American National Standard

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additional controls for use with american national standard code for information interchange

american national standards institute, inc.
1430 broadway, new york, new york 10018

ANSI X3.64-1979

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Published by

American National Standards Institute
1430 Broadway, New York, New York 10018

Printed in the United States of America

A4½M481/1350

ANSI®
X3.64-1979

American National Standard Additional Controls for Use with American National Standard Code for Information Interchange

Secretariat

Computer and Business Equipment Manufacturers Association

Approved July 18, 1979

American National Standards Institute, Inc

Abstract

This standard defines a set of encoded control functions to facilitate data interchange with two-dimensional character-imaging input-output devices. These control functions augment the set of control functions in the American National Standard Code for Information Interchange, ANSI X3.4-1977 (ASCII). These control functions may be used in either seven-bit or eight-bit environments following the code structure defined in American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Exchange, ANSI X3.41-1974.

The primary purpose of this standard is to provide a general set of controls to accommodate the foreseeable needs in the following diverse information interchange applications:

(1) Interactive terminals of the cathode ray tube type
(2) Interactive terminals of the printer type
(3) Line printers
(4) Microfilm printers
(5) Software usage
(6) Form filling
(7) Composition imaging (for example, typesetting)
(8) Word processing
(9) Input-output devices with auxiliary devices
(10) Buffered and nonbuffered devices

The types of controls include editing functions, formatting, and the specification and control of input areas, as well as certain status setting and interrogation functions, mode selection and typesetting composition functions. The standard does not contain any network or data transmission controls.

A control sequence structure is defined, similar to that of escape sequences, that permits numeric and selective parameters to be included as part of many of the controls. This structure, as well as the structure of the standard as a whole, is open ended so that more controls can be included in future revisions.

Foreword

(This Foreword is not a part of American National Standard Additional Controls for Use with the American Standard Code for Information Interchange, ANSI X3.64-1979.

American National Standard Code for Information Interchange, ANSI X3.4-1977, provides coded representation for a set of graphics and control characters having general utility in information interchange. In some applications it may be desirable to augment the standard repertory of characters with additional graphics or control functions. ASCII includes characters intended to facilitate the representation of such additional graphics or control functions by a process known as code extension.

American National Standard Code Extension Techniques for use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, ANSI X3.41-1974, specifies standard rules of procedure to be used in the coding for additional control functions or additional graphic characters so as to provide consistent representations in either seven-bit or eight-bit environments.

This standard builds upon those two previous standards to provide a coding structure for additional controls to facilitate the operation of two-dimensional input-output devices, such as character-imaging cathode ray tube devices and printers.

This standard was developed after extensive study of various potential applications and of trends expected in system design.

Questions regarding technical interpretations of details in this standard should be addressed to American National Standards Institute, citing this standard by name and number, with a request that such questions be referred to the designated technical authority for this standard. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

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American National Standard Additional Controls for Use with American National Standard Code for Information Interchange

1. GENERAL.

1.1 Introduction.

This standard defines a set of control functions that augment the set of control functions in American National Standard Code for Information Interchange, ANSI X3.4-1977 (ASCII), in accordance with the principles defined in American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, ANSI X3.41-1974. The primary purpose of this standard is to accommodate the foreseeable needs for input/output control of two-dimensional character-imaging devices, including interactive terminals of both the cathode ray tube and printer types, as well as output to microfilm printers. ANSI X3.41-1974 envisaged many sets of control functions that would be application oriented. This standard describes a set of functions that can coexist in a manner compatible with ANSI X3.41-1974, despite the fact that it is derived in a way not foreseen when the latter was adopted. In the following sections the more general characteristics or groupings of functions are discussed, followed by a series of control function definitions. The functions represent what have been found necessary for standardization. This standard describes a large set of functions that have been implemented, though not all in a single system or always encoded as herein. The work here represents a cohesive structure for the representation of coded information for interchange. This standard establishes a set of controls drawn from the abstract concepts of ANSI X3.4-1977 and ANSI X3.41-1974.

The intent of this standard is to facilitate data interchange, not to standardize equipment. The intent is not the abstract specification of a sophisticated character imaging device. However, it is necessary to make certain assumptions about the device architecture. These assumptions are as unrestrictive as possible and are presented in Appendix B.

The developers of this standard do not expect that any single system or device would necessarily implement all of the functions included. In fact, those who implement from this standard are cautioned not to cite the standard unless they explicitly describe the individual portions implemented. It is inappropriate to make references that say according to, based upon, taken from, etc unless the enumeration of individual portions is included in the reference to the standard.

This standard is based upon a concept that permits any or all of the functions proposed worldwide via the "Repertoire of Control Functions" (currently ISO/TC97/SC2/646) to be represented uniquely within a single coded structure. This is possible without resorting to preselection into sets of only 32 controls known in ANSI X3.41-1974 as C1 sets. It is felt that the "boiling out" of more concise sets may come after a more universal control alphabet is structured. The developers of this standard are strongly of the opinion that there is no technical infeasibility in the direct adaptation into one single implementation of the structures described in this standard.

1.2 Scope.
This standard encompasses control functions for use with the coding schemes established by two other standards. The other standards are:

American National Standard Code for Information Interchange, ANSI X3.4-1977 (ASCII)

American National Standard Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange, ANSI X3.41-1974

When the preceding American National Standard referred to in this document are superseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply.

1.3 Field of Application.

1.3.1 Seven-Bit Code.

The standard deals with controls that can be represented as ESCape Fe sequences in 7-bit environments according to ANSI X3.41-1974.

1.3.2 Eight-Bit Code.

The standard deals with controls that can be represented in 8-bit environments according to ANSI X3.41-1974.

1.3.3 Duality in 7-Bit and 8-Bit Coding.

It is the intent of this standard that any control described within be identical in meaning in either 7-bit or 8-bit implementations.

1.4 Partial Implementation.

The implementation of all of the controls described in this standard in a single device is not a constraint intended by this standard.

2. DEFINITIONS AND NOTATION.

2.1 Definitions.
In this standard, the following definitions shall apply. These definitions are either not found in X3 Technical Report X3/TR-1-77, American National Dictionary for Information Processing, or are used with specific meaning in this standard. For convenience of the reader a number of terms from ANSI X3.4-1977 and ANSI X3.41-1974 are also included. All other terms are found in Technical Report X3/TR-1-77.

active position. The character position in a visual display that is to image the graphic symbol representing the next graphic or control character for which a graphic representation is required.

advance. To move the active position in the direction of increasing horizontal character position in a visual display, normally; however, see 4.5.1 for a discussion of end-of-line conditions.

application. A hardware or software implementation of a process or a device.

application program. A program that runs under control of an operating system.

area. A set of adjacent character positions in a visual display that are not necessarily on the same line.

auxiliary device. A device connected to a character imaging device for the purpose of storing, retrieving, or imaging data.

backward. In the direction of decreasing horizontal character position in a visual display, normally; however, see 4.5.1 for a discussion of beginning-of-line conditions.

bit combination. An ordered set of bits that represents a character.

blind interchange. Information interchange in which no prior agreements between sender and recipient are necessary in order to achieve successful interpretation of the information, except agreed-upon standards.

C0 set. A set of 32 control characters allocated to columns 0 and 1 of a code table.

C1 set. A set of 32 control characters allocated to columns 8 and 9 of an 8-bit code table or represented as ESCape Fe sequences in a 7-bit environment with identical meaning.

character. A member of a set of elements that is used for the organization, control, or representation of data.

character imaging device. A device that gives a visual representation of data in the form of graphic symbols using any technology, such as a cathode ray tube or printer.

character position. The portion of a visual display that images or is capable of imaging a graphic symbol.

control. A control character, an escape sequence, or a control sequence that performs a control function.

control character. A character whose occurrence in a particular context initiates, modifies, or stops a control function.

control function. An action that affects the recording, processing, transmission, or interpretation of data.

control sequence. A sequence of characters that is used for control purposes to perform a control function. It begins with the Control Sequence Introducer (CSI) control character and may contain a parameter string.

Control Sequence Introducer (CSI). A control character (in 8 bits) or an Escape sequence (in 7 bits) that provides supplementary controls and that is itself a prefix affecting the interpretation of a limited number of contiguous bit combinations.

control string. A string of characters that is used to perform a control function and is delimited by an opening and closing delimiter control.

cursor. A visual representation of the active position.

cursor control. An Editor function that moves the active position.

decipoint. A unit of length equal to 1/720 inch or 0.0353 mm.

default. A function-dependent value that is assumed when no explicit value is specified.

delete. To remove displayed symbols and close up adjacent graphic symbols to fill the gap.

designate. To identify a set of characters that are to be represented, in some cases immediately and in others on the occurrence of a further control function, in a prescribed manner.

display. The area for visual presentation of data on any type of character imaging device, including printer and cathode ray tube devices. A visual display. The display consists of a series of lines identified 1, 2, 3, ... and character positions within each line identified 1, 2, 3, ... with respect to the visual area, not a buffer, if any. In this standard the term "display" shall not be interpreted to mean a cathode ray tube device exclusively.

Editor function. A control that effects the layout or positioning of previously entered or received information in a character imaging device (for example, a printing or cathode ray tube device) and is intended to be interpreted and executed without remaining in the data stream. See Format effector.

enter. To input information manually into a character imaging device or to read information from an auxiliary device into a character imaging device.

erase. To remove displayed graphic symbols without closing up adjacent symbols to fill the gap.

Escape character (ESC). A control character that provides supplementary characters (code extension) and is itself a prefix affecting the interpretation of a limited number of contiguous bit combinations.

Escape sequence. A sequence of characters that is used for control purposes to perform a control function and whose first character is the Escape (ESC) control character.

field. An area whose boundaries are specified by Horizontal Tabulation Stops.

fill. A process involving the movement of text to or from display lines to accomplish a justification process.

Final character. A character whose bit combination terminates an escape or control sequence.

fixed space. A character that normally has no graphic representation, occupies a character position in a visual display, and is usually encoded as bit combination 2/0.

following. Lines or character positions in a visual display with larger numbered lines or larger numbered character positions than that of the active position.

font. A complete assortment of displayable graphic symbols in one size or style.

Format effector. A control that effects the layout or positioning of information in a character imaging device (for example, a printing cathode ray tube device) and may remain in the data stream subsequent to interpretation and processing. See Editor function.

form filling. A process of entering information into a preformatted visual display.

forward. In the direction of increasing horzontal character position in a visual display, normally; however, see 4.5.1 for a discussion of end-of-line conditions.

graphic character. A character, other than a control character, that has a visual representation normally handwritten, printed, or displayed.

graphic rendition. A visual style of displaying a set of graphic symbols.

graphic symbol. A visual representation of a graphic character or a control for which a graphic representation is required.

guarded area. A protected area that will not be included in the transmitted data stream when a device is induced to transmit.

input area. An area in which information can be entered.

intermediate character. A character whose bit combination precedes a Final character in an escape or control sequence.

introducer. A control character or escape sequence that by its occurrence begins a sequence of bit combinations that are interpreted as a single graphic character or as a single control.

invoke. To cause a designated set of characters to be represented by the prescribed bit combinations whenever those bit combinations occur until an appropriate code extension function occurs.

leader. A sequence of horizontal graphic symbols that lead the eye to the left or right.

left justify. To adjust the graphic symbols on a visual display so that the left margin of the display is regular.

line. A set of adjacent character positions in a visual display that have the same vertical position.

mode. A state of a device, or other sender or recipient, that affects the interpretation of received information, the operation of the sender or recipient, or the format of the transmitted information.

Monitor Send-Receive. A mode of operation of a character imaging device in which each graphic input is imaged locally as it is entered.

next. See following.

numeric parameter. A string of bit combinations that represents a number.

operating system. Software that controls the execution of computer programs and may provide scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management, and related services.

parameter.
(1) A string of one or more bit combinations representing a single value.
(2) The value so represented.

parameter string. A string of bit combinations that represent one or more parameter values.

point. A unit of length equal to 1/72 inch or 0.353 mm.

preceding. Lines or character positions in a visual display with smaller numbered lines or smaller numbered character positions than that of the active position.

private use. A technique of encoding or representing information in a prescribed, but nonstandard, way.

protected area. A qualified area into which no data may be entered.

quad. A process of justification that causes information to be displayed at the left margin, the right margin, or centered between margins.

qualified area. An area that may have restrictions on the type of data that may be entered and whose boundaries are specified by the Define Area Qualification (DAQ) control.

received data stream. The stream of bit combinations received by a character imaging device for purposes of information interchange.

represent.
(1) To use a prescribed bit combination with the meaning of a character in a set of characters that has been designated and invoked.
(2) To use an escape sequence with the meaning of an additional control character.

reserved for future standardization. An unused entry in a coding table where future standardization may take place.

right justify. To adjust the graphic symbols of a visual display so that the right margin of the display is regular.

scroll. An action whereby all of the graphic symbols of a visual display are moved in a specified direction.

selected area. An area that will be transmitted in a data stream when the device is induced to transmit.

selective parameter. A string of bit combinations that selects a subfunction from a specified list of subfunctions.

