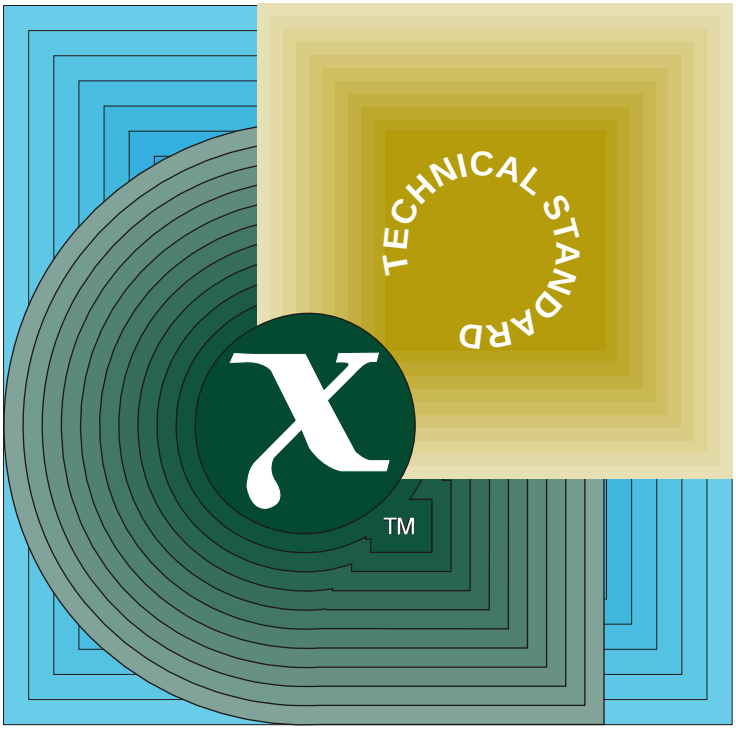
Technical Standard

X/Open Curses
Issue 4, Version 2



THE Open GROUP

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X/Open CAE Specification

X/Open Curses, Issue 4, Version 2

X/Open Company Ltd.

X/Open CAE Specification

X/Open Curses, Issue 4, Version 2

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Preface

X/Open

X/Open is an independent, worldwide, open systems organisation supported by most of the world's largest information systems suppliers, user organisations and software companies. Its mission is to bring to users greater value from computing, through the practical implementation of open systems.

X/Open's strategy for achieving this goal is to combine existing and emerging standards into a comprehensive, integrated, high-value and usable open system environment, called the Common Applications Environment (CAE). This environment covers the standards, above the hardware level, that are needed to support open systems. It provides for portability and interoperability of applications, and so protects investment in existing software while enabling additions and enhancements. It also allows users to move between systems with a minimum of retraining.

X/Open defines this CAE in a set of specifications which include an evolving portfolio of application programming interfaces (APIs) which significantly enhance portability of application programs at the source code level, along with definitions of and references to protocols and protocol profiles which significantly enhance the interoperability of applications and systems.

The X/Open CAE is implemented in real products and recognised by a distinctive trade mark — the X/Open brand — that is licensed by X/Open and may be used on products which have demonstrated their conformance.

X/Open Technical Publications

X/Open publishes a wide range of technical literature, the main part of which is focussed on specification development, but which also includes Guides, Snapshots, Technical Studies, Branding/Testing documents, industry surveys, and business titles.

There are two types of X/Open specification:

- *CAE Specifications*

  CAE (Common Applications Environment) specifications are the stable specifications that form the basis for X/Open-branded products. These specifications are intended to be used widely within the industry for product development and procurement purposes.

  Anyone developing products that implement an X/Open CAE specification can enjoy the benefits of a single, widely supported standard. In addition, they can demonstrate compliance with the majority of X/Open CAE specifications once these specifications are referenced in an X/Open component or profile definition and included in the X/Open branding programme.

  CAE specifications are published as soon as they are developed, not published to coincide with the launch of a particular X/Open brand. By making its specifications available in this way, X/Open makes it possible for conformant products to be developed as soon as is practicable, so enhancing the value of the X/Open brand as a procurement aid to users.

- *Preliminary Specifications*

  These specifications, which often address an emerging area of technology and consequently are not yet supported by multiple sources of stable conformant implementations, are released in a controlled manner for the purpose of validation through implementation of products. A Preliminary specification is not a draft specification. In fact, it is as stable as X/Open can make it, and on publication has gone through the same rigorous X/Open development and review procedures as a CAE specification.

  Preliminary specifications are analogous to the *trial-use* standards issued by formal standards organisations, and product development teams are encouraged to develop products on the basis of them. However, because of the nature of the technology that a Preliminary specification is addressing, it may be untried in multiple independent implementations, and may therefore change before being published as a CAE specification. There is always the intent to progress to a corresponding CAE specification, but the ability to do so depends on consensus among X/Open members. In all cases, any resulting CAE specification is made as upwards-compatible as possible. However, complete upwards-compatibility from the Preliminary to the CAE specification cannot be guaranteed.

In addition, X/Open publishes:

- *Guides*

  These provide information that X/Open believes is useful in the evaluation, procurement, development or management of open systems, particularly those that are X/Open-compliant. X/Open Guides are advisory, not normative, and should not be referenced for purposes of specifying or claiming X/Open conformance.

- *Technical Studies*

  X/Open Technical Studies present results of analyses performed by X/Open on subjects of interest in areas relevant to X/Open's Technical Programme. They are intended to communicate the findings to the outside world and, where appropriate, stimulate discussion and actions by other bodies and the industry in general.

- *Snapshots*

  These provide a mechanism for X/Open to disseminate information on its current direction and thinking, in advance of possible development of a Specification, Guide or Technical Study. The intention is to stimulate industry debate and prototyping, and solicit feedback. A Snapshot represents the interim results of an X/Open technical activity. Although at the time of its publication, there may be an intention to progress the activity towards publication of a Specification, Guide or Technical Study, X/Open is a consensus organisation, and makes no commitment regarding future development and further publication. Similarly, a Snapshot does not represent any commitment by X/Open members to develop any specific products.

Versions and Issues of Specifications

As with all *live* documents, CAE Specifications require revision, in this case as the subject technology develops and to align with emerging associated international standards. X/Open makes a distinction between revised specifications which are fully backward compatible and those which are not:

- a new *Version* indicates that this publication includes all the same (unchanged) definitive information from the previous publication of that title, but also includes extensions or additional information. As such, it *replaces* the previous publication.

- a new *Issue* does include changes to the definitive information contained in the previous publication of that title (and may also include extensions or additional information). As such, X/Open maintains *both* the previous and new issue as current publications.

Corrigenda

Most X/Open publications deal with technology at the leading edge of open systems development. Feedback from implementation experience gained from using these publications occasionally uncovers errors or inconsistencies. Significant errors or recommended solutions to reported problems are communicated by means of Corrigenda.

The reader of this document is advised to check periodically if any Corrigenda apply to this publication. This may be done in any one of the following ways:

- anonymous ftp to ftp.xopen.org
- ftpmail (see below)
- reference to the Corrigenda list in the latest X/Open Publications Price List.

To request Corrigenda information using ftpmail, send a message to ftpmail@xopen.org with the following four lines in the body of the message:

```
open
cd pub/Corrigenda
get index
quit
```

This will return the index of publications for which Corrigenda exist. Use the same email address to request a copy of the full corrigendum information following the email instructions.

This Document

This specification is a CAE Specification (see above) that defines the X/Open Curses interface offered to application programs by X/Open Curses conformant systems. Readers are expected to be experienced C language programmers and to be familiar with the **XBD** specification. This specification is structured as follows:

- Chapter 1 introduces Curses, gives an overview of enhancements that have been made to this version and lists specific interfaces marked TO BE WITHDRAWN. This chapter also defines the requirements for conformance to this document and shows the generic format followed by interface definitions in Chapter 4.
- Chapter 2 describes the relationship between Curses and the C language, the compilation environment, and the X/Open System Interface operating system requirements. It also defines the effect of the interface on the name space for identifiers and introduces the major data types that the interfaces use.
- Chapter 3 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 4. 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 4 defines the Curses functional interfaces.

- Chapter 5 defines the contents of headers which declare constants, macros and data structures that are needed by programs using the services provided by Chapter 4.
- Chapter 6 on page 237 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.
- Appendix A on page 255 discusses the use of these capabilities by the writer of a **terminfo** entry to describe the characteristics of the terminal in use.

The chapters are followed by a glossary, which contains normative definitions of terms used in the document. Comprehensive references are available in the index.

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.
- 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

- Shading is used to identify X/Open Enhanced Curses material, relating to interfaces included to provide enhanced capabilities for applications originally written to be compiled on systems based on the UNIX operating system. Therefore, the features described may not be present on systems that conform to XPG4 or to earlier XPG releases. The relevant reference manual pages may provide additional or more specific portability warnings about use of the material.

  If an entire **SYNOPSIS** section is shaded and marked with one EC, all the functionality described in that entry is an extension.

  The material on pages labelled ENHANCED CURSES and the material flagged with the EC margin legend is available only in cases where the _XOPEN_CURSES version test macro is defined.

Notes:

1. 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>**.
2. The values of errors are defined in **<errno.h>**.

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X/Open® is a registered trade mark, and the ‘‘X’’ device is a trade mark, of X/Open Company Limited.

The names of terminals and of terminal manufacturers cited as examples in Chapter 6 and Appendix A may be trade marks, which are the property of their respective owners.

Acknowledgements

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- Novell, Inc. for permission to reproduce portions of its copyrighted System V Interface Definition (SVID) and material from the UNIX System V Release 4.2 documentation.
- Hewlett-Packard Company, International Business Machines Corporation, Novell Inc., The Open Software Foundation, and Sun Microsystems, Inc., for their work in developing the X/Open UNIX Extension and sponsoring it through the X/Open Direct Review (Fast-track) process.

Referenced Documents

The following documents are referenced in this specification:

ANSI C
: American National Standard for Information Systems: Standard X3.159-1989, Programming Language C. TO BE COMPLETED.

ISO 8859-1
: ISO 8859-1: 1987, Information Processing — 8-bit Single-byte Coded Graphic Character Sets — Part 1: Latin Alphabet No. 1.

ISO / IEC 646
: ISO / IEC 646: 1991, Information Processing — ISO 7-bit Coded Character Set for Information Interchange.

ISO C
: ISO / IEC 9899: 1990: Programming Languages — C, including:
Technical Corrigendum 1: 1994.
Amendment 1: 1994, Multibyte Support Extensions (MSE) for ISO C.
Amendment 1: 1995, C Integrity.

SVID Issue 2
: System V Interface Definition (Spring 1986 - Issue 2).

SVID 3rd Edition
: 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).

System V Release 4.2
: Operating System API Reference, UNIX® SVR4.2 (1992) (ISBN: 0-13-017658-3).

The following X / Open documents are referenced in this specification.

Curses Interface, Issue 3
: X / Open Specification, February 1992, Supplementary Definitions, Issue 3 (ISBN: 1-872630-38-3, C213), Chapters 9 to 14 inclusive, Curses Interface; this specification was formerly X / Open Portability Guide, Issue 3, Volume 3, January 1989, XSI Supplementary Definitions (ISBN: 0-13-685850-3, XO / XPG / 89 / 004).

Curses Interface, Issue 4
: X / Open CAE Specification, December 1994, X / Open Curses, Issue 4 (ISBN: 1-85912-077-6, C437).

Curses Interface, Issue 4, Version 2
: X / Open CAE Specification, May 1996, X / Open Curses, Issue 4, Version 2 (ISBN: 1-85912-171-3, C610). (This document.)

Headers Interface
: X / Open Specification, February 1992, Supplementary Definitions, Issue 3 (ISBN: 1-872630-38-3, C213), Chapter 19, Cpio and Tar Headers; this specification was formerly X / Open Portability Guide Issue 3, Volume 3, January 1989, XSI Supplementary

Definitions (ISBN: 0-13-685850-3, XO / XPG / 89 / 004).

XBD, Issue 4, Version 2
X / Open CAE Specification, August 1994, System Interface Definitions, Issue 4, Version 2 (ISBN: 1-85912-036-9, C434).

XCU, Issue 4, Version 2
X / Open CAE Specification, August 1994, Commands and Utilities, Issue 4, Version 2 (ISBN: 1-85912-034-2, C436).

XSH, Issue 3
X / Open Specification, February 1992, System Interfaces and Headers, Issue 3 (ISBN: 1-872630-37-5, C212); this specification was formerly X / Open Portability Guide, Issue 3, Volume 2, January 1989, XSI System Interface and Headers (ISBN: 0-13-685843-0, XO / XPG / 89 / 003).

XSH, Issue 4
X / Open CAE Specification, July 1992, System Interfaces and Headers, Issue 4 (ISBN: 1-872630-47-2, C202).

XSH, Issue 4, Version 2
X / Open CAE Specification, August 1994, System Interfaces and Headers, Issue 4, Version 2 (ISBN: 1-85912-037-7, C435).

Chapter 1

Introduction

The Curses interface provides a terminal-independent method of updating character screens.

The functions in this document are oriented towards locally-connected asynchronous terminals that recognise the code set of the current locale. For such terminals, applications conforming to this interface are portable. The Curses interface may also be used with synchronous and networked asynchronous terminals, provided the restrictions described in Section 3.9 on page 30 are considered.

1.1 This Document

Is Issue 4, Version 2.

1.1.1 Relationship to Issue 3

The unshaded material in this specification preserves syntactic compatibility with the **Curses** specification, Issue 3, although existing interfaces from the **Curses** specification, Issue 3 have been clarified as a result of industry feedback.

Relationship to Issue 4, Version 1

Version 2 contains corrections and clarifications which have been suggested by industry feedback. In particular, many of the function prototypes have been corrected, and colour handling has been further clarified. The CHANGE HISTORY section of the manpages gives specific detail on when changes were made.

1.1.2 New Features

These are the features first introduced for issue 4.

Internationalisation

This version of the **Curses** specification has been enhanced to support a wide range of internationalised capabilities. Traditional single-byte character operations are preserved, and multi-byte and wide-character interfaces are included to allow use of the Curses features with a wide range of character code sets. The actual code sets supported are implementation-defined.

Enhanced Character Sets

Emerging character-set standards specify characters with a constant width greater than an octet (such as ISO/IEC 10646-1:1993), or multi-byte code sets (such as the ISO 2022:1986 EUC encoding used to encode the Japanese and Chinese language characters).

