINDOW *, const cchar_t *);
int    wborder(WINDOW *, chtype, chtype, chtype, chtype,
               chtype, chtype, chtype, chtype);
int    wborder_set(WINDOW *, const cchar_t *, const cchar_t *,
                   const cchar_t *, const cchar_t *,
                   const cchar_t *, const cchar_t *,
                   const cchar_t *, const cchar_t *);
int    wchgat(WINDOW *, int, attr_t, short, const void *);
int    wclear(WINDOW *);
int    wclrtobot(WINDOW *);
int    wclrtoeol(WINDOW *);
void   wcursyncup(WINDOW *);
int    wcolor_set(WINDOW *, short, void *);
int    wdelch(WINDOW *);
int    wdeleteln(WINDOW *);
int    wechochar(WINDOW *, const chtype);
```

```
int    wecho_wchar(WINDOW *, const cchar_t *);
int    werase(WINDOW *);
int    wgetbkgrnd(WINDOW *, cchar_t *);
int    wgetch(WINDOW *);
int    wgetnstr(WINDOW *, char *, int);
int    wgetn_wstr(WINDOW *, wint_t *, int);
int    wgetstr(WINDOW *, char *);
int    wget_wch(WINDOW *, wint_t *);
int    wget_wstr(WINDOW *, wint_t *);
int    whline(WINDOW *, chtype, int);
int    whline_set(WINDOW *, const cchar_t *, int);
chtype winch(WINDOW *);
int    winchnstr(WINDOW *, chtype *, int ;
int    winchstr(WINDOW *, chtype *);
int    winnstr(WINDOW *, char *, int);
int    winnwstr(WINDOW *, wchar_t *, int);
int    winsch(WINDOW *, chtype);
int    winsdelln(WINDOW *, int);
int    winsertln(WINDOW *);
int    winsnstr(WINDOW *, const char *, int);
int    wins_nwstr(WINDOW *, const wchar_t *, int);
int    winsstr(WINDOW *, const char *);
int    winstr(WINDOW *, char *);
int    wins_wch(WINDOW *, const cchar_t *);
int    wins_wstr(WINDOW *, const wchar_t *);
int    win_wch(WINDOW *, cchar_t *);
int    win_wchnstr(WINDOW *, cchar_t *, int);
int    win_wchstr(WINDOW *, cchar_t *);
int    winwstr(WINDOW *, wchar_t *);
int    wmove(WINDOW *, int, int);
int    wnoutrefresh(WINDOW *);
int    wprintw(WINDOW *, char *, ...);
int    wredrawln(WINDOW *, int, int);
int    wrefresh(WINDOW *);
int    wscanw(WINDOW *, char *, ...);
int    wscrl(WINDOW *, int);
int    wsetscrreg(WINDOW *, int, int);
int    wstandend(WINDOW *);
int    wstandout(WINDOW *);
void   wsyncup(WINDOW *);
void   wsyncdown(WINDOW *);
void   wtimeout(WINDOW *, int);
int    wtouchln(WINDOW *, int, int, int);
wchar_t *wunctrl(cchar_t *);
int    wvline(WINDOW *, chtype, int);
int    wvline_set(WINDOW *, const cchar_t *, int);
```

See Also

<stdio.h>, **<term.h>**, **<termios.h>**, **<unctrl.h>**, **<wchar.h>**.

<termh>

Name

term.h - terminal capabilities

Synopsis

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

Description

The following data type is defined through **typedef**:

TERMINAL
An opaque representation of the capabilities for a single terminal from the terminfo database.

The <term.h> header provides a declaration for the following object: *cur_term*. It represents the current terminal record from the terminfo database that the application has selected by calling set_curterm().

The <term.h> header contains the variable names listed in the Variable column.

The following are declared as functions, and may also be defined as macros:

```
int    del_curterm(TERMINAL *);
int    putp(const char *);
int    restartterm(char *, int, int *);
TERMINAL *set_curterm(TERMINAL *);
int    setupterm(char *, int, int *);
int    tgetent(char *, const char);
int    tgetflag(char *);
int    tgetnum(char *);
char  *tgetstr(char *, char **);
char  *tgoto(char *, int, int);
int    tigetflag(char *);
int    tigetnum(char *);
char  *tigetstr(char *);
char  *tparm(char *, long, long, long, long, long,
       long, long, long, long);
int    tputs(const char *, int, int (*)(int));
```

See Also

printf(), *putp()*, *tigetflag()*, *tgetent()*, **<curses.h>**.

<unctrlh>

Name

unctrl.h - definitions for unctrl()

Description

The <unctrl.h> header defines the chtype type as defined in <curses.h>.

The following is declared as a function, and may also be defined as a macro:

```
char *unctrl(chtype);
```

See Also

unctrl(), **<curses.h>**.

Chapter 17. Terminfo Source Format (ENHANCED CURSES)

The **terminfo** database contains a description of the capabilities of a variety of devices, such as terminals and printers. Devices are described by specifying a set of capabilities, by quantifying certain aspects of the device, and by specifying character sequences that effect particular results.

This chapter specifies the format of **terminfo** source files.

X/Open-compliant implementations provide a facility that accepts source files in the format specified in this chapter as a means of entering information into the **terminfo** database. The facility for installing this information into the database is implementation-specific. A valid **terminfo** entry describing a given model of terminal can be added to **terminfo** on any X/Open-compliant implementation to permit use of the same terminal model.

The **terminfo** database is often used by screen-oriented applications such as **vi** and Curses programs, as well as by some utilities such as **ls** and **more**. This usage allows them to work with a variety of devices without changes to the programs.

Source File Syntax

Source files can use the ISO 8859-1 codeset. The behavior when the source file is in another codeset is unspecified. Traditional practice has been to translate information from other codesets into the source file syntax.

terminfo source files consist of one or more device descriptions. Each description defines a mnemonic name for the terminal model. Each description consists of a header (beginning in column 1) and one or more lines that list the features for that particular device. Every line in a **terminfo** source file must end in a comma. Every line in a **terminfo** source file except the header must be indented with one or more white spaces (either spaces or tabs).

Entries in **terminfo** source files consist of a number of comma-separated fields. White space after each comma is ignored. Embedded commas must be escaped by using a backslash. The following example shows the format of a **terminfo** source file:

```
alias1 | alias2 | ... | aliasn | longname,
<white space> am, lines #24,
<white space> home=\Eh,
```

The first line, commonly referred to as the header line, must begin in column one and must contain at least two aliases separated by vertical bars. The last field in the header line must be the long name of the device and it may contain any string.

Alias names must be unique in the **terminfo** database and they must conform to file naming conventions established by implementation-specific **terminfo** compilation utilities. Implementations will recognize alias names consisting only of characters from the portable filename character set except that implementations need not accept a first character of minus(-). For example, a typical restriction is that they cannot contain white space or slashes. There may be further constraints imposed on source file values by the implementation-specific **terminfo** compilation utilities.

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Source File Syntax

Each capability in **terminfo** is of one of the following types:

- Boolean capabilities show that a device has or does not have a particular feature.
- Numeric capabilities quantify particular features of a device.
- String capabilities provide sequences that can be used to perform particular operations on devices.

Capability names adhere to an informal length limit of five characters. Whenever possible, capability names are chosen to be the same as or similar to those specified by the ANSI X3.64-1979 standard. Semantics are also intended to match those of the ANSI standard.

All string capabilities may have padding specified, with the exception of those used for input. Input capabilities, listed under the **Strings** section in the following tables, have names beginning with **key**_. These capabilities are defined in **<term.h>**.

Minimum Guaranteed Limits

All X/Open-compliant implementations support at least the following limits for the **terminfo** source file:

Source File Characteristic	Minimum Guaranteed Value
Length of a line	1023 bytes
Length of a terminal alias	14 bytes
Length of a terminal model name	128 bytes
Width of a single field	128 bytes
Length of a string value	1000 bytes
Length of a string representing a numeric value	99 digits
Magnitude of a numeric value	0 up to and including 32767

An implementation may support higher limits than those specified above.

Formal Grammar

The grammar and lexical conventions in this section together describe the syntax for **terminfo** terminal descriptions within a terminfo source file. A terminal description that satisfies the requirements of this section will be accepted by all implementations.

```
descriptions : START_OF_HEADER_LINE[4]  rest_of_header_line feature_lines
          | descriptions START_OF_HEADER_LINE rest_of_header_line
          | feature_lines
          ;
rest_of_header_line : PIPE LONGNAME COMMA NEWLINE
          | aliases PIPE LONGNAME COMMA NEWLINE
          ;

feature_lines : start_feature_line rest_of_feature_line
          | feature_lines start_feature_line rest_of_feature_line
          ;
```

```
start_feature_line : START_FEATURE_LINE_BOOLEAN[5]
           | START_FEATURE_LINE_NUMERIC[6]
           | START_FEATURE_LINE_STRING[7]
           ;
rest_of_feature_line : features COMMA NEWLINE
          | COMMA NEWLINE
          ;

features : COMMA feature
          | features COMMA feature
          ;

aliases : PIPE ALIAS
          | aliases PIPE ALIAS
          ;