Simultaneous Send-Receive. A mode of operation of a character imaging device in which the local input facilities are logically disconnected from the output mechanism.

string delimiter. A control that begins or ends a string of characters in a data stream.

tabulation. A technique of identifying character positions in a visual display for the purpose of arranging information systematically.

tabulation stop. An indication that a character position is to be used for tabulation or the boundary between fields.

Thin Space. A character that normally has no graphic representation, that occupies a portion of a character position in a visual display, and whose width may be adjusted by a control sequence.

transfer. To move information from a character imaging device to an auxiliary device.

transmission control. A control intended to control or facilitate transmission of information over communication networks.

transmit. To send data as a data stream for purposes of information interchange.

transmitted data stream. The stream of bit combinations sent by a character imaging device when it is induced to transmit for purposes of information interchange.

2.2 Notation.

2.2.1 A Single Bit Combination. In this standard the following notations are used:

(1) For the bits of a 7-bit bit combination:

```
      b7  b6  b5  b4  b3  b2  b1
```

(2) For the bits of an 8-bit bit combination:

```
   a8  a7  a6  a5  a4  a3  a2  a1
```

(3) Bit weight for column and row reference:

```
    <---column---><----row---->
     8  4  2   1   8  4  2  1
```

A bit combination is sometimes referred to by the column and row numbers of its position in the code table. The column number is the decimal equivalent of bits b7-b5 in a 7-bit environment (or bits a8-a5 in an 8-bit environment) and the row number is the decimal equivalent of bits b4-b1 or bits a4-a1, giving to these bits the weight shown above. Bit combinations are represented by the notation "column m, row n" or alternatively as m/n, where m and n are the decimal column and row numbers respectively.

Example: In the ASCII code table the bit representation for the character "K" positioned in column 4, row 11 in a 7-bit environment is:

```
        b7  b6  b5  b4  b3  b2  b1
         1   0   0   1   0   1   1
```

In an 8-bit environment it is:

```
     a8  a7  a6  a5  a4  a3  a2  a1
      0   1   0   0   1   0   1   1
```

The bit combination may be represented as "column 4, row 11" or alternatively as "4/11" in either 7-bit or 8-bit environments.

2.2.2 Sequences of Bit Combinations. The following conventions are used to represent sequences of bit combinations:

(1) Controls (control characters, escape sequences, and control sequences) are given mnemonics that consist of two to four uppercase letters.
(2) Classes of bit combinations are represented by a single uppercase letter, possibly followed by:
(a) one lowercase letter to indicate a subclass, or
(b) one lowercase letter to indicate a string of characters in the class, or
(c) two lowercase letters or numbers to indicate ordinal position in the string.
(3) Strings of zero or more bit combinations of the same class are indicated by the notation X...X where X is anything in 2.2.2(2).
(4) Spaces are used to separate items 2.2.2(1), (2), and (3).

2.2.3 Classes of Bit Combinations. The following classes of bit combinations are used in this standard:

(1) P is a parameter character in a control sequence. P is from 3/0 to 3/15, inclusive.
(2) I is an Intermediate character in an Escape sequence or a control sequence. I is from 2/0 to 2/15, inclusive.
(3) F is a Final character in:
(a) an Escape sequence (here F is from 3/0 to 7/14, inclusive, as specified in ANSI X3.41-1974), or
(b) a control sequence (here F is from 4/0 to 7/14, inclusive, as specified in this standard).
(4) Gs is a graphic character appearing in strings. Gs is from 2/0 to 7/14, inclusive.
(5) Ce is a control represented as a single bit combination in the C1 set of controls in an 8-bit set. Ce is from 8/0 to 9/15, inclusive.
(6) Fe is a Final character of a two-character Escape sequence which has an equivalent representation in an 8-bit environment as a Ce. Fe is from 4/0 to 5/15 inclusive as specified in ANSI X3.41-1974.
(7) Fs is a Final character of a two character Escape sequence, which is standardized internationally with identical representation in 7-bit and 8-bit environments and is independent of the currently designated C0 and C1 control sets. Fs is from 6/0 to 7/14, inclusive, as specified in ANSI X3.41-1974.
(8) Pn is a numeric parameter in a control sequence. Pn is a string of zero or more characters from 3/0 to 3/9, inclusive.
(9) Ps is a variable number of selective parameters in a control sequence, with each selective parameter separated from the other by 3/11. Ps is a string of zero or more characters from 3/0 to 3/9, inclusive and 3/11.

Example: The format of an Escape sequence as defined in ANSI X3.41-1974 and used in this standard is:

ESC I...I F

where:

(1) ESC is the introducer control character 1/11 that is named Escape.
(2) I...I are the intermediate bit combinations that may or may not be present. I characters are bit combination 2/0 to 2/15, inclusive, in both 7-bit and 8-bit environments.
(3) F is the Final character. F characters are bit combinations 3/0 to 7/14 inclusive in Escape sequences in both 7-bit and 8-bit environments.
(4) The occurrence of characters in the inclusive ranges of 0/0 to 1/15 and 7/15 to 15/15 is an error condition whose recovery is not specified.

3. CONTROL FUNCTION SEQUENCES AND STRINGS.

3.1 General.

This standard contains descriptions of three controls that serve to introduce sequences of bit combinations much as the ESCape (ESC) in ESCape sequences. These three controls are:

Name	Mnemonic
Single Shift 2	SS2
Single Shift 3	SS3
Control Sequence Introducer	CSI

Functionally each requires additional information to cause its action to be effected. The complexity of this information ranges from which graphic to select in the case of SS2 or SS3 to which subfunction of what function to perform in the case of CSI.

3.2 Control Strings.

Two additional families of strings are established. These differ from the ESCape sequences or the others above. The form is that of an opening delimiter (the control function), a string of graphics and spaces (bit combinations 2/0 to 7/14 inclusive), and a closing delimiter. One family of these strings is used in a software mode and is assigned for communication by a human with his system. The other is intended for use in a hardware mode for portions of the system to pass information within the standard coded framework.

3.2.1 Software Control Strings.

The software areas of interaction are the Operating System Control Program, the Privacy Discipline, and the actual Application Program. These are envisaged as being interdependent, but direct communication paths are established to each discipline using the functions defined. The opening delimiters for the software strings are:

Name	Mnemonic
Operating System Command	OSC
Privacy Message	PM
Application Program Command	APC

The string is terminated by the occurrence of a String Terminator (see 3.2.3). The occurrence of other control characters and/or characters from columns 10 to 15 within such a string are error conditions whose recovery is not specified by this standard.

3.2.2 Device Control Strings.

There are many devices whose control is effected by the receipt of a command string at their interface. These capabilities and/or requirements are recognized in the string introducer Device Control String (DCS). These strings take the form of the introducer character DCS followed by one or more bit combinations representing the function. These may be characters from columns 2 to 7, excluding 7/15 (2/0 to 7/14), which represent the command or status data. The string is terminated by the occurrence of a String Terminator (see 3.2.3). The occurrence of other control characters and/or characters from columns 10 to 15 within such a string are error conditions whose recovery is not specified by this standard.

Example: DCS Gs...Gs ST

The opening delimiter for hardware/system strings is:

Name	Mnemonic
Device Control String	DCS

3.2.3 Terminating Control Strings.

The final delimiter is:

Name	Mnemonic
String Terminator	ST

This control terminates any of the software and device control strings (opening delimiter APC, DCS, OSC, or PM).

3.3 Representation of Characters.
The context of this standard addresses the representation of each control character as a single 8-bit bit combination in columns 8 and 9 (8/0 to 9/15 inclusive). In a 7-bit environment the equivalent representation of each control character is obtained by a two-character escape sequence called an Fe escape sequence (see ANSI X3.41-1974). An Fe escape sequence consists of the ESCape character (1/11) followed by a corresponding character from columns 4 or 5 (4/0 to 5/15 inclusive). It is intended that the 7-bit and 8-bit capabilities be identical. For example, the control 8/10 in an 8-bit environment has an identical interpretation as the two-character escape sequence 1/11 4/10 in a 7-bit environment.

It is important to retain the concept that the abstract term control implies the string of bits taken together as a whole regardless of the number of characters used in their representation.

3.4 Editing Functions.
Many character imaging devices have a variety of editing capabilities involving an active position indicator known as a cursor. Most applications of such devices do not demand transmission of the information involved in performing many of the editing capabilities of the device. On the other hand, it is recognized that very effective use may be made of some of those editing functions by a central unit driving the character imaging device. It is also recognized that many character imaging devices are incapable of performing the editing themselves and thus must encode the functions to permit a central logic driver to generate simulations of the functions. Additionally, it is often useful for the central logic driver to cause local functions to occur in a diagnostic mode. For these reasons the encoding of editing functions is included.

3.5 Control Sequence Functions.
The general form of a control sequence function is as follows:

CSI P...P I...I F

where:

(1) CSI is the introducer character (9/11 in 8 bits and 1/11 5/11 in 7 bits).
(2) P...P is called the "parameter string." The minimum length is zero, and the maximum length is defined by the implementation. However, all bit combinations are from 3/0 to 3/15 inclusive.
(3) F is the function defining character. It is used either as itself or with the I character(s) to establish what function is encoded. (F characters are bit combinations 4/0 to 7/14, inclusive.)
(4) I...I are the intermediate characters used to expand the repertoire of functions beyond the limit of 63 implied above. (I characters are bit combinations 2/0 to 2/15, inclusive.)
(5) The occurrence of bit combinations from columns 0 and 1 (0/0 to 1/15), from columns 8 to 15 (8/0 to 15/15), or position 7/15 in control sequences are error conditions whose recovery is not specified by this standard.

3.5.1 Parameter Values.
In a control sequence a parameter string consists of bit combinations from 3/0 to 3/15 inclusive. A parameter string may represent one or more parameters. Each standardized parameter consists of one or more bit combinations from 3/0 to 3/9, inclusive, representing the decimal values 0 to 9, or is possibly of zero length. The maximum length of a parameter is an implementation-defined limit. Parameters are separated from each other by the bit combination 3/11, usually a semicolon (;). The bit combination 3/10 is reserved for future standardization.

In each parameter leading bit combinations of 3/0 are not significant and may be omitted. A zero length parameter or one consisting only of 3/0 bit combinations represents a default

whose value depends upon the control function.

There are two types of parameters: numeric and selective. Numeric parameters are used for passing numeric values, and selective parameters are used to select particular entries in a specified list. The form of both types is the same.

3.5.2 One Numeric Parameter.
In CSI sequences the standardized numeric parameters will be expressed by use of the bit combinations from 3/0 to 3/9, inclusive. The meanings ascribed to the bit combinations will be the value associated with the corresponding row position (0-9). Hopefully, in the vast majority of character sets these values will correspond to the graphics (decimal digits zero through nine) involved in those positions.

3.5.3 Multiple Numeric Parameters.
In some control functions there is a need for more than one single parameter. This is particularly true in the case of those functions requiring coordinates. The parametric data in these functions will consist of a string of characters from 3/0 to 3/9 with the bit combination 3/11 (usually ; semicolon) as a separator between parameters. The default case described in 3.4.1 applies to each numeric parameter separately or to the entire parameter string as a whole.

3.5.4 Parameters Using Decipoints.
In several of the control functions a dimensional base of reference is called out. This dimensional base is called a "Decipoint," which is one-tenth of a typographic point, where a typographic point is defined as 1/72 inch. Therefore, a decipoint is 1/720 inch or 0.0353 mm. This base was chosen because it is a common denominator between typographic practice and data processing practice. In those parameteric sequences where the typographic measure is established, the parameter is expressed in units of "Decipoints." Thus one inch would be a value of 720.

3.5.5 Selective Parameters.
In CSI sequences the standardized selective parameters are represented by use of bit combinations from 3/0 to 3/9 inclusive. The values 3/0 to 3/9 singly and in combination represent individual selective parameters. Each selective parameter, although represented by a string of decimal digits, is not interpreted as a number; its meaning depends on the control function. The meaning of each selective parameter is listed with the definition of the function. Unspecified standard parameters (using 3/0 to 3/9 inclusive) are reserved for future standardization. The default case described in 3.4.1 applies to selective parameters. In a control sequence which represents a control with selective parameters, the number of parameters is variable. Each parameter selects a particular entry in the list specified with the control. Multiple selective parameters within the same control sequence are separated by the bit combination 3/11. The maximum number of parameters in a selective Control Sequence is implementation-defined, as is the order of performance and the effect of conflicting or unusual combinations.