The previous version of the **Curses** specification was capable of supporting ISO 8859-1. Many traditional implementations only supported ISO 646:1991 and preceding code set specifications, in which the length of a character was an octet.

The primary standardisation issue with the increasing size of a character is that neither the ANS X3.159-1989 or ISO/IEC 9899:1990 C language definition requires the existence of an integral data type greater than 32-bits. Although such data types are commonly defined, X/Open cannot require support for them at this time. The opaque data type **cchar_t** and associated routines address this issue.

Writing Direction

The references to writing direction have been generalised to permit both right-to-left and left-to-right writing. This specification does not specify whether the implementation supports more than one direction of writing. The behaviour of the interfaces in this volume is unspecified if the writing direction is vertical, or if the writing direction is horizontal with row height greater than one.

Wide and Non-spacing Characters

New interfaces are introduced for use with wide characters and wide character strings. The traditional single-byte character string interfaces have been made more general for use with multi-byte character strings. The traditional **chtype** interfaces note that they are usable only in restricted environments and do not support extensible attributes. The behaviour of the **chtype** interfaces in this volume is unspecified if the **char** data type is greater than 8 bits, or if any single byte character takes more than one display column, or if the application or implementation stores a multi-byte or wide-character value into a **chtype** object.

A new, extensible attribute model has been provided for wide-character interfaces. The display model has been generalised to support both multi-column characters and non-spacing characters. The concept of a complex character is introduced.

Other Enhancements

New interfaces and capabilities are introduced to support colour terminals, printers, modems and mice.

1.1.3 To Be Withdrawn

Some of the interfaces and headers in this issue are marked **TO BE WITHDRAWN**. Various factors may have contributed to the decision to withdraw an interface. In all cases, the reasons for withdrawal of an interface are documented on the relevant pages.

If a migration path exists, advice is given to application developers regarding alternative means of obtaining similar functionality. This information may be found in the **APPLICATION USAGE** sections on the relevant pages in Chapter 4.

Interfaces marked **TO BE WITHDRAWN** shall still exist on conformant implementations. However, they will be marked **WITHDRAWN** in a future issue of this document. Interfaces marked **WITHDRAWN** may still exist on conformant implementations.

Application writers should not use functionality marked **TO BE WITHDRAWN**.

The following interfaces are marked **TO BE WITHDRAWN** in this document:

Headers and Interfaces To Be Withdrawn			
tgetent( )	*tgetnum*( )	*tgoto*( )	*vwscanw*( )
tgetflag( )	*tgetstr*( )	*vwprintw*( )	

1.1.4 Withdrawn

No interfaces or headers in this issue are marked **WITHDRAWN**.

1.2 Conformance

An implementation conforming to this document shall meet the requirements specified by Base Curses conformance (see Section 1.2.1) or by Enhanced Curses conformance (see Section 1.2.2).

1.2.1 Base Curses Conformance

An implementation that claims Base Curses conformance shall meet the following criteria:

- The system shall support all the interfaces and headers defined within this specification except that it need not support those occurring on pages labelled ENHANCED CURSES and in shaded areas of this specification marked with the EC margin legend.
- The **chtype** data type shall support at least octet-based code sets, such as ISO 8859-1.
- The system may provide additional or enhanced interfaces, headers and facilities not required by this specification, provided that such additions or enhancements do not affect the behaviour of an application that requires only the facilities described in this document.

1.2.2 Enhanced Curses Conformance

An implementation that claims Enhanced Curses conformance shall meet the following criteria:

- The system shall support Base Curses conformance as defined above.
- The system shall support the requirements in this specification occurring on pages labelled ENHANCED CURSES and in shaded areas of this specification marked with the EC margin legend.
- The system may provide additional or enhanced interfaces, headers and facilities not required by this specification, provided that such additions or enhancements do not affect the behaviour of an application that requires only the facilities described in this document.

1.3 Terminology

The following terms are used in this specification:

can
This describes a permissible optional feature or behaviour available to the user or application; all systems support such features or behaviour as mandatory requirements.

implementation-dependent
The value or behaviour is not consistent across all implementations. The provider of an implementation normally documents the requirements for correct program construction and correct data in the use of that value or behaviour. When the value or behaviour in the implementation is designed to be variable or customisable on each instantiation of the system, the provider of the implementation normally documents the nature and permissible ranges of this variation. Applications that are intended to be portable must not rely on implementation-dependent values or behaviour.

may
With respect to implementations, the feature or behaviour is optional. Applications should not rely on the existence of the feature. To avoid ambiguity, the reverse sense of *may* is expressed as *need not*, instead of *may not*.

must
This describes a requirement on the application or user.

obsolescent
Certain features are *obsolescent*, which means that they may be considered for withdrawal in future revisions of this document. They are retained in this version because of their widespread use. Their use in new applications is discouraged.

should
With respect to implementations, the feature is recommended, but it is not mandatory. Applications should not rely on the existence of the feature.

With respect to users or applications, the word means recommended programming practice that is necessary for maximum portability.

undefined
A value or behaviour is undefined if this document imposes no portability requirements on applications for erroneous program constructs or erroneous data. Implementations may specify the result of using that value or causing that behaviour, but such specifications are not guaranteed to be consistent across all implementations. An application using such behaviour is not fully portable to all systems.

unspecified
A value or behaviour is unspecified if this document imposes no portability requirements on applications for correct program construct or correct data. Implementations may specify the result of using that value or causing that behaviour, but such specifications are not guaranteed to be consistent across all implementations. An application requiring a specific behaviour, rather than tolerating any behaviour when using that functionality, is not fully portable to all systems.

will
This means that the behaviour described is a requirement on the implementation and applications can rely on its existence.

1.3.1 Shaded Text

Shaded text in this document is qualified by a code in the left margin. The code and its meaning is as follows:

EC X/Open Enhanced Curses
The material relates to interfaces included to provide enhanced capabilities for applications originally written to be compiled on systems based on the UNIX operating system. Therefore, the features described may not be present on systems that conform to XPG4 or to earlier XPG releases. The relevant reference manual pages may provide additional or more specific portability warnings about use of the material.

If an entire **SYNOPSIS** section is shaded and marked with one EC, all the functionality described in that entry is an extension.

The material on pages labelled ENHANCED CURSES and the material flagged with the EC margin legend is available only in cases where the _XOPEN_CURSES version test macro is defined.

1.4 Format of Entries

The entries in Chapter 4 and Chapter 5 are based on a common format.

NAME
This section gives the name or names of the entry and briefly states its purpose.

SYNOPSIS
This section summarises the use of the entry being described. If it is necessary to include a header to use this interface, the names of such headers are shown, for example:

```
#include <stdio.h>
```

DESCRIPTION
This section describes the functionality of the interface or header.

RETURN VALUE
This section indicates the possible return values, if any.

If the implementation can detect errors, ''successful completion'' means that no error has been detected during execution of the function. If the implementation does detect an error, the error will be indicated.

For functions where no errors are defined, ''successful completion'' means that if the implementation checks for errors, no error has been detected. If the implementation can detect errors, and an error is detected, the indicated return value will be returned and *errno* may be set.

ERRORS
This section gives the symbolic names of the values returned in *errno* if an error occurs.

''No errors are defined'' means that values and usage of *errno*, if any, depend on the implementation.

EXAMPLES
This section gives examples of usage, where appropriate.

APPLICATION USAGE
This section gives warnings and advice to application writers about the entry.

FUTURE DIRECTIONS
This section provides comments which should be used as a guide to current thinking; there is not necessarily a commitment to adopt these future directions.

SEE ALSO
This section gives references to related information.

CHANGE HISTORY
This section shows the derivation of the entry and any significant changes that have been made to it.

The only sections relating to conformance are the **SYNOPSIS**, **DESCRIPTION**, **RETURN VALUE** and **ERRORS** sections.

Chapter 2

Use and Implementation of Interfaces

Each of the following statements applies unless explicitly stated otherwise in the detailed descriptions that follow. If an argument to a function has an invalid value (such as a value outside the domain of the function, or a pointer outside the address space of the program, or a null pointer), the behaviour is undefined. Any function declared in a header may also be implemented as a macro defined in the header, so a library function should not be declared explicitly if its header is included. Any macro definition of a function can be suppressed locally by enclosing the name of the function in parentheses, because the name is then not followed by the left parenthesis that indicates expansion of a macro function name. For the same syntactic reason, it is permitted to take the address of a library function even if it is also defined as a macro. The use of the C-language **#undef** construct to remove any such macro definition will also ensure that an actual function is referred to. Any invocation of a library function that is implemented as a macro will expand to code that evaluates each of its arguments exactly once, fully protected by parentheses where necessary, so it is generally safe to use arbitrary expressions as arguments. Likewise, those function-like macros described in the following sections may be invoked in an expression anywhere a function with a compatible return type could be called.

Provided that a library function can be declared without reference to any type defined in a header, it is also permissible to declare the function, either explicitly or implicitly, and use it without including its associated header. If a function that accepts a variable number of arguments is not declared (explicitly or by including its associated header), the behaviour is undefined.

As a result of changes introduced in this version of the **Curses** specification, application writers are only required to include the minimum number of headers. Implementations of XSI-conformant systems will make all necessary symbols visible as described in the Headers section of this document.

2.1 C Language Definition

The C language that is the basis for the synopses and code examples in this document is *ISO C*, as specified in the referenced ISO C standard. *Common Usage C*, which refers to the C language before standardisation, was the basis for previous editions of this specification.

2.2 The Compilation Environment

Applications should ensure that the feature test macro _XOPEN_SOURCE is defined before inclusion of any header. This is needed to enable the functionality described in this document, and possibly to enable functionality defined elsewhere in the Common Applications Environment.

The _XOPEN_SOURCE macro may be defined automatically by the compilation process, but to ensure maximum portability, applications should make sure that _XOPEN_SOURCE is defined by using either compiler options or **#define** directives in the source files, before any **#include** directives. Identifiers in this document may only be undefined using the **#undef** directive as described in Chapter 2 on page 7 or Section 2.2.1 on page 9. These **#undef** directives must follow all **#include** directives of any XSI headers.

Most strictly conforming POSIX and ISO C applications will compile on systems compliant to this specification. However, an application which uses any of the items marked as an extension to POSIX and ISO C, for any purpose other than that shown here, may not compile. In such cases, it may be necessary to alter those applications to use alternative identifiers.

Since this document is aligned with the ISO C standard, and since all functionality enabled by the _POSIX_C_SOURCE set equal to 2 should be enabled by _XOPEN_SOURCE, there should be no need to define either _POSIX_SOURCE or _POSIX_C_SOURCE if _XOPEN_SOURCE is defined. Therefore if _XOPEN_SOURCE is defined and _POSIX_SOURCE is defined, or _POSIX_C_SOURCE is set equal to 1 or 2, the behaviour is the same as if only _XOPEN_SOURCE is defined. However should _POSIX_C_SOURCE be set to a value greater than 2, the behaviour is undefined.

The *c89* and *cc* utilities recognise the additional **–l** operand for standard libraries:

–l curses This operand makes visible all library functions referenced in this specification, (except for those labelled ENHANCED CURSES and except for portions marked with the EC margin legend).

EC If the implementation defines _XOPEN_CURSES and if the application defines the _XOPEN_SOURCE_EXTENDED feature test macro, then **-l curses** also makes visible all library functions referenced in this specification and labelled ENHANCED CURSES and portions marked with the EC margin legend.

It is unspecified whether the library **libcurses.a** exists as a regular file.

EC An application that uses any API specified as ENHANCED CURSES or relies on any portion of this specification marked with the EC margin legend must define _XOPEN_SOURCE_EXTENDED = 1 in each source file or as part of its compilation environment. When _XOPEN_SOURCE_EXTENDED = 1 is defined in a source file, it must appear before any header is included.

If the implementation supports the utilities marked **DEVELOPMENT** in the **XCU** specification, the *lint* utility recognises the additional **–l curses** operand for standard libraries:

–l curses Names the library **llib-lcurses.ln**, which will contain functions specified in this document.

It is unspecified whether the library **llib-lcurses.ln** exists as a regular file.

2.2.1 The X/Open Name Space (ENHANCED CURSES)

EC The requirements in this section are in effect only for implementations that claim Enhanced Curses compliance.

All identifiers in this document are defined in at least one of the headers, as shown in Chapter 5. When _XOPEN_SOURCE is defined, each header defines or declares some identifiers, potentially conflicting with identifiers used by the application. The set of identifiers visible to the application consists of precisely those identifiers from the header pages of the included headers, as well as additional identifiers reserved for the implementation. In addition, some headers may make visible identifiers from other headers as indicated on the relevant header pages.

The identifiers reserved for use by the implementation are described below.

1. Each identifier with external linkage described in the header section is reserved for use as an identifier with external linkage if the header is included.
2. Each macro name described in the header section is reserved for any use if the header is included.
3. Each identifier with file scope described in the header section is reserved for use as an identifier with file scope in the same name space if the header is included.
4. All identifiers consisting of exactly 2 upper-case letters.

If any header is included, identifiers with the **_t** suffix are reserved for any use by the implementation.

If any header in the following table is included, macros with the prefixes shown may be defined. After the last inclusion of a given header, an application may use identifiers with the corresponding prefixes for its own purpose, provided their use is preceded by an **#undef** of the corresponding macro.

Header	**Prefix**
<curses.h>	A_, ACS_, ALL_, BUTTON, COLOR_, KEY_, MOUSE, REPORT_, WA_, WACS_
<term.h>	ext_

The following identifiers are reserved regardless of the inclusion of headers:

1. All identifiers that begin with an underscore and either an upper-case letter or another underscore are always reserved for any use by the implementation.
2. All identifiers that begin with an underscore are always reserved for use as identifiers with file scope in both the ordinary identifier and tag name spaces.
3. All identifiers listed as reserved in the **XSH** specification are reserved for use as identifiers with external linkage.

All the identifiers defined in this document that have external linkage are always reserved for use as identifiers with external linkage.

No other identifiers are reserved.

Applications must not declare or define identifiers with the same name as an identifier reserved in the same context. Since macro names are replaced whenever found, independent of scope and name space, macro names matching any of the reserved identifier names must not be defined if any associated header is included.