feature : BOOLEAN
          | NUMERIC
          | STRING
          ;
```

The lexical conventions for **terminfo** descriptions are as follows:

1. White space consists of the ' ' and <tab> character.
2. An ALIAS may contain any graph [8] characters other than ',','/' and 'l'.
3. A LONGNAME may contain any print [9] characters other than ',' and 'l'.
4. A BOOLEAN feature may contain any print characters other than ',', '=', and '#'.
5. A NUMERIC feature consists of:
   a. A name which may contain any print character other than ',', '=', and '#'.
   b. The '#' character.
   c. A positive integer which conforms to the C language convention for integer constants.
6. A STRING feature consists of:
   a. A name which may contain any print character other than ',', '=', and '#'.
   b. The '=' character.
   c. A string which may contain any print characters other than ','.
7. White space immediately following a ',' is ignored.
8. Comments consist of <bol>, optional whitespace, a required '#', and a terminating <eol>.
9. A header line must begin in column one.
10. A feature line must not begin in column one.
11. Blank lines are ignored.

Defined Capabilities

X/Open defines the capabilities listed in the following table. All X/Open-compliant implementations must accept each of these capabilities in an entry in a **terminfo**

---

4. An ALIAS that begins in column one. This is handled by the lexical analyzer.
5. A BOOLEAN feature that begins after column one but is the first feature on the feature line. This is handled by the lexical analyzer.
6. A NUMERIC feature that begins after column one but is the first feature on the feature line. This is handled by the lexical analyzer.
7. A STRING feature that begins after column one but is the first feature on the feature line. This is handled by the lexical analyzer.
8. Graph characters are those characters for which *isgraph()* returns non-zero.
9. Print characters are those characters for which *isprint()* returns non-zero.

source file. Implementations use this information to determine how properly to operate the current terminal. In addition, implementations return any of the current terminal's capabilities when the application calls the query functions listed in *tgetent()*.

The table of capabilities has the following columns:

Variable
Names for use by the Curses functions that operate on the **terminfo** database. These names are reserved and the application must not define them.

Capname
The short name for a capability specified in the **terminfo** source file. It is used for updating the source file and by the *tput* command.

Termcap
Codes provided for compatibility with older applications. These codes are **TO BE WITHDRAWN**. Because of this, not all **Capnames** have **Termcap** codes.

Booleans

Variable	Capname	Termcap	Description
auto_left_margin	**bw**	bw	**cub1** wraps from column 0 to last column
auto_right_margin	**am**	am	Terminal has automatic margins
back_color_erase	**bce**	ut	Screen erased with background color
can_change	**ccc**	cc	Terminal can re-define existing color
ceol_standout_glitch	**xhp**	xs	Standout not erased by overwriting (hp)
col_addr_glitch	**xhpa**	YA	Only positive motion for **hpa/mhpa** caps
cpi_changes_res	**cpix**	YF	Changing character pitch changes resolution
cr_cancels_micro_mode	**crxm**	YB	Using **cr** turns off micro mode
dest_tabs_magic_smso	**xt**	xt	Destructive tabs, magic **smso** char (t1061)
eat_newline_glitch	**xenl**	xn	Newline ignored after 80 columns (Concept)
erase_overstrike	**eo**	eo	Can erase overstrikes with a blank
generic_type	**gn**	gn	Generic line type (*e.g.*, dialup, switch)
hard_copy	**hc**	hc	Hardcopy terminal
hard_cursor	**chts**	HC	Cursor is hard to see
has_meta_key	**km**	km	Has a meta key (shift, sets parity bit)
has_print_wheel	**daisy**	YC	Printer needs operator to change character set
has_status_line	**hs**	hs	Has extra ″status line″
hue_lightness_saturation	**hls**	hl	Terminal uses only HLS color notation (Tektronix)
insert_null_glitch	**in**	in	Insert mode distinguishes nulls
lpi_changes_res	**lpix**	YG	Changing line pitch changes resolution
memory_above	**da**	da	Display may be retained above the screen

Variable	Capname	Termcap	Description
memory_below	**db**	db	Display may be retained below the screen
move_insert_mode	**mir**	mi	Safe to move while in insert mode
move_standout_mode	**msgr**	ms	Safe to move in standout modes
needs_xon_xoff	**nxon**	nx	Padding won't work, xon/xoff required
no_esc_ctlc	**xsb**	xb	Beehive (f1=escape, f2=ctrl C)
no_pad_char	**npc**	NP	Pad character doesn't exist
non_dest_scroll_region	**ndscr**	ND	Scrolling region is nondestructive
non_rev_rmcup	**nrrmc**	NR	**smcup** does not reverse **rmcup**
over_strike	**os**	os	Terminal overstrikes on hard-copy terminal
prtr_silent	**mc5i**	5i	Printer won't echo on screen
row_addr_glitch	**xvpa**	YD	Only positive motion for **vpa/mvpa** caps
semi_auto_right_margin	**sam**	YE	Printing in last column causes **cr**
status_line_esc_ok	**eslok**	es	Escape can be used on the status line
tilde_glitch	**hz**	hz	Hazeltine; can't print tilde (~)
transparent_underline	**ul**	ul	Underline character overstrikes
xon_xoff	**xon**	xo	Terminal uses xon/xoff handshaking

Numbers

Variable	Capname	Termcap	Description
bit_image_entwining	**bitwin**	Yo	Number of passes for each bit-map row
bit_image_type	**bitype**	Yp	Type of bit image device
buffer_capacity	**bufsz**	Ya	Number of bytes buffered before printing
buttons	**btns**	BT	Number of buttons on the mouse
columns	**cols**	co	Number of columns in a line
dot_horz_spacing	**spinh**	Yc	Spacing of dots horizontally in dots per inch
dot_vert_spacing	**spinv**	Yb	Spacing of pins vertically in pins per inch
init_tabs	**it**	it	Tabs initially every # spaces
label_height	**lh**	lh	Number of rows in each label
label_width	**lw**	lw	Number of columns in each label
lines	**lines**	li	Number of lines on a screen or a page
lines_of_memory	**lm**	lm	Lines of memory if > **lines;** 0 means varies
max_attributes	**ma**	ma	Maximum combined video attributes terminal can display
magic_cookie_glitch	**xmc**	sg	Number of blank characters left by **smso** or **rmso**
max_colors	**colors**	Co	Maximum number of colors on the screen
max_micro_address	**maddr**	Yd	Maximum value in **micro_..._address**
max_micro_jump	**mjump**	Ye	Maximum value in **parm_..._micro**
max_pairs	**pairs**	pa	Maximum number of color-pairs on the screen
maximum_windows	**wnum**	MW	Maximum number of definable windows

Source File Syntax

Variable	Capname	Termcap	Description
micro_col_size	**mcs**	Yf	Character step size when in micro mode
micro_line_size	**mls**	Yg	Line step size when in micro mode
no_color_video	**ncv**	NC	Video attributes that can't be used with colors
num_labels	**nlab**	Nl	Number of labels on screen (start at 1)
number_of_pins	**npins**	Yh	Number of pins in print-head
output_res_char	**orc**	Yi	Horizontal resolution in units per character
output_res_line	**orl**	Yj	Vertical resolution in units per line
output_res_horz_inch	**orhi**	Yk	Horizontal resolution in units per inch
output_res_vert_inch	**orvi**	Yl	Vertical resolution in units per inch
padding_baud_rate	**pb**	pb	Lowest baud rate where padding needed
print_rate	**cps**	Ym	Print rate in characters per second
virtual_terminal	**vt**	vt	Virtual terminal number
wide_char_size	**widcs**	Yn	Character step size when in double-wide mode
width_status_line	**wsl**	ws	Number of columns in status line

Strings

Variable	Capname	Termcap	Description
acs_chars	**acsc**	ac	Graphic charset pairs aAbBcC
alt_scancode_esc	**scesa**	S8	Alternate escape for scancode emulation (default is for VT100)
back_tab	**cbt**	bt	Back tab
bell	**bel**	bl	Audible signal (bell)
bit_image_carriage_return	**bicr**	Yv	Move to beginning of same row
bit_image_newline	**binel**	Zz	Move to next row of the bit image
bit_image_repeat	**birep**	Xy	Repeat bit-image cell #1 #2 times
carriage_return	**cr**	cr	Carriage return
change_char_pitch	**cpi**	ZA	Change number of characters per inch
change_line_pitch	**lpi**	ZB	Change number of lines per inch
change_res_horz	**chr**	ZC	Change horizontal resolution
change_res_vert	**cvr**	ZD	Change vertical resolution
change_scroll_region	**csr**	cs	Change to lines #1 through #2 (VT100)
char_padding	**rmp**	rP	Like **ip** but when in replace mode
char_set_names	**csnm**	Zy	Returns a list of character set names
clear_all_tabs	**tbc**	ct	Clear all tab stops
clear_margins	**mgc**	MC	Clear all margins (top, bottom, and sides)
clear_screen	**clear**	cl	Clear screen and home cursor
clr_bol	**el1**	cb	Clear to beginning of line, inclusive
clr_eol	**el**	ce	Clear to end of line
clr_eos	**ed**	cd	Clear to end of display
code_set_init	**csin**	ci	Init sequence for multiple codesets
color_names	**colornm**	Yw	Give name for color #1
column_address	**hpa**	ch	Set horizontal position to absolute #1

Variable	Capname	Termcap	Description
command_character	**cmdch**	CC	Terminal settable cmd character in prototype
create_window	**cwin**	CW	Define win #1 to go from #2,#3 to #4,#5
cursor_address	**cup**	cm	Move to row #1 col #2
cursor_down	**cud1**	do	Down one line
cursor_home	**home**	ho	Home cursor (if no **cup**)
cursor_invisible	**civis**	vi	Make cursor invisible
cursor_left	**cub1**	le	Move left one space.
cursor_mem_address	**mrcup**	CM	Memory relative cursor addressing
cursor_normal	**cnorm**	ve	Make cursor appear normal (undo **vs/vi**)
cursor_right	**cuf1**	nd	Non-destructive space (cursor or carriage right)
cursor_to_ll	**ll**	ll	Last line, first column (if no **cup**)
cursor_up	**cuu1**	up	Upline (cursor up)
cursor_visible	**cvvis**	vs	Make cursor very visible
define_bit_image_region	**defbi**	Yx	Define rectangular bit-image region
define_char	**defc**	ZE	Define a character in a character set
delete_character	**dch1**	dc	Delete character
delete_line	**dl1**	dl	Delete line
device_type	**devt**	dv	Indicate language/codeset support
dial_phone	**dial**	DI	Dial phone number #1
dis_status_line	**dsl**	ds	Disable status line
display_clock	**dclk**	DK	Display time-of-day clock
display_pc_char	**dispc**	S1	Display PC character
down_half_line	**hd**	hd	Half-line down (forward 1/2 linefeed)
ena_acs	**enacs**	eA	Enable alternate character set
end_bit_image_region	**endbi**	Yy	End a bit-image region
enter_alt_charset_mode	**smacs**	as	Start alternate character set
enter_am_mode	**smam**	SA	Turn on automatic margins
enter_blink_mode	**blink**	mb	Turn on blinking
enter_bold_mode	**bold**	md	Turn on bold (extra bright) mode
enter_ca_mode	**smcup**	ti	String to begin programs that use cup
enter_delete_mode	**smdc**	dm	Delete mode (enter)
enter_dim_mode	**dim**	mh	Turn on half-bright mode
enter_doublewide_mode	**swidm**	ZF	Enable double wide printing
enter_draft_quality	**sdrfq**	ZG	Set draft quality print
enter_horizontal_hl_mode	**ehhlm**		Turn on horizontal highlight mode
enter_insert_mode	**smir**	im	Insert mode (enter)
enter_italics_mode	**sitm**	ZH	Enable italics
enter_left_hl_mode	**elhlm**		Turn on left highlight mode
enter_leftward_mode	**slm**	ZI	Enable leftward carriage motion
enter_low_hl_mode	**elohlm**		Turn on low highlight mode
enter_micro_mode	**smicm**	ZJ	Enable micro motion capabilities
enter_near_letter_quality	**snlq**	ZK	Set near-letter quality print
enter_normal_quality	**snrmq**	ZL	Set normal quality print
enter_pc_charset_mode	**smpch**	S2	Enter PC character display mode
enter_protected_mode	**prot**	mp	Turn on protected mode
enter_reverse_mode	**rev**	mr	Turn on reverse video mode
enter_right_hl_mode	**erhlm**		Turn on right highlight mode
enter_scancode_mode	**smsc**	S4	Enter PC scancode mode

Variable	Capname	Termcap	Description
enter_secure_mode	**invis**	mk	Turn on blank mode (characters invisible)
enter_shadow_mode	**sshm**	ZM	Enable shadow printing
enter_standout_mode	**smso**	so	Begin standout mode
enter_subscript_mode	**ssubm**	ZN	Enable subscript printing
enter_superscript_mode	**ssupm**	ZO	Enable superscript printing
enter_top_hl_mode	**ethlm**		Turn on top highlight mode
enter_underline_mode	**smul**	us	Start underscore mode
enter_upward_mode	**sum**	ZP	Enable upward carriage motion
enter_vertical_hl_mode	**evhlm**		Turn on vertical highlight mode
enter_xon_mode	**smxon**	SX	Turn on xon/xoff handshaking
erase_chars	**ech**	ec	Erase #1 characters
exit_alt_charset_mode	**rmacs**	ae	End alternate character set
exit_am_mode	**rmam**	RA	Turn off automatic margins
exit_attribute_mode	**sgr0**	me	Turn off all attributes
exit_ca_mode	**rmcup**	te	String to end programs that use **cup**
exit_delete_mode	**rmdc**	ed	End delete mode
exit_doublewide_mode	**rwidm**	ZQ	Disable double wide printing
exit_insert_mode	**rmir**	ei	End insert mode
exit_italics_mode	**ritm**	ZR	Disable italics
exit_leftward_mode	**rlm**	ZS	Enable rightward (normal) carriage motion
exit_micro_mode	**rmicm**	ZT	Disable micro motion capabilities
exit_pc_charset_mode	**rmpch**	S3	Disable PC character display mode