3.5.6 Structure of Control Sequences.
For both numeric and selective parameters the complete control sequence structure is:

CSI P11...P1m 3/11 P21...P2m 3/11 ...
... 3/11 Pn1...Pnm I...I F

If P11 is 3/0 to 3/11, inclusive, the parameter string is interpreted according to the standard format described below.

If P11 is 3/12 to 3/15, inclusive, the entire parameter string is subject to private or experimental interpretation. This implies the possibility of private or experimental implementations of control sequences within the structure of the controls.

(1) CSI is 9/11 in an 8-bit environment; CSI is the two-character escape Fs sequence 1/11 5/11 in a 7-bit environment.

(2) Px1...Pxm is a numeric or selective parameter. Pxy is 3/0 to 3/9 inclusive for standardized parameters. Occurrences of 3/12 to 3/15 inclusive are undefined.

(3) I...I is a string of intermediate characters, where I is from 2/0 to 2/15 inclusive.

(4) F is the Final character. 4/0 to 6/15 is standardized or reserved for future standardization. 7/0 to 7/14 inclusive is available for private or experimental use.

NOTE: The occurrence of bit combinations in the following inclusive ranges: 0/0 to 1/15, or 7/15 to 15/15, or the occurrence of a P after an I has been encountered is an error condition whose recovery is not specified by this standard.

3.5.7 Mixed Parameters.
The definition of functions having both numeric and selective parameters is reserved for future standardization. The bit combination 3/10 has been reserved for use as the separator between the numeric and selective parameters in such control sequences when they become standardized.

3.5.8 Examples of Parameter Strings.

Char	Bit Combination	Explanation
7	3/7	A value of 7
98	3/9 3/8	A parameter with value 98
4;2	3/4 3/11 3/2	Two parameters with values 4 and 2
<3	3/12 3/3	A private parameter string
2;	3/2 3/11	Two parameters with the first having the value 2 and the second being the default
;5	3/11 3/5	Two parameters with the first the default and the second being 5
1;;4	3/1 3/11 3/11 3/4	Three parameters with the first value 1, the middle value the default, and the third value 4
0007	3/0 3/0 3/0 3/7	A single parameter interpreted exactly as in the first example above (a single value of 7)

3.5.9 Mode Controls.

3.5.9.1 Concepts.
This standard defines a number of two-state modes and one four-state mode that alter the meaning of subsequent control functions. The setting of the modes may be changed by using the Set Mode (SM), Reset Mode (RM), and Set Editing Extent Mode (SEM) control sequences. Their selective parameter or parameters identify which mode is to be set or reset. Several key concepts in this approach are summarized here:

(1) In an actual implementation some or all of these modes may have fixed values, incapable of being set or reset explicitly.

(2) The initial or fixed value of each mode depends on the implementation and may be either the so-called Set or Reset state as specified in this standard.

(3) Some modes specified may be implemented by programming or by hardware.

(4) Information interchange without prior agreements about implementor options is called blind interchange. Blind interchange would demand both an extensive mode setting/resetting sequence of text

and a means of identifying the successful acceptance of such a stream. This would amount to formalization of an agreement between sender and recipient.

(5) Inability of a device to respond to a mode changing control function is an error condition whose recovery is not standardized.

3.5.9.2 Classification.
The nineteen modes are divided into four classes:

(1) Modes that apply when a device is transmitting a data stream or transferring to an auxiliary device. They are:

FETM	Format Effector Transfer Mode
GATM	Guarded Area Transfer Mode
MATM	Multiple Area Transfer Mode
SATM	Selected Area Transfer Mode
SRTM	Status Reporting Transfer Mode

(2) Modes that apply locally to the device and do not affect the device when sending or receiving. They are:

CRM	Control Representation Mode
KAM	Keyboard Action Mode
SRM	Send-Receive Mode

(3) Modes which apply locally, when the device is receiving a data stream, and when it is transferring from an auxiliary device. They are:

EBM	Editing Boundary Mode
ERM	Erasure Mode
FEAM	Format Effector Action Mode
HEM	Horizontal Editing Mode
IRM	Insertion-Replacement Mode
PUM	Positioning Unit Mode
SEM	Select Editing Extent Mode
TSM	Tabulation Stop Mode
VEM	Vertical Editing Mode

(4) Modes that apply when a device is transmitting or receiving.

LNM	Line Feed New Line Mode

The definitions of the modes are arranged alphabetically in Section 5 along with the definitions of the controls. However, the reader may wish to familiarize himself with the modes before proceeding further.

3.6 ESCape Fs Functions.
There are four ESCape Fs functions which are defined in this standard according to the structure specified in ANSI X3.41-1974. The format is:

ESC Fs

Coding	Mnemonic	Name
1/11 6/0	DMI	Disable Manual Input
1/11 6/1	INT	Interrupt
1/11 6/2	EMI	Enable Manual Input
1/11 6/3	RIS	Reset to Initial State

4. OTHER CONSIDERATIONS.

4.1 Reserved Positions.

In reviewing the coded representations that are a part of this standard, the reader's attention is directed to an often used term. The term is "reserved for future standardization." The reservation is deliberately worded and is a restriction placed upon implementors. Implementors are warned that future standardization will take place in the reserved bit combinations. In each structured capability described private or experimental positions, or both, are provided for implementors to use without risk of negative impact by later standardization. On the other hand, private or experimental implementations, or both, reduce the likelihood of faultless interchange without explicit prior agreement between parties to the interchange.

4.2 Editing Functions and Format Effectors.

The evolution of character imaging devices has led to a situation where format effecting actions have come to have an ambiguous meaning. In the original definitions of format effectors (horizontal tabulation, backspace, etc) there was no mandatory physical action at the sending device. That is, the intention was that the receiving or interpreting device cause the desired action. The advent of buffered character imaging devices and those that, through architecture, appear to be buffered has led to editing action, which is expected to take place immediately upon entry of the controls. This standard describes two types of functions that act in the areas of editing and format effect. Those intended to be to be interpreted and executed without remaining in the character stream (as in the buffered device) are called "Editor function" in annotation with each definition. Those that are intended to remain in the character stream for subsequent execution are called "Format effector" in an annotation with each definition. In this standard the term "Format effector" also applies to the Format effectors defined in ANSI X3.4-1977, that is, Backspace-BS, Horizontal Tabulation-HT, Line Feed/New Line-LF/NL, Vertical Tabulation-VT, Form Feed-FF, and Carriage Return-CR. It is the intention that the Format effectors defined in ANSI X3.4-1977 be treated in the same way as the Format effectors defined in this standard. Implementation may perform some or all Format effectors, as well as leaving them in the data stream. See the descriptions of Format Effector Action Mode (FEAM) and Format Effector Transfer Mode (FETM).

The processing of a Format effector in a received character stream is expected to be as described in the applicable definition. The "Editor function" definitions generally would not appear in the received character stream as suggested in 3.4 except when the sender intended to edit previously sent data. The Editor functions are encoded solely as control sequences. Some "Format effector" functions appear as control sequences, while others appear as single characters (in 8 bits; two-character ESC Fe sequences in 7 bits).

4.3 Narrowed Definitions.

The definitions in this standard are deliberately broad. The primary intent is that those disciplines utilizing the functions described will find their own interaction with other disciplines enhanced. Where the open-ended definitions must be limited in order to cause "blind" interchange without equivocation there are at least two options:

(1) The implementing discipline will build a more specific or more narrowly defined standard based upon, but not incompatible with, the general standard; or

(2) The community of disciplines will direct the coding standardization body to narrow the definitions along prescribed paths.

Lacking one of these options, implementors are requested to identify how they narrowed or completed each definition. Until the time when the distillation of

capabilities has gained broad review and experience, it is improper for the coding standardization body to devote extensive effort toward a narrower conceptual model.

4.4 Transmission Control Relationships. It is the intent of this standard to make the interface with the communications or transmission environment more exact than in previous standards. No new transmission functions are included. Instead, many evolved functions that bridged both the network and terminating device have been defined totally independently of the communications implications. This work is also intended to function independently of the many transmission disciplines by attempting to gain transparency to them.

4.5 Interactions between Functions. This section introduces an apparent paradox in this standard. It treats in an introductory fashion the situations that are not the proper subject of a coding standard. At the same time it must be pointed out that the functions are no less valuable without specifying the implementation. The material is included to call attention to the fact that there are many remaining implementor options that may impact interchange. As in all previous coding standards, "blind" interchange of coded information is the goal. This standard admits that it does not, of itself, change that goal into a certainty. Implementations of individual functions from this standard imply decisions taken by the implementor as to interrelationships between functions and/or concepts. Examples of such possible situations are given in 4.5.1 through 4.5.3.

4.5.1 Cursor Boundary Value Problems. A character imaging device may use a cursor or active position indicator. This standard approaches a character imaging device from the viewpoint that, if there is a buffer, there is applicability whether the visible display area (page or window) is larger than, identical to, or smaller than the buffer. Keeping this in mind, there result conditions where the cursor action when reaching a boundary (edge) of the display area is at issue. This standard does not address which of several possible actions may take place, nor does it attempt to enumerate all possible situations. For example:

(1) Upon reaching the edge of a display the cursor disappears (from the operator's standpoint) if the operator attempts further positioning activity.

(2) Upon reaching the edge of a display the cursor does not move (from the operator's standpoint) if the operator attempts further positioning activity.

(3) Upon reaching the edge of a display the cursor moves to the opposite end of the window (from the operator's standpoint) if the operator attempts further positioning activity.

(4) Upon reaching the edge of a display the cursor moves to the opposite end of the window, but one row or column offset as applicable (from the operator's standpoint) if the operator attempts further positioning activity.

(5) Upon reaching the edge of a display automatic scrolling is induced.

(6) Some combination of (1) through (5).

4.5.2 Selected and Protected Areas. The areas selected for transmission and those areas protected against operator modification need not be either mutually exclusive or overlapping. In particular it is noted that a frequent usage would be to start a selected area immediately prior to the end of a protected area. This example could have applicability in a supervisory monitor situation in order to protect the contents of the selected area from modification by the operator.

4.5.3 Cursor and Protected Areas. This standard considers protected areas to be boundary situations as described in 4.5.1. As a result, a suitable boundary action would be expected.

4.6 Modal Interactions.
The result of the several modes that can be set or reset by the Set Mode (SM) or Reset Mode (RM) controls involves interactions among the modes. In local or editing situations these interactions are reasonably obvious. Implementors and users are requested to explore the interactions between the modes indicated by the asterisk at the intersection of their respective row and column in the following:

	EBM	ERM	FEAM	HEM	IRM
FETM			*		
HEM		*			*
SEM	*			*	*
CRM			*		

4.7 Implementor Dependencies.
The following introduces, but does not exhaustively describe, those matters left to the implementors. Therefore, they are subject to agreement between sender and recipient. It is the intent of this standard to provide the functional framework for implementations without specifying narrow conceptual goals. Thus the standard avoids identifying particular mandatory characteristics of the environment in which the coded character stream would operate. Some of the open-ended definitions beyond those already introduced above include:

(1) Whether or not the coded data are transmitted to and from separate devices and/or systems.

(2) Whether a terminal device is involved that has operator keys, or whether the functions will be system (software) generated.

(3) The number of bits, number of characters, and form of the bit combination or bit combinations generated by a single or multiple key depression.

(4) Whether characters entered become immediately visible or are processed (partial or full) prior to becoming visible.

(5) If there is a buffer, whether it is dimensionally (position count) larger, identically the same, or smaller than the display.

(6) Whether a control function occupies buffer space, display space, or both.

(7) When, in the processing, a control function becomes executed.

(8) The representation of a clear or erased state. The controls in this standard are intended to function in a rigid address structured environment or in a variably filled string environment.

(9) Whether delimited strings remain bracketed by their delimiters or become encoded under control of pointers and registers, etc.

(10) Whether there are implementation-defined default values for parametric functions when the standard does not specify a standardized default.

(11) What action will be taken in error recovery.

(12) The initial state of a device upon power-up, including the settings of the modes.

(13) Whether the width of a displayed character position is fixed or variable (depending on the character occupying the position).

4.8 The Active Position.
In this and other standards describing control functions a concept of an active position is used. Historically, this concept has referred to a unique physical position. As our technology has advanced there is an increasing awareness that there may well be more than one active position in a device. In fact, there may be an active position for each concurrent data stream source. The most common implementations of this concept at the time of development of this standard are

the split-screen or split-platen devices. For convenience many implementors have chosen to simplify the issue by use of multiple-device concepts associated with the multiple-stream capability. In this standard the concept of an active position is not limited to a single position for all data streams processed but may include an active position associated with each data stream where there is more than one.