Headers may be included in any order, and each may be included more than once in a given scope, with no difference in effect from that of being included only once.

If used, a header must be included outside of any external declaration or definition, and it must be first included before the first reference to any type or macro it defines, or to any function or object it declares. However, if an identifier is declared or defined in more than one header, the second and subsequent associated headers may be included after the initial reference to the identifier. Prior to the inclusion of a header, the program must not define any macros with names lexically identical to symbols defined by that header.

2.2.2 Interfaces Implemented as Macros (ENHANCED CURSES)

EC The requirements in this section are in effect only for implementations that claim Enhanced Curses compliance.

The following interfaces with arguments must be implemented as macros. The relevance to the application programmer is that the '&' character cannot be used before the arguments.

Macros	Chapter 4 Entry
COLOR_PAIR( ), PAIR_NUMBER( )	*can_change_color( )*
getbegyx( ), *getmaxyx*( ), *getparyx*( ), *getyx*( )	*getbegyx( )*

The descriptions of headers in Chapter 5 list other macros, like COLOR_BLACK, that do not take arguments.

2.3 Relationship to the XSH Specification

2.3.1 Error Numbers

Most functions provide an error number in *errno*, which is either a variable or macro defined in **<errno.h>**; the macro expands to a modifiable **lvalue** of type **int**.

A list of valid values for *errno* and advice to application writers on the use of *errno* appears in the **XSH** specification.

2.4 Data Types

All of the data types used by Curses functions are defined by the implementation. The following list describes these types:

EC **attr_t** An integral type that can contain at least an **unsigned short**. The type **attr_t** is used to hold an OR-ed set of attributes defined in **<curses.h>** that begin with the prefix WA_.

bool Boolean data type

chtype An integral type that can contain at least an **unsigned char** and attributes. Values of type **chtype** are formed by OR-ing together an **unsigned char** value and zero or more of the base attribute flags defined in **<curses.h>** on page 220 that have the A_ prefix. The application can extract these components of a **chtype** value using the base masks defined in **<curses.h>** for this purpose.

EC The **chtype** data type also contains a colour-pair. Values of type **chtype** are formed by OR-ing together an **unsigned char** value, a colour pair, and zero or more of the attributes defined in **<curses.h>** that begin with the prefix A_. The application can extract these components of a **chtype** value using the masks defined in **<curses.h>** for this purpose.

SCREEN An opaque terminal representation.

EC **wchar_t** As described in **<stddef.h>**.

EC **cchar_t** A type that can reference a string of wide characters of up to an implementation-dependent length, a colour-pair, and zero or more attributes from the set of all attributes defined in this document. A null **cchar_t** object is an object that references a empty wide-character string. Arrays of **cchar_t** objects are terminated by a null **cchar_t** object.

WINDOW An opaque window representation.

Chapter 3

Interface Overview

3.1 Components

A Curses initialisation function, usually *initscr*( ), determines the terminal model in use, by reference to either an argument or an environment variable. If that model is defined in **terminfo**, then the same **terminfo** entry tells Curses exactly how to operate the terminal.

In this case, a comprehensive API lets the application perform terminal operations. The Curses run-time system receives each terminal request and sends appropriate commands to the terminal to achieve the desired effect.

Relationship to the XBD Specification

Applications using Curses should not also control the terminal using capabilities of the general terminal interface defined in the **XBD** specification, Chapter 9, **General Terminal Interface**.

There is no requirement that the paradigms that exist while in Curses mode be carried over outside the Curses environment (see *def_prog_mode*( ) on page 66).

Relationship to Signals

Curses implementations may provide for special handling of the SIGINT, SIGQUIT and SIGTSTP signals if their disposition is SIGDFL at the time *initscr*( ) is called (see *initscr*( ) on page 115).

Any special handling for these signals may remain in effect for the life of the process or until the process changes the disposition of the signal.

None of the Curses functions are required to be safe with respect to signals (see *sigaction*( ) in the **XSH** specification).

The behaviour of Curses with respect to signals not defined by the **XSH** specification is unspecified.

3.2 Screens, Windows and Terminals

Screen

A screen is the physical output device of the terminal. In Curses, a **SCREEN** data type is an opaque data type associated with a terminal. Each window (see below) is associated with a **SCREEN**.

Windows

The Curses functions permit manipulation of *window* objects, which can be thought of as two-dimensional arrays of characters and their renditions. A default window called *stdscr*, which is the size of the terminal screen, is supplied. Others may be created with *newwin*( ).

Variables declared as **WINDOW *** refer to windows (and to subwindows, derived windows, and pads, as described below). These data structures are manipulated with functions described on the reference manual pages in Chapter 6. Among the most basic functions are *move*( ) and *addch*( ). More general versions of these functions are included that allow a process to specify a window.

After using functions to manipulate a window, *refresh*( ) is called, telling Curses to make the CRT screen look like *stdscr*.

Line drawing characters may be specified to be output. On input, Curses is also able to translate arrow and function keys that transmit escape sequences into single values. The line drawing characters and input values use names defined in **<curses.h>**.

Each window has a flag that indicates that the information in the window could differ from the information displayed on the terminal device. Making any change to the contents of the window, moving or modifying the window, or setting the window's cursor position, sets this flag (*touches* the window). Refreshing the window clears this flag. (For further information, see *is_linetouched*( ) on page 133.)

Subwindows

A *subwindow* is a window, created within another window (called the *parent window*), and positioned relative to the parent window. A subwindow can be created by calling *derwin*( ), *newpad*( ) or *subwin*( ).

Subwindows can be created from a parent window by calling *subwin*( ). The position and size of subwindows on the screen must be identical to or totally within the parent window. Changes to either the parent window or the subwindow affect both. Window clipping is not a property of subwindows.

Ancestors

The term *ancestor* refers to a window's parent, or its parent, and so on.

Derived Windows

Derived windows are subwindows whose position is defined by reference to the parent window rather than in absolute screen coordinates. Derived windows are otherwise no different from subwindows.

Pads

A pad is a specialised case of subwindow that is not necessarily associated with a viewable part of a screen. Functions that deal with pads are all discussed in *newpad*( ) on page 150.

Terminal

A terminal is the logical input and output device through which character-based applications interact with the user. **TERMINAL** is an opaque data type associated with a terminal. A **TERMINAL** data structure primarily contains information about the capabilities of the terminal, as defined by **terminfo**. A **TERMINAL** also contains information about the terminal modes and current state for input and output operations. Each screen (see above) is associated with a **TERMINAL**.

3.3 Characters

3.3.1 Character Storage Size

Historically, a position on the screen has corresponded to a single stored byte. This correspondence is no longer true for several reasons:

- Some characters may occupy several columns when displayed on the screen (see Section 3.3.2).
- Some characters may be non-spacing characters, defined only in association with a spacing character (see Section 3.3.5 on page 17).
- The number of bytes to hold a character from the extended character sets depends on the LC_CTYPE locale category.

The internal storage format of characters and renditions is unspecified. There is no implied correspondence between the internal storage format and the external representation of characters and renditions in objects of type **chtype** and **cchar_t**.

3.3.2 Multi-column Characters

EC Some character sets define *multi-column characters* that occupy more than one column position when displayed on the screen.

Writing a character whose width is greater than the width of the destination window is an error.

3.3.3 Attributes

Each character can be displayed with *attributes* such as underlining, reverse video or colour on terminals that support such display enhancements. Current attributes of a window are applied to all characters that are written into the window with *waddch*( ), *wadd_wch*( ), *waddstr*( ), *waddchstr*( ), *waddwstr*( ), *waddwchstr*( ) and *wprintw*( ). Attributes can be combined.

Attributes can be specified using constants with the A_ prefix specified in **<curses.h>**. The A_
EC constants manipulate attributes in objects of type **chtype**. Additional attributes can be specified using constants with the WA_ prefix. The WA_ constants manipulate attributes in objects of type **attr_t**.

Two constants that begin with A_ and WA_ and that represent the same terminal capability refer to the same attribute in the **terminfo** database and in the window data structure. The effect on a window does not differ depending on whether the application specifies A_ or WA_ constants. For example, when an application updates window attributes using the interfaces that support the A_ values, a query of the window attribute using the function that returns WA_ values reflects this update. When it updates window attributes using the interfaces that support the WA_ values, for which corresponding A_ values exist, a query of the window attribute using the function that returns A_ values reflects this update.

3.3.4 Rendition

EC The *rendition* of a character displayed on the screen is its attributes and a colour pair.

The rendition of a character written to the screen becomes a property of the character and moves with the character through any scrolling and insert/delete line/character operations. To the extent possible on a particular terminal, a character's rendition corresponds to the graphic rendition of the character put on the screen.

If a given terminal does not support a rendition that an application program is trying to use, Curses may substitute a different rendition for it.

EC Colours are always used in pairs (referred to as colour-pairs). A colour-pair consists of a foreground colour (for characters) and a background colour (for the field on which the characters are displayed).

3.3.5 Non-spacing Characters

EC The requirements in this section are in effect only for implementations that claim Enhanced Curses compliance.

Some character sets may contain *non-spacing* characters. (Non-spacing characters are those, other than the '\0' character, for which *wcwidth*( ) returns a width of zero.) The application may write non-spacing characters to a window. Every non-spacing character in a window is associated with a spacing character and modifies the spacing character. Non-spacing characters in a window cannot be addressed separately. A non-spacing character is implicitly addressed whenever a Curses operation affects the spacing character with which the non-spacing character is associated.

Non-spacing characters do not support attributes. For interfaces that use wide characters and attributes, the attributes are ignored if the wide character is a non-spacing character. Multi-column characters have a single set of attributes for all columns. The association of non-spacing characters with spacing characters can be controlled by the application using the wide character interfaces. The wide character string functions provide codeset-dependent association.

Two typical effects of a non-spacing character associated with a spacing character called *c*, are as follows:

- The non-spacing character may modify the appearance of *c*. (For instance, there may be non-spacing characters that add diacritical marks to characters. However, there may also be spacing characters with built-in diacritical marks.)
- The non-spacing character may bridge *c* to the character following *c*. (Examples of this usage are the formation of ligatures and the conversion of characters into compound display forms, words, or ideograms.)

Implementations may limit the number of non-spacing characters that can be associated with a spacing character, provided any limit is at least 5.

Complex Characters

A *complex character* is a set of associated characters, which may include a spacing character and may include any non-spacing characters associated with it. A *spacing complex character* is a spacing character followed by any non-spacing characters associated with it. That is, a spacing complex character is a complex character that includes one spacing character. An example of a code set that has complex characters is ISO/IEC 10646-1:1993.

A complex character can be written to the screen; if it does not include a spacing character, any non-spacing characters are associated with the spacing complex character that exists at the

specified screen position. When the application reads information back from the screen, it obtains spacing complex characters.

The **cchar_t** data type represents a complex character and its rendition. When a **cchar_t** represents a non-spacing complex character (that is, when there is no spacing character within the complex character), then its rendition is not used; when it is written to the screen, it uses the rendition specified by the spacing character already displayed.

An object of type **cchar_t** can be initialised using *setcchar*( ) and its contents can be extracted using *getcchar*( ). The behaviour of functions that take a **cchar_t** input argument is undefined if the application provides a **cchar_t** value that was not initialised in this way or obtained from a Curses function that has a **cchar_t** output argument.

3.3.6 Window Properties

Associated with each window are the following properties that affect the placing of characters into the window (see Section 3.4.4 on page 22).

Window Rendition

Each window has a rendition, which is combined with the rendition component of the window's background property described below.

Window Background

Each window has a background property. The background property specifies:

- A spacing complex character (the background character) that will be used in a variety of situations where visible information is deleted from the screen.
- A rendition to use in displaying the background character in those situations, and in other situations specified in Section 3.4.4 on page 22.

3.4 Conceptual Operations

3.4.1 Screen Addressing

Many Curses functions use a coordinate pair. In the **DESCRIPTION**, coordinate locations are represented as (*y*, *x*) since the *y* argument always precedes the *x* argument in the function call. These coordinates denote a line/column position, not a character position.

The coordinate *y* always refers to the row (of the window), and *x* always refers to the column. The first row and the first column is number 0, not 1. The position (0, 0) is the window's *origin*.

For example, for terminals that display the ISO 8859-1 character set (with left-to-right writing), (0, 0) represents the upper left-hand corner of the screen.

Functions that start with *mv* take arguments that specify a (*y*, *x*) position and move the cursor (as though *move*( ) were called) before performing the requested action. As part of the requested action, further cursor movement may occur, specified on the respective reference manual page.

3.4.2 Basic Character Operations

Adding (Overwriting)

The Curses functions that contain the word add, such as *addch*( ), actually specify one or more
EC characters to replace (overwrite) characters already in the window. If these functions specify only non-spacing characters, they are appended to a spacing character already in the window; see also Section 3.3.5 on page 17.

When replacing a multi-column character with a character that requires fewer columns, the new character is added starting at the specified or implied column position. All columns that the former multi-column character occupied that the new character does not require are *orphaned columns*, which are filled using the background character and rendition.

Replacing a character with a character that requires more columns also replaces one or more subsequent characters on the line. This process may also produce orphaned columns.

Truncation, Wrapping and Scrolling

If the application specifies a character or a string of characters such that writing them to a
EC window would extend beyond the end of the line (for example, if the application tries to deposit any multi-column character at the last column in a line), the behaviour depends on whether the function supports line wrapping:

- If the function does not wrap, it fails.
- If the function wraps, then it places one or more characters in the window at the start of the next line, beginning with the first character that would not completely fit on the original line.

EC If the final character on the line is a multi-column character that does not completely fit on the line, the entire character wraps to the next line and columns at the end of the original line may be orphaned.

If the original line was the last line in the window, the wrap may cause a scroll to occur:

— If scrolling is enabled, a scroll occurs. The contents of the first line of the window are lost. The contents of each remaining line in the window move to the previous line. The last line of the window is filled with any characters that wrapped. Any remaining space on the last line is filled with the background character and rendition.

— If scrolling is disabled, any characters that would extend beyond the last column of the last line are truncated.

The *scrollok*( ) function enables and disables scrolling.

Some *add* functions move the cursor just beyond the end of the last character added. If this position is beyond the end of a line, it causes wrapping and scrolling under the conditions specified in the second bullet above.

Insertion

Insertion functions (such as *insch*( )) insert characters immediately before the character at the specified or implied cursor position.