exit_scancode_mode	**rmsc**	S5	Disable PC scancode mode
exit_shadow_mode	**rshm**	ZU	Disable shadow printing
exit_standout_mode	**rmso**	se	End standout mode
exit_subscript_mode	**rsubm**	ZV	Disable subscript printing
exit_superscript_mode	**rsupm**	ZW	Disable superscript printing
exit_underline_mode	**rmul**	ue	End underscore mode
exit_upward_mode	**rum**	ZX	Enable downward (normal) carriage motion
exit_xon_mode	**rmxon**	RX	Turn off xon/xoff handshaking
fixed_pause	**pause**	PA	Pause for 2-3 seconds
flash_hook	**hook**	fh	Flash the switch hook
flash_screen	**flash**	vb	Visible bell (may move cursor)
form_feed	**ff**	ff	Hardcopy terminal page eject
from_status_line	**fsl**	fs	Return from status line
get_mouse	**getm**	Gm	Curses should get button events
goto_window	**wingo**	WG	Go to window #1
hangup	**hup**	HU	Hang-up phone
init_1string	**is1**	i1	Terminal or printer initialization string
init_2string	**is2**	is	Terminal or printer initialization string
init_3string	**is3**	i3	Terminal or printer initialization string
init_file	**if**	if	Name of initialization file
init_prog	**iprog**	iP	Path name of program for initialization
initialize_color	**initc**	IC	Set color #1 to RGB #2, #3, #4
initialize_pair	**initp**	Ip	Set color-pair #1 to fg #2, bg #3
insert_character	**ich1**	ic	Insert character
insert_line	**il1**	al	Add new blank line

Variable	Capname	Termcap	Description
insert_padding	**ip**	ip	Insert pad after character inserted

Note: The "**key**_" strings are sent by specific keys. The "**key**_" descriptions include the macro, defined in **<curses.h>**, for the code returned by *getch()* when the key is pressed (see *getch()*).

key_a1	**ka1**	K1	upper left of keypad
key_a3	**ka3**	K3	upper right of keypad
key_b2	**kb2**	K2	center of keypad
key_backspace	**kbs**	kb	sent by backspace key
key_beg	**kbeg**	@1	sent by beg(inning) key
key_btab	**kcbt**	kB	sent by back-tab key
key_c1	**kc1**	K4	lower left of keypad
key_c3	**kc3**	K5	lower right of keypad
key_cancel	**kcan**	@2	sent by cancel key
key_catab	**ktbc**	ka	sent by clear-all-tabs key
key_clear	**kclr**	kC	sent by clear-screen or erase key
key_close	**kclo**	@3	sent by close key
key_command	**kcmd**	@4	sent by cmd (command) key
key_copy	**kcpy**	@5	sent by copy key
key_create	**kcrt**	@6	sent by create key
key_ctab	**kctab**	kt	sent by clear-tab key
key_dc	**kdch1**	kD	sent by delete-character key
key_dl	**kdl1**	kL	sent by delete-line key
key_down	**kcud1**	kd	sent by terminal down-arrow key
key_eic	**krmir**	kM	sent by **rmir** or **smir** in insert mode
key_end	**kend**	@7	sent by end key
key_enter	**kent**	@8	sent by enter/send key
key_eol	**kel**	kE	sent by clear-to-end-of-line key
key_eos	**ked**	kS	sent by clear-to-end-of-screen key
key_exit	**kext**	@9	sent by exit key
key_f0	**kf0**	k0	sent by function key f0
key_f1	**kf1**	k1	sent by function key f1
⋮	⋮	..	⋮
key_f62	**kf62**	Fq	sent by function key f62
key_f63	**kf63**	Fr	sent by function key f63
key_find	**kfnd**	@0	sent by find key
key_help	**khlp**	%1	sent by help key
key_home	**khome**	kh	sent by home key
key_ic	**kich1**	kI	sent by ins-char/enter ins-mode key
key_il	**kil1**	kA	sent by insert-line key
key_left	**kcub1**	kl	sent by terminal left-arrow key
key_ll	**kll**	kH	sent by home-down key
key_mark	**kmrk**	%2	sent by mark key
key_message	**kmsg**	%3	sent by message key
key_mouse	**kmous**	Km	0631, Mouse event has occurred
key_move	**kmov**	%4	sent by move key
key_next	**knxt**	%5	sent by next-object key
key_npage	**knp**	kN	sent by next-page key
key_open	**kopn**	%6	sent by open key
key_options	**kopt**	%7	sent by options key
key_ppage	**kpp**	kP	sent by previous-page key
key_previous	**kprv**	%8	sent by previous-object key
key_print	**kprt**	%9	sent by print or copy key

Variable	Capname	Termcap	Description
key_redo	**krdo**	%0	sent by redo key
key_reference	**kref**	&1	sent by ref(erence) key
key_refresh	**krfr**	&2	sent by refresh key
key_replace	**krpl**	&3	sent by replace key
key_restart	**krst**	&4	sent by restart key
key_resume	**kres**	&5	sent by resume key
key_right	**kcuf1**	kr	sent by terminal right-arrow key
key_save	**ksav**	&6	sent by save key
key_sbeg	**kBEG**	&9	sent by shifted beginning key
key_scancel	**kCAN**	&0	sent by shifted cancel key
key_scommand	**kCMD**	*1	sent by shifted command key
key_scopy	**kCPY**	*2	sent by shifted copy key
key_screate	**kCRT**	*3	sent by shifted create key
key_sdc	**kDC**	*4	sent by shifted delete-char key
key_sdl	**kDL**	*5	sent by shifted delete-line key
key_select	**kslt**	*6	sent by select key
key_send	**kEND**	*7	sent by shifted end key
key_seol	**kEOL**	*8	sent by shifted clear-line key
key_sexit	**kEXT**	*9	sent by shifted exit key
key_sf	**kind**	kF	sent by scroll-forward/down key
key_sfind	**kFND**	*0	sent by shifted find key
key_shelp	**kHLP**	#1	sent by shifted help key
key_shome	**kHOM**	#2	sent by shifted home key
key_sic	**kIC**	#3	sent by shifted input key
key_sleft	**kLFT**	#4	sent by shifted left-arrow key
key_smessage	**kMSG**	%a	sent by shifted message key
key_smove	**kMOV**	%b	sent by shifted move key
key_snext	**kNXT**	%c	sent by shifted next key
key_soptions	**kOPT**	%d	sent by shifted options key
key_sprevious	**kPRV**	%e	sent by shifted prev key
key_sprint	**kPRT**	%f	sent by shifted print key
key_sr	**kri**	kR	sent by scroll-backward/up key
key_sredo	**kRDO**	%g	sent by shifted redo key
key_sreplace	**kRPL**	%h	sent by shifted replace key
key_sright	**kRIT**	%i	sent by shifted right-arrow key
key_srsume	**kRES**	%j	sent by shifted resume key
key_ssave	**kSAV**	!1	sent by shifted save key
key_ssuspend	**kSPD**	!2	sent by shifted suspend key
key_stab	**khts**	kT	sent by set-tab key
key_sundo	**kUND**	!3	sent by shifted undo key
key_suspend	**kspd**	&7	sent by suspend key
key_undo	**kund**	&8	sent by undo key
key_up	**kcuu1**	ku	sent by terminal up-arrow key
keypad_local	**rmkx**	ke	Out of “keypad-transmit” mode
keypad_xmit	**smkx**	ks	Put terminal in “keypad-transmit” mode
lab_f0	**lf0**	l0	Labels on function key f0 if not f0
lab_f1	**lf1**	l1	Labels on function key f1 if not f1
lab_f2	**lf2**	l2	Labels on function key f2 if not f2
lab_f3	**lf3**	l3	Labels on function key f3 if not f3
lab_f4	**lf4**	l4	Labels on function key f4 if not f4
lab_f5	**lf5**	l5	Labels on function key f5 if not f5
lab_f6	**lf6**	l6	Labels on function key f6 if not f6
lab_f7	**lf7**	l7	Labels on function key f7 if not f7

Variable	Capname	Termcap	Description
lab_f8	**lf8**	l8	Labels on function key f8 if not f8
lab_f9	**lf9**	l9	Labels on function key f9 if not f9
lab_f10	**lf10**	la	Labels on function key f10 if not f10
label_format	**fln**	Lf	Label format
label_off	**rmln**	LF	Turn off soft labels
label_on	**smln**	LO	Turn on soft labels
meta_off	**rmm**	mo	Turn off ″meta mode″
meta_on	**smm**	mm	Turn on ″meta mode″ (8th bit)
micro_column_address	**mhpa**	ZY	Like **column_address** for micro adjustment
micro_down	**mcud1**	ZZ	Like **cursor_down** for micro adjustment
micro_left	**mcub1**	Za	Like **cursor_left** for micro adjustment
micro_right	**mcuf1**	Zb	Like **cursor_right** for micro adjustment
micro_row_address	**mvpa**	Zc	Like **row_address** for micro adjustment
micro_up	**mcuu1**	Zd	Like **cursor_up** for micro adjustment
mouse_info	**minfo**	Mi	Mouse status information
newline	**nel**	**nw**	Newline (behaves like cr followed by lf)
order_of_pins	**porder**	Ze	Matches software bits to print-head pins
orig_colors	**oc**	oc	Set all color(-pair)s to the original ones
orig_pair	**op**	op	Set default color-pair to the original one
pad_char	**pad**	pc	Pad character (rather than null)
parm_dch	**dch**	DC	Delete #1 chars
parm_delete_line	**dl**	DL	Delete #1 lines
parm_down_cursor	**cud**	DO	Move down #1 lines.
parm_down_micro	**mcud**	Zf	Like **parm_down_cursor** for micro adjust.
parm_ich	**ich**	IC	Insert #1 blank chars
parm_index	**indn**	SF	Scroll forward #1 lines.
parm_insert_line	**il**	AL	Add #1 new blank lines
parm_left_cursor	**cub**	LE	Move cursor left #1 spaces
parm_left_micro	**mcub**	Zg	Like **parm_left_cursor** for micro adjust.
parm_right_cursor	**cuf**	RI	Move right #1 spaces.
parm_right_micro	**mcuf**	Zh	Like **parm_right_cursor** for micro adjust.
parm_rindex	**rin**	SR	Scroll backward #1 lines.
parm_up_cursor	**cuu**	UP	Move cursor up #1 lines.
parm_up_micro	**mcuu**	Zi	Like **parm_up_cursor** for micro adjust.
pc_term_options	**pctrm**	S6	PC terminal options
pkey_key	**pfkey**	pk	Prog funct key #1 to type string #2
pkey_local	**pfloc**	pl	Prog funct key #1 to execute string #2
pkey_plab	**pfxl**	xl	Prog key #1 to xmit string #2 and show string #3
pkey_xmit	**pfx**	px	Prog funct key #1 to xmit string #2

Variable	Capname	Termcap	Description
plab_norm	**pln**	pn	Prog label #1 to show string #2
print_screen	**mc0**	ps	Print contents of the screen
prtr_non	**mc5p**	pO	Turn on the printer for #1 bytes
prtr_off	**mc4**	pf	Turn off the printer
prtr_on	**mc5**	po	Turn on the printer
pulse	**pulse**	PU	Select pulse dialing
quick_dial	**qdial**	QD	Dial phone number #1, without progress detection
remove_clock	**rmclk**	RC	Remove time-of-day clock
repeat_char	**rep**	rp	Repeat char #1 #2 times
req_for_input	**rfi**	RF	Send next input char (for ptys)
req_mouse_pos	**reqmp**	RQ	Request mouse position report
reset_1string	**rs1**	r1	Reset terminal completely to sane modes
reset_2string	**rs2**	r2	Reset terminal completely to sane modes
reset_3string	**rs3**	r3	Reset terminal completely to sane modes
reset_file	**rf**	rf	Name of file containing reset string
restore_cursor	**rc**	rc	Restore cursor to position of last sc
row_address	**vpa**	cv	Set vertical position to absolute #1
save_cursor	**sc**	sc	Save cursor position
scancode_escape	**scesc**	S7	Escape for scancode emulation
scroll_forward	**ind**	sf	Scroll text up
scroll_reverse	**ri**	sr	Scroll text down
select_char_set	**scs**	Zj	Select character set
set0_des_seq	**s0ds**	s0	Shift into codeset 0 (EUC set 0, ASCII)
set1_des_seq	**s1ds**	s1	Shift into codeset 1
set2_des_seq	**s2ds**	s2	Shift into codeset 2
set3_des_seq	**s3ds**	s3	Shift into codeset 3
set_a_attributes	**sgr1**		Define second set of video attributes #1-#6
set_a_background	**setab**	AB	Set background color to #1 using ANSI escape
set_a_foreground	**setaf**	AF	Set foreground color to #1 using ANSI escape
set_attributes	**sgr**	sa	Define first set of video attributes #1-#9
set_background	**setb**	Sb	Set background color to #1
set_bottom_margin	**smgb**	Zk	Set bottom margin at current line
set_bottom_margin_parm	**smgbp**	Zl	Set bottom margin at line #1 or #2 lines from bottom
set_clock	**sclk**	SC	Set clock to hours (#1), minutes (#2), seconds (#3)
set_color_band	**setcolor**	**Yz**	Change to ribbon color #1
set_color_pair	**scp**	sp	Set current color pair to #1
set_foreground	**setf**	Sf	Set foreground color to #1
set_left_margin	**smgl**	ML	Set left margin at current column
set_left_margin_parm	**smglp**	Zm	Set left (right) margin at column #1 (#2)
set_lr_margin	**smglr**	ML	Sets both left and right margins
set_page_length	**slines**	YZ	Set page length to #1 lines
set_pglen_inch	**slength**	YI	Set page length to #1 hundredth of an inch

Variable	Capname	Termcap	Description
set_right_margin	**smgr**	MR	Set right margin at current column
set_right_margin_parm	**smgrp**	Zn	Set right margin at column #1
set_tab	**hts**	st	Set a tab in all rows, current column
set_tb_margin	**smgtb**	MT	Sets both top and bottom margins
set_top_margin	**smgt**	Zo	Set top margin at current line
set_top_margin_parm	**smgtp**	Zp	Set top (bottom) margin at line #1 (#2)
set_window	**wind**	wi	Current window is lines #1-#2 cols #3-#4
start_bit_image	**sbim**	Zq	Start printing bit image graphics
start_char_set_def	**scsd**	Zr	Start definition of a character set
stop_bit_image	**rbim**	Zs	End printing bit image graphics
stop_char_set_def	**rcsd**	Zt	End definition of a character set
subscript_characters	**subcs**	Zu	List of “subscript-able” characters
superscript_characters	**supcs**	Zv	List of “superscript-able” characters
tab	**ht**	ta	Tab to next 8-space hardware tab stop
these_cause_cr	**docr**	Zw	Printing any of these chars causes **cr**
to_status_line	**tsl**	ts	Go to status line, col #1
tone	**tone**	TO	Select touch tone dialing
user0	**u0**	u0	User string 0
user1	**u1**	u1	User string 1
user2	**u2**	u2	User string 2
user3	**u3**	u3	User string 3
user4	**u4**	u4	User string 4
user5	**u5**	u5	User string 5
user6	**u6**	u6	User string 6
user7	**u7**	u7	User string 7
user8	**u8**	u8	User string 8
user9	**u9**	u9	User string 9
underline_char	**uc**	uc	Underscore one char and move past it
up_half_line	**hu**	hu	Half-line up (reverse 1/2 linefeed)
wait_tone	**wait**	WA	Wait for dial tone
xoff_character	**xoffc**	XF	X-off character
xon_character	**xonc**	XN	X-on character
zero_motion	**zerom**	Zx	No motion for the subsequent character

Sample Entry

The following entry describes the AT&T; 610 terminal.