5. CONTROL FUNCTIONS AND DEFINITIONS.

5.1 General.

In the following definitions there are implicit actions dependent upon mode conditions that may alter the stated definition significantly. Most definitions for controls that are affected by a mode explicitly mention the effect of the mode when in the reset and set states. Some definitions for the modes that are affected by other modes also explicitly mention the effect of the other modes when in the reset and set states. Usually the effect in the reset state is mentioned first. However, of the nine modes that affect a device when it is receiving, Format Effector Action Mode (FEAM) and Insertion-Replacement Mode (IRM) are not mentioned explicitly since they affect all Format effectors. The remaining nine modes affect the device locally or when it is sending and so are not usually mentioned specifically.

Each definition is labeled Format effector, Editor function, Introducer, or String delimiter, or is not labeled. The format is given using the notation of 2.2. The default value or values indicates the function-dependent parameter value to be used when the parameter is omitted or consists solely of 3/0 characters. Each definition is cross-referenced to applicable tables in Sections 6 to 12. These cross-references direct the reader to coded representations and to functional or other groupings. Appendix F also lists the controls by functional grouping.

Wherever selective parameter values are listed for a control sequence, it is implicit that the unused standard values are reserved for future standardization. The use of a Private (experimental) parameter string in such functions, (that is, a parameter string beginning with bit combinations 3/12 to 3/15, inclusive) is not restricted.

In order to make the text of this standard more concise, each definition has been constructed such that the name is the implicit subject of the sentence on the following line.

In the following definitions the term "display" refers to the entire visual area for imaging characters on a device of any type. The term shall not be interpreted exclusively to mean a cathode ray tube device.

5.2 APC APPLICATION PROGRAM COMMAND

(String delimiter; format: Ce or ESC Fe)

Indicates the beginning of an application program command. An application program command is a string of graphics (bit combinations 2/0 to 7/14, inclusive), starting with the first character after the application program command delimiter and terminating with the control ST (String Terminator). The interpretation of the command is subject to the individual application program. Applications utilizing the application program command delimiter will most often have some graphic representation for APC. See Section 3.

(See Sections 6 and 7.)

5.3 CBT CURSOR BACKWARD TABULATION

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position horizontally in the backward direction to the preceding in a series of predetermined positions according to the parameter value. A parameter value of zero or one will indicate the preceding horizontal tabulation stop, while a larger value (N) will indicate that the Nth preceding horizontal tabulation stop is desired.

(Numeric parameter: see Sections 8 and 10.)

5.4 CCH CANCEL CHARACTER

(format: Ce or ESC Fe)

Indicates that the preceding graphic character, control character, escape sequence, or control sequence in the data stream is to be ignored.

(See Sections 6 and 7.)

5.5 CHA CURSOR HORIZONTAL ABSOLUTE

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position forward or backward along the active line to the character position specified by the parameter. A parameter value of zero or one moves the active position to the first character position of the active line. A parameter value of N moves the active position to character position N of the active line.

(Numeric parameter: see Sections 8 and 10.)

5.6 CHT CURSOR HORIZONTAL TABULATION

(Editor function; format: CSI Pn F; default value: 1)

Advances the active position horizontally to the next or following in a series of predetermined positions according to the parameter value. A parameter value of zero or one will indicate the next horizontal tabulation stop, and a larger value (N) will indicate that the Nth following horizontal tabulation stop is desired.

(Numeric parameter: see Sections 8 and 10.)

5.7 CNL CURSOR NEXT LINE

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position to the first position of the next display line or Nth following display line depending upon the parameter. A parameter value of zero or one indicates the next line. A parameter value of N indicates the Nth following line.

(Numeric parameter: see Sections 8 and 10.)

5.8 CPL CURSOR PRECEDING LINE

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position to the first position of the preceding display line or Nth preceding display line, depending upon the parameter. A parameter value of zero or one indicates the preceding line. A parameter value of N indicates the Nth preceding line.

(Numeric parameter: see Sections 8 and 10.)

5.9 CPR CURSOR POSITION REPORT

(format: CSI Pn 3/11 Pn F; default values: 1)

Reports the active position by means of the parameters. Sending this sequence from a device indicates the active position on the device. This sequence has two parameter values, the first specifying the vertical position and the second specifying the horizontal. The default condition with no parameters present is equivalent to a Cursor at Home Position.

This control sequence may be solicited either by a DSR (Device Status Report) or unsolicited.

(Numeric parameters: see Sections 8 and 10.)

5.10 CRM CONTROL REPRESENTATION MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes controls to be performed as defined and to have no graphic representation in the display. The set state causes controls to have a graphic representation in the display. This mode may not apply to certain controls which are intended to always have a graphic representation. Whether Format effectors and other controls are performed, stored, or subsequently transmitted, or any combination thereof, is not affected by CRM. See FEAM (Format Effector Action Mode) and FETM (Format Effector Transfer Mode).

(Mode-changing parameter: see Section 12.)

5.11 CSI CONTROL SEQUENCE INTRODUCER

(Introducer; format: Ce or ESC Fe)

Indicates the start of a control sequence that may contain a parameter string along with an associated control function. (See Sections 3, 6, and 7.)

5.12 CTC CURSOR TABULATION CONTROL

(Editor function; format: CSI Ps F; default value: 3/0)

Causes one or more tabulation stops to be set or cleared according to the parameter(s). This control is intended to contrast with its Format effector counterparts (HTS, TBC, VTS) in that there is no intention for CTC to remain in the data stream once its effect has been gained.

When horizontal tabulation stops are set or cleared, the number of lines affected is all or one depending on the reset or set states of the Tabulation Stop Mode (TSM).

Param.	Parameter Meaning
3/0	Set a horizontal tabulation stop at the active position (default)
3/1	Set a vertical tabulation stop at the active line
3/2	Clear the horizontal tabulation stop at the active position
3/3	Clear the vertical tabulation stop at the active line
3/4	Clear all horizontal tabulation stops in the active line
3/5	Clear all horizontal tabulation stops in the device
3/6	Clear all vertical tabulation stops in the device

(Selective parameter(s): see Sections 9 and 10.)

5.13 CUB CURSOR BACKWARD

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position in the backward direction. The distance moved is determined by the parameter. If the parameter value is zero or one, the active position is moved one position backward. If the parameter value is N, the active position is moved N positions backward.

(Numeric parameter: see Sections 8 & 10.)

5.14 CUD CURSOR DOWN

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position downward without altering the horizontal position. The number of lines moved is determined by the parameter. If the parameter value is zero or one, the active position is moved one line downward. If the parameter value is N, the active position is moved N lines downward.

(Numeric parameter: see Sections 8 and 10.)

5.15 CUF CURSOR FORWARD

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position in the forward direction. The distance moved is determined by the parameter. A parameter value of zero or one moves the active position one position forward. A parameter value of N moves the active position N positions forward.

(Numeric parameter: see Sections 8 and 10.)

5.16 CUP CURSOR POSITION

(Editor function; format: CSI Pn 3/11 Pn F; default values: 1)

Moves the active position to the position specified by the parameters. This sequence has two parameter values, the first specifying the vertical position and the second specifying the horizontal position. A parameter value of zero or one for the first or second parameter moves the active position to the first line or column in the display respectively. The default condition with no parameters present is equivalent to a Cursor to Home action.

(Numeric parameters: see Sections 8 & 10.)

5.17 CUU CURSOR UP

(Editor function; format: CSI Pn F; default value: 1)

Moves the active position upward without altering the horizontal position. The number of positions moved is determined by the parameter. A parameter value of zero or one moves the active position one line upward. A parameter value of N moves the active position N lines upward.

(Numeric parameter: see Sections 8 and 10.)

5.18 CVT CURSOR VERTICAL TABULATION

(Editor function; format: CSI Pn F; default value: 1)

Advances the active position to the next or following in a series of predetermined lines without altering the horizontal position. A parameter value of zero or one indicates an advance to the line of the next vertical tabulation stop. A parameter value of N indicates an advance of N vertical tabulation stops.

(Numeric parameter: see Sections 8 and 10.)

5.19 DA DEVICE ATTRIBUTES

(format: CSI Pn F; default value: 0)

(1) Requests a device to send a Device Attributes (DA) control sequence to identify itself. This form is derived by the DA control sequence with either no parameter or a parameter of 3/0.

(2) Response to the request stated in 5.19.1 (1). This form is derived by the DA control sequence with a numeric parameter whose value is greater than zero. The meaning of this parameter will be a unique device identification code according to a register that is to be established independently of, but in accordance with, this standard. This control sequence may be issued as a solicited response as above or unsolicited.

(Numeric parameter: see Sections 8 and 10.)

5.20 DAQ DEFINE AREA QUALIFICATION

(format: CSI Ps F; default value: 3/0)

Indicates that the active position is the first character position of a qualified area. The end of a qualified area is indicated by the beginning of the following qualified area. The qualifications of the area are specified according to the parameter(s).

Param.	Parameter Meaning (Area Qualification)
3/0	ACCEPT ALL INPUT (DEFAULT)
3/1	ACCEPT NO INPUT (PROTECTED) AND DO NOT TRANSMIT (guarded)
3/2	ACCEPT GRAPHICS
3/3	ACCEPT NUMERICS
3/4	ACCEPT ALPHABETICS
3/5	RIGHT JUSTIFY IN AREA
3/6	ZERO FILL IN AREA
3/7	HORIZONTAL TAB STOP AT START OF AREA (START FIELD)
3/8	ACCEPT NO INPUT (PROTECTED), BUT SELECT FOR TRANSMISSION (UNGUARDED)
3/9	SPACE FILL IN AREA

NOTE: DAQ with a 3/1 parameter is equivalent to the single control character Start of Protected Area (SPA). A qualified area that is not specified with a 3/1 parameter may be selected for transmission or transfer to an auxiliary device. See Multiple Area Transfer Mode (MATM), Selected Area Transfer Mode (SATM), and Transfer Termination Mode (TTM). DAQ with a 3/7 parameter is equivalent to a Horizontal Tabulation Stop and delimits a field.

(Selective parameter(s): see Sections 9 and 10.)

5.21 DCH DELETE CHARACTER

(Editor function; format: CSI Pn F; default value: 1)

Deletes the character at the active position and possibly other adjacent characters according to the parameter. The adjacent string of characters, if any, is shifted toward the active position. The vacated character positions at the other end are erased. A parameter value of zero or one indicates one character is removed. A parameter value of N indicates that N characters are removed.

The extent (display, line, field, or qualified area) of the string affected is determined by the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM). The deleted and shifted strings include the active position and the character positions to the right or left depending on the reset or set state of the Horizontal Editing Mode (HEM).

The effect of this control on any start or end of selected area, start or end of qualified area (see SSA, ESA, DAQ), or tabulation stops in the shifted string is not defined by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.22 DCS DEVICE CONTROL STRING

(String delimiter; format: Ce or ESC Fe)

Indicates the beginning of a device control string, which is used to effect the control of a receiving device or report the status of the sending device. A device control string is a string of graphics (bit combinations 2/0 to 7/14 inclusive), starting with the first character after the Device Control String delimiter and terminating with the control ST (String Terminator). The meaning of the string is implementor defined. These strings are intended for detailed messages involving either control or status reporting. Examples of applications of Device Control Strings are program loading, configuration control, mode control, and diagnostics. For other status reporting see DSR (Device Status Report) and SRTM (Status Reporting Transfer Mode) below.

(See Sections 3, 6, and 7)

5.23 DL DELETE LINE

(Editor function; format: CSI Pn F; default value: 1)

Removes the contents of the active line and possibly adjacent lines depending on the parameter. The contents of either all following lines or all preceding lines are shifted in a block toward the active line, depending on the reset or set state of the Vertical Editing Mode (VEM) respectively. The lines at the other end of the shifted part are either erased or additional lines are shifted into the current display depending on the reset or set state of the Editing Boundary Mode (EBM). A parameter value of zero or one removes the contents of the active line and shifts all adjacent lines one line toward the active line. A parameter value of N removes the contents of the N lines including the active line and shifts all adjacent lines N lines toward the active line.

The effect of DL on the active position is not specified by this standard.

(Numeric parameter: see Section 8 and 10.)

5.24 DMI DISABLE MANUAL INPUT

(format: ESC Fs)

Causes all or part of the manual input facility of the receiving device to be disabled.

DMI is equivalent to the set state of the Keyboard Action Mode (KAM). See Appendix E for the distinction between ESCape Fs controls and C1 set controls.

Coded as 1/11 6/0

(ESCape Fs Control)

5.25 DSR DEVICE STATUS REPORT

(format: CSI Ps F; default value: 3/0)

Reports the general status of the device sending the control sequence (parameter values 3/0 to 3/4 inclusive) and/or requests a status report from the receiving device (parameter values 3/5 and 3/6), according to the parameter(s).