The insertion shifts all characters that were formerly at or beyond the cursor position on the cursor line toward the end of that line. The disposition of the characters that would thus extend beyond the end of the line depends on whether the function supports wrapping:

- If the function does not wrap, those characters are removed from the window. This may produce orphaned columns.
- If the function supports wrapping, the effect is as described above in **Truncation, Wrapping and Scrolling** on page 19 (except that the overwriting discussed in the final dash is an insertion).

EC If multi-column characters are displayed, some cursor positions are within a multi-column character but not at the beginning of a character. Any request to insert data at a position that is not the beginning of a multi-column character will be adjusted so that the actual cursor position is at the beginning of the multi-column character in which the requested position occurs.

There are no warning indications relative to cursor relocation. The application should not maintain an image of the cursor position, since this constitutes placing terminal-specific information in the application and defeats the purpose of using Curses.

Portable applications cannot assume that a cursor position specified in an insert function is a reusable indication of the actual cursor position.

Deletion

EC Deletion functions (such as *delch*( )) delete the simple or complex character at the specified or
EC implied cursor position, no matter which column of the character this is. All column positions are replaced by the background character and rendition and the cursor is not relocated. If a character-deletion operation would cause a previous wrapping operation to be undone, then the results are unspecified.

Window Operations

Overlapping a window (that is, placing one window on top of another) and overwriting a window (that is, copying the contents of one window into another) follows the operation of
EC overwriting multi-column glyphs around its edge. Any orphaned columns are handled as in the character operations.

Characters that Straddle the Subwindow Border

EC A subwindow can be defined such that multi-column characters straddle the subwindow border. The character operations deal with these straddling characters as follows:

- Reading the subwindow with a function such as *in_wch*( ) reads the entire straddling character.
- Adding, inserting or deleting in the subwindow deletes the entire straddling character before the requested operation begins and does not relocate the cursor.
- Scrolling lines in the subwindow has the following effects:
  - — A straddling character at the start of the line is completely erased before the scroll operation begins.
  - — A straddling character at the end of the line moves in the direction of the scroll and continues to straddle the subwindow border. Column positions outside the subwindow at the straddling character's former position are orphaned unless another straddling character scrolls into those positions.

If the application calls a function such as *border*( ), the above situations do not occur because writing the border on the subwindow deletes any straddling characters.

In the above cases involving multi-column characters, operations confined to a subwindow can modify the screen outside the subwindow. Therefore, saving a subwindow, performing operations within the subwindow, and then restoring the subwindow may disturb the appearance of the screen. To overcome these effects (for example, for pop-up windows), the application should refresh the entire screen.

3.4.3 Special Characters

Some functions process special characters as specified below.

In functions that do not move the cursor based on the information placed in the window, these special characters would only be used within a string in order to affect the placement of subsequent characters; the cursor movement specified below does not persist in the visible cursor beyond the end of the operation. In functions that do move the cursor, these special characters can be used to affect the placement of subsequent characters and to achieve movement of the visible cursor.

<backspace> Unless the cursor was already in column 0, <backspace> moves the cursor one column toward the start of the current line and any characters after the <backspace> are added or inserted starting there.

<carriage return>
Unless the cursor was already in column 0, <carriage return> moves the cursor to the start of the current line. Any characters after the <carriage return> are added or inserted starting there.

<newline> In an add operation, Curses adds the background character into successive columns until reaching the end of the line. Scrolling occurs as described in **Truncation, Wrapping and Scrolling** on page 19. Any characters after the <newline> character are added, starting at the start of the new line.

In an insert operation, <newline> erases the remainder of the current line with the background character, effectively a *wclrtoeol*( ), and moves the cursor to the start of a new line. When scrolling is enabled, advancing the cursor to a new line may cause scrolling as described in **Truncation, Wrapping and Scrolling** on page 19.

Any characters after the <newline> character are inserted at the start of the new line.

The *filter*( ) function may inhibit this processing.

<tab> Tab characters in text move subsequent characters to the next horizontal tab stop. By default, tab stops are in column 0, 8, 16, and so on.

In an insert or add operation, Curses inserts or adds, respectively, the background character into successive columns until reaching the next tab stop. If there are no more tab stops in the current line, wrapping and scrolling occur as described in **Truncation, Wrapping and Scrolling** on page 19.

Control Characters

The Curses functions that perform special-character processing conceptually convert control characters to the caret ('^') character followed by a second character (which is an upper-case letter if it is alphabetic) and write this string to the window in place of the control character. The functions that retrieve text from the window will not retrieve the original control character.

3.4.4 Rendition of Characters Placed into a Window

When the application adds or inserts characters into a window, the effect is as follows:

If the character is not the space character, then the window receives:

- the character that the application specifies
- the colour that the application specifies; or the window colour, if the application does not specify a colour
- the attributes specified, OR-ed with the window attributes.

If the character is the space character, then the window receives:

- the background character
- the colour that the application specifies; or the window colour, if the application does not specify a colour
- the attributes specified, OR-ed with the window attributes.

3.5 Input Processing

The Curses input model provides a variety of ways to obtain input from the keyboard.

3.5.1 Keypad Processing

The application can enable or disable *keypad translation* by calling *keypad*( ). When translation is enabled, Curses attempts to translate a sequence of terminal input that represents the pressing of a function key into a single key code. When translation is disabled, Curses passes terminal input to the application without such translation, and any interpretation of the input as representing the pressing of a keypad key must be done by the application.

The complete set of key codes for keypad keys that Curses can process is specified by the constants defined in **<curses.h>** whose names begin with ''KEY_''.

EC Each terminal type described in the **terminfo** database may support some or all of these key codes. The **terminfo** database specifies the sequence of input characters from the terminal type that correspond to each key code (see Section A.1.8 on page 262).

The Curses implementation cannot translate keypad keys on terminals where pressing the keys does not transmit a unique sequence.

When translation is enabled and a character that could be the beginning of a function key (such as escape) is received, Curses notes the time and begins accumulating characters. If Curses receives additional characters that represent the pressing of a keypad key, within an unspecified interval from the time the first character was received, then Curses converts this input to a key code for presentation to the application. If such characters are not received during this interval, translation of this input does not occur and the individual characters are presented to the application separately. (Because Curses waits for this interval to accumulate a key code, many terminals experience a delay between the time a user presses the escape key and the time the escape is returned to the application.)

EC In addition, No Timeout Mode provides that in any case where Curses has received part of a function key sequence, it waits indefinitely for the complete key sequence. The ''unspecified interval'' in the previous paragraph becomes infinite in No Timeout Mode. No Timeout Mode allows the use of function keys over slow communication lines. No Timeout Mode lets the user type the individual characters of a function key sequence, but also delays application response when the user types a character (not a function key) that begins a function key sequence. For this reason, in No Timeout Mode many terminals will appear to hang between the time a user presses the escape key and the time another key is pressed. No Timeout Mode is switchable by calling *notimeout*( ).

If any special characters (see Section 3.4.3 on page 21) are defined or redefined to be characters that are members of a function key sequence, then Curses will be unable to recognise and translate those function keys.

Several of the modes discussed below are described in terms of availability of input. If keypad translation is enabled, then input is not available once Curses has begun receiving a keypad sequence until the sequence is completely received or the interval has elapsed.

3.5.2 Input Mode

The **XBD** specification (**Special Characters**) defines flow-control characters, the interrupt character, the erase character, and the kill character. Four mutually-exclusive Curses modes let the application control the effect of these input characters:

Input Mode	Effect
Cooked Mode	This achieves normal line-at-a-time processing with all special characters handled outside the application. This achieves the same effect as canonical-mode input processing as specified in the **XBD** specification. The state of the ISIG and IXON flags are not changed upon entering this mode by calling *nocbreak*( ), and are set upon entering this mode by calling *noraw*( ).
EC	The implementation supports erase and kill characters from any supported locale, no matter what the width of the character is.
cbreak Mode	Characters typed by the user are immediately available to the application and Curses does not perform special processing on either the erase character or the kill character. An application can select *cbreak* mode to do its own line editing but to let the abort character be used to abort the task. This mode achieves the same effect as non-canonical-mode, Case B input processing (with MIN set to 1 and ICRNL cleared) as specified in the **XBD** specification. The state of the ISIG and IXON flags are not changed upon entering this mode.
Half-Delay Mode	The effect is the same as *cbreak*, except that input functions wait until a character is available or an interval defined by the application elapses, whichever comes first. This mode achieves the same effect as non-canonical-mode, Case C input processing (with TIME set to the value specified by the application) as specified in the **XBD** specification. The state of the ISIG and IXON flags are not changed upon entering this mode.
Raw Mode	Raw mode gives the application maximum control over terminal input. The application sees each character as it is typed. This achieves the same effect as non-canonical mode, Case D input processing as specified in the **XBD** specification. The ISIG and IXON flags are cleared upon entering this mode.

The terminal interface settings are recorded when the process calls *initscr*( ) or *newterm*( ) to initialise Curses and restores these settings when *endwin*( ) is called. The initial input mode for
EC Curses operations is unspecified unless the implementation supports Enhanced Curses compliance, in which the initial input mode is *cbreak* mode.

The behaviour of the BREAK key depends on other bits in the display driver that are not set by Curses.

3.5.3 Delay Mode

Two mutually-exclusive delay modes specify how quickly certain Curses functions return to the application when there is no terminal input waiting when the function is called:

No Delay The function fails.

Delay The application waits until the implementation passes text through to the application. If *cbreak* or Raw Mode is set, this is after one character. Otherwise, this is after the first <newline> character, end-of-line character, or end-of-file character.

The effect of No Delay Mode on function key processing is unspecified.

3.5.4 Echo Processing

Echo mode determines whether Curses echoes typed characters to the screen. The effect of Echo mode is analogous to the effect of the ECHO flag in the local mode field of the **termios** structure associated with the terminal device connected to the window. However, Curses always clears the ECHO flag when invoked, to inhibit the operating system from performing echoing. The method of echoing characters is not identical to the operating system's method of echoing characters, because Curses performs additional processing of terminal input.

If in Echo mode, Curses performs its own echoing: Any visible input character is stored in the current or specified window by the input function that the application called, at that window's cursor position, as though *addch*( ) were called, with all consequent effects such as cursor movement and wrapping.

If not in Echo mode, any echoing of input must be performed by the application. Applications often perform their own echoing in a controlled area of the screen, or do not echo at all, so they disable Echo mode.

It may not be possible to turn off echo processing for synchronous and networked asynchronous terminals because echo processing is done directly by the terminals. Applications running on such terminals should be aware that any characters typed will appear on the screen at wherever the cursor is positioned.

3.6 The Set of Curses Functions

The Curses functions allow: overall screen, window and pad manipulation; output to windows and pads; reading terminal input; control over terminal and Curses input and output options; environment query functions; colour manipulation; use of soft label keys; access to the **terminfo** database of terminal capabilities; and access to low-level functions.

3.6.1 Function Name Conventions

The reference manual pages in Chapter 4 present families of multiple Curses functions. Most function families have different functions that give the programmer the following options:

- A function with the basic name operates on the window *stdscr*. A function with the same name plus the *w* prefix operates on a window specified by the *win* argument.

  When the reference manual page for a function family refers to the *current or specified window*, it means *stdscr* for the basic functions and the window specified by *win* for any *w* function.

  Functions whose names have the *p* prefix require an argument that is a pad instead of a window.

- A function with the basic name operates based on the current cursor position (of the current or specified window, as described above). A function with the same name plus the *mv* prefix moves the cursor to a position specified by the *y* and *x* arguments before performing the specified operation.

  When the reference manual page for a function family refers to the *current or specified position*, it means the cursor position for the basic functions and the position (*y*, *x*) for any *mv* function.

  The *mvw* prefix exists and combines the *mv* semantics discussed here with the *w* semantics discussed above. The window argument is always specified before the coordinates.

- 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 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.

3.6.2 Function Families Provided

Function Names	Description	s	w	c	Refer to
	Add (Overwrite)				
[*mv*][*w*]*addch*( )	add a character	Y	Y	Y	*addch*( )
[*mv*][*w*]*addch*[*n*]*str*( )	add a character string	N	N	N	*addchstr*( )
[*mv*][*w*]*add*[*n*]*str*( )	add a string	Y	Y	Y	*addnstr*( )
[*mv*][*w*]*add*[*n*]*wstr*( )	add a wide character string	Y	Y	Y	*addnwstr*( )
[*mv*][*w*]*add_wch*( )	add a wide character and rendition	Y	Y	Y	*add_wch*( )
[*mv*][*w*]*add_wch*[*n*]*str*( )	add an array of wide characters and renditions	?	N	N	*add_wchnstr*( )
	Change Renditions				
[*mv*][*w*]*chgat*( )	change renditions of characters in a window	-	N	N	*chgat*( )
	Delete				
[*mv*][*w*]*delch*( )	delete a character	-	-	N	*delch*( )
	Get (Input from Keyboard to Window)				
[*mv*][*w*]*getch*( )	get a character	Y	Y	Y	*getch*( )
[*mv*][*w*]*get*[*n*]*str*( )	get a character string	Y	Y	Y	*getnstr*( )
[*mv*][*w*]*get_wch*( )	get a wide character	Y	Y	Y	*get_wch*( )
[*mv*][*w*]*get*[*n*]*_wstr*( )	get an array of wide characters and key codes	Y	Y	Y	*get_wstr*( )
	Explicit Cursor Movement				
[*w*]*move*( )	move the cursor	-	-	-	*move*( )
	Input (Read Back from Window)				
[*mv*][*w*]*inch*( )	input a character	-	-	-	*inch*( )
[*mv*][*w*]*inch*[*n*]*str*( )	input an array of characters and attributes	-	-	-	*inchnstr*( )
[*mv*][*w*]*in*[*n*]*str*( )	input a string	-	-	-	*innstr*( )
[*mv*][*w*]*in*[*n*]*wstr*( )	input a string of wide characters	-	-	-	*innwstr*( )
[*mv*][*w*]*in_wch*( )	input a wide character and rendition	-	-	-	*in_wch*( )
[*mv*][*w*]*in_wch*[*n*]*str*( )	input an array of wide characters and renditions	-	-	-	*inwchnstr*( )
	Insert				
[*mv*][*w*]*insch*( )	insert a character	Y	N	N	*insch*( )
[*mv*][*w*]*ins*[*n*]*str*( )	insert a character string	Y	N	N	*insnstr*( )
[*mv*][*w*]*ins_*[*n*]*wstr*( )	insert a wide-character string	Y	N	N	*ins_nwstr*( )
[*mv*][*w*]*ins_wch*( )	insert a wide character	Y	N	N	*ins_wch*( )
	Print and Scan				
[*mv*][*w*]*printw*( )	print formatted output	-	-	-	*mvprintw*( )
[*mv*][*w*]*scanw*( )	convert formatted output	-	-	-	*mvscanw*( )

Legend

The following notation indicates the effect when characters are moved to the screen. (For the Get functions, this applies only when echoing is enabled.)

s Y means these functions perform special-character processing (see Section 3.4.3 on page 21). N means they do not. ? means the results are unspecified when these functions are applied to special characters.

w Y means these functions perform wrapping (see **Truncation, Wrapping and Scrolling** on page 19). N means they do not.

c Y means these functions advance the cursor (see **Truncation, Wrapping and Scrolling** on page 19). N means they do not.