```
610|610bct|ATT610|att610|AT&T610;80column;98key; keyboard,
      am, eslok, hs, mir, msgr, xenl, xon,
      cols#80, it#8, lh#2, lines#24, lw#8, nlab#8, wsl#80,
      acsc=″aaffggjjkkllmmnnooppqqrrssttuuvvwwxxyyzz{{||}}~~,
      bel=^G, blink=\E[5m, bold=\E[1m, cbt=\E[Z,
      civis=\E[25l, clear=\E[H\E[J, cnorm=\E[25h\E[12l,
      cr=\r, csr=\E[%i%p1%d;%p2%dr, cub=\E[%p1%dD, cub1=\b,
      cud=\E[%p1%dB, cud1=\E[B, cuf=\E[%p1%dC, cuf1=\E[C,
      cup=\E[%i%p1%d;%p2%dH, cuu=\E[%p1%dA, cuu1=\E[A,
      cvvis=\E[12;25h, dch=\E[%p1%dP, dch1=\E[P, dim=\E[2m,
      dl=\E[%p1%dM, dl1=\E[M, ed=\E[J, el=\E[K, el1=\E[1K,
      flash=\E[5h$<200>\E[5l, fsl=\E8, home=\E[H, ht=\t,
      ich=\E[%p1%d@, il=\E[%p1%dL, il1=\E[L, ind=\ED, .ind=\ED$<9>,
```