Param.	Parameter Meaning
3/0	READY, NO MALFUNCTIONS DETECTED (DEFAULT)
3/1	BUSY - RETRY LATER
3/2	BUSY - WILL NOTIFY WHEN READY (USING A DSR CONTROL SEQUENCE)
3/3	MALFUNCTION - RETRY
3/4	MALFUNCTION - WILL NOTIFY WHEN READY (USING A DSR CONTROL SEQUENCE)
3/5	PLEASE REPORT STATUS (USING A DSR CONTROL SEQUENCE OR DCS STRING)
3/6	PLEASE REPORT ACTIVE POSITION (USING A CPR CONTROL SEQUENCE)

DSR with a parameter value of 0, 1, 2, 3, or 4 may be sent as a response to a requesting DSR (parameter value of 5), or as a response to MW (Message Waiting), or it may be sent unsolicited.

(Selective parameter(s): see Sections 9 and 10.)

5.26 EA ERASE IN AREA

(Editor function; format: CSI Ps F; default value: 3/0)

Erases some or all of the characters in the current qualified area, that is, the qualified area in which the active position resides, according to the parameter.

Param.	Parameter Meaning
3/0	FROM ACTIVE POSITION TO END INCLUSIVE (DEFAULT)
3/1	FROM START TO ACTIVE POSITION INCLUSIVE
3/2	ALL OF QUALIFIED AREA INCLUSIVE

Whether unprotected areas or all areas are erased depends on the reset or set state of the Erasure Mode (ERM). Character positions outside of the current display may be affected if the Editing Boundary Mode (EBM) is in the set state.

(Selective parameter: see Sections 9 and 10.)

5.27 EBM EDITING BOUNDARY MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The intent of this mode is to distinguish between considering the display as a series of discrete pages or as a window into a continuous series of lines or characters.

The reset state limits the effect of certain Editor functions to the current display. The Editor functions DCH (Delete Character) and DL (Delete Line) insert erased positions at the beginning or end of the current display. Overflowed characters may be lost when insertions are made. The positioning and erasure Editor functions are limited to the current display.

The set state does not limit the effect of Editor functions to the current display. Character positions beyond the current display may be affected by the Editor functions DCH and DL. Insertions (IL, ICH, and receiving a data stream when

IRM is in the set state) and erasures may affect character positions beyond the current display. The positioning Editor functions are not limited to the current display and may cause scrolling to occur.

This mode affects the following erasure Editor functions: Erase Character (ECH), Erase in Area (EA), Erases in Display (ED), Erase in Field (EF) and Erase in Line (EL). The positioning Editor functions affected are: Cursor Backward Tabulation (CBT), Cursor Horizontal Tabulation (CHT), Cursor Next Line (CNL), Cursor Preceding Line (CPL), Cursor Backward (CUB), Cursor Down (CUD), Cursor Forward (CUF), Cursor Up (CUU), and Cursor Vertical Tabulation (CVT).

This mode does not affect NP (Next Page), PP (Previous Page), SD (Scroll Down), SL (Scroll Left), SR (Scroll Right), and SU (Scroll Up) Editor functions. This mode does not affect the absolute position Editor functions Cursor Horizontal Absolute (CHA) and Cursor Position (CUP).

(Mode-changing parameter: see Section 12)

5.28 ECH ERASE CHARACTER

(Editor function; format: CSI Pn F; default value: 1)

Erases the character at the active position and possibly other following characters, according to the parameter. The active position is unchanged. A numeric parameter of zero or one indicates that one character is erased. A numeric parameter of N indicates that N characters are erased.

Whether unprotected areas or all areas are erased depends on the reset or set state of the Erasure Mode (ERM). Character positions outside of the current display may be affected if the Editing Boundary Mode (EBM) is in the set state.

(Numeric parameter: see Sections 8 and 10.)

5.29 ED ERASE IN DISPLAY

(Editor function; format: CSI Ps F; default value: 3/0)

Erases some or all of the characters in the display according to the parameter.

Param.	Parameter Meaning
3/0	FROM ACTIVE POSITION TO END INCLUSIVE (DEFAULT)
3/1	FROM START TO ACTIVE POSITION INCLUSIVE
3/2	ALL OF DISPLAY

Whether unprotected areas or all areas are erased depends on the reset or set state of the Erasure Mode (ERM). Character positions outside of the current display may be affected if the Editing Boundary Mode (EBM) is in the set state.

(Selective parameter: see Sections 9 and 10.)

5.30 EF ERASE IN FIELD

(Editor function; format: CSI Ps F; default value: 3/0)

Erases some or all of the characters in the current field, that is, the string of character positions between the preceding and the following horizontal tabulation stops according to the parameter.

Param.	Parameter Meaning
3/0	FROM ACTIVE POSITION TO END INCLUSIVE (DEFAULT)
3/1	FROM START TO ACTIVE POSITION INCLUSIVE
3/2	ALL OF FIELD INCLUSIVE

Whether unprotected areas or all areas are erased depends on the reset or set state of the Erasure Mode (ERM). Character positions outside of the current display may be affected if the Editing Boundary Mode (EBM) is in the set state.

(Selective parameter: see Sections 9 and 10.)

5.31 EL ERASE IN LINE

(Editor function; format: CSI Ps F; default value: 3/0)

Erases some or all of the characters in the active line according to the parameter.

Param.	Parameter Meaning
3/0	FROM ACTIVE POSITION TO END INCLUSIVE (DEFAULT)
3/1	FROM START TO ACTIVE POSITION INCLUSIVE
3/2	ALL OF LINE INCLUSIVE

Whether unprotected areas or all areas are erased depends on the reset or set state of the Erasure Mode (ERM). Character positions outside of the current display may be affected if the Editing Boundary Mode (EBM) is in the set state.

(Selective parameter: see Sections 9 and 10.)

5.32 EMI ENABLE MANUAL INPUT

(format: ESC Fs)

Enables the manual input facility of the receiving device to permit input. EMI is equivalent to the reset state of the Keyboard Action Mode (KAM). See Appendix E for the coding distinction between ESCape Fs controls and C1 set controls.

Coded as 1/11 6/2

(ESCape Fs Control)

5.33 EPA END OF PROTECTED AREA

(format: Ce or ESC Fe)

Indicates that the active position is the end of a string of consecutive character positions that are protected against manual alteration and that are guarded against transmission in a data stream or transfer to an auxiliary device. The beginning of this string of character positions is indicated by the control character SPA (Start of Protected Area).

See Define Area Qualification (DAQ) for equivalent and alternate forms of protected areas.

(See Sections 6 and 7.)

5.34 ERM ERASURE MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes erase functions to erase only unprotected characters applicable to the function. The set state causes erase functions to erase characters regardless of their protected state.

See Start of Protected Area (SPA), End of Protected Area (EPA), and Define Area Qualification (DAQ).

(Mode-changing parameter: see Section 12.)

5.35 ESA END OF SELECTED AREA

(format: Ce or ESC Fe)

Indicates that the active position is the end of a string of consecutive character positions whose contents are selected to be subsequently transmitted in a data stream or transferred to an auxiliary input/output device. The beginning of this string is indicated by the control character SSA (Start of Selected Area).

Neither SSA nor ESA actually initiates the transmission. Whether SSA and ESA are included in the string when it is transmitted is not specified by this standard.

(See Sections 6 and 7.)

5.36 FEAM FORMAT EFFECTOR ACTION MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. In the reset state Format effectors are performed immediately when received in a data stream or transferred from an auxiliary device. Implementations may store Format effectors or not after performing them.

In the set state Format effectors are not performed when received in a data stream; they are not transferred from an auxiliary device but instead are stored.

If the Control Representation Mode is set, the Format effectors will (also) have a graphic representation independent of whether they are being performed or not as specified by FEAM.

(Mode-changing parameter: see Section 12.)

5.37 FETM FORMAT EFFECTOR TRANSFER MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes Format effectors to be inserted in a data stream or included in data when transferred to an auxiliary device. The set state causes Format effectors not to be inserted in a transmitted data stream and not be included in data when transferred to an auxiliary device, except for Format effectors that were stored (see FEAM).

(Mode-changing parameter: see Section 12.)

5.38 FNT FONT SELECTION

(Format effector; format: CSI Pn 3/11 Pn I F; default values: 0)

Designates a stylistic font to be invoked by subsequent SGR control sequences (Select Graphic Rendition) with parameter value 10 to 19 inclusive. The first parameter specifies the primary or alternative font to be affected. The second parameter identifies the stylistic font to be designated, according to some register that is to be established. Default stylistic font(s) are implementation defined.

Param.	Meaning of First Parameter
3/0	PRIMARY FONT (DEFAULT)
3/1	FIRST ALTERNATIVE FONT
3/2	SECOND ALTERNATIVE FONT
3/3	THIRD ALTERNATIVE FONT
to	TO
3/9	NINTH ALTERNATIVE FONT

(Numeric parameters: see Sections 8 and 11.)

5.39 GATM GUARDED AREA TRANSFER MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state permits only unguarded data to be transmitted in a data stream or transferred to an auxiliary device. The set state permits all data to be transmitted in a data stream or transferred to an auxiliary device.

See Start of Protected Area (SPA), End of Protected Area (EPA), and Define Area Qualification (DAQ).

(Mode-changing parameter: see Section 12.)

5.40 GSM GRAPHIC SIZE MODIFICATION

(Format effector; format: CSI Pn 3/11 Pn I F; default values: 100)

Changes the height and/or width of all designated primary and alternative fonts as established by the preceding Graphic Size Selection (GSS) uniformly until the next occurrence of either GSM or GSS in the data stream. The first and second parameters are the percentages by which the height and width specified by the most recent GSS is to be multiplied respectively. If either parameter is omitted, the corresponding dimensional size is restored to the most recent GSS specification; that is, 100 is the default value for each parameter. This function is used where minor styling changes are desired. Implementors are cautioned to suggest suitable precautions to their users. GSM affects only those characters that follow it in the data stream, not those previously received.

Example: A GSS specification of 200 would be reduced to 150 by a GSM parameter of 75 or increased to 250 by a GSM parameter of 125.

(Numeric parameters: see Sections 8 and 11.)

5.41 GSS GRAPHIC SIZE SELECTION

(Format effector; format: CSI Pn I F; default value: none)

Changes the height and width of all designated primary and alternative fonts to be established until the next occurrence of either GSS or GSM (Graphics Size Modification) in the data stream. The value of the parameter is the height expressed in units of decipoints. The width is implicitly defined by the height depending on implementation, the font selected, or both. GSS affects only those characters that follow it in the data stream, not those previously received.

(Numeric parameter: see Sections 8 and 11.)

5.42 HEM HORIZONTAL EDITING MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. In the reset state a character insertion causes a string of data at and following the active position to be shifted forward, and a character deletion causes a string of data following the active position to be shifted backward.

In the set state a character insertion causes a string of data at and preceding the active position to be shifted backward and a character deletion causes a string of data preceding the active position to be shifted forward.

This mode affects the action of the control DCH (Delete Character) and ICH (Insert Character) and when data is entered or received while the Insertion-Replacement Mode (IRM) is set.

(Mode-changing parameter: see Section 12.)

5.43 HPA HORIZONTAL POSITION ABSOLUTE

(Format effector; format: CSI Pn F; default value: 1)

Moves the active position within the active line to the position specified by the parameter. A parameter value of zero or one moves the active position to the first position of the active line. A parameter value of N moves the active position to position N of the active line.

Whether the parameter is expressed in units of character positions or decipoints depends on the reset or set state of the Positioning Unit Mode (PUM).

(Numeric parameter: see Sections 8 and 10.)

5.44 HPR HORIZONTAL POSITION RELATIVE

(Format effector; format: CSI Pn F; default value: 1)

Moves the active position forward the number of positions specified by the parameter. A parameter value of zero or one indicates a single-position move. A parameter value of N indicates an N-position move.

Whether the parameter is expressed in units of character positions or decipoints depends on the reset or set state of the Positioning Unit Mode (PUM).
(Numeric parameter: see Sections 8 and 10.)

5.45 HTJ HORIZONTAL TAB WITH JUSTIFY

(Format effector; format: Ce or ESC Fe)

Shifts the characters between the preceding horizontal tabulation stop and the active position, but not including the character at the active position, forward up to the following horizontal tabulation stop. The active position is also moved to the next horizontal tabulation stop. The character positions between the preceding horizontal tabulation stop and the new beginning of the shifted string are erased.

(See Sections 6 and 7.)

5.46 HTS HORIZONTAL TABULATION SET

(Format effector; format: Ce or ESC Fe)

Sets one horizontal tabulation stop at the active position.