- The attribute specified by this column does not apply to these functions.

3.7 Interfaces Implemented as Macros

The following interfaces with arguments must be implemented as macros. The relevance to the application programmer is that the '&' character cannot be used before the arguments.

Macros	Chapter 4 Entry
getbegyx( ), *getmaxyx*( ), *getparyx*( ), *getyx*( )	*getbegyx*( )

The header file reference manual pages list other macros, like COLOR_BLACK, that do not take arguments.

3.8 Initialised Curses Environment

Before executing an application that uses Curses, the terminal must be prepared as follows:

- If the terminal has hardware tab stops, they should be set.
- Any initialisation strings defined for the terminal must be output to the terminal.

EC The resulting state of the terminal must be compatible with the model of the terminal that Curses has, as reflected in the terminal's entry in the **terminfo** database (see Chapter 6).

To initialise Curses, the application must call *initscr*( ) or *newterm*( ) before calling any of the other functions that deal with windows and screens, and it must call *endwin*( ) before exiting. To get character-at-a-time input without echoing (most interactive, screen-oriented programs want this), the following sequence should be used:

initscr( )
cbreak( )
noecho( )

Most programs would additionally use the sequence:

nonl( )
intrflush(*stdscr*, FALSE)
keypad(*stdscr*, TRUE)

3.9 Synchronous and Networked Asynchronous Terminals

This section indicates to the application writer some considerations to be borne in mind when driving synchronous, networked asynchronous (NWA) or non-standard directly-connected asynchronous terminals.

Such terminals are often used in a mainframe environment and communicate to the host in block mode. That is, the user types characters at the terminal then presses a special key to initiate transmission of the characters to the host.

Frequently, although it may be possible to send arbitrary sized blocks to the host, it is not possible or desirable to cause a character to be transmitted with only a single keystroke.

This can cause severe problems to an application wishing to make use of single-character input; see Section 3.5 on page 23.

Output

The Curses interface can be used in the normal way for all operations pertaining to output to the terminal, with the possible exception that on some terminals the *refresh*( ) routine may have to redraw the entire screen contents in order to perform any update.

If it is additionally necessary to clear the screen before each such operation, the result could be undesirable.

Input

Because of the nature of operation of synchronous (block-mode) and NWA terminals, it might not be possible to support all or any of the Curses input functions. In particular, the following points should be noted:

- Single-character input might not be possible. It may be necessary to press a special key to cause all characters typed at the terminal to be transmitted to the host.
- It is sometimes not possible to disable echo. Character echo may be performed directly by the terminal. On terminals that behave in this way, any Curses application that performs input should be aware that any characters typed will appear on the screen at wherever the cursor is positioned. This does not necessarily correspond to the position of the cursor in the window.

Chapter 4

Curses Interfaces

This chapter describes the Curses functions, macros and external variables to support application portability at the C-language source level.

The display model defined in Section 3.4 on page 19 contains important information, not repeated for individual interface definitions, regarding cursor movement, relocation of the cursor in the case of multi-column characters, wrapping of characters to subsequent lines of the screen, truncation of characters, and other important concepts. The reference manual pages must be read in conjunction with this overview information.

The interface definitions are collated as though any underscore characters were not present.

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

Section 3.4.4 on page 22, *add_wch*( ), *attroff*( ), *doupdate*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. Also the type of argument *ch* is changed from **chtype** to **const chtype**.

NAME

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

SYNOPSIS

```
#include <curses.h>

int addchstr(const chtype *chstr);

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

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

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

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

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

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

EC 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.

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

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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

EC

```
#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, const char *str, int n);

int mvwaddstr(WINDOW *win, int y, int x, const char *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*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

In Issue 3, the *addstr*( ), *mvaddstr*( ), *mvwaddstr*( ) and *waddstr*( ) functions were described in the *addstr*( ) entry. In Issue 4, the type of the *str* argument defined for these functions is changed from **char *** to **const char ***, and the **DESCRIPTION** is changed to indicate that the functions will handle multi-byte sequences correctly.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

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

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

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

SYNOPSIS

EC

```
#include <curses.h>

int add_wch(const cchar_t *wch);

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

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

int mvwadd_wch(WINDOW *win, int y, int x, const cchar_t *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

Section 3.4.4 on page 22, *addch*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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

EC

```
#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_t**s (or the entire array of **cchar_t**s, 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>.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

This entry is rewritten for clarity. The **DESCRIPTION** is updated to specify that it is undefined whether these functions can be used to manipulate attributes beyond those defined in Issue 3. The *standend*( ), *standout*( ), *wstandend*( ) and *wstandout*( ) functions are moved to the *standend*( ) entry.

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

EC

```
#include <curses.h>

int attr_get(attr_t *attrs, 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);

int 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 colour 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 colour of the current or specified window to *color_pair_number*.

RETURN VALUE

These functions always return OK.

ERRORS

No errors are defined.

SEE ALSO

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

CHANGE HISTORY

First released in Issue 4

Issue 4, Version 2

This entry is rewritten to include the colour handling functions *wcolor_set*( ) and *color_set*( ).

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( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The argument list is explicitly declared as **void**.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The argument list is explicitly declared as **void**. The **RETURN VALUE** section is changed to indicate that the function always returns OK. The *flash*( ) function is moved to its own entry.

NAME

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

SYNOPSIS

EC

```
#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, logical OR the requested attributes into the window rendition, and set the background property 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, logical 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 window 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.

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

Section 3.3.4 on page 17, **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

Rewritten for clarity.

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 character

SYNOPSIS

EC

```
#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 window 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

Section 3.3.4 on page 17, **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made, Issue 4, Version 2.

NAME

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

SYNOPSIS

EC
```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The **DESCRIPTION** is changed to describe this function in terms of a call to the *wborder*( ) function.

NAME

box_set — draw borders from complex characters and renditions

SYNOPSIS

EC
```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

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

SYNOPSIS

EC

```
#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 colour on terminals that support colour.

Querying Capabilities

The *has_colors*( ) function indicates whether the terminal is a colour terminal. The *can_change_color*( ) function indicates whether the terminal is a colour terminal on which colours can be redefined.

Initialisation

The *start_color*( ) function must be called in order to enable use of colours and before any colour manipulation function is called. The function initialises eight basic colours (black, blue, green, cyan, red, magenta, yellow, and white) that can be specified by the colour macros (such as COLOR_BLACK) defined in **<curses.h>**. (See **Colour-related Macros** on page 223.) The initial appearance of these eight colours is not specified.

The function also initialises two global external variables:

- COLORS defines the number of colours that the terminal supports. (See **Colour Identification** below.) If COLORS is 0, the terminal does not support redefinition of colours (and *can_change_colour*( ) will return FALSE).
- COLOR_PAIRS defines the maximum number of colour-pairs that the terminal supports. (See **User-defined Colour Pairs** below.)

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

Colour Identification

The *init_color*( ) function redefines colour number *color*, on terminals that support the redefinition of colours, 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 colour on the screen to the new definition.

The *color_content*( ) function identifies the intensity components of colour number *color*. It stores the red, green, and blue intensity components of this colour 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 Colour Pairs

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

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

The *pair_content*( ) function retrieves the component colours of a colour-pair number *pair*. It stores the foreground and background colour 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 upper 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 colour or some other video attribute.

On colour 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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made in section "NAME" and section "APPLICATION USAGE", Issue 4, Version 2.

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

Section 3.5.2 on page 24, **<curses.h>**, **XBD** specification, Chapter 9, **General Terminal Interface**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *raw*( ) and *noraw*( ) functions are merged with this entry. In previous issues, they appeared in entries of their own.

The entry is rewritten for clarity. The argument list for all these functions is explicitly declared as **void**.

NAME

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

SYNOPSIS

EC

```
#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 current or specified 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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *erase*( ) and *werase*( ) functions are merged with this entry. In previous issues, they appeared in entries of their own.

The entry is rewritten for clarity. The argument list for the *clear*( ) and *erase*( ) functions is explicitly declared as **void**.

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, with the consequences discussed in **Truncation, Wrapping and Scrolling** on page 19. 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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *idlok*( ), *leaveok*( ), *scrollok*( ), *setscrreg*( ) and *wsetscrreg*( ) functions are merged with this entry. In previous issues, they appeared in entries of their own.

The entry is rewritten for clarity. The **DESCRIPTION** of *clearok*( ) is updated to indicate that clearing of a screen applies if the flag is TRUE in either *curscr* or the specified window.

The **RETURN VALUE** is changed to indicate that the *clearok*( ), *leaveok*( ) and *scrollok*( ) functions always return OK.

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. These functions do not update the cursor.

RETURN VALUE

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

ERRORS

No errors are defined.

SEE ALSO

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

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *clrtobot*( ) function is explicitly declared as **void**.

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. These functions do not update the cursor.

RETURN VALUE

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

ERRORS

No errors are defined.

SEE ALSO

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

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *clrtoeol*( ) function is explicitly declared as **void**.

NAME

color_content — identify red, green and blue intensity of a colour

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *can_change_color*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

COLOR_PAIRS, COLORS — external variables for colour support

SYNOPSIS

EC

```
#include <curses.h>

extern int COLOR_PAIRS;

extern int COLORS;
```

DESCRIPTION

Refer to *can_change_color*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

COLS — number of columns on terminal screen

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

copywin — copy a region of a window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

curscr — current window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

curs_set — set the cursor mode

SYNOPSIS

EC

```
#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>.

CHANGE HISTORY

First released in Issue 4.

NAME

cur_term — current terminal information

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *reset_prog_mode*( ) and *reset_shell_mode*( ) functions are merged with this entry. In previous issues, they appeared in entries of their own.

The entry is rewritten for clarity. The argument list for all these functions is explicitly declared as **void**.

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

Section 6.1.3 on page 241, *napms*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

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>.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *delch*( ) function is explicitly declared as **void**.

NAME

del_curterm, restartterm, set_curterm, setupterm — interfaces to the **terminfo** database

SYNOPSIS

EC

```
#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);
```

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 initialises 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

Section A.3 on page 279, *baudrate*( ), *erasechar*( ), *has_ic*( ), *longname*( ), *putc*( ), *termattrs*( ), *termname*( ), *tgetent*( ), *tigetflag*( ), *use_env*( ), **<term.h>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *deleteln*( ) function is explicitly declared as **void**.

NAME

delscreen — free storage associated with a screen

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

NAME

derwin, newwin, subwin — window creation functions

SYNOPSIS

```
#include <curses.h>

EC  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

EC 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>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 4.

This entry is a merger of the Issue 3 entries *refresh*( ) and *wnoutrefresh*( ). The **DESCRIPTION** is rewritten for clarity and the argument list for the *doupdate*( ) and *refresh*( ) functions is explicitly declared as **void**. Otherwise the functionality is identical to that defined in Issue 3.

NAME

dupwin — duplicate a window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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 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 behaviour is undefined.

RETURN VALUE

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

ERRORS

No errors are defined.

SEE ALSO

Section 3.5 on page 23, *getch*(), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *echo*() and *noecho*() functions is explicitly declared as **void**.

Issue 4, Version 2

Further clarification of the state of the *echo* modes.

NAME

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

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list is explicitly declared as **void**.

NAME

erase, werase — clear a window

SYNOPSIS

```
#include <curses.h>

int erase(void);

int werase(WINDOW *win);
```

DESCRIPTION

Refer to *clear*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *clear*( ).

NAME

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

SYNOPSIS

```
#include <curses.h>

char erasechar(void);
```

EC
```
int erasewchar(wchar_t *ch);
```

```
char killchar(void);
```

EC
```
int killwchar(wchar_t *ch);
```

DESCRIPTION

EC 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.

EC 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.

EC 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

Section 3.3.3 on page 16, *clearok*( ), *delscreen*( ), *tcgetattr*( ) (in the **XSH** specification) , **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *killchar*( ) function is merged with this entry. In previous issues, it appeared in an entry of its own.

The entry is rewritten for clarity. The argument list for the *erasechar*( ) and *killchar*( ) functions is explicitly declared as **void**. The functions *erasewchar*( ) and *killwchar*( ) are added and marked as an X/Open UNIX Extension.

NAME

filter — disable use of certain terminal capabilities

SYNOPSIS

EC

```
#include <curses.h>

void filter(void);
```

DESCRIPTION

The *filter*( ) function changes the algorithm for initialising 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

Section 6.1.3 on page 241, *initscr*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 4.

In previous issues, this function was included in the entry for *beep*( ). It is moved to its own entry in Issue 4, the argument list is explicitly declared as **void**, and the **RETURN VALUE** section is changed to indicate that the function always returns OK.

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>.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *flushinp*( ) function is explicitly declared as **void**.

NAME

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

SYNOPSIS

```
#include <curses.h>

EC  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*.

EC 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>.

CHANGE HISTORY

First released in Issue 4.

Corrections made to "APPLICATION USAGE" section, Issue 4, Version 2.