```
      invis=\E[8m,
      is1=\E[8;0 | \E[3;4;5;13;15l\E[13;20l\E[7h\E[12h\E(B\E)0,
      is2=\E[0m^O, is3=\E(B\E)0, kLFT=\E[\s@, kRIT=\E[\sA,
      kbs=^H, kcbt=\E[Z, kclr=\E[2J, kcub1=\E[D, kcud1=\E[B,
      kcuf1=\E[C, kcuu1=\E[A, kfP=\EOc, kfP0=\ENp,
      kfP1=\ENq, kfP2=\ENr, kfP3=\ENs, kfP4=\ENt, kfI=\EOd,
      kfB=\EOe, kf4=\EOf, kf(CW=\EOg, kf6=\EOh, kf7=\EOi,
      kf8=\EOj, kf9=\ENo, khome=\E[H, kind=\E[S, kri=\E[T,
      ll=\E[24H, mc4=\E[4i, mc5=\E[5i, nel=\EE,
      pfxl=\E[%p1%d;%p2%l%02dq%%p1%{9}%<%t\s\s\sF%p1%1d\s\s\s\s\s
\s\s\s\s\s\s%;%p2%s,
      pln=\E[%p1%d;0;0;0q%p2%:-16.16s, rc=\E8, rev=\E[7m,
      ri=\EM, rmacs=^O, rmir=\E[4l, rmln=\E[2p, rmso=\E[m,
      rmul=\E[m, rs2=\Ec\E[3l, sc=\E7,
      sgr=\E[0%%p6%t;1%;%%p5%t;2%;%%p2%t;4%;%%p4%t;5%;
                %%p3%p1% | %t;7%;%%p7%t;8%;m%%p9%t^N%e^O%;,
      sgr0=\E[m^O, smacs=^N, smir=\E[4h, smln=\E[p,
      smso=\E[7m, smul=\E[4m, tsl=\E7\E[25;%i%p1%dx,
```

Types of Capabilities in the Sample Entry

The sample entry shows the formats for the three types of **terminfo** capabilities: Boolean, numeric, and string. All capabilities specified in the **terminfo** source file must be followed by commas, including the last capability in the source file. In **terminfo** source files, capabilities are referenced by their capability names (as shown in the **Capname** column of the previous tables).

Boolean Capabilities

A boolean capability is true if its **Capname** is present in the entry, and false if its **Capname** is not present in the entry.

The '@' character following a **Capname** is used to explicitly declare that a boolean capability is false.

Numeric Capabilities

Numeric capabilities are followed by the character '#' and then a positive integer value. The example assigns the value 80 to the **cols** numeric capability by coding:

```
cols#80
```

Values for numeric capabilities may be specified in decimal, octal or hexadecimal, using normal C-language conventions.

String Capabilities

String-valued capabilities such as **el** (clear to end of line sequence) are listed by the **Capname**, an '=', and a string ended by the next occurrence of a comma.

A delay in milliseconds may appear anywhere in such a capability, preceded by $ and enclosed in angle brackets, as in **el=\EK$<3>**. The Curses implementation achieves delays by outputting to the terminal an appropriate number of system-defined padding characters. The *tputs()* function provides delays when used to send such a capability to the terminal.

The delay can be any of the following: a number, a number followed by an asterisk, such as **5***, a number followed by a slash, such as **5/**, or a number followed by both, such as **5*/**.

- A '*' shows that the required delay is proportional to the number of lines affected by the operation, and the amount given is the delay required per affected unit. (In the case of insert characters, the factor is still the number of lines affected. This is always 1 unless the device has **in** and the software uses it.) When a '*' is specified, it is sometimes useful to give a delay of the form **3.5** to specify a delay per unit to tenths of milliseconds. (Only one decimal place is allowed.)
- A '/' indicates that the delay is mandatory and padding characters are transmitted regardless of the setting of **xon**. If '/' is not specified or if a device has **xon** defined, the delay information is advisory and is only used for cost estimates or when the device is in raw mode. However, any delay specified for **bel** or **flash** is treated as mandatory.

The following notation is valid in terminfo source files for specifying special characters:

Notation	Represents Character
^x	Control-x (for any appropriate x)
\a	Alert
\b	Backspace
\E or \e	An ESCAPE character
\f	Form feed
\l	Linefeed
\n	Newline
\r	Carriage return
\s	Space
\t	Tab
\^	Caret (^)
****	Backslash (\)
\,	Comma (,)
\:	Colon (:)
\0	Null
\nnn	Any character, specified as three octal digits

(See the **XBD** specification, **General Terminal Interface**.)

Commented-out Capabilities

Sometimes individual capabilities must be commented out. To do this, put a period before the capability name. For example, see the second **ind** Note that capabilities are defined in a left-to-right order and, therefore, a prior definition will override a later definition.

Device Capabilities

Basic Capabilities

The number of columns on each line for the device is given by the **cols** numeric capability. If the device has a screen, then the number of lines on the screen is given by the **lines** capability. If the device wraps around to the beginning of the next line when it reaches the right margin, then it should have the **am** capability. If the terminal can clear its screen, leaving the cursor in the home position, then this is given by the **clear** string capability. If the terminal overstrikes (rather than clearing a position when a character is struck over) then it should have the **os** capability. If the device is a printing terminal, with no soft copy unit, specify both **hc** and **os**. If there is a way to move the cursor to the left edge of the current row, specify this as **cr**.

(Normally this will be carriage return, control-M.) If there is a way to produce an audible signal (such as a bell or a beep), specify it as **bel**. If, like most devices, the device uses the xon-xoff flow-control protocol, specify **xon**.

If there is a way to move the cursor one position to the left (such as backspace), that capability should be given as **cub1**. Similarly, sequences to move to the right, up, and down should be given as **cuf1**, **cuu1**, and **cud1**, respectively. These local cursor motions must not alter the text they pass over; for example, you would not normally use "**cuf1**=\s" because the space would erase the character moved over.

A very important point here is that the local cursor motions encoded in **terminfo** are undefined at the left and top edges of a screen terminal. Programs should never attempt to backspace around the left edge, unless **bw** is specified, and should never attempt to go up locally off the top. To scroll text up, a program goes to the bottom left corner of the screen and sends the **ind** (index) string. To scroll text down, a program goes to the top left corner of the screen and sends the ri (reverse index) string. The strings **ind** and **ri** are undefined when not on their respective corners of the screen.

Parameterized versions of the scrolling sequences are **indn** and rin. These versions have the same semantics as **ind** and **ri**, except that they take one argument an scroll the number of lines specified by that argument.

They are also undefined except at the appropriate edge of the screen.

The **am** capability tells whether the cursor sticks at the right edge of the screen when text is output, but this does not necessarily apply to a **cuf1** from the last column. Backward motion from the left edge of the screen is possible only when **bw** is specified. In this case, **cub1** will move to the right edge of the previous row. If **bw** is not given, the effect is undefined. This is useful for drawing a box around the edge of the screen, for example. If the device has switch-selectable automatic margins, **am** should be specified in the **terminfo** source file. In this case, initialization strings should turn on this option, if possible. If the device has a command that moves to the first column of the next line, that command can be given as **nel** (newline). It does not matter if the command clears the remainder of the current line, so if the device has no **cr** and If it may still be possible to craft a working **nel** out of one or both of them.

These capabilities suffice to describe hardcopy and screen terminals. Thus the AT&T; 5320 hardcopy terminal is described as follows:

```
5320|att5320|AT&T; 5320 hardcopy terminal,
  am, hc, os,
  cols#132,
  bel=^G, cr=\r, cub1=\b, cnd1=\n,
  dch1=\E[P, dl1=\E[M,
  ind=\n,
```

while the Lear Siegler ADM-3 is described as

```
adm3|lsi adm3,
  am, bel=^G, clear=^Z, cols#80, cr=^M, cub1=^H,
  cud1=^J, ind=^J, lines#24,
```

Parameterized Strings

Cursor addressing and other strings requiring arguments are described by a argumentized string capability with escapes in a form (%x) comparable to *printf()*. For example, to address the cursor, the **cup** capability is given, using two

arguments: the row and column to address to. (Rows and columns are numbered from zero and refer to the physical screen visible to the user, not to any unseen memory.) If the terminal has memory relative cursor addressing, that can be indicated by **mrcup**.

The argument mechanism uses a stack and special % codes to manipulate the stack in the manner of Reverse Polish Notation (postfix). Typically a sequence pushes one of the arguments onto the stack and then prints it in some format. Often more complex operations are necessary. Operations are in postfix form with the operands in the usual order. That is, to subtract 5 from the first argument, one would use %p1%{5}%-.

The % encodings have the following meanings:

%% Outputs '%'.

%[[:]flags][width[.precision]][doxXs]
As in printf(); flags are [-+#] and space.

%c Print pop() gives %c.

%p[1-9]
Push the ith argument.

%P[a-z]
Set dynamic variable [a-z] to pop().

%g[a-z]
Get dynamic variable [a-z] and push it.

%P[A-Z]
Set static variable [a-z] to pop().

%g[A-Z]
Get static variable [a-z] and push it.

%'c' Push char constant c.

%{nn} Push decimal constant nn.

%l Push strlen(pop()).

%+ %- %* %/ %m
Arithmetic (%m is mod): push(pop integer2 op pop integer1) where integer1 represents the top of the stack

%&; %l %^
Bit operations: push(pop integer2 op pop integer1)

%= %> %<
Logical operations: push(pop integer2 op pop integer1)

%A %O
Logical operations: and, or

%! %~ Unary operations: push(op pop())

%i (For ANSI terminals) add 1 to the first argument (if one argument present), or first two arguments (if more than one argument present).

% expr %t thenpart %e elsepart %;
If-then-else, %e elsepart is optional; else-if's are possible ala Algol 68: % c1 %t b1 %e c2 %t b2 %e c3 %t b3 %e c4 %t b4 %e b5%; ci are conditions, bi are bodies.

If the "-" flag is used with "%[**doxXs**]", then a colon must be placed between the "%" and the "-" to differentiate the flag from the binary "%-" operator. For example: "%:**-16.16s**".

Consider the Hewlett-Packard 2645, which, to get to row 3 and column 12, needs to be sent **\E&a12c03Y** padded for 6 milliseconds. Note that the order of the rows and columns is inverted here, and that the row and column are zero-padded as two digits. Thus its **cup** capability is:

```
cup=\E&a%p2%2;2dc%p1%2.2dY$<6>
```

The Micro-Term ACT-IV needs the current row and column sent preceded by a ^**T**, with the row and column simply encoded in binary:

```
cup=^T%p1%c%p2%c
```

Devices that use "%c" need to be able to backspace the cursor (**cub1**), and to move the cursor up one line on the screen (cuu1). This is necessary because it is not always safe to transmit \n, ^D, and \r, as the system may change or discard them. (The library functions dealing with **terminfo** set tty modes so that tabs are never expanded, so \t is safe to send. This turns out to be essential for the Ann Arbor 4080.)

A final example is the LSI ADM-3a, which uses row and column offset by a blank character, thus:

```
cup=\E=%p1%'\s'%+%c%p2%'\s'%+%c
```

After sending "**\E=**", this pushes the first argument, pushes the ASCII value for a space (32), adds them (pushing the sum on the stack in place of the two previous values), and outputs that value as a character. Then the same is done for the second argument. More complex arithmetic is possible using the stack.

Cursor Motions

If the terminal has a fast way to home the cursor (to very upper left corner of screen) then this can be given as **home**; similarly a fast way of getting to the lower left-hand corner can be given as ll; this may involve going up with cuu1 from the home position, but a program should never do this itself (unless ll does) because it can make no assumption about the effect of moving up from the home position. Note that the home position is the same as addressing to (0,0): to the top left corner of the screen, not of memory. (Thus, the **EH** sequence on Hewlett-Packard terminals cannot be used for **home** without losing some of the other features on the terminal.)

If the device has row or column absolute-cursor addressing, these can be given as single argument capabilities **hpa** (horizontal position absolute) and **vpa** (vertical position absolute). Sometimes these are shorter than the more general two-argument sequence (as with the Hewlett-Packard 2645) and can be used in preference to **cup**. If there are argumentized local motions (such as "move n spaces to the right"), these can be given as cud, **cub**, **cuf**, and **cuu** with a single argument indicating how many spaces to move. These are primarily useful if the device does not have **cup**, such as the Tektronix 4025.

If the device needs to be in a special mode when running a program that uses these capabilities, the codes to enter and exit this mode can be given as **smcup** and **rmcup**. This arises, for example, from terminals, such as the Concept, with more than one page of memory. If the device has only memory relative cursor addressing and not screen relative cursor addressing, a one screen-sized window

must be fixed into the device for cursor addressing to work properly. This is also used for the Tektronix 4025, where **smcup** sets the command character to be the one used by **terminfo**. If the **rmcup** sequence will not restore the screen after an **smcup** sequence is output (to the state prior to outputting **smcup**), specify **nrrmc**.

Area Clears

If the terminal can clear from the current position to the end of the line, leaving the cursor where it is, this should be given as **el**. If the terminal can clear from the beginning of the line to the current position inclusive, leaving the cursor where it is, this should be given as **el1**. If the terminal can clear from the current position to the end of the display, then this should be given as **ed**. **ed** is only defined from the first column of a line. (Thus, it can be simulated by a request to delete a large number of lines, if a true **ed** is not available.)

Insert/Delete Line

If the terminal can open a new blank line before the line where the cursor is, this should be given as **il1**; this is done only from the first position of a line. The cursor must then appear on the newly blank line. If the terminal can delete the line which the cursor is on, then this should be given as **dl1**; this is done only from the first position on the line to be deleted. Versions of **il1** and **dl1** which take a single argument and insert or delete that many lines can be given as **il** and **dl**.

If the terminal has a settable destructive scrolling region (like the VT100) the command to set this can be described with the **csr** capability, which takes two arguments: the top and bottom lines of the scrolling region. The cursor position is, alas, undefined after using this command. It is possible to get the effect of insert or delete line using this command - the **sc** and **rc** (save and restore cursor) commands are also useful. Inserting lines at the top or bottom of the screen can also be done using **ri** or **ind** on many terminals without a true insert/delete line, and is often faster even on terminals with those features.

To determine whether a terminal has destructive scrolling regions or non-destructive scrolling regions, create a scrolling region in the middle of the screen, place data on the bottom line of the scrolling region, move the cursor to the top line of the scrolling region, and do a reverse index (ri) followed by a delete line (**dl1**) or index (**ind**). If the data that was originally on the bottom line of the scrolling region was restored into the scrolling region by the **dl1** or **ind**, then the terminal has non-destructive scrolling regions. Otherwise, it has destructive scrolling regions. Do not specify **csr** if the terminal has non-destructive scrolling regions, unless **ind**, **ri**, **indn**, **rin**, **dl**, and **dl**1 all simulate destructive scrolling.

If the terminal has the ability to define a window as part of memory, which all commands affect, it should be given as the argumentized string **wind**. The four arguments are the starting and ending lines in memory and the starting and ending columns in memory, in that order.

If the terminal can retain display memory above, then the **da** capability should be given; if display memory can be retained below, then **db** should be given. These indicate that deleting a line or scrolling a full screen may bring non-blank lines up from below or that scrolling back with **ri** may bring down non-blank lines.

Insert/Delete Character

There are two basic kinds of intelligent terminals with respect to insert/delete character operations which can be described using **terminfo**. The most common

insert/delete character operations affect only the characters on the current line and shift characters off the end of the line rigidly. Other terminals, such as the Concept 100 and the Perkin-Elmer Owl, make a distinction between typed and untyped blanks on the screen, shifting upon an insert or delete only to an untyped blank on the screen which is either eliminated, or expanded to two untyped blanks. You can determine the kind of terminal you have by clearing the screen and then typing text separated by cursor motions. Type "**abc def**" using local cursor motions (not spaces) between the **abc** and the **def**. Then position the cursor before the abc and put the terminal in insert mode. If typing characters causes the rest of the line to shift rigidly and characters to fall off the end, then your terminal does not distinguish between blanks and untyped positions. If the **abc** shifts over to the **def** which then move together around the end of the current line and onto the next as you insert, you have the second type of terminal, and should give the capability in, which stands for "insert null." While these are two logically separate attributes (one line versus multiline insert mode, and special treatment of untyped spaces) we have seen no terminals whose insert mode cannot be described with the single attribute.

terminfo can describe both terminals that have an insert mode and terminals which send a simple sequence to open a blank position on the current line. Give as **smir** the sequence to get into insert mode. Give as **rmir** the sequence to leave insert mode. Now give as **ich1** any sequence needed to be sent just before sending the character to be inserted. Most terminals with a true insert mode will not give **ich1**; terminals that send a sequence to open a screen position should give it here. (If your terminal has both, insert mode is usually preferable to **ich1**. Do not give both unless the terminal requires both to be used in combination.) If post-insert padding is needed, give this as a number of milliseconds padding in **ip** (a string option). Any other sequence which may need to be sent after an insert of a single character may also be given in **ip**. If your terminal needs both to be placed into an "insert mode" and a special code to precede each inserted character, then both **smir**/**rmir** and **ich1** can be given, and both will be used. The **ich** capability, with one argument, n, will insert n blanks.

If padding is necessary between characters typed while not in insert mode, give this as a number of milliseconds padding in **rmp**.

It is occasionally necessary to move around while in insert mode to delete characters on the same line (for example, if there is a tab after the insertion position). If your terminal allows motion while in insert mode you can give the capability **mir** to speed up inserting in this case. Omitting **mir** will affect only speed. Some terminals (notably Datamedia) must not have **mir** because of the way their insert mode works.

Finally, you can specify **dch1** to delete a single character, dch with one argument, n, to delete n characters, and delete mode by giving **smdc** and **rmdc** to enter and exit delete mode (any mode the terminal needs to be placed in for dch1 to work).

A command to erase *n* characters (equivalent to outputting *n* blanks without moving the cursor) can be given as **ech** with one argument.

Highlighting, Underlining, and Visible Bells

Your device may have one or more kinds of display attributes that allow you to highlight selected characters when they appear on the screen. The following display modes (shown with the names by which they are set) may be available:

- A blinking screen (**blink**)
- Bold or extra-bright characters (**bold**)

- Dim or half-bright characters (**dim**)
- Blanking or invisible text (**invis**)
- Protected text (**prot**)
- A reverse-video screen (**rev**)
- An alternate character set (**smacs** to enter this mode and **rmacs** to exit it) (If a command is necessary before you can enter alternate character set mode, give the sequence in **enacs** or "enable alternate-character-set" mode.) Turning on any of these modes singly may turn off other modes.

sgr0 should be used to turn off all video enhancement capabilities. It should always be specified because it represents the only way to turn off some capabilities, such as **dim** or **blink**.

Choose one display method as *standout mode* and use it to highlight error messages and other text to which you want to draw attention. Choose a form of display that provides strong contrast but that is easy on the eyes. (We recommend reverse-video plus half-bright or reverse-video alone.) The sequences to enter and exit standout mode are given as **smso** and **rmso**, respectively. If the code to change into or out of standout mode leaves one or even two blank spaces on the screen, as the TVI 912 and Teleray 1061 do, then **xmc** should be given to tell how many spaces are left.

Sequences to begin underlining and end underlining can be specified as **smul** and **rmul**, respectively. If the device has a sequence to underline the current character and to move the cursor one space to the right (such as the Micro-Term MIME), this sequence can be specified as uc.

Terminals with the "magic cookie" glitch (**xmc**) deposit special "cookies" when they receive mode-setting sequences, which affect the display algorithm rather than having extra bits for each character. Some terminals, such as the Hewlett-Packard 2621, automatically leave standout mode when they move to a new line or the cursor is addressed. Programs using standout mode should exit standout mode before moving the cursor or sending a newline, unless the **msgr** capability, asserting that it is safe to move in standout mode, is present.

If the terminal has a way of flashing the screen to indicate an error quietly (a bell replacement), then this can be given as **flash**; it must not move the cursor. A good flash can be done by changing the screen into reverse video, pad for 200 ms, then return the screen to normal video.

If the cursor needs to be made more visible than normal when it is not on the bottom line (to make, for example, a non-blinking underline into an easier to find block or blinking underline) give this sequence as **cvvis**. The boolean **chts** should also be given. If there is a way to make the cursor completely invisible, give that as **civis**. The capability **cnorm** should be given, which undoes the effects of either of these modes.

If your terminal generates underlined characters by using the underline character (with no special sequences needed) even though it does not otherwise overstrike characters, then specify the capability **ul**. For devices on which a character overstriking another leaves both characters on the screen, specify the capability **os**. If overstrikes are erasable with a blank, then this should be indicated by specifying **eo**.

If there is a sequence to set arbitrary combinations of modes, this should be given as **sgr** (set attributes), taking nine arguments. Each argument is either 0 or non-zero, as the corresponding attribute is on or off. The nine arguments are, in order: standout, underline, reverse, blink, dim, bold, blank, protect, alternate character set. Not all modes need to be supported by **sgr**; only those for which corresponding separate attribute commands exist should be supported. For example, let's assume that the terminal in question needs the following escape sequences to turn on various modes.

tparm Argument	Attribute	Escape Sequence
	none	\E[0m
p1	standout	\E[0;4;7m
p2	underline	\E[0;3m
p3	reverse	\E[0;4m
p4	blink	\E[0;5m
p5	dim	\E[0;7m
p6	bold	\E[0;3;4m
p7	invis	\E[0;8m
p8	protect	not available
p9	altcharset	^O (off) ^N (on)

Note that each escape sequence requires a 0 to turn off other modes before turning on its own mode. Also note that, as suggested above, *standout* is set up to be the combination of *reverse* and *dim*. Also, because this terminal has no *bold* mode, *bold* is set up as the combination of *reverse* and *underline*. In addition, to allow combinations, such as *underline+blink*, the sequence to use would be **\E[0;3;5m**. The terminal doesn't have protect mode, either, but that cannot be simulated in any way, so **p8** is ignored. The *altcharset* mode is different in that it is either **^O** or **^N**, depending on whether it is off or on. If all modes were to be turned on, the sequence would be:

```
\E[0;3;4;5;7;8m^N
```

Now look at when different sequences are output. For example, **;3** is output when either **p2** or **p6** is true, that is, if either *underline* or *bold* modes are turned on. Writing out the above sequences, along with their dependencies, gives the following:

Sequence	When to Output	terminfo Translation
\E[0	always	\E[0
;3	if p2 or p6	%%p2%p6%|%t;3%;
;4	if p1 or p3 or p6	%%p1%p3%|%p6%|%t;4%;
;5	if p4	%%p4%t;5%;
;7	if p1 or p5	%%p1%p5%|%t;7%;
;8	if p7	%%p7%t;8%;
m	always	m
caret.N or ^O	if p9 ^N, else ^O	%%p9%t^N%e^O%;

Putting this all together into the **sgr** sequence gives:

```
sgr=\E[0%%p2%p6%|%t;3%;%%p1%p3%|%p6%
   |%t;4%;%%p5%t;5%;%%p1%p5%
   |%t;7%;%%p7%t;8%;m%%p9%t^N%e^O%;,
```

Remember that **sgr** and **sgr0** must always be specified.

Keypad

If the device has a keypad that transmits sequences when the keys are pressed, this information can also be specified. Note that it is not possible to handle devices where the keypad only works in local (this applies, for example, to the unshifted Hewlett-Packard 2621 keys). If the keypad can be set to transmit or not transmit, specify these sequences as **smkx** and **rmkx**. Otherwise the keypad is assumed to always transmit.

The sequences sent by the left arrow, right arrow, up arrow, down arrow, and home keys can be given as **kcub1**, **kcuf1**, **kcuu1**, **kcud1** and **khome**, respectively. If there are function keys such as f0, f1, ..., f63, the sequences they send can be specified as **kf0**, **kf1**, ..., **kf63**. If the first 11 keys have labels other than the default f0 through f10, the labels can be given as **lf0**, **lf1**, ..., **lf10**.

The codes transmitted by certain other special keys can be given: **kll** (home down), **kbs** (backspace), **ktbc** (clear all tabs), **kctab** (clear the tab stop in this column), **kclr** (clear screen or erase key), **kdch1** (delete character), **kdl1** (delete line), **krmir** (exit insert mode), **kel** (clear to end of line), **ked** (clear to end of screen), **kich1** (insert character or enter insert mode), **kil1** (insert line), **knp** (next page), **kpp** (previous page), **kind** (scroll forward/down), **kri** (scroll backward/up), **khts** (set a tab stop in this column). In addition, if the keypad has a 3 by 3 array of keys including the four arrow keys, the other five keys can be given as **ka1**, **ka3**, **kb2**, **kc1**, and **kc3**. These keys are useful when the effects of a 3 by 3 directional pad are needed. Further keys are defined above in the capabilities list.

Strings to program function keys can be specified as **pfkey**, **pfloc**, and **pfx**. A string to program screen labels should be specified as **pln**. Each of these strings takes two arguments: a function key identifier and a string to program it with. **pfkey** causes pressing the given key to be the same as the user typing the given string; **pfloc** causes the string to be executed by the terminal in local mode; and **pfx** causes the string to be transmitted to the computer. The capabilities **nlab**, **lw** and **lh** define the number of programmable screen labels and their width and height.

If there are commands to turn the labels on and off, give them in **smln** and **rmln**. **smln** is normally output after one or more pln sequences to make sure that the change becomes visible.

Tabs and Initialization

If the device has hardware tabs, the command to advance to the next tab stop can be given as **ht** (usually control-I). A “backtab” command that moves leftward to the next tab stop can be given as **cbt**. By convention, if tty modes show that tabs are being expanded by the computer rather than being sent to the device, programs should not use **ht** or **cbt** (even if they are present) because the user might not have the tab stops properly set. If the device has hardware tabs that are initially set every *n* spaces when the device is powered up, the numeric argument it is given, showing the number of spaces the tabs are set to. This is normally used by *tput* **init** to determine whether to set the mode for hardware tab expansion and whether to set the tab stops. If the device has tab stops that can be saved in nonvolatile memory, the **terminfo** description can assume that they are properly set. If there are commands to set and clear tab stops, they can be given as **tbc** (clear all tab stops) and **hts** (set a tab stop in the current column of every row).

Other capabilities include: **is1**, **is2**, and **is3**, initialization strings for the device; **iprog**, the path name of a program to be run to initialize the device; and if, the name of a file containing long initialization strings. These strings are expected to set

the device into modes consistent with the rest of the **terminfo** description. They must be sent to the device each time the user logs in and be output in the following order: run the program **iprog**; output **is1**; output **is2**; set the margins using **mgc**, **smgl** and **smgr**; set the tabs using **tbc** and **hts**; print the file if; and finally output **is3**. This is usually done using the **init** option of *tput*.

Most initialization is done with **is2**. Special device modes can be set up without duplicating strings by putting the common sequences in **is2** and special cases in **is1** and **is3**. Sequences that do a reset from a totally unknown state can be given as **rs1**, **rs2**, **rf**, and **rs3**, analogous to **is1**, **is2**, **is3**, and **if**. (The method using files, **if** and **rf**, is used for a few terminals however, the recommended method is to use the initialization and reset strings.) These strings are output by *tput* **reset**, which is used when the terminal gets into a wedged state. Commands are normally placed in **rs1**, **rs2**, **rs3**, and **rf** only if they produce annoying effects on the screen and are not necessary when logging in. For example, the command to set a terminal into 80-column mode would normally be part of **is2**, but on some terminals it causes an annoying glitch on the screen and is not normally needed because the terminal is usually already in 80-column mode.

If a more complex sequence is needed to set the tabs than can be described by using **tbc** and **hts**, the sequence can be placed in **is2** or **if**.

Any margin can be cleared with **mgc**. (For instructions on how to specify commands to set and clear margins.

Delays

Certain capabilities control padding in the **tty** driver. These are primarily needed by hard-copy terminals, and are used by *tput* **init** to set tty modes appropriately. Delays embedded in the capabilities **cr**, **ind**, **cub1**, **ff**, and **tab** can be used to set the appropriate delay bits to be set in the tty driver. If **pb** (padding baud rate) is given, these values can be ignored at baud rates below the value of **pb**.

Status Lines

If the terminal has an extra “status line” that is not normally used by software, this fact can be indicated. If the status line is viewed as an extra line below the bottom line, into which one can cursor address normally (such as the Heathkit H19’s 25th line, or the 24th line of a VT100 which is set to a 23-line scrolling region), the capability **hs** should be given. Special strings that go to a given column of the status line and return from the status line can be given as **tsl** and **fsl**. (**fsl** must leave the cursor position in the same place it was before **tsl**. If necessary, the **sc** and **rc** strings can be included in **tsl** and **fsl** to get this effect.) The capability **tsl** takes one argument, which is the column number of the status line the cursor is to be moved to.

If escape sequences and other special commands, such as tab, work while in the status line, the flag **eslok** can be given. A string which turns off the status line (or otherwise erases its contents) should be given as **dsl**. If the terminal has commands to save and restore the position of the cursor, give them as **sc** and **rc**. The status line is normally assumed to be the same width as the rest of the screen (that is, **cols**). If the status line is a different width (possibly because the terminal does not allow an entire line to be loaded) the width, in columns, can be indicated with the numeric argument **wsl**.

Line Graphics

If the device has a line drawing alternate character set, the mapping of glyph to character would be given in **acsc**. The definition of this string is based on the alternate character set used in the Digital VT100 terminal, extended slightly with some characters from the AT&T; 4410v1 terminal.

Glyph Name	VT100+ Character
arrow pointing right	+
arrow pointing left	,
arrow pointing down	.
solid square block	0
lantern symbol	I
arrow pointing up	-
diamond	`
checker board (stipple)	a
degree symbol	f
plus/minus	g
board of squares	h
lower right corner	j
upper right corner	k
upper left corner	l
lower left corner	m
plus	n
scan line 1	o
horizontal line	q
scan line 9	s
left tee (|-)	t
right tee (-|)	u
bottom tee (|)	v
top tee (|)	w
vertical line	x
bullet	~

The best way to describe a new device's line graphics set is to add a third column to the above table with the characters for the new device that produce the appropriate glyph when the device is in alternate-character-set mode. For example:

Glyph Name	VT100+ Character	Character Used on New Device
upper left corner	l	R
lower left corner	m	F
upper right corner	k	T
lower right corner	j	G
horizontal line	q	,
vertical line	x	.

Now write down the characters left to right; for example:

```
acsc=lRmFkTjGq\,x.
```

In addition, **terminfo** lets you define multiple character sets.

Color Manipulation

Most color terminals belong to one of two classes of terminal:

Tektronix-style

The Tektronix method uses a set of N predefined colors (usually 8) from which an application can select ″current″ foreground and background colors. Thus a terminal can support up to N colors mixed into N*N color-pairs to be displayed on the screen at the same time.

Hewlett-Packard-style

In the HP method, the application cannot define the foreground independently of the background, or vice-versa. Instead, the application must define an entire color-pair at once. Up to M color-pairs, made from 2*M different colors, can be defined this way.

The numeric variables **colors** and **pairs** define the number of colors and color-pairs that can be displayed on the screen at the same time. If a terminal can change the definition of a color (for example, the Tektronix 4100 and 4200 series terminals), this should be specified with **ccc** (can change color). To change the definition of a color (Tektronix 4200 method), use **initc** (initialize color). It requires four arguments: color number (ranging from 0 to **colors**-1) and three RGB (red, green, and blue) values or three HLS colors (Hue, Lightness, Saturation). Ranges of RGB and HLS values are terminal-dependent.

Tektronix 4100 series terminals only use HLS color notation. For such terminals (or dual-mode terminals to be operated in HLS mode) one must define a boolean variable **hls**; that would instruct the *init_color*() functions to convert its RGB arguments to HLS before sending them to the terminal. The last three arguments to the **initc** string would then be HLS values.

If a terminal can change the definitions of colors, but uses a color notation different from RGB and HLS, a mapping to either RGB or HLS must be developed.

If the terminal supports ANSI escape sequences to set background and foreground, they should be coded as setab and setaf, respectively. If the terminal supports other escape sequences to set background and foreground, they should be coded as **setb** and **setf**, respectively. The *vidputs*() function and the refresh functions use **setab** and **setaf** if they are defined. Each of these capabilities requires one argument: the number of the color. By convention, the first eight colors (0-7) map to, in order: black, red, green, yellow, blue, magenta, cyan, white. However, color re-mapping may occur or the underlying hardware may not support these colors. Mappings for any additional colors supported by the device (that is, to numbers greater than 7) are at the discretion of the **terminfo** entry writer.

To initialize a color-pair (HP method), use **initp** (initialize pair). It requires seven arguments: the number of a color-pair (range=0 to **pairs**-1), and six RGB values: three for the foreground followed by three for the background. (Each of these groups of three should be in the order RGB.) When **initc** or **initp** are used, RGB or HLS arguments should be in the order ″red, green, blue″ or ″hue, lightness, saturation″), respectively. To make a color-pair current, use **scp** (set color-pair). It takes one argument, the number of a color-pair.

Some terminals (for example, most color terminal emulators for PCs) erase areas of the screen with current background color. In such cases, **bce** (background color erase) should be defined. The variable **op** (original pair) contains a sequence for setting the foreground and the background colors to what they were at the terminal start-up time. Similarly, **oc** (original colors) contains a control sequence for setting all colors (for the Tektronix method) or color-pairs (for the HP method) to the values they had at the terminal start-up time.

Some color terminals substitute color for video attributes. Such video attributes should not be combined with colors. Information about these video attributes should be packed into the ncv (no color video) variable. There is a one-to-one correspondence between the nine least significant bits of that variable and the video attributes. The following table depicts this correspondence.

Attribute	Bit Position	Decimal Value	Characteristic That Sets
WA_ STANDOUT	0	1	**sgr,** parameter 1
WA_ UNDERLINE	1	2	**sgr,** parameter 2
WA_ REVERSE	2	4	**sgr,** parameter 3
WA_ BLINK	3	8	**sgr,** parameter 4
WA_ DIM	4	16	**sgr,** parameter 5
WA_ BOLD	5	32	**sgr,** parameter 6
WA_ INVIS	6	64	**sgr,** parameter 7
WA_ PROTECT	7	128	**sgr,** parameter 8
WA_ ALTCHARSET	8	256	**sgr,** parameter 9
WA_ HORIZONTAL	9	512	**sgr1,** parameter 1
WA_ LEFT	10	1024	**sgr1,** parameter 2
WA_ LOW	11	2048	**sgr1,** parameter 3
WA_ RIGHT	12	4096	**sgr1,** parameter 4
WA_ TOP	13	8192	**sgr1,** parameter 5
WA_ VERTICAL	14	16384	**sgr1,** parameter 6

When a particular video attribute should not be used with colors, set the corresponding **ncv bit** to 1; otherwise set it to 0. To determine the information to pack into the **ncv** variable, add the decimal values corresponding to those attributes that cannot coexist with colors. For example, if the terminal uses colors to simulate reverse video (bit number 2 and decimal value 4) and bold (bit number 5 and decimal value 32), the resulting value for **ncv** will be 36 (4 + 32).

Miscellaneous

If the terminal requires other than a null (zero) character as a pad, then this can be given as **pad**. Only the first character of the **pad** string is used. If the terminal does not have a pad character, specify **npc**.

If the terminal can move up or down half a line, this can be indicated with **hu** (half-line up) and **hd** (half-line down). This is primarily useful for superscripts and subscripts on hardcopy terminals. If a hardcopy terminal can eject to the next page (form feed), give this as **ff** (usually control-L).

If there is a command to repeat a given character a given number of times (to save time transmitting a large number of identical characters) this can be indicated with the argumentized string **rep**. The first argument is the character to be repeated and the second is the number of times to repeat it. Thus, **tparm(repeat_char, 'x', 10)** is the same as **xxxxxxxxxx**.

If the terminal has a settable command character, such as the Tektronix 4025, this can be indicated with **cmdch**. A prototype command character is chosen which is used in all capabilities. This character is given in the **cmdch** capability to identify it. The following convention is supported on some systems: If the environment variable CC exists, all occurrences of the prototype character are replaced with the character in CC.

Terminal descriptions that do not represent a specific kind of known terminal, such as *switch*, *dialup*, *patch*, and *network*, should include the **gn** (generic) capability so that programs can complain that they do not know how to talk to the terminal. (This capability does not apply to virtual terminal descriptions for which the escape sequences are known.) If the terminal is one of those supported by the virtual terminal protocol, the terminal number can be given as **vt**. A line-turn-around sequence to be transmitted before doing reads should be specified in **rfi**.

If the device uses xon/xoff handshaking for flow control, give **xon**. Padding information should still be included so that functions can make better decisions about costs, but actual pad characters will not be transmitted. Sequences to turn on and off xon/xoff handshaking may be given in **smxon** and **rmxon**. If the characters used for handshaking are not ^**S** and ^**Q**, they may be specified with **xonc** and **xoffc**.

If the terminal has a “meta key” which acts as a shift key, setting the 8th bit of any character transmitted, this fact can be indicated with **km**. Otherwise, software will assume that the 8th bit is parity and it will usually be cleared. If strings exist to turn this “meta mode” on and off, they can be given as **smm** and **rmm**.

If the terminal has more lines of memory than will fit on the screen at once, the number of lines of memory can be indicated with **lm**. A value of **lm#0** indicates that the number of lines is not fixed, but that there is still more memory than fits on the screen.

Media copy strings which control an auxiliary printer connected to the terminal can be given as:

mc0 Print the contents of the screen
mc4 Turn off the printer
mc5 Turn on the printer

When the printer is on, all text sent to the terminal will be sent to the printer. A variation, **mc5p**, takes one argument, and leaves the printer on for as many characters as the value of the argument, then turns the printer off. The argument should not exceed 255. If the text is not displayed on the terminal screen when the printer is on, specify **mc5i** (silent printer). All text, including **mc4**, is transparently passed to the printer while an **mc5p** is in effect.

Special Cases

The working model used by **terminfo** fits most terminals reasonably well. However, some terminals do not completely match that model, requiring special support by **terminfo**. These are not meant to be construed as deficiencies in the terminals; they are just differences between the working model and the actual hardware. They may be unusual devices or, for some reason, do not have all the features of the **terminfo** model implemented.

Terminals that cannot display tilde (~) characters, such as certain Hazeltine terminals, should indicate **hz**.

Terminals that ignore a linefeed immediately after an **am** wrap, such as the Concept 100, should indicate **xenl**. Those terminals whose cursor remains on the right-most column until another character has been received, rather than wrapping immediately upon receiving the right-most character, such as the VT100, should also indicate **xenl**.

If **el** is required to get rid of standout (instead of writing normal text on top of it), **xhp** should be given.

Those Teleray terminals whose tabs turn all characters moved over to blanks, should indicate **xt** (destructive tabs). This capability is also taken to mean that it is not possible to position the cursor on top of a “magic cookie.” Therefore, to erase standout mode, it is necessary, instead, to use delete and insert line.

For Beehive Superbee terminals that do not transmit the escape or control-C characters, specify **xsb**, indicating that the f1 key is to be used for escape and the f2 key for control-C.

Similar Terminals

If there are two similar terminals, one can be defined as being just like the other with certain exceptions. The string capability **use** can be given with the name of the similar terminal. The capabilities given before use override those in the terminal type invoked by **use**. A capability can be canceled by placing capability-name@ prior to the appearance of the string capability use. For example, the entry:

```
att4424-2|Teletype 4424 in display function group ii,
  rev@, sgr@, smul@, use=att4424,
```

defines an AT&T; 04424 terminal that does not have the **rev**, **sgr**, and smul capabilities, and hence cannot do highlighting. This is useful for different modes for a terminal, or for different user preferences. More than one **use** capability may be given.

Printer Capabilities

The **terminfo** database lets you define capabilities of printers as well as terminals.

Rounding Values

Because argumentized string capabilities work only with integer values, **terminfo** designers should create strings that expect numeric values that have been rounded. Application designers should note this and should always round values to the nearest integer before using them with a argumentized string capability.

Printer Resolution

A printer’s resolution is defined to be the smallest spacing of characters it can achieve. In general, the horizontal and vertical resolutions are independent. Thus the vertical resolution of a printer can be determined by measuring the smallest achievable distance between consecutive printing baselines, while the horizontal resolution can be determined by measuring the smallest achievable distance between the leftmost edges of consecutive printed, identical, characters.

All printers are assumed to be capable of printing with a uniform horizontal and vertical resolution. The view of printing that **terminfo** currently presents is one of printing inside a uniform matrix: All characters are printed at fixed positions relative

to each “cell” in the matrix; furthermore, each cell has the same size given by the smallest horizontal and vertical step sizes dictated by the resolution. (The cell size can be changed as will be seen later.)

Many printers are capable of “proportional printing,” where the horizontal spacing depends on the size of the character last printed. **terminfo** does not make use of this capability, although it does provide enough capability definitions to allow an application to simulate proportional printing.

A printer must not only be able to print characters as close together as the horizontal and vertical resolutions suggest, but also of “moving” to a position an integral multiple of the smallest distance away from a previous position. Thus printed characters can be spaced apart a distance that is an integral multiple of the smallest distance, up to the length or width of a single page.

Some printers can have different resolutions depending on different “modes.” In “normal mode,” the existing **terminfo** capabilities are assumed to work on columns and lines, just like a video terminal. Thus the old **lines** capability would give the length of a page in lines, and the **cols** capability would give the width of a page in columns. In “micro mode,” many **terminfo** capabilities work on increments of lines and columns. With some printers the micro mode may be concomitant with normal mode, so that all the capabilities work at the same time.

Specifying Printer Resolution

The printing resolution of a printer is given in several ways. Each specifies the resolution as the number of smallest steps per distance:

Characteristic	Number of Smallest Steps
orhi	Steps per inch horizontally
orvi	Steps per inch vertically
orc	Steps per column
orl	Steps per line

When printing in normal mode, each character printed causes movement to the next column, except in special cases described later; the distance moved is the same as the per-column resolution. Some printers cause an automatic movement to the next line when a character is printed in the rightmost position; the distance moved vertically is the same as the per-line resolution. When printing in micro mode, these distances can be different, and may be zero for some printers.

Automatic Motion after Printing	
Normal Mode:	
orc	Steps moved horizontally
orl	Steps moved vertically
Micro Mode:	
mcs	Steps moved horizontally
mls	Steps moved vertically

Some printers are capable of printing wide characters. The distance moved when a wide character is printed in normal mode may be different from when a regular width character is printed. The distance moved when a wide character is printed in micro mode may also be different from when a regular character is printed in micro mode, but the differences are assumed to be related: If the distance moved for a regular character is the same whether in normal mode or micro mode (**mcs=orc**),

then the distance moved for a wide character is also the same whether in normal mode or micro mode. This doesn't mean the normal character distance is necessarily the same as the wide character distance, just that the distances don't change with a change in normal to micro mode. However, if the distance moved for a regular character is different in micro mode from the distance moved in normal mode (**mcs<orc**), the micro mode distance is assumed to be the same for a wide character printed in micro mode, as the table below shows.

Automatic Motion after Printing Wide Character
Normal Mode or Micro Mode (**mcs = orc**):
widcs Steps moved horizontally
Micro Mode (**mcs < orc**):
mcs Steps moved horizontally

There may be control sequences to change the number of columns per inch (the character pitch) and to change the number of lines per inch (the line pitch). If these are used, the resolution of the printer changes, but the type of change depends on the printer:

Changing the Character/Line Pitches	
cpi **cpix**	Change character pitch If set, cpi changes orhi, otherwise changes orc
lpi **lpix**	Change line pitch If set, lpi changes orvi, otherwise changes orl
chr **cvr**	Change steps per column Change steps per line

The **cpi** and **lpi** string capabilities are each used with a single argument, the pitch in columns (or characters) and lines per inch, respectively. The **chr** and **cvr** string capabilities are each used with a single argument, the number of steps per column and line, respectively.

Using any of the control sequences in these strings will imply a change in some of the values of **orc**, **orhi**, **orl**, and **orvi**. Also, the distance moved when a wide character is printed, **widcs**, changes in relation to **orc**. The distance moved when a character is printed in micro mode, **mcs**, changes similarly, with one exception: if the distance is 0 or 1, then no change is assumed.

Programs that use **cpi**, **lpi**, **chr**, or **cvr** should recalculate the printer resolution (and should recalculate other values).

Capabilities that Cause Movement

In the following descriptions, "movement" refers to the motion of the "current position." With video terminals this would be the cursor; with some printers, this is the carriage position. Other printers have different equivalents. In general, the current position is where a character would be displayed if printed.

terminfo has string capabilities for control sequences that cause movement a number of full columns or lines. It also has equivalent string capabilities for control sequences that cause movement a number of smallest steps.

String Capabilities for Motion	
mcub1	Move 1 step left
mcuf1	Move 1 step right
mcuu1	Move 1 step up
mcud1	Move 1 step down
mcub	Move *N* steps left
mcuf	Move *N* steps right
mcuu	Move *N* steps up
mcud	Move *N* steps down
mhpa	Move *N* steps from the left
mvpa	Move *N* steps from the top

The latter six strings are each used with a single argument, *N*.

Sometimes the motion is limited to less than the width or length of a page. Also, some printers don't accept absolute motion to the left of the current position. **terminfo** has capabilities for specifying these limits.

Limits to Motion	
mjump	Limit on use of **mcub1**, **mcuf1**, **mcuu1**, **mcud1**
maddr	Limit on use of **mhpa**, **mvpa**
xhpa	If set, **hpa** and **mhpa** can't move left
xvpa	If set, **vpa** and **mvpa** can't move up

If a printer needs to be in a "micro mode" for the motion capabilities described above to work, there are string capabilities defined to contain the control sequence to enter and exit this mode. A boolean is available for those printers where using a carriage return causes an automatic return to normal mode.

Entering/Exiting Micro Mode	
smicm	Enter micro mode
rmicm	Exit micro mode
crxm	Using cr exits micro mode

The movement made when a character is printed in the rightmost position varies among printers. Some make no movement, some move to the beginning of the next line, others move to the beginning of the same line. **terminfo** has boolean capabilities for describing all three cases.

What Happens After Character Printed in Rightmost Position	
sam	Automatic move to beginning of same line

Some printers can be put in a mode where the normal direction of motion is reversed. This mode can be especially useful when there are no capabilities for leftward or upward motion, because those capabilities can be built from the motion reversal capability and the rightward or downward motion capabilities. It is best to leave it up to an application to build the leftward or upward capabilities, though, and not enter them in the **terminfo** database. This allows several reverse motions to be strung together without intervening wasted steps that leave and reenter reverse mode.

Entering/Exiting Reverse Modes	
slm	Reverse sense of horizontal motions
rlm	Restore sense of horizontal motions
sum	Reverse sense of vertical motions
rum	Restore sense of vertical motions
While sense of horizontal motions reversed:	
mcub1	Move 1 step right
mcuf1	Move 1 step left
mcub	Move N steps right
mcuf	Move N steps left
cub1	Move 1 column right
cuf1	Move 1 column left
cub	Move N columns right
cuf	Move N columns left
While sense of vertical motions reversed:	
mcuu1	Move 1 step down
mcud1	Move 1 step up
mcuu	Move N steps down
mcud	Move N steps up
cuu1	Move 1 line down
cud1	Move 1 line up
cuu	Move N lines down
cud	Move N lines up

The reverse motion modes should not affect the **mvpa** and **mhpa** absolute motion capabilities. The reverse vertical motion mode should, however, also reverse the action of the line “wrapping” that occurs when a character is printed in the right-most position. Thus printers that have the standard **terminfo** capability **am** defined should experience motion to the beginning of the previous line when a character is printed in the rightmost position in reverse vertical motion mode.

The action when any other motion capabilities are used in reverse motion modes is not defined; thus, programs must exit reverse motion modes before using other motion capabilities.

Two miscellaneous capabilities complete the list of motion capabilities. One of these is needed for printers that move the current position to the beginning of a line when certain control characters, such as *line-feed* or *form-feed*, are used. The other is used for the capability of suspending the motion that normally occurs after printing a character.

Miscellaneous Motion Strings	
docr	List of control characters causing cr
zerom	Prevent auto motion after printing next single character

Margins

terminfo provides two strings for setting margins on terminals: one for the left and one for the right margin. Printers, however, have two additional margins, for the top and bottom margins of each page. Furthermore, some printers require not using motion strings to move the current position to a margin and then fixing the margin there, but require the specification of where a margin should be regardless of the current position. Therefore **terminfo** offers six additional strings for defining margins with printers.

Setting Margins	
smgl	Set left margin at current column
smgr	Set right margin at current column
smgb	Set bottom margin at current line
smgt	Set top margin at current line
smgbp	Set bottom margin at line N
smglp	Set left margin at column N
smgrp	Set right margin at column N
smgtp	Set top margin at line N

The last four strings are used with one or more arguments that give the position of the margin or margins to set. If both of **smglp** and **smgrp** are set, each is used with a single argument, *N*, that gives the column number of the left and right margin, respectively. If both of **smgtp** and **smgbp** are set, each is used to set the top and bottom margin, respectively: **smgtp** is used with a single argument, *N*, the line number of the top margin; however, **smgbp** is used with two arguments, *N* and *M*, that give the line number of the bottom margin, the first counting from the top of the page and the second counting from the bottom. This accommodates the two styles of specifying the bottom margin in different manufacturers' printers. When coding a **terminfo** entry for a printer that has a settable bottom margin, only the first or second argument should be used, depending on the printer. When writing an application that uses **smgbp** to set the bottom margin, both arguments must be given.

If only one of **smglp** and **smgrp** is set, then it is used with two arguments, the column number of the left and right margins, in that order. Likewise, if only one of **smgtp** and **smgbp** is set, then it is used with two arguments that give the top and bottom margins, in that order, counting from the top of the page. Thus when coding a **terminfo** entry for a printer that requires setting both left and right or top and bottom margins simultaneously, only one of **smglp** and **smgrp** or **smgtp** and **smgbp** should be defined; the other should be left blank. When writing an application that uses these string capabilities, the pairs should be first checked to see if each in the pair is set or only one is set, and should then be used accordingly.

In counting lines or columns, line zero is the top line and column zero is the left-most column. A zero value for the second argument with **smgbp** means the bottom line of the page.

All margins can be cleared with **mgc**.

Shadows, Italics, Wide Characters, Superscripts, Subscripts

Five sets of strings describe the capabilities printers have of enhancing printed text.

Enhanced Printing	
sshm	Enter shadow-printing mode
rshm	Exit shadow-printing mode
sitm	Enter italicizing mode
ritm	Exit italicizing mode
swidm	Enter wide character mode
rwidm	Exit wide character mode

Enhanced Printing	
ssupm **rsupm** **supcs**	Enter superscript mode Exit superscript mode List of characters available as superscripts
ssubm **rsubm** **subcs**	Enter subscript mode Exit subscript mode List of characters available as subscripts

If a printer requires the **sshm** control sequence before every character to be shadow-printed, the **rshm** string is left blank. Thus programs that find a control sequence in **sshm** but none in rshm should use the **sshm** control sequence before every character to be shadow-printed; otherwise, the sshm control sequence should be used once before the set of characters to be shadow-printed, followed by **rshm**. The same is also true of each of the **sitm/ritm**, **swidm/rwidm**, **ssupm/rsupm**, and **ssubm/rsubm** pairs.

terminfo also has a capability for printing emboldened text (**bold**). While shadow printing and emboldened printing are similar in that they “darken” the text, many printers produce these two types of print in slightly different ways. Generally, emboldened printing is done by overstriking the same character one or more times. Shadow printing likewise usually involves overstriking, but with a slight movement up and/or to the side so that the character is “fatter.”

It is assumed that enhanced printing modes are independent modes, so that it would be possible, for instance, to shadow print italicized subscripts.

As mentioned earlier, the amount of motion automatically made after printing a wide character should be given in **widcs**.

If only a subset of the printable ASCII characters can be printed as superscripts or subscripts, they should be listed in **supcs** or **subcs** strings, respectively. If the **ssupm** or **ssubm** strings contain control sequences, but the corresponding **supcs** or **subcs** strings are empty, it is assumed that all printable ASCII characters are available as superscripts or subscripts.

Automatic motion made after printing a superscript or subscript is assumed to be the same as for regular characters. Note that the existing **msgr** boolean capability describes whether motion control sequences can be used while in “standout mode.” This capability is extended to cover the enhanced printing modes added here. **msgr** should be set for those printers that accept any motion control sequences without affecting shadow, italicized, widened, superscript, or subscript printing. Conversely, if **msgr** is not set, a program should end these modes before attempting any motion.

Alternate Character Sets

In addition to allowing you to define line graphics, **terminfo** lets you define alternate character sets. The following capabilities cover printers and terminals with multiple selectable or definable character sets:

Alternate Character Sets	
scs	Select character set N
scsd	Start definition of character set N, M characters
defc	Define character A, B dots wide, descender D
rcsd	End definition of character set N
csnm	List of character set names
daisy	Printer has manually changed print-wheels

The **scs**, **rcsd**, and **csnm** strings are used with a single argument, N, a number from 0 to 63 that identifies the character set. The **scsd** string is also used with the argument *N* and another, *M*, that gives the number of characters in the set. The **defc** string is used with three arguments: *A* gives the ASCII code representation for the character, *B* gives the width of the character in dots, and*D* is zero or one depending on whether the character is a “descender” or not. The **defc** string is also followed by a string of “image-data” bytes that describe how the character looks (see below).

Character set 0 is the default character set present after the printer has been initialized. Not every printer has 64 character sets, of course; using **scs** with an argument that doesn’t select an available character set should cause a null pointer to be returned by **tparm**.

If a character set has to be defined before it can be used, the **scsd** control sequence is to be used before defining the character set, and the **rcsd** is to be used after. They should also cause a NULL pointer to be returned by **tparm** when used with an argument *N* that doesn’t apply. If a character set still has to be selected after being defined, the **scs** control sequence should follow the **rcsd** control sequence. By examining the results of using each of the **scs**, **scsd**, and **rcsd** strings with a character set number in a call to **tparm**, a program can determine which of the three are needed.

Between use of the **scsd** and **rcsd** strings, the **defc** string should be used to define each character. To print any character on printers covered by **terminfo**, the ASCII code is sent to the printer. This is true for characters in an alternate set as well as “normal” characters. Thus the definition of a character includes the ASCII code that represents it. In addition, the width of the character in dots is given, along with an indication of whether the character should descend below the print line (such as the lower case letter “g” in most character sets). The width of the character in dots also indicates the number of image-data bytes that will follow the **defc** string. These image-data bytes indicate where in a dot-matrix pattern ink should be applied to “draw” the character.

It’s easiest for the creator of **terminfo** entries to refer to each character set by number; however, these numbers will be meaningless to the application developer. The **csnm** string alleviates this problem by providing names for each number.

When used with a character set number in a call to **tparm**, the **csnm** string will produce the equivalent name. These names should be used as a reference only. No naming convention is implied, although anyone who creates a **terminfo** entry for a printer should use names consistent with the names found in user documents for the printer. Application developers should allow a user to specify a character set by number (leaving it up to the user to examine the **csnm** string to determine the correct number), or by name, where the application examines the **csnm** string to determine the corresponding character set number.

These capabilities are likely to be used only with dot-matrix printers. If they are not available, the strings should not be defined. For printers that have manually changed print-wheels or font cartridges, the boolean **daisy** is set.

Dot-Matrix Graphics

Dot-matrix printers typically have the capability of reproducing raster graphics images. Three numeric capabilities and three string capabilities help a program draw raster-graphics images independent of the type of dot-matrix printer or the number of pins or dots the printer can handle at one time.

Dot-Matrix Graphics	
npins	Number of pins, *N*, in print-head
spinv	Spacing of pins vertically in pins per inch
spinh	Spacing of dots horizontally in dots per inch
porder	Matches software bits to print-head pins
sbim	Start printing bit image graphics, *B* bits wide
rbim	End printing bit image graphics

The **sbim** sring is used with a single argument, *B*, the width of the image in dots.

The model of dot-matrix or raster-graphics that **terminfo** presents is similar to the technique used for most dot-matrix printers: each pass of the printer's print-head is assumed to produce a dot-matrix that is *N* dots high and *B* dots wide. This is typically a wide, squat, rectangle of dots. The height of this rectangle in dots will vary from one printer to the next; this is given in the **npins** numeric capability. The size of the rectangle in fractions of an inch will also vary; it can be deduced from the **spinv** and **spinh** numeric capabilities. With these three values an application can divide a complete raster-graphics image into several horizontal strips, perhaps interpolating to account for different dot spacing vertically and horizontally.

The **sbim** and **rbim** strings start and end a dot-matrix image, respectively. The **sbim** string is used with a single argument that gives the width of the dot-matrix in dots. A sequence of "image-data bytes" are sent to the printer after the **sbim** string and before the **rbim** string. The number of bytes is a integral multiple of the width of the dot-matrix; the multiple and the form of each byte is determined by the **porder** string as described below.

The **porder** string is a comma separated list of pin numbers optionally followed by an numerical offset. The offset, if given, is separated from the list with a semicolon. The position of each pin number in the list corresponds to a bit in an 8-bit data byte. The pins are numbered consecutively from 1 to **npins**, with 1 being the top pin. Note that the term "pin" is used loosely here; "ink-jet" dot-matrix printers don't have pins, but can be considered to have an equivalent method of applying a single dot of ink to paper. The bit positions in **porder** are in groups of 8, with the first position in each group the most significant bit and the last position the least significant bit. An application produces 8-bit bytes in the order of the groups in **porder**.

An application computes the "image-data bytes" from the internal image, mapping vertical dot positions in each print-head pass into 8-bit bytes, using a 1 bit where ink should be applied and 0 where no ink should be applied. This can be reversed (0 bit for ink, 1 bit for no ink) by giving a negative pin number. If a position is skipped in **porder**, a 0 bit is used. If a position has a lower case 'x' instead of a pin number, a 1 bit is used in the skipped position. For consistency, a lower case 'o' can be used to represent a 0 filled, skipped bit. There must be a multiple of 8 bit

positions used or skipped in **porder**; if not, low-order bits of the last byte are set to 0. The offset, if given, is added to each data byte; the offset can be negative.

Some examples may help clarify the use of the **porder** string. The AT&T; 470, AT&T; 475 and C.Itoh 8510 printers provide eight pins for graphics. The pins are identified top to bottom by the 8 bits in a byte, from least significant to most. The **porder** strings for these printers would be **8,7,6,5,4,3,2,1**. The AT&T; 478 and AT&T; 479 printers also provide eight pins for graphics. However, the pins are identified in the reverse order. The **porder** strings for these printers would be **1,2,3,4,5,6,7,8**. The AT&T; 5310, AT&T; 5320, Digital LA100, and Digital LN03 printers provide six pins for graphics. The pins are identified top to bottom by the decimal values 1, 2, 4, 8, 16 and 32. These correspond to the low six bits in an 8-bit byte, although the decimal values are further offset by the value 63. The **porder** string for these printers would be **,,6,5,4,3,2,1;63,** or alternately **o,o,6,5,4,3,2,1;63**.

Effect of Changing Printing Resolution

If the control sequences to change the character pitch or the line pitch are used, the pin or dot spacing may change:

Changing the Character/Line Pitches	
cpi **cpix**	Change character pitch If set, cpi changes spinh
lpi **lpix**	Change line pitch If set, lpi changes spinv

orhi' and **orhi** are the values of the horizontal resolution in steps per inch, before using **cpi** and after using **cpi**, respectively. Likewise, **orvi**' and **orvi** are the values of the vertical resolution in steps per inch, before using **lpi** and after using **lpi**, respectively. Thus, the changes in the dots per inch for dot-matrix graphics follow the changes in steps per inch for printer resolution.

Print Quality

Many dot-matrix printers can alter the dot spacing of printed text to produce *near-letter-quality* printing or *draft-quality* printing. It is important to be able to choose one or the other because the rate of printing generally decreases as the quality improves. Three strings describe these capabilities:

Print Quality	
snlq	Set near-letter quality print
snrmq	Set normal quality print
sdrfq	Set draft quality print

The capabilities are listed in decreasing levels of quality. If a printer doesn't have all three levels, the respective strings should be left blank.

Printing Rate and Buffer Size

Because there is no standard protocol that can be used to keep a program synchronized with a printer, and because modern printers can buffer data before printing it, a program generally cannot determine at any time what has been printed. Two numeric capabilities can help a program estimate what has been printed.

Print Rate/Buffer Size	
cps	Nominal print rate in characters per second
bufsz	Buffer capacity in characters

cps is the nominal or average rate at which the printer prints characters; if this value is not given, the rate should be estimated at one-tenth the prevailing baud rate. **bufsz** is the maximum number of subsequent characters buffered before the guaranteed printing of an earlier character, assuming proper flow control has been used. If this value is not given it is assumed that the printer does not buffer characters, but prints them as they are received.

As an example, if a printer has a 1000-character buffer, then sending the letter “a” followed by 1000 additional characters is guaranteed to cause the letter “a” to print. If the same printer prints at the rate of 100 characters per second, then it should take 10 seconds to print all the characters in the buffer, less if the buffer is not full. By keeping track of the characters sent to a printer, and knowing the print rate and buffer size, a program can synchronize itself with the printer.

Note that most printer manufacturers advertise the maximum print rate, not the nominal print rate. A good way to get a value to put in for **cps** is to generate a few pages of text, count the number of printable characters, and then see how long it takes to print the text.

Applications that use these values should recognize the variability in the print rate. Straight text, in short lines, with no embedded control sequences will probably print at close to the advertised print rate and probably faster than the rate in **cps**. Graphics data with a lot of control sequences, or very long lines of text, will print at well below the advertised rate and below the rate in **cps**. If the application is using **cps** to decide how long it should take a printer to print a block of text, the application should pad the estimate. If the application is using **cps** to decide how much text has already been printed, it should shrink the estimate. The application will thus err in favor of the user, who wants, above all, to see all the output in its correct place.

Selecting a Terminal

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 by default the path

a/att4424

within an implementation-specific directory.

(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

If that fails, it then checks the default pathname.

This is useful for developing experimental definitions or when write permission in the implementation-defined default database is not available.

Source File Syntax

If the *LINES* and *COLUMNS* environment variables 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**.

Application Usage

The most effective way to prepare a terminal description is by imitating the description of a similar terminal in **terminfo** and to build up a description gradually, using partial descriptions with a screen-oriented editor, to check that they are correct. To easily test a new terminal description the environment variable *TERMINFO* can be set to the pathname of a directory containing the compiled description, and programs will look there rather than in the **terminfo** database.

Conventions for Device Aliases

Every device must be assigned a name, such as **vt100**. Device names (except the long name) should be chosen using the following conventions. The name should not contain hyphens because hyphens are reserved for use when adding suffixes that indicate special modes.

These special modes may be modes that the hardware can be in, or user preferences. To assign a special mode to a particular device, append a suffix consisting of a hyphen and an indicator of the mode to the device name. For example, the **-w** suffix means *wide mode*; when specified, it allows for a width of 132 columns instead of the standard 80 columns. Therefore, if you want to use a vt100 device set to wide mode, name the device **vt100-w**. Use the following suffixes where possible:

Suffix	Meaning	Example
-w	Wide mode (more than 80 columns)	5410-w
-am	With automatic margins (usually default)	vt100-am
-nam	Without automatic margins	vt100-nam
-n	Number of lines on the screen	2300-40
-na	No arrow keys (leave them in local)	c100-na
-np	Number of pages of memory	c100-4p
-rv	Reverse video	4415-rv

Variations of Terminal Definitions

It is implementation-defined how the entries in **terminfo** may be created.

There is more than one way to write a **terminfo** entry. A minimal entry may permit applications to use Curses to operate the terminal. If the entry is enhanced to describe more of the terminal's capabilities, applications can use Curses to invoke those features, and can take advantages of optimizations within Curses and thus operate more efficiently. For most terminals, an optimal **terminfo** entry has already been written.

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Glossary

background. A property of a window that specifies a character (the background character) and a rendition to be used in a variety of situations.

Curses window. Data structures, which can be thought of as two-dimensional arrays of characters that represent screen displays. These data structures are manipulated with Curses functions.

cursor position. The line and column position on the screen denoted by the terminal's cursor.

empty wide-character string. A wide-character string whose first element is a null wide-character code.

erase character. A special input character that deletes the last character in the current line, if there is one.

kill character. A special input character that deletes all data in the current line, if there are any.

null chtype. A chtype with all bits set to zero.

null wide-character code. A wide-character code with all bits set to zero.

pad. A window that is not necessarily associated with a viewable part of a screen.

parent window. A window that has subwindows or derived windows associated with it.

rendition. The rendition of a character displayed on the screen is its attributes !and a color pair.

SCREEN. An opaque Curses data type that is associated with the display screen.

subwindow. A window, created within another window, but positioned relative to that other window. Changes made to a subwindow do not affect its parent window. A derived window differs from a subwindow only in that it is positioned relative to the origin of its parent window. Changes to a parent window will affect both subwindows and derived windows.

touch. To set a flag in a window that indicates that the information in the window could differ from the that displayed on the terminal device.

wide-character code (C language). An integer value corresponding to a single graphic symbol or control code.

wide-character string. A contiguous sequence of wide-character codes terminated by and including the first null wide-character code.

window. A two-dimensional array of characters representing all or part of the terminal screen. The term *window* in this document means one of the data structures maintained by the Curses implementation, unless specified otherwise. (This document does not define the interaction between the Curses implementation and other windowing system paradigms.)

window hierarchy. The aggregate of a parent window and all of its subwindows and derived windows.

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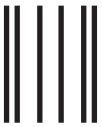

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