Whether all lines or only the active line is affected depends on the reset or set state of the Tabulation Stop Mode (TSM).
(See Sections 6 and 7.)

5.47 HVP HORIZ. AND VERTICAL POSITION

(Format effector; format: CSI Pn 3/11 Pn F; default values: 1)

Moves the active position to the position specified by the parameters. This sequence has two parameter values, the first specifying the vertical position and the second specifying the horizontal. A parameter value of zero or one for the first or second parameter moves the active position to the first line or column in the display, respectively. The default condition with no parameters present moves the active position to the home position. Whether the parameter is expressed in units of character positions or decipoints depends on the reset or set state of the Positioning Unit Mode (PUM).

(Numeric parameters: see Sections 8 and 10.)

5.48 ICH INSERT CHARACTER

(Editor function; format: CSI Pn F; default value: 1)

Erased character positions are inserted at the active position according to the parameter. The contents of a string beginning at the active position are shifted forward or backward from the active position, depending on the reset or set state of the Horizontal Editing Mode (HEM). The contents of the character positions at the other end of the string are removed as the shifting progresses. A parameter value of zero or one indicates a single-position shift. A parameter value of N indicates an N-position shift.

The extent of the positions affected (display, line, field, or qualified area) depends on the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM). The effect of ICH on any start or end of a selected or qualified area (see SSA, ESA, and DAQ) or on tabulation stops in the shifted string is not defined by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.49 IL INSERT LINE

(Editor function; format: CSI Pn F; default value: 1)

Inserts one or more erased lines at the active line according to the parameter by shifting the contents of the active line and either all following or all preceding lines away from the active line, depending on the reset or set state of the Vertical Editing Mode (VEM), respectively. The contents of the lines at the other end of the shifted part are removed. A parameter value of zero or one causes the contents of the active line and following or preceding lines to move down or up one line; a parameter value of N causes the contents of the active line and following or preceding lines to move down or up N lines, depending on the reset or set state of the Vertical Editing Mode (VEM), respectively.

If the Editing Boundary Mode (EBM) is set, lines outside the current display may be affected. If the Tabulation Stop Mode (TSM) is in the set state, horizontal tabulation stops in the erased lines are cleared.

The effect of IL on the active position is not specified in this standard.

(Numeric parameter: see Sections 8 and 10.)

5.50 IND INDEX

(Format effector; format: Ce or ESC Fe)

Causes the active position to move downward one line without changing the horizontal position.

(See Sections 6 and 7.)

5.51 INT INTERRUPT

(format: ESC Fs)

Indicates to the receiving device that the current process is to be interrupted and an agreed procedure is to be initiated.

Coding 1/11 6/1

(ESCape Fs Control)

5.52 IRM INSERTION-REPLACEMENT MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. In the reset state the entry or receipt of a graphic character or a control for which a graphic representation is required causes the appropriate graphical symbol to replace (or, depending on implementation, to be combined with) the graphical symbol currently imaged at the active position. Then the active position is advanced one character position for all graphical symbols or the active position is affected as appropriate for Format effectors.

In the set state the entry or receipt of a graphic character or a control for which a graphic representation is required causes the appropriate graphical symbol to be inserted at the active position after shifting the character at the active position and the following or preceding characters forward or backward one character position depending on the reset or set state of the Horizontal Editing Mode (HEM), respectively. Then the active position is advanced one character position or is not moved for all graphical symbols, depending on the reset or set state of the Horizontal Editing Mode (HEM), respectively, or the active position is affected as appropriate for Format effectors. The extent of the characters affected (display, line, field, or qualified area) depends on the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM).

(Mode-changing parameter: see Section 12.)

5.53 JFY JUSTIFY

(Format effector; format: CSI Ps I F; default value: 3/0)

Invokes a process wherein the layout of the graphics (and possibly some Format effectors) that follow in the data stream are altered until the occurrence of the next Justify control sequence (JFY) in the data stream. Justification is a process involving positioning of text in order to provide a more esthetically pleasing appearance to the resulting image. It is not expected that devices will be capable of visible and continuous layout changing, but instead may accomplish the process as sufficient text has been processed to ensure a sensible result. As a Format effector this control sequence is intended to be placed in the character stream for subsequent processing.

In the following parameter list several terms are used that are broadly defined:

Fill: A process involving the movement of text to or from display lines to accomplish the justification process.

Interword Spacing: A process whereby the spacing between words is altered according to an implementation-dependent strategy in order to accomplish the justification process.

Letter Spacing: A process whereby the spacing between all or a selected list of graphics is altered according to an implementation-dependent strategy in order to accomplish the justification process.

Hyphenation: A process whereby words are broken according to an implementation-dependent strategy in order to accomplish the justification process.

Italian Form: A process similar to hyphenation except that the strategy for breaking words is less complex and the final character on a line containing a broken word is underscored.

Margin: An imaging boundary for horizontal positioning.

Flush: A concept involving alignment of characters so as to appear to have their edges against a vertical line.

NOTE: It is expected that there will be more than one parameter in a Justify control sequence. Whatever parametric actions are desired will be presented, each separated by the bit combination 3/11. See Section 3.

Param.	Parameter Meaning
3/0	TERMINATE ALL JUSTIFY ACTION (DEFAULT)
3/1	FILL ACTION ON (TEXT TO OR FROM OTHER LINES)
3/2	INTERWORD SPACING
3/3	LETTER SPACING
3/4	HYPHENATION
3/5	FLUSH LEFT MARGIN
3/6	CENTER TEXT BETWEEN MARGINS
3/7	FLUSH RIGHT MARGIN
3/8	ITALIAN FORM (ARBITRARY WORD BREAK WITH UNDERSCORE)

(Selective parameter(s): see Sections 9 and 11.)

5.54 KAM KEYBOARD ACTION MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state enables the manual input facilities at the receiving device. The set state disables all or part of the manual input facilities at the receiving device.

(Mode-changing parameter: see Section 12.)

5.55 LNM LINE FEED NEW LINE MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes the interpretation of the Format effector Line Feed (LF) defined in ANSI X3.4-1977 to imply only vertical movement of the active position. The set state causes the Format Effector Line Feed (LF) to imply movement to the first position of the following line. This is the so-called New Line (NL) option.

This mode does not affect the Vertical Tabulation (VT), Form Feed (FF), Index (IND), or Next Line (NEL) Format effectors.

(Mode-changing parameter: see Section 12.)

5.56 MATM MULTIPLE AREA TRANSFER MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes only the single selected area containing the active position to be transmitted in a data stream or transferred to an auxiliary device. The set state causes all selected areas in the display to be transmitted in a data stream or transferred to an auxiliary device.

This mode is significant only if the Selected Area Transfer Mode (SATM) is in the reset state.

(Mode-changing parameter: see Section 12.)

5.57 MC MEDIA COPY

(format: CSI Ps F; default value: 3/0)

Controls the transfer of data between the device and an auxiliary input/output device. Parameter values 3/0 to 3/3 inclusive initiate a transfer of data between the buffer of the device and an auxiliary input/output device. Parameter values 3/4 to 3/7 inclusive are modes that disable or enable the device to copy subsequently received data from the received data stream to an auxiliary input/output device. In addition, the received data stream may or may not be entered or displayed, depending on implementation. The direction of the data transfer and the identification of the auxiliary device depend on the parameter(s).

Param.	Parameter Meaning
3/0	TO PRIMARY AUXILIARY DEVICE (DEFAULT)
3/1	FROM PRIMARY AUXILIARY DEVICE
3/2	TO SECONDARY AUXILIARY DEVICE
3/3	FROM SECONDARY AUXILIARY DEVICE
3/4	TURN OFF COPYING RECEIVED DATA STREAM TO PRIMARY AUXILIARY DEVICE
3/5	TURN ON COPYING RECEIVED DATA STREAM TO PRIMARY AUXILIARY DEVICE
3/6	TURN OFF COPYING RECEIVED DATA STREAM TO SECONDARY AUXILIARY DEVICE
3/7	TURN ON COPYING RECEIVED DATA STREAM TO SECONDARY AUXILIARY DEVICE

(Selective parameter(s): see Sections 9 and 10.)

5.58 MW MESSAGE WAITING

(format: Ce or ESC Fe)

Causes a message waiting indicator to be set in a device when received. This function permits both priority (or overriding) interchange and solicited interchange. The response to this action may be accomplished using a Device Status Report (DSR).

(See Sections 6 and 7.)

5.59 NEL NEXT LINE

(Format effector; format: Ce or ESC Fe)

Causes the active position to move to the first position on the next line downward.

(See Sections 6 and 7.)

5.60 NP NEXT PAGE

(Editor function; format: CSI Pn F; default value: 1)

Causes a subsequent page of a multiple-page store to be displayed according to the parameter. If the parameter value is zero or one, then the next page is the result. If the parameter is N, then the Nth page after the current page is the result.

The effect of NP on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.61 OSC OPERATING SYSTEM COMMAND

(String delimiter; format: Ce or ESC Fe)

Indicates the beginning of an Operating System Command. An Operating System Command is a string of graphics (bit combinations 2/0 to 7/14 inclusive) starting with the first character after the Operating System Command delimiter and terminating with the control ST (String Terminator). The interpretation of the command is subject to the particular operating system and is not, of itself, part of this standard. Applications utilizing the Operating System Command delimiter will most often have some graphic representation for OSC.

(See Sections 3, 6, and 7.)

5.62 PLD PARTIAL LINE DOWN

(Format effector; format: Ce or ESC Fe)

Causes the active position to move vertically downward. The amount of downward movement is intended to be sufficient to effect an appearance of subscripting between graphics that immediately precede the control and those that follow it, until the next occurrence of Partial Line Up (PLU).

Any interactions between PLD and vertical format effectors other than PLU are not defined by this standard.

(See Sections 6 and 7.)

5.63 PLU PARTIAL LINE UP

(Format effector; format: Ce or ESC Fe)

Causes the active position to move vertically upward. The amount of upward movement is intended to be sufficient to effect an appearance of superscripting between graphics that immediately precede the control and those that follow it, until the next occurrence of Partial Line Down (PLD).

Any interactions between PLU and vertical format effectors other than PLD are not defined by this standard.

(See Sections 6 and 7.)

5.64 PM PRIVACY MESSAGE

(String delimiter; format: Ce or ESC Fe)

Indicates the beginning of a privacy message. A privacy message is a character string of graphics (bit combinations 2/0 to 7/14 inclusive) starting with the first character after the Privacy Message delimiter and terminating with the control ST (String Terminator) delimiter. The interpretation of the privacy message is subject to the individual privacy and security methods in effect. Applications utilizing the Privacy Message delimiter will most often have some graphic representation for PM.

(See Sections 3, 6, and 7.)

5.65 PP PRECEDING PAGE

(Editor function; format: CSI Pn F; default value: 1)

Causes a preceding page of a multiple-page store to be displayed. If the parameter value is zero or one, then the preceding page is the result. If the parameter is N, then the Nth page preceding the current page is the result.

The effect of PP on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.66 PU1 PRIVATE USE ONE

(format: Ce or ESC Fe)

Reserved for a function without standardized meaning for private use as required, subject to the prior agreement of the sender and the recipient of the data.

(See Sections 6 and 7.)

5.67 PU2 PRIVATE USE TWO

(format: Ce or ESC Fe)

Reserved for a function without standardized meaning for private use as required, subject to the prior agreement of the sender and the recipient of the data.

(See Sections 6 and 7.)

5.68 PUM POSITIONING UNIT MODE

A parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes the numeric parameters of horizontal and vertical positioning Format effectors to be specified in units of character positions.

The set state causes horizontal and vertical positioning Format effectors to be specified in decipoints.

This mode affects the HPA, HPR, HVP, VPA, and VPR format effectors.

(Mode-changing parameter: see Section 12.)

5.69 QUAD QUAD

(Format effector; format: CSI Ps I F; default value: 3/0)

Causes a typographic form known as quadding to be effected. The effect of this control sequence is to terminate the string and perform the form of quadding indicated by the parameter. The beginning of the string to be positioned is indicated by the preceding occurrence in the data stream of either QUAD or a vertical positioning Format effector (LF, NL, IND, NEL, RI, VPA, VPR). The effect of this control sequence is limited to a single line of text.

Param.	Parameter Meaning
3/0	FLUSH LEFT (DEFAULT)
3/1	FLUSH LEFT AND FILL WITH LEADER
3/2	CENTER
3/3	CENTER AND FILL WITH LEADER
3/4	FLUSH RIGHT
3/5	FLUSH RIGHT AND FILL WITH LEADER

(Selective parameter(s): see Sections 9 and 11.)