NAME

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

SYNOPSIS

EC

```
#include <curses.h>

chtype getbkgd(WINDOW *win);
```

DESCRIPTION

Refer to *bkgd*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

getbkgrnd — get background character and rendition

SYNOPSIS

EC

```
#include <curses.h>

int getbkgrnd(cchar_t *ch);
```

DESCRIPTION

Refer to *bkgrnd*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

getcchar — get a wide character string and rendition from a **cchar_t**

SYNOPSIS

EC
```
#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 colour 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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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>**.

Processing of terminal input is subject to the general rules described in Section 3.5 on page 23.

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 as specified in Section 3.4.3 on page 21 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

Section 3.5 on page 23, *cbreak*( ), *doupdate*( ), *insch*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *getch*( ) function is explicitly declared

as **void**.

Issue 4, Version 2

The Return Value section is expanded.

NAME

getmaxyx — get size of a window

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *getbegyx*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

```
#include <curses.h>

EC  int getnstr(char *str, int n);
    int getstr(char *str);
EC  int mvgetnstr(int y, int x, char *str, int n);
    int mvgetstr(int y, int x, char *str);
EC  int mvwgetnstr(WINDOW *win, int y, int x, char *str, int n);
    int mvwgetstr(WINDOW *win, int y, int x, char *str);
EC  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, carriage return or end-of-file is received. The resulting value is placed in the area pointed to by *str*. The
EC 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
EC 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

Section 3.5 on page 23, *beep*( ), *getch*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

In Issue 3, the *getstr*( ), *mvgetstr*( ), *mvwgetstr*( ) and *wgetstr*( ) functions were described in the *addstr*( ) entry. In Issue 4, the **DESCRIPTION** of these functions is rewritten for clarity and is updated to indicate that they will handle multi-byte sequences correctly.

Corrections made to first sentence of "DESCRIPTION", Issue 4, Version 2.

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

EC

```
#include <curses.h>

int getn_wstr(wchar_t *wstr, int n);

int get_wstr(wchar_t *wstr);

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

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

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

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

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

int wget_wstr(WINDOW *win, wchar_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>** (in the **XSH** specification), **XBD** specification, Chapter 9, **General Terminal Interface**.

CHANGE HISTORY

First released in Issue 4.

NAME

getparyx — get subwindow origin coordinates

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *getbegyx*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

```
#include <curses.h>

int getstr(char *str);
```

DESCRIPTION

Refer to *getnstr*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *getnstr*( ).

NAME

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

SYNOPSIS

EC

```
#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 described in Section 3.5 on page 23.

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 as specified in Section 3.4.3 on page 21 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

Section 3.5 on page 23, *beep*( ), *cbreak*( ), *ins_wch*( ), *keypad*( ), *move*( ), **<curses.h>**, **<wchar.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

EC

```
#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 initialises 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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

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

SYNOPSIS

EC

```
#include <curses.h>

int get_wstr(wint_t *wstr);
```

DESCRIPTION

Refer to *getn_wstr*( ).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

getyx — get cursor coordinates

SYNOPSIS

```
#include <curses.h>

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

DESCRIPTION

Refer to *getbegyx*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *getbegyx*( ).

NAME

halfdelay — control input character delay mode

SYNOPSIS

EC

```
#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* 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

Section 3.5.2 on page 24, *cbreak*( ), **<curses.h> XBD** specification, Chapter 9, **General Terminal Interface**.

CHANGE HISTORY

First released in Issue 4.

NAME

has_colors — indicate whether terminal supports colours

SYNOPSIS

EC

```
#include <curses.h>

bool has_colors(void);
```

DESCRIPTION

Refer to *can_change_color*( ).

CHANGE HISTORY

First released in Issue 4.

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>.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *has_il*( ) function is merged with this entry. In previous issues, it appeared in an entry of its own.

The entry is rewritten for clarity. The argument list for the *has_ic*( ) and *has_il*( ) functions is explicitly declared as **void**.

NAME

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

SYNOPSIS

EC

```
#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.

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>**.

CHANGE HISTORY

First released in Issue 4.

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

EC

```
#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, const cchar_t *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.

SEE ALSO

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

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

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

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *clearok*( ).

NAME

immedok — enable or disable immediate terminal refresh

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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>.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *inch*( ) function is explicitly declared as **void**.

NAME

inchnstr, inchstr, mvinchnstr, mvinchstr, mvwinchnstr, mvwinchstr, winchnstr, winchstr — input an array of single-byte characters and renditions from a window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

init_color, init_pair — redefine specified colour or colour pair

SYNOPSIS

EC

```
#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*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

initscr, newterm — screen initialisation 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 initialises 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 initialise the *cur_term* external variable.

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

Section A.3 on page 279, *delscreen*( ), *doupdate*( ), *del_curterm*( ), *filter*( ), *slk_attroff*( ), *use_env*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *newterm*( ) function is merged with this entry. In previous issues, it appeared in an entry of its own.

The entry is rewritten for clarity. The argument list for the *initscr*( ) function is explicitly declared as **void**.

NAME

innstr, instr, mvinnstr, mvinstr, mvwinnstr, mvwinstr, winnstr, winstr — input a multi-byte character string from a window

SYNOPSIS

EC

```
#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.

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>.

CHANGE HISTORY

First released in Issue 4.

NAME

innwstr, inwstr, mvinnwstr, mvinwstr, mvwinnwstr, mvwinwstr, winnwstr, winwstr — input a string of wide characters from a window

SYNOPSIS

EC

```
#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>.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

Further clarification in the "DESCRIPTION" section, Issue 4, Version 2.

NAME

insdelln, winsdelln — delete or insert lines into a window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *insertln*( ) function is explicitly declared as **void**.

NAME

insnstr, insstr, mvinsnstr, mvinsstr, mvwinsnstr, mvwinsstr, winsnstr, winsstr — insert a multi-byte character string into a window

SYNOPSIS

EC

```
#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 *insnstr*( ) and *winsnstr*( ) functions perform wrapping. The *insstr*( ) and *winsstr*( ) 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>.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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

EC

```
#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>.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

insstr — insert a multi-byte character string into the current window

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *insnstr*( ).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

instr — input a multi-byte character string from the current window

SYNOPSIS

EC

```
#include <curses.h>

int instr(char *str);
```

DESCRIPTION

Refer to *innstr*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

ins_wch, mvins_wch, mvwins_wch, wins_wch — insert a complex character and rendition into a window

SYNOPSIS

EC

```
#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.

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

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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

ins_wstr — insert a wide-character string into the current window

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *ins_nwstr*( ).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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 the value of *bf* is TRUE, then flushing of the output buffer associated with the current screen will occur when an interrupt key (interrupt, suspend, or quit) is pressed. If the value of bf is FALSE then no flushing of the buffer will occur when an interrupt key is pressed 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

Section 3.5 on page 23, **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

Issue 4, Version 2

The description of the *bf* argument has been changed to align with Issue 3 and preserve compatibility.

NAME

in_wch, mvin_wch, mvwin_wch, win_wch — extract a complex character and rendition from a window

SYNOPSIS

EC

```
#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>.

CHANGE HISTORY

First released in Issue 4.

NAME

in_wchnstr, in_wchstr, mvin_wchnstr, mvin_wchstr, mvwin_wchnstr, mvwin_wchstr, win_wchnstr, win_wchstr — extract an array of complex characters and renditions from a window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

inwstr — input a string of wide characters from the current window

SYNOPSIS

EC

```
#include <curses.h>

int inwstr(wchar_t *wstr);
```

DESCRIPTION

Refer to *innwstr*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

isendwin — determine whether a screen has been refreshed

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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

Section 3.2 on page 14, *doupdate*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

NAME

keyname, key_name — get name of key

SYNOPSIS

EC

```
#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
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>**.

CHANGE HISTORY

First released in Issue 4.

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 behaviour 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

Section 3.5.1 on page 23, **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

NAME

killchar, killwchar — terminal environment query functions

SYNOPSIS

```
#include <curses.h>

char killchar(void);

EC  int killwchar(wchar_t *ch);
```

DESCRIPTION

Refer to *erasechar*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *erasechar*( ).

NAME

leaveok — control cursor position resulting from refresh operations

SYNOPSIS

```
#include <curses.h>

int leaveok(WINDOW *win, bool bf);
```

DESCRIPTION

Refer to *clearok*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *clearok*( ).

NAME

LINES — number of lines on terminal screen

SYNOPSIS

EC
```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *longname*( ) function is explicitly declared as **void**.

NAME

meta — enable/disable meta-keys

SYNOPSIS

EC
```
#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

Section 3.5 on page 23, *getch*( ), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set** (ISTRIP flag).

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

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*( )

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
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*( )
mvscanw( )	*mvwscanw*( )	*mvscanw*( )
mvvline( )	*mvwvline*( )	*hline*( )
mvvline_set( )	*mvwvline_set*( )	*hline_set*( )

SEE ALSO

w.

CHANGE HISTORY

First released in Issue 4.

NAME

mvcur — output cursor movement commands to the terminal

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

mvderwin — define window coordinate transformation

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

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*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity and its name is changed from *printw*( ) to *mvprintw*( ).

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*( ) (in the **XSH** specification), *wcstombs*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity and its name is changed from *scanw*( ) to *mvscanw*( ).

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

NAME

napms — suspend the calling process

SYNOPSIS

EC

```
#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*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

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);

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

DESCRIPTION

The *newpad*( ) function creates a specialised **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.

EC 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

EC 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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The *pnoutrefresh*( ) and *prefresh*( ) functions are merged with this entry. In previous issues, they appeared in the entry for *prefresh*( ). The *subpad*( ) function is new in Issue 4.

NAME

newterm — screen initialisation function

SYNOPSIS

```
#include <curses.h>

SCREEN *newterm(char *type, FILE *outfile, FILE *infile);
```

DESCRIPTION

Refer to *initscr*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *initscr*( ).

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *derwin*( ).

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>.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *nl*( ) and *nonl*( ) functions is explicitly declared as **void**.

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*( )

CHANGE HISTORY

First released in Issue 4.

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.

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

Section 3.5 on page 23, *getch*( ), *halfdelay*( ), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

NAME

noqiflush, qiflush — enable/disable queue flushing

SYNOPSIS

EC

```
#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

Section 3.5 on page 23, *intrflush*( ), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set** (NOFLSH flag).

CHANGE HISTORY

First released in Issue 4.

NAME

notimeout, timeout, wtimeout — control blocking on input

SYNOPSIS

EC

```
#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

Section 3.5 on page 23, *getch*( ), *halfdelay*( ), *nodelay*( ), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set**.

CHANGE HISTORY

First released in Issue 4.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The type of argument *srcwin*( ) is changed from **WINDOW *** to **WINDOW *CONST**.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

pair_content, PAIR_NUMBER — get information on a colour pair

SYNOPSIS

EC

```
#include <curses.h>

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

int PAIR_NUMBER(int value);
```

DESCRIPTION

Refer to *can_change_color*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

pechochar, pecho_wchar — write a character and rendition and immediately refresh the pad

SYNOPSIS

EC
```
#include <curses.h>

int pechochar(WINDOW *pad, 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>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

The second argument of *pechochar*( ) is changed to type `chtype` from `chtype *`.

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *newpad*( ).

NAME

printw — print formatted output in the current window

SYNOPSIS

```
#include <curses.h>

int printw(char *fmt, ...);
```

DESCRIPTION

Refer to *mvprintw*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *mvprintw*( ).

NAME

putp, tputs — output commands to the terminal

SYNOPSIS

EC

```
#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).

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

Changing the terminal attributes using these functions may cause the renditions of characters within a curses window to be altered on some terminals.

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.

SEE ALSO

doupdate( ), *is_linetouched*( ), *putchar*( ) (in the **XSH** specification), *tgetent*( ), *tigetflag*( ), **<term.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

putwin — dump window to a file

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *getwin*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

qiflush — enable queue flushing

SYNOPSIS

EC

```
#include <curses.h>

void qiflush(void);
```

DESCRIPTION

Refer to *noqiflush*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

raw — set Raw Mode

SYNOPSIS

```
#include <curses.h>

int raw(void);
```

DESCRIPTION

Refer to *cbreak*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *cbreak*( ).

NAME

redrawwin, wredrawln — line update status functions

SYNOPSIS

EC

```
#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 optimisation 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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

refresh — refresh current window

SYNOPSIS

```
#include <curses.h>

int refresh(void);
```

DESCRIPTION

Refer to *doupdate*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *doupdate*( ).

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *def_prog_mode*( ).

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The argument list for the *resetty*( ) and *savetty*( ) functions is explicitly declared as **void**.

NAME

restartterm — change terminal type

SYNOPSIS

EC

```
#include <term.h>

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

DESCRIPTION

Refer to *del_curterm*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

ripoffline — reserve a line for a dedicated purpose

SYNOPSIS

EC
```
#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 initialisation 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 initialisation 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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

savetty — save terminal mode

SYNOPSIS

```
#include <curses.h>

int savetty(void);
```

DESCRIPTION

Refer to *resetty*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

scanw — convert formatted input from the current window

SYNOPSIS

```
#include <curses.h>

int scanw(char *fmt, ...);
```

DESCRIPTION

Refer to *mvscanw*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *mvscanw*( ).

NAME

scr_dump, scr_init, scr_restore, scr_set — screen file input/output functions

SYNOPSIS

EC

```
#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 initialise 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*( ) (in the **XSH** specification), *read*( ) (in the **XSH** specification), *write*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

scrl, scroll, wscrl — scroll a Curses window

SYNOPSIS

```
#include <curses.h>

EC  int scrl(int n);

    int scroll(WINDOW *win);

EC  int wscrl(WINDOW *win, int n);
```

DESCRIPTION

The *scroll*( ) function scrolls *win* one line in the direction of the first line.

EC 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. The interaction of these functions with *setsccreg*( ) is currently unspecified.

RETURN VALUE

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

ERRORS

No errors are defined.

SEE ALSO

<curses.h>.

CHANGE HISTORY

First released in Issue 4.

In previous issues, the *scroll*( ) function was described in an entry of its own. It has been merged with this entry in Issue 4. Its description has been rewritten for clarity, but otherwise its functionality is identical.

FUTURE DIRECTIONS

In a future issue the interaction of these functions with *setsccreg*( ) will be defined.

NAME

scrollok — enable or disable scrolling on a window

SYNOPSIS

```
#include <curses.h>

int scrollok(WINDOW *win, bool bf);
```

DESCRIPTION

Refer to *clearok*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *clearok*( ).

NAME

setcchar — set **cchar_t** from a wide character string and rendition

SYNOPSIS

EC
```
#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 initialises the object pointed to by *wcval* according to the character attributes in *attrs*, the colour 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

Section 3.3 on page 16, *attroff*( ), *can_change_color*( ), *getcchar*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

set_curterm — set current terminal

SYNOPSIS

EC

```
#include <term.h>

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

DESCRIPTION

Refer to *del_curterm*( ).

CHANGE HISTORY

First released in Issue 4.

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *clearok*( ).

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

Section 3.2 on page 14, *initscr*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity.

NAME

setupterm — access the **terminfo** database

SYNOPSIS

EC

```
#include <term.h>

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

DESCRIPTION

Refer to *del_curterm*( ).

CHANGE HISTORY

First released in Issue 4.

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

EC

```
#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);
int 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*( ), *slk_attr_set*( ), and *slk_color*( ) functions correspond to *slk_attroff*( ), *slk_attrond*( ), *slk_attrset*( ) and *color_set*( ) and thus support the attribute constants with the WA_ prefix and colour.

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, *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*( ) (in the **XSH** specification), *ripoffline*( ), *wcswidth*( ) (in the **XSH** specification), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

This entry is rewritten to include the colour handling functions.

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>**.

CHANGE HISTORY

Derived from the *attroff*( ) entry in Issue 3. The entry is reworded for clarity, but otherwise the functionality is identical to previous issues.

NAME

start_color — initialise use of colours on terminal

SYNOPSIS

EC

```
#include <curses.h>

int start_color(void);
```

DESCRIPTION

Refer to *can_change_color*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

stdscr — default window

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

subpad — create a subwindow in a pad

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *newpad*( ).

CHANGE HISTORY

First released in Issue 4.

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*( ).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The functionality previously described by this entry is moved to the entry for *derwin*( ).

NAME

syncok, wcursyncup, wsyncdown, wsyncup — synchronise a window with its parents or children

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

termattrs — get supported terminal video attributes

SYNOPSIS

EC

```
#include <curses.h>

chtype termattrs(void);

attr_t term_attrs(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

Attributes in *attroff*( ), *attr_get*( ) and **<curses.h.>**

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", rewritten for clarity, Issue 4, Version 2.

NAME

termname — get terminal name

SYNOPSIS

EC

```
#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

Section 6.1.1 on page 239, *del_curterm*( ), *getenv*( ) (in the **XSH** specification), *initscr*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

NAME

tgetent, tgetflag, tgetnum, tgetstr, tgoto — **termcap** database emulation (**TO BE WITHDRAWN**)

SYNOPSIS

EC

```
#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 the 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 *tigetflg*( ) page.

Portable applications must use *tputs*( ) to output the strings returned by *tgetstr*( ) and *tgoto*( ).

SEE ALSO

putc( ), *setupterm*( ), *tigetflg*( ), **<term.h>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

The first argument to *tgoto*( ) is changed from `const char *` to `char *`.

NAME

tigetflag, tigetnum, tigetstr, tparm — retrieve capabilities from the **terminfo** database

SYNOPSIS

EC

```
#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 in the table in Section 6.1.3 on page 241.

The *tparm*( ) function takes as *cap* a string capability. If *cap* is parameterised (as described in Section A.1.2 on page 256), *tparm*( ) resolves the parameterisation. If the parameterised 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 parameterisation resolved. Otherwise, it returns a null pointer.

ERRORS

No errors are defined.

APPLICATION USAGE

For parameterised 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 parameterised 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>**.

CHANGE HISTORY

First released in Issue 4.

NAME

timeout — control blocking on input

SYNOPSIS

EC

```
#include <curses.h>

void timeout(int delay);
```

DESCRIPTION

Refer to *notimeout*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

touchline, touchwin — window refresh control functions

SYNOPSIS

```
#include <curses.h>

EC  int touchline(WINDOW *win, int start, int count);

    int touchwin(WINDOW *win);
```

DESCRIPTION

Refer to *is_linetouched*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

tparm — retrieve capabilities from the **terminfo** database

SYNOPSIS

EC

```
#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*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

tputs — output commands to the terminal

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *putp*( ).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

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

Section 3.5 on page 23, *doupdate*( ), *getch*( ), *initscr*( ), **<curses.h>**, **XBD** specification, Section 9.2, **Parameters That Can Be Set**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The **RETURN VALUE** section now states that the function returns OK on success and ERR on failure. No return values were defined in previous issues.

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>**.

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is rewritten for clarity. The **RETURN VALUE** section now states that the function may return a null pointer. This condition was not specified in previous issues.

NAME

ungetch, unget_wch — push a character onto the input queue

SYNOPSIS

EC

```
#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. The result of successive calls without an intervening call to *getch*( ) or *get_wch*( ) are unspecified.

RETURN VALUE

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

ERRORS

No errors are defined.

SEE ALSO

Section 3.5 on page 23, *getch*( ), *get_wch*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

NAME

untouchwin — window refresh control function

SYNOPSIS

EC

```
#include <curses.h>

int untouchwin(WINDOW *win);
```

DESCRIPTION

Refer to *is_linetouched*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

use_env — specify source of screen size information

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

The first argument is changed from `char bool` to `bool boolval`.

NAME

vidattr, vid_attr, vidputs, vid_puts — output attributes to the terminal

SYNOPSIS

EC

```
#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 color_pair_number, void *opt, int
            (*putfunc)(int));
```

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 which 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 theattributes, short for the colour 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* (which can be specified as an argument to either *vidputs*( ) or *vid_puts*( )) is either *putchar*( ) or some other function with the same prototype. Both the *vidputs*( ) and the *vid_puts*( ) function ignore 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*( ) (in the **XSH** specification), *putwchar*( ) (in the **XSH** specification), *tigetflag*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Issue 4, Version 2

This entry is rewritten to include the colour handling functions.

NAME

vline — draw vertical line

SYNOPSIS

EC

```
#include <curses.h>

int vline(chtype ch, int n);
```

DESCRIPTION

Refer to *hline*( ).

CHANGE HISTORY

First released in Issue 4.

NAME

vline_set — draw vertical line from complex character and rendition

SYNOPSIS

EC

```
#include <curses.h>

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

DESCRIPTION

Refer to *hline_set*( ).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

vwprintw — print formatted output in window (**TO BE WITHDRAWN**)

SYNOPSIS

EC
```
#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 requirement to include **varargs.h** and **stdarg.h** which both contain definitions of `va_list`.

SEE ALSO

mvprintw( ), *fprintf*( ) (in the **XSH** specification), *vw_printw*( ), **<curses.h>**, **<varargs.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

vw_printw — print formatted output in window

SYNOPSIS

EC

```
#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*( ) (in the **XSH** specification), **<curses.h>**, **<stdarg.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

vwscanw — convert formatted input from a window (**TO BE WITHDRAWN**)

SYNOPSIS

EC
```
#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( ) (in the **XSH** specification), *mvscanw*( ), *vw_scanw*( ), **<curses.h>**, **<varargs.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 4.

Corrections made to section "SYNOPSIS", Issue 4, Version 2.

NAME

vw_scanw — convert formatted input from a window

SYNOPSIS

EC

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

int vw_scanw(WINDOW *, char *, va_list varflist);
```

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( ) (in the **XSH** specification), *mvscanw*( ), **<curses.h>**, **<stdarg.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 4.

Corrections made to sections "SYNOPSIS" and "APPLICATION USAGE", Issue 4, Version 2.

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*( )
wdeleteln( )	*deleteln*( )
wechochar( )	*echochar*( )
wecho_wchar( )	*echo_wchar*( )

3. The *wunctrl*( ) function is an exception to this rule and has an entry under its own name.

* There is no corresponding function without the *w* prefix.

Function	Refer to
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.

CHANGE HISTORY

First released in Issue 4.

NAME

wunctrl — generate printable representation of a wide character

SYNOPSIS

EC

```
#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>**.

CHANGE HISTORY

First released in Issue 4.

Chapter 5

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 4 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.

NAME

curses.h — definitions for screen handling and optimisation functions

SYNOPSIS

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

DESCRIPTION

Objects

EC 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, Version 2, July 1996, (ISBN: 1-85912-171-3, C610) (this document).

Data Types

The following data types are defined through **typedef**:

EC	**attr_t**	An OR-ed set of attributes
	bool	Boolean data type
EC	**chtype**	A character, attributes and a colour-pair
	SCREEN	An opaque terminal representation
EC	**wchar_t**	As described in **<stddef.h>**
EC	**wint_t**	As described in **<wchar.h>**
EC	**cchar_t**	References a string of wide characters
	WINDOW	An opaque window representation

These data types are described in more detail in Section 2.4 on page 12.

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

Attribute Bits

EC 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**:

EC	A_ALTCHARSET	Alternate character set
	A_BLINK	Blinking
	A_BOLD	Extra bright or bold
	A_DIM	Half bright
EC	A_INVIS	Invisible
	A_PROTECT	Protected
	A_REVERSE	Reverse video
	A_STANDOUT	Best highlighting mode of the terminal
	A_UNDERLINE	Underlining

EC 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
EC A_COLOR	Bit-mask to extract colour-pair information

Line-drawing Constants

EC 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 as described in Section A.1.12 on page 264.

EC

char Constant	cchar_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

Colour-related Macros

EC The following colour-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:

EC

```
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
EC	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 $0 \leq n \leq 63$
	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.

EC 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 Code	Description
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     addchnstr(const chtype *, int);
EC      int     addchstr(const chtype *);
        int     addnstr(const char *, int);
        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);
EC      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);
EC      int     bkgd(chtype);
        void    bkgdset(chtype);
        int     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);
EC      int     box_set(WINDOW *, const cchar_t *, const cchar_t *);
        bool    can_change_color(void);
        int     cbreak(void);
EC      int     chgat(int, attr_t, short, const void *);
        int     clearok(WINDOW *, bool);
        int     clear(void);
        int     clrtobot(void);
        int     clrtoeol(void);
EC      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);
EC      void    delscreen(SCREEN *);
        int     delwin(WINDOW *);
EC      WINDOW *derwin(WINDOW *, int, int, int, int);
        int     doupdate(void);
EC      WINDOW *dupwin(WINDOW *);
        int     echo(void);
EC      int     echochar(const chtype);
        int     echo_wchar(const cchar_t *);
        int     endwin(void);
        char    erasechar(void);
        int     erase(void);
EC      int     erasewchar(wchar_t *);
        void    filter(void);
        int     flash(void);
        int     flushinp(void);
EC      chtype  getbkgd(WINDOW *);
        int     getbkgrnd(cchar_t *);
        int     getcchar(const cchar_t *, wchar_t *, attr_t *, short *, void *);
        int     getch(void);
EC      int     getnstr(char *, int);
        int     getn_wstr(wint_t *, int);
        int     getstr(char *);
EC      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);
EC      int     hline(chtype, int);
        int     hline_set(const cchar_t *, int);
        void    idcok(WINDOW *, bool);
        int     idlok(WINDOW *, bool);
EC      void    immedok(WINDOW *, bool);
        chtype  inch(void);
EC      int     inchnstr(chtype *, int);
        int     inchstr(chtype *);
        WINDOW *initscr(void);
EC      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);
EC      int     insdelln(int);
        int     insertln(void);
EC      int     insnstr(const char *, int);
        int     ins_nwstr(const wchar_t *, int);
        int     insstr(const char *);
        int     instr(char *);
```

```
        int    ins_wch(const cchar_t *);
        int    ins_wstr(const wchar_t *);
        int    intrflush(WINDOW *, bool);
EC      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);
EC      int    killwchar(wchar_t *);
        int    leaveok(WINDOW *, bool);
        char   *longname(void);
EC      int    meta(WINDOW *, bool);
        int    move(int, int);
        int    mvaddch(int, int, const chtype);
EC      int    mvaddchnstr(int, int, const chtype *, int);
        int    mvaddchstr(int, int, const chtype *);
EC      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);
EC      int    mvderwin(WINDOW *, int, int);
        int    mvgetch(int, int);
EC      int    mvgetnstr(int, int, char *, int);
        int    mvgetn_wstr(int, int, wint_t *, int);
        int    mvgetstr(int, int, char *);
EC      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);
EC      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);
EC      int    mvinsnstr(int, int, const char *, int);
        int    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_wstr(int, int, const wchar_t *);
        int    mvin_wch(int, int, cchar_t *);
        int    mvin_wchnstr(int, int, cchar_t *, int);
        int    mvin_wchstr(int, int, cchar_t *);
        int    mvinwstr(int, int, wchar_t *);
        int    mvprintw(int, int, char *,  ...);
        int    mvscanw(int, int, char *, ...);
EC      int    mvvline(int, int, chtype, int);
        int    mvvline_set(int, int, const cchar_t *, int);
        int    mvwaddch(WINDOW *, int, int, const chtype);
EC      int    mvwaddchnstr(WINDOW *, int, int, const chtype *, int);
        int    mvwaddchstr(WINDOW *, int, int, const chtype *);
EC      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_wchstr(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);
EC      int    mvwgetnstr(WINDOW *, int, int, char *, int);
        int    mvwgetn_wstr(WINDOW *, int, int, wint_t *, int);
        int    mvwgetstr(WINDOW *, int, int, char *);
EC      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);
EC      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);
EC      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 *, ...);
EC      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);
EC      void   noqiflush(void);
        int    noraw(void);
EC      int    notimeout(WINDOW *, bool);
        int    overlay(const WINDOW *, WINDOW *);
        int    overwrite(const WINDOW *, WINDOW *);
EC      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 *, ...);
EC      int    putp(const char *);
        int    putwin(WINDOW *, FILE *);
        void   qiflush(void);
        int    raw(void);
EC      int    redrawwin(WINDOW *);
        int    refresh(void);
        int    reset_prog_mode(void);
        int    reset_shell_mode(void);
        int    resetty(void);
EC      int    ripoffline(int, int (*)(WINDOW *, int));
        int    savetty(void);
        int    scanw(char *, ...);
EC      int    scr_dump(const char *);
        int    scr_init(const char *);
        int    scrl(int);
        int    scroll(WINDOW *);
        int    scrollok(WINDOW *, bool);
EC      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 *);
EC      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);
EC      int    start_color(void);
        WINDOW *subpad(WINDOW *, int, int, int, int);
        WINDOW *subwin(WINDOW *, int, int, int, int);
EC      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 *);
EC      char   *tparm(char *, long, long, long, long, long, long, long, long,
                      long);
        int    typeahead(int);
EC      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, 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);
EC      int    waddchnstr(WINDOW *, const chtype *, int);
        int    waddchstr(WINDOW *, const chtype *);
EC      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);
```

```
EC      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 *);
EC      void   wcursyncup(WINDOW *);
        int    wcolor_set(WINDOW *, short, void *);
        int    wdelch(WINDOW *);
        int    wdeleteln(WINDOW *);
EC      int    wechochar(WINDOW *, const chtype);
        int    wecho_wchar(WINDOW *, const cchar_t *);
        int    werase(WINDOW *);
EC      int    wgetbkgrnd(WINDOW *, cchar_t *);
        int    wgetch(WINDOW *);
EC      int    wgetnstr(WINDOW *, char *, int);
        int    wgetn_wstr(WINDOW *, wint_t *, int);
        int    wgetstr(WINDOW *, char *);
EC      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 *);
EC      int    winchnstr(WINDOW *, chtype *, int);
        int    winchstr(WINDOW *, chtype *);
        int    winnstr(WINDOW *, char *, int);
        int    winnwstr(WINDOW *, wchar_t *, int);
        int    winsch(WINDOW *, chtype);
EC      int    winsdelln(WINDOW *, int);
        int    winsertln(WINDOW *);
EC      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 *, ...);
EC      int    wredrawln(WINDOW *, int, int);
        int    wrefresh(WINDOW *);
        int    wscanw(WINDOW *, char *, ...);
EC      int    wscrl(WINDOW *, int);
        int    wsetscrreg(WINDOW *, int, int);
        int    wstandend(WINDOW *);
        int    wstandout(WINDOW *);
EC      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

Chapter 1, **<stdio.h>** (in the **XSH** specification), **<term.h>**, **<termios.h>** (in the **XSH** specification), **<unctrl.h>**, **<wchar.h>** (in the **XSH** specification).

CHANGE HISTORY

First released in Issue 2.

Issue 4

The entry is completely rewritten to include new constants, data types and function prototypes.

Issue 4, Version 2

This entry is completely rewritten to correct the function prototypes.

NAME

term.h — terminal capabilities

SYNOPSIS

EC
```
#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 in the table in Section 6.1.3 on page 241.