5.70 REP REPEAT

(format: CSI Pn F; default value: 1)

Indicates that the single graphic character or control immediately preceding the control sequence is to be repeated. The number of repetitions is specified by the parameter. A parameter value of zero or one repeats the preceding single graphic or control once. A parameter value of N repeats the preceding single graphic or control N times.

(Numeric parameter: see Sections 8 and 10.)

5.71 RI REVERSE INDEX

(Format effector; format: Ce or ESC Fe)

Moves the active position to the same horizontal position on the preceding line.

(See Sections 6 and 7.)

5.72 RIS RESET TO INITIAL STATE

(format: ESC Fs)

Resets a device to its initial state, that is, the state it has after it is switched on. This may imply, if applicable: remove tabulation stops, remove input areas, reset graphic rendition, erase all positions, move active position to first character position of first line.

Coding 1/11 6/3

NOTE: RIS may or may not set or reset modes depending on implementation.

(ESCape Fs Control)

5.73 RM RESET MODE

(format: CSI Ps F; default value: none)

Resets one or more modes of the receiving device (see 3.5.8) as specified by each selective parameter in the parameter string. Each mode to be reset is specified by a separate parameter. See Section 12 for the parameter encoding. See also Set Mode (SM) control sequence.

(Selective parameter(s): see Sections 9 and 10.)

5.74 SATM AREA TRANSFER MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes the selected area(s) defined by SSA (Start of Selected Area), ESA (End of Selected Area), and DAQ (Define Area Qualification) to be transmitted in a data stream or transferred to an auxiliary device.

The set state causes the full contents of the buffer to be transmitted in a data stream or transferred to an auxiliary device.

NOTE: SATM does not cause the device to initiate a transmission of a data stream.

(Mode-changing parameter: see Section 12.)

5.75 SD SCROLL DOWN

(Editor function; format: CSI Pn F; default value: 1)

Causes the entire contents of the visible display to be moved down one line. The last line is removed from sight and another line moves into the top line. The number of lines to be scrolled is dependent upon the parameter. If the parameter value is zero or one, one line is scrolled. If the parameter value is N, N lines are scrolled.

The effect of SD on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.76 SEM SELECT EDITING EXTENT MODE

(format: CSI Ps F; default value: 3/0)

Selects the extent of the display to be affected by the Insert Character (ICH) and Delete Character (DCH) actions according to the parameter. This mode also affects insertions performed when data are entered or received when the Insertion-Replacement Mode (IRM) is in the set state.

Param.	Parameter Meaning
3/0	EDIT IN DISPLAY (DEFAULT)
3/1	EDIT IN LINE
3/2	EDIT IN FIELD (BETWEEN HORIZONTAL TAB STOPS)
3/3	EDIT IN QUALIFIED AREA (DEFINED BY DAQ, SPA, EPA)

(Selective parameter: see Sections 9 and 11.)

5.77 SGR SELECT GRAPHIC RENDITION

(Format effector; format: CSI Ps F; default value: 3/0)

Invokes the graphic rendition specified by the parameter(s). All following characters in the data stream are rendered according to the parameter(s) until the next occurrence of SGR in the data stream. Parameter values 10 through 19 invoke a font that may have been previously designated by FNT (Font Selection).

Param.	Parameter Meaning
3/0	PRIMARY RENDITION (IMPLEMENTATION DEFINED) (DEFAULT)
3/1	BOLD OR INCREASED INTENSITY
3/2	FAINT, DECREASED INTENSITY, OR SECONDARY COLOR
3/3	ITALIC
3/4	UNDERSCORE
3/5	SLOW BLINK (SLOWER THAN 150 PER MINUTE)
3/6	RAPID BLINK (EQUAL TO OR FASTER THAN 150 PER MINUTE)
3/7	NEGATIVE (REVERSE) IMAGE
3/8	RESERVED FOR FUTURE STANDARDIZATION
3/9	RESERVED FOR FUTURE STANDARDIZATION
3/1 3/0	PRIMARY FONT AS DESIGNATED BY FNT
3/1 3/1	FIRST ALTERNATIVE FONT AS DESIGNATED BY FNT
to	
3/1 3/9	NINTH ALTERNATIVE FONT AS DESIGNATED BY FNT
3/2 3/0	FRAKTUR

(Selective parameter(s): see Sections 9 and 11.)

5.78 SL SCROLL LEFT

(Editor function; format: CSI Pn I F; default value: 1)

Causes the entire contents of the visible display to move to the left according to the parameter. The leftmost column is removed from sight and a new rightmost column appears for each position moved. A numeric parameter of zero or one shifts all characters one character to the left. A numeric parameter of N shifts all characters N characters to the left.

The effect of SL on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 11.)

5.79 SM SET MODE

(format: CSI Ps F; default value: none)

Causes one or more modes to be set (see 3.5.8) within the receiving device as specified by each selective parameter in the parameter string. Each mode to be set is specified by a separate parameter. A mode is set until reset by a Reset Mode (RM) control sequence.

See Section 12 for the parameter encoding.

(Selective parameter(s): see Sections 9 and 10.)

5.80 SPA START OF PROTECTED AREA

(format: Ce or ESC Fe)

Indicates the beginning of a string of consecutive character positions which are protected against manual alteration and guarded against transmission in a data stream or transfer to an auxiliary device. The end of this string of character positions is indicated by the control character EPA (End of Protected Area). See Define Area Qualification (DAQ) for equivalent and alternate forms of protected areas.

(See Sections 6 and 7)

5.81 SPI SPACING INCREMENT

(Format effector; format: CSI Pn 3/11 Pn I F; default value: none)

Specifies the distance to be moved (horizontally) for a single fixed space and the distance to be moved (vertically) for a single-line vertical spacing. The values of the parameters express the increment in decipoints; that is, a parameter value of 120 would specify 6 to the inch or a parameter value of 90 would specify 8 to the inch (see Section 3). The first parameter is the vertical increment and the second is the horizontal. If either is omitted, the implementor-defined default is the result (often 120;72).

(Numeric parameters: see Sections 8 and 11.)

5.82 SR SCROLL RIGHT

(Editor function; format: CSI Pn I F; default value: 1)

Causes the entire contents of the visible display to move to the right according to the parameter. The rightmost column is removed from sight and another leftmost column appears, for each position moved. A numeric parameter of zero or one shifts all characters one character to the right. A numeric parameter of N shifts all characters N characters to the right.

The effect of SR on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 11.)

5.83 SRM SEND-RECEIVE MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. In the reset state a device is in the Monitor Send Receive mode, which means that each graphic input is visible at the device as it is keyed. In the set state a device is in the Simultaneous Send-Receive Mode, where the local input facilities are logically disconnected from the output mechanism. Only data sent as a data stream to the device are imaged. These modes are not to be confused with the transmission circuit disciplines Half Duplex and Full Duplex. There is a possible, but not mandatory, relationship. The intention of SRM is directed toward the connection between the local input and the output mechanism rather than toward the line discipline.

(Mode-changing parameter: see Section 12.)

5.84 SRTM STATUS REPORT TRANSFER MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes status reporting information to be transmitted only if applicable using DSR or as a response to DSR or DCS (or manual stimulation). The set state causes status reporting to be automatic at each transmission by the inclusion of a Device Control String (DCS) in the transmitted data stream.

(Mode-changing parameter: see Section 12.)

5.85 SS2 SINGLE SHIFT TWO

(Introducer; format: Ce or ESC Fe)

Used to extend the graphic set of the code table. It is a nonlocking shift character that changes the meaning of the next single-bit combination, which shall be from 2/1 to 7/14 inclusive. The changed meaning is obtained from a set of up to 94 additional graphics from an appropriately designated G2 graphic set.

(See Sections 6 and 7.)

5.86 SS3 SINGLE SHIFT THREE

(Introducer; format: Ce or ESC Fe)

Used to extend the graphic set of the code table. It is a nonlocking shift character that changes the meaning of the next single-bit combination, which shall be 2/1 to 7/14 inclusive. The changed meaning is obtained from a set of up to 94 additional graphics from an appropriately designated G3 graphic set.

(See Sections 6 and 7.)

5.87 SSA START OF SELECTED AREA

(format: Ce or ESC Fe)

Indicates the beginning of a string of consecutive character positions whose contents are selected to be subsequently transmitted as a data stream or transferred to an auxiliary input/output device. The end of this string of character positions is indicated by either the control ESA (End of Selected Area) or the end of display. The active position also terminates the string if the Transfer Termination Mode (TTM) is in the reset state. The actual transmission is not initiated by either SSA or ESA.

(See Sections 6 and 7.)

5.88 ST STRING TERMINATOR

(String delimiter; format: Ce or ESC Fe)

Indicates, by its occurrence in a string of characters, the end of the message that was introduced by either DCS (Device Control String), APC (Application Program Command), PM (Privacy Message), or OSC (Operating System Command). Applications utilizing the String Terminator will most often have some graphic representation for ST.

(See Sections 3, 6, and 7.)

5.89 STS SET TRANSMIT STATE

(format: Ce or ESC Fe)

Causes the communications interface or its equivalent, or both, to be notified that there are data ready for transfer from the device. This function may be activated by a data input action or by processing in a received data stream.

NOTE: This control does not cause the device to initiate a transmission of a data stream.

(See Sections 6 and 7.)

5.90 SU SCROLL UP

(Editor function; format: CSI Pn F; default value: 1)

Causes the entire contents of the visible display to be moved up. The first line is removed from sight and another line moves into the last line, for each line moved. The number of lines moved is determined from the parameter value. A parameter value of zero or one moves the contents of the display up one line. A parameter value of N moves the contents of the display up N lines.

The effect of SU on the active position is not specified by this standard.

(Numeric parameter: see Sections 8 and 10.)

5.91 TBC TABULATION CLEAR

(Format effector; format: CSI Ps F; default value: 3/0)

Tabulation stops are cleared according to the parameters.

Param.	Parameter Meaning
3/0	Clear the horizontal tabulation stop at the active position (the default case)
3/1	Clear the vertical tabulation stop at the active line
3/2	Clear all horizontal tabulation stops in the active line
3/3	Clear all horizontal tabulation stops
3/4	Clear all vertical tabulation stops

When horizontal tabulation stops are cleared, the number of lines affected is all or one depending on the reset or set states of the Tabulation Stop Mode (TSM).

(Selective parameter(s): see Sections 9 and 10.)

5.92 TSM TABULATION STOP MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes the setting and clearing of horizontal tabulation stops to apply to the corresponding character position of all lines. The set state causes tabulation stops to be independent for each line.

(Mode-changing parameter: see Section 12.)

5.93 TSS THIN SPACE SPECIFICATION

(Format effector; format: CSI Pn I F; default value: none)

Specifies the width in decipoints of subsequent Thin Space characters in the data stream until the next occurrence of TSS in the data stream. A Thin Space character may be inserted between characters in an application that utilizes variable interword spacing to effect justification or other processes.

(Numeric parameter: see Sections 8 and 11.)

5.94 TTM TRANSFER TERMINATION MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state includes the active position in the criteria that determine the end of a string selected to be transmitted as a data stream or transferred to an auxiliary device; the set state does not include the active position in the criteria. See Start of Selected Area (SSA), End of Selected Area (ESA), and Define Area Qualification (DAQ).

(Mode-changing parameter: see Section 12.)

5.95 VEM VERTICAL EDITING MODE

Is a parameter applicable to the Set Mode (SM) and Reset Mode (RM) control sequences. The reset state causes the Insert Line (IL) and the Delete Line (DL) controls to act at and below the active line. The set state causes IL and DL to act at and above the active line.

(Mode-changing parameter: see Section 12.)

5.96 VPA VERTICAL POSITION ABSOLUTE

(Format effector; format: CSI Pn F; default value: 1)

Moves the active position to the line specified by the parameter without changing the horizontal position. A parameter value of zero or one moves the active position vertically to the first line. A parameter value of N moves the active position vertically to line N.

Whether the parameter is expressed in units of character positions or decipoints depends on the reset or set state of the Positioning Unit Mode (PUM).

NOTE: This function may be limited to forward movement only (for example, line printers).

(Numeric parameter: see Sections 8 and 10.)

5.97 VPR VERTICAL POSITION RELATIVE

(Format effector; format: CSI Pn F; default value: 1)

Moves the active position downward the number of lines specified by the parameter without changing the horizontal position. A parameter value of zero or one moves the active position one line downward. A parameter value of N moves the active position N lines downward.

Whether the parameter is expressed in units of character positions or decipoints depends on the reset or set state of the Positioning Unit Mode (PUM).

NOTE: This function is limited to forward movement only.

(Numeric parameter: see Sections 8 and 10.)

5.98 VTS VERTICAL TABULATION SET

(Format effector; format: Ce or ESC Fe)

Sets a vertical tabulation stop at the active line.