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));
```

The **<term.h>** header defines the following data type through **typedef**:

`bool` As described in **<curses.h>**.

SEE ALSO

Chapter 6, *printf*( ), *putp*( ), *tigetflag*( ), *tgetent*( ), **<curses.h>**.

CHANGE HISTORY

First released in Issue 4.

Corrections made, Issue 4, Version 2.

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>**.

CHANGE HISTORY

First released in Issue 4.

Chapter 6

Terminfo Source Format (ENHANCED CURSES)

EC The requirements in this chapter are in effect only for implementations that claim Enhanced Curses compliance.

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 must 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.

Section 6.1 on page 238 describes the syntax of **terminfo** source files. A grammar and lexical conventions appear in Section 6.1.2 on page 239. A list of all terminal capabilities defined by X/Open appears in Section 6.1.3 on page 241. An example follows in Section 6.1.4 on page 251. Section A.1 on page 255 describes the specification of devices in general, such as video terminals. Section A.2 on page 268 describes the specification of printers.

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.

6.1 Source File Syntax

Source files can use the ISO 8859-1 codeset. The behaviour 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:

alias$_1$ | *alias*$_2$ | ... | *alias*$_n$ | *longname*,
<*white space*> **am, lines #24,**
<*white space*> **home=\Eeh,**

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 recognise 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. Section A.4.1 on page 279 provides conventions for choosing alias names.

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>**.

6.1.1 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 32 767

An implementation may support higher limits than those specified above.

6.1.2 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
          ;
```

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.

```
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 '|'.
3. A LONGNAME may contain any print[9] characters other than ',' and '|'.
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.

8. Graph characters are those characters for which *isgraph*( ) returns non-zero.
9. Print characters are those characters for which *isprint*( ) returns non-zero.

6.1.3 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** 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*( ) on page 194 (in the cases where the following table lists a **Termcap** code) and *tigetflag*( ) on page 196.

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 **Capname**s have **Termcap** codes.

Booleans

Variable	Cap-name	Term-cap	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 colour
can_change	**ccc**	cc	Terminal can re-define existing colour
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 colour 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
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

Variable	Cap-name	Term-cap	Description
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	Cap-name	Term-cap	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 colours 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 colour-pairs on the screen
maximum_windows	**wnum**	MW	Maximum number of definable windows
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 colours
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

Variable	Cap-name	Term-cap	Description
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	Cap-name	Term-cap	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 colour #1
column_address	**hpa**	ch	Set horizontal position to absolute #1
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.

Variable	Cap-name	Term-cap	Description
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
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

Variable	Cap-name	Term-cap	Description
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 initialisation string
init_2string	**is2**	is	Terminal or printer initialisation string
init_3string	**is3**	i3	Terminal or printer initialisation string
init_file	**if**	if	Name of initialisation file
init_prog	**iprog**	iP	Path name of program for initialisation
initialize_color	**initc**	IC	Set colour #1 to RGB #2, #3, #4
initialize_pair	**initp**	Ip	Set colour-pair #1 to fg #2, bg #3
insert_character	**ich1**	ic	Insert character
insert_line	**il1**	al	Add new blank line

Variable	Cap-name	Term-cap	Description
insert_padding	**ip**	ip	Insert pad after character inserted

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*( )).

Variable	Cap-name	Term-cap	Description
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

Variable	Cap-name	Term-cap	Description
key_mark	**kmrk**	%2	sent by mark key
key_message	**kmsg**	%3	sent by message key
key_mouse	**kmous**	Km	0631, Mouse event has occured
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
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

Variable	Cap-name	Term-cap	Description
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
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 colour(-pair)s to the original ones
orig_pair	**op**	op	Set default colour-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

Variable	Cap-name	Term-cap	Description
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
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 colour to #1 using ANSI escape
set_a_foreground	**setaf**	AF	Set foreground colour to #1 using ANSI escape
set_attributes	**sgr**	sa	Define first set of video attributes #1-#9
set_background	**setb**	Sb	Set background colour 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

Variable	Cap-name	Term-cap	Description
set_clock	**sclk**	SC	Set clock to hours (#1), minutes (#2), seconds (#3)
set_color_band	**setcolor**	Yz	Change to ribbon colour #1
set_color_pair	**scp**	sp	Set current colour pair to #1
set_foreground	**setf**	Sf	Set foreground colour 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
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

6.1.4 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,
```

6.1.5 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, in situations described in Section A.1.16 on page 268.

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** in the example in Section 6.1.4 on page 251. Note that capabilities are defined in a left-to-right order and, therefore, a prior definition will override a later definition.

Appendix A

Application Usage

A.1 Device Capabilities

A.1.1 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.

Parameterised 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 and 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, initialisation 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 **lf** 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,
```

A.1.2 Parameterised Strings

Cursor addressing and other strings requiring arguments are described by a argumentised 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 *i*th 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 $integer_2$ op pop $integer_1$) where $integer_1$ represents the top of the stack

%& %| %^ Bit operations: push(pop $integer_2$ op pop $integer_1$)

%= %> %< Logical operations: push(pop $integer_2$ op pop $integer_1$)

%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: **%? c_1 %t b_1 %e c_2 %t b_2 %e c_3 %t b_3 %e c_4 %t b_4 %e b_5%;**
c_i are conditions, b_i 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.

A.1.3 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 argumentised 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**.

A.1.4 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.)

A.1.5 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 **dl1** 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 argumentised 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.

A.1.6 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.

A.1.7 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`
`^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.

A.1.8 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.

A.1.9 Tabs and Initialisation

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**, initialisation strings for the device; **iprog**, the path name of a program to be run to initialise the device; and **if**, the name of a file containing long initialisation 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 initialisation 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 initialisation 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, see **Margins** on page 273.)

A.1.10 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**.

A.1.11 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**.

A.1.12 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 (see Section A.2.5 on page 275).

A.1.13 Colour Manipulation

Most colour terminals belong to one of two classes of terminal:

- **Tektronix-style**

  The Tektronix method uses a set of N predefined colours (usually 8) from which an application can select "current" foreground and background colours. Thus a terminal can support up to N colours mixed into N*N colour-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 colour-pair at once. Up to M colour-pairs, made from 2*M different colours, can be defined this way.

The numeric variables **colors** and **pairs** define the number of colours and colour-pairs that can be displayed on the screen at the same time. If a terminal can change the definition of a colour (for example, the Tektronix 4100 and 4200 series terminals), this should be specified with **ccc** (can change colour). To change the definition of a colour (Tektronix 4200 method), use **initc** (initialise colour). It requires four arguments: colour number (ranging from 0 to **colors**–1) and three RGB (red, green, and blue) values or three HLS colours (Hue, Lightness, Saturation). Ranges of RGB and HLS values are terminal-dependent.

Tektronix 4100 series terminals only use HLS colour 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 colours, but uses a colour 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 colour. By convention, the first eight colours (0–7) map to, in order: black, red, green, yellow, blue, magenta, cyan, white. However, colour re-mapping may occur or the underlying hardware may not support these colours. Mappings for any additional colours supported by the device (that is, to numbers greater than 7) are at the discretion of the **terminfo** entry writer.

To initialise a colour-pair (HP method), use **initp** (initialise pair). It requires seven arguments: the number of a colour-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 colour-pair current, use **scp** (set colour-pair). It takes one argument, the number of a colour-pair.

Some terminals (for example, most colour terminal emulators for PCs) erase areas of the screen with current background colour. In such cases, **bce** (background colour erase) should be defined. The variable **op** (original pair) contains a sequence for setting the foreground and the background colours to what they were at the terminal start-up time. Similarly, **oc** (original colours) contains a control sequence for setting all colours (for the Tektronix method) or colour-pairs (for the HP method) to the values they had at the terminal start-up time.

Some colour terminals substitute colour for video attributes. Such video attributes should not be combined with colours. Information about these video attributes should be packed into the **ncv** (no colour 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 colours, 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 colours. For example, if the terminal uses colours 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).

A.1.14 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 argumentised 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.

A.1.15 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.

A.1.16 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.

A.2 Printer Capabilities

The **terminfo** database lets you define capabilities of printers as well as terminals. Capabilities available for printers are included in the lists in Section 6.1.3 on page 241.

A.2.1 Rounding Values

Because argumentised 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 argumentised string capability.

A.2.2 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.

A.2.3 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	Change character pitch
cpix	If set, **cpi** changes **orhi**, otherwise changes **orc**
lpi	Change line pitch
lpix	If set, **lpi** changes **orvi**, otherwise changes **orl**
chr	Change steps per column
cvr	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; see Section A.2.7 on page 277).

Effects of Changing the Character/Line Pitches

Before	*After*
Using **cpi** with **cpix** clear:	
orhi´	**orhi**
orc´	**orc**=$\frac{\textbf{orhi}}{V_{cpi}}$
Using **cpi** with **cpix** set:	
orhi´	**orhi**=**orc**$\cdot V_{cpi}$
orc´	**orc**
Using **lpi** with **lpix** clear:	
orvi´	**orvi**
orl´	**orl**=$\frac{\textbf{orvi}}{V_{lpi}}$
Using **lpi** with **lpix** set:	
orvi´	**orvi**=**orl**$\cdot V_{lpi}$
orl´	**orl**
Using **chr:**	
orhi´	**orhi**
orc´	V_{chr}
Using **cvr:**	
orvi´	**orvi**
orl´	V_{cvr}

Using **cpi** or **chr**:	
widcs´	$\mathbf{widcs} = \mathbf{widcs´}\frac{\mathbf{orc}}{\mathbf{orc´}}$
mcs´	$\mathbf{mcs} = \mathbf{mcs´}\frac{\mathbf{orc}}{\mathbf{orc´}}$

V_{cpi}, V_{lpi}, V_{chr}, and V_{cvr} are the arguments used with **cpi**, **lpi**, **chr**, and **cvr**, respectively. The prime marks (') indicate the old values.

A.2.4 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 italicising mode
ritm	Exit italicising mode
swidm	Enter wide character mode
rwidm	Exit wide character mode
ssupm	Enter superscript mode
rsupm	Exit superscript mode
supcs	List of characters available as superscripts
ssubm	Enter subscript mode
rsubm	Exit subscript mode
subcs	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 italicised 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. Thus, for example, printing any of the following three examples results in equivalent motion:

Bi B_i B^i

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, italicised, widened, superscript, or subscript printing. Conversely, if **msgr** is not set, a program should end these modes before attempting any motion.

A.2.5 Alternate Character Sets

In addition to allowing you to define line graphics (described in Section A.1.12 on page 264), **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 initialised. 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; the number of these bytes and their form are defined in Section A.2.6 on page 276.

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.

A.2.6 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**.

A.2.7 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	Change character pitch
cpix	If set, **cpi** changes **spinh**
lpi	Change line pitch
lpix	If set, **lpi** changes **spinv**

Programs that use **cpi** or **lpi** should recalculate the dot spacing:

Effects of Changing the Character/Line Pitches

Before	After
Using **cpi** with **cpix** clear:	
spinh´	**spinh**
Using **cpi** with **cpix** set:	
spinh´	$\textbf{spinh} = \textbf{spinh´} \cdot \frac{\textbf{orhi}}{\textbf{orhi´}}$
Using **lpi** with **lpix** clear:	
spinv´	**spinv**
Using **lpi** with **lpix** set:	
spinv´	$\textbf{spinv} = \textbf{spinv´} \cdot \frac{\textbf{orhi}}{\textbf{orhi´}}$
Using **chr:**	
spinh´	**spinh**
Using **cvr:**	
spinv´	**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.

A.2.8 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.

A.2.9 Printing Rate and Buffer Size

Because there is no standard protocol that can be used to keep a program synchronised 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 synchronise 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 recognise 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 favour of the user, who wants, above all, to see all the output in its correct place.

A.3 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.

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**.

A.4 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.

A.4.1 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`
-*n*p	Number of pages of memory	`c100-4p`
-rv	Reverse video	`4415-rv`

A.4.2 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 optimisations within Curses and thus operate more efficiently. For most terminals, an optimal **terminfo** entry has already been written.

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. See Section 3.3.6 on page 18.

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
EC A wide-character code with all bits set to zero.

pad
EC 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
EC The rendition of a character displayed on the screen is its attributes and a colour 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)
EC An integer value corresponding to a single graphic symbol or control code.

wide-character string
EC 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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