(See Sections 6 and 7.)

6. INDEPENDENT CONTROL FUNCTIONS BY MNEMONIC.

Table 1 lists the functions intended as independent control functions, that is, controls that do not have an introducer. Table 1 includes the control characters that are part of the set for representation by encoding as single Ce characters in columns 8 or 9 (in an 8-bit environment) or by corresponding ESC Fe sequences (in a 7-bit environment).

Table 1
Listing of Independent Control Functions (No Introducer)

Mnem	Name
APC	APPLICATION PROGRAM COMMAND (2)
CCH	CANCEL CHARACTER
CSI	CONTROL SEQUENCE INTRODUCER (1)
DCS	DEVICE CONTROL STRING (2)
EPA	END OF PROTECTED AREA
ESA	END OF SELECTED AREA
HTJ	HORIZONTAL TABULATION WITH JUSTIFICATION (FE)
HTS	HORIZONTAL TABULATION SET (FE)
IND	INDEX (FE)
MW	MESSAGE WAITING
NEL	NEXT LINE (FE)
OSC	OPERATING SYSTEM COMMAND (2)
PLD	PARTIAL LINE DOWN (FE)
PLU	PARTIAL LINE UP (FE)
PM	PRIVACY MESSAGE (2)
PU1	PRIVATE USE ONE
PU2	PRIVATE USE TWO
RI	REVERSE INDEX (FE)
SPA	START OF PROTECTED AREA
SS2	SINGLE SHIFT TWO (1)
SS3	SINGLE SHIFT THREE (1)
SSA	START OF SELECTED AREA
ST	STRING TERMINATOR (2)
STS	SET TRANSMIT STATE
VTS	VERTICAL TABULATION SET (FE)

NOTES:
(1) Introducer
(2) String delimiter
(FE) Format effector

7. INDEPENDENT CONTROL FUNCTIONS BY CODING.

The form for an independent control is:

7-bit environment: ESC Fe
8-bit environment: Ce

Table 2 lists the encoding of the independent control functions of Table 1. Each entry in Table 2 indicates the encoding of the single character control (Ce) in an 8-bit environment or the Final character (Fe) of the equivalent two character Escape Fe sequence in a 7-bit environment. For example, CSI is 9/11 in 8 bits and is 1/11 5/11 in 7 bits.

Table 2
Coded Assignments of Set of Table 1

7-bit envir.	b7	1		1		format:	ESC Fe
	b6	0		0			
	b5	0		1			
	Column:	4		5			
8-bit envir.	a8	1		1		format:	Ce
	a7	0		0			
	a6	0		0			
	a5	0		1			
	Column:	8		9			
a4 a3 a2 a1							
b4 b3 b2 b1	row						
0 0 0 0	0	fut.std.		DCS (2)			
0 0 0 1	1	fut.std.		PU1			
0 0 1 0	2	fut.std.		PU2			
0 0 1 1	3	fut.std.		STS			
0 1 0 0	4	IND (FE)		CCH			
0 1 0 1	5	NEL (FE)		MW			
0 1 1 0	6	SSA		SPA			
0 1 1 1	7	ESA		EPA			
1 0 0 0	8	HTS (FE)		fut.std.			
1 0 0 1	9	HTJ (FE)		fut.std.			
1 0 1 0	10	VTS (FE)		fut.std.			
1 0 1 1	11	PLD (FE)		CSI (1)			
1 1 0 0	12	PLU (FE)		ST (2)			
1 1 0 1	13	RI (FE)		OSC (2)			
1 1 1 0	14	SS2 (1)		PM (2)			
1 1 1 1	15	SS3 (1)		APC (2)			

NOTES: (1) Introducer
(2) String delimiter
(FE) Format effector
The notation "Fut.std." means reserved for future standardization.

8. NUMERIC PARAMETER SEQUENCES BY MNEMONIC.

Table 3 lists the control sequences that permit numeric parameters (one or two).

Table 3
Control Sequences with Numeric Parameters

Mnem	Name
CBT	CURSOR BACKWARD TABULATION (EF)
CHA	CURSOR HORIZONTAL ABSOLUTE (EF)
CHT	CURSOR HORIZONTAL TABULATION (EF)
CNL	CURSOR NEXT LINE (EF)
CPL	CURSOR PRECEDING LINE (EF)
CPR	CURSOR POSITION REPORT (2)
CUB	CURSOR BACKWARD (EF)
CUD	CURSOR DOWN (EF)
CUF	CURSOR FORWARD (EF)
CUP	CURSOR POSITION (2,EF)
CUU	CURSOR UP (EF)
CVT	CURSOR VERTICAL TABULATION (EF)
DA	DEVICE ATTRIBUTES
DCH	DELETE CHARACTER (EF)
DL	DELETE LINE (EF)
ECH	ERASE CHARACTER (EF)
FNT	FONT SELECTION (2,FE)
GSM	GRAPHIC SIZE MODIFICATION (2,FE)
GSS	GRAPHIC SIZE SELECTION (FE)
HPA	HORIZONTAL POSITION ABSOLUTE (FE)
HPR	HORIZONTAL POSITION RELATIVE (FE)
HVP	HORIZONTAL AND VERTICAL POSITION (2,FE)
ICH	INSERT CHARACTER (EF)
IL	INSERT LINE (EF)
NP	NEXT PAGE (EF)
PP	PRECEDING PAGE (EF)
REP	REPEAT
SD	SCROLL DOWN (EF)
SL	SCROLL LEFT (EF)
SPI	SPACING INCREMENT (2,FE)
SR	SCROLL RIGHT (EF)
SU	SCROLL UP (EF)
TSS	THIN SPACE SPECIFICATION (FE)
VPA	VERTICAL POSITION ABSOLUTE (FE)
VPR	VERTICAL POSITION RELATIVE (FE)

NOTES:
(2) Two numeric parameters
(FE) Format effector
(EF) Editor function

9. SELECTIVE PARAMETER SEQUENCES BY MNEMONIC.

Table 4 lists the control functions that permit selective parameters (a variable number).

Table 4
Listing of Control Sequences with Selective Parameter(s)

Mnem	Name
CTC	CURSOR TABULATION CONTROL (EF)
DAQ	DEFINE AREA QUALIFICATION
DSR	DEVICE STATUS REPORT
EA	ERASE IN AREA (EF)
ED	ERASE IN DISPLAY (EF)
EF	ERASE IN FIELD (EF)
EL	ERASE IN LINE (EF)
JFY	JUSTIFY (FE)
MC	MEDIA COPY
QUAD	QUAD (FE)
RM	RESET MODE
SEM	SELECT EDITING EXTENT MODE
SGR	SELECT GRAPHIC RENDITION (FE)
SM	SET MODE
TBC	TABULATION CLEAR (FE)

NOTES:
(FE) Format effector
(EF) Editor function

10. CONTROL SEQUENCES BY CODING.

The form for a control sequence without intermediates is:

```
CSI                              P...P F
7-bit environment:  1/11 5/11    P...P F
8-bit environment:  9/11         P...P F
```

where P...P is the parameter string (3/0 to 3/15 inclusive) and F is the Final character (4/0 to 7/14 inclusive). Characters 0/0 to 1/15 and 7/15 to 15/15 are error conditions (see Section 3.) Each entry in Table 5 indicates the coding of the Final bit combination (F) of the control sequence.

Table 5
Coding of Final Bit Combinations for Control Sequences without Intermediates

A8				0	0	0	0	
a7	b7			1	1	1	1	
a6	b6			0	0	1	1	
a5	b5			0	1	0	1	
		column:		4	5	6	7	
a4	a3	a2	a1					
b4	b3	b2	b1	row				
0	0	0	0	0	ICH (1EF)	DCH (1EF)	HPA (1FE)	Private Use
0	0	0	1	1	CUU (1EF)	SEM (3)	HPR (1FE)	Private Use
0	0	1	0	2	CUD (1EF)	CPR (2)	REP (1)	Private Use
0	0	1	1	3	CUF (1EF)	SU (1EF)	DA (1)	Private Use
0	1	0	0	4	CUB (1EF)	SD (1EF)	VPA (1FE)	Private Use
0	1	0	1	5	CNL (1EF)	NP (1EF)	VPR (1FE)	Private Use
0	1	1	0	6	CPL (1EF)	PP (1EF)	HVP (2FE)	Private Use
0	1	1	1	7	CHA (1EF)	CTC (3EF)	TBC (3FE)	Private Use
1	0	0	0	8	CUP (2EF)	ECH (1EF)	SM (3)	Private Use
1	0	0	1	9	CHT (1EF)	CVT (1EF)	MC (3)	Private Use
1	0	1	0	10	ED (3EF)	CBT (1EF)	fut. std.	Private Use
1	0	1	1	11	EL (3EF)	fut. std.	fut. std.	Private Use
1	1	0	0	12	IL (1EF)	fut. std.	RM (3)	Private Use
1	1	0	1	13	DL (1EF)	fut. std.	SGR (3FE)	Private Use
1	1	1	0	14	EF (3EF)	fut. std.	DSR (3)	Private Use
1	1	1	1	15	EA (3EF)	fut. std.	DAQ (3)	Error

NOTES:
(1) One numeric parameter
(2) Two numeric parameters
separated from each other by 3/11
(3) A variable number of selective parameters
separated from each other by 3/11
(FE) Format effector (see 4.2)
(EF) Editor function (see 4.2)

In a 7-bit environment a8 is not present. The notation "fut. std." means reserved for future standardization and "private use" means reserved for private or experimental use.

11. CONTROL SEQUENCES (INTERMEDIATE CHARACTERS).

The general form for a control sequence with a single intermediate character is:

```
        CSI                          P...P I F
        7-bit environment:  1/11 5/11 P...P I F
        8-bit environment:  9/11      P...P I F
```

where P...P is the parameter string (3/0 to 3/15 inclusive), I is the Intermediate (2/0 to 2/15 inclusive), and F is the Final character (4/0 to 7/14 inclusive). Characters from 0/0 to 1/15 and from 7/15 to 15/15 are error conditions (see Section 3). Each entry in Table 6 indicates the coding of the Final bit combination (F) of the control sequence with a single Intermediate of 2/0.

Table 6
Coding of Final Bit Combinations for Control Sequences
with a Single Intermediate (2/0)

a8					0	0	0	0
a7	b7				1	1	1	1
a6	b6				0	0	1	1
a5	b5				0	1	0	1
		column:			4	5	6	7
a4	a3	a2	a1					
b4	b3	b2	b1	row				
0	0	0	0	0	SL (1EF)	fut. std.	fut. std.	private use
0	0	0	1	1	SR (1EF)	fut. std.	fut. std.	private use
0	0	1	0	2	GSM (2FE)	fut. std.	fut. std.	private use
0	0	1	1	3	GSS (1FE)	fut. std.	fut. std.	private use
0	1	0	0	4	FNT (2FE)	fut. std.	fut. std.	private use
0	1	0	1	5	TSS (1FE)	fut. std.	fut. std.	private use
0	1	1	0	6	JFY (3FE)	fut. std.	fut. std.	private use
0	1	1	1	7	SPI (2FE)	fut. std.	fut. std.	private use
1	0	0	0	8	QUAD(3FE)	fut. std.	fut. std.	private use
1	0	0	1	9	fut. std.	fut. std.	fut. std.	private use
1	0	1	0	10	fut. std.	fut. std.	fut. std.	private use
1	0	1	1	11	fut. std.	fut. std.	fut. std.	private use
1	1	0	0	12	fut. std.	fut. std.	fut. std.	private use
1	1	0	1	13	fut. std.	fut. std.	fut. std.	private use
1	1	1	0	14	fut. std.	fut. std.	fut. std.	private use
1	1	1	1	15	fut. std.	fut. std.	fut. std.	error

NOTES:
(1) One numeric parameter
(2) Two numeric parameters
separated from each other by 3/11
(3) A variable number of selective parameters
separated from each other by 3/11
(FE) Format effector (see 4.2)
(EF) Editor function (see 4.2)

In a 7-bit environment a8 is not present. The notation "fut. std." means reserved for future standardization. The notation "private use" means reserved for private or experimental use. Control sequences with Intermediates 2/1 to 2/15 inclusive are reserved for future standardization (columns 4-6) and private use (7/0 to 7/14 inclusive).

Examples (see also Section 3.5):

The general form for a Control Sequence is:

CSI P...P I...I F

In an 8-bit environment Cursor Forward one position is:

9/11 3/1 4/3 or 9/11 3/0 4/3 or 9/11 4/3

NOTE: The second example uses the fact that the default for CUF is 1. The third example illustrates that leading zeros (3/0) are not significant.

In a 7-bit environment Cursor Forward one position is:

1/11 5/11 3/1 4/3 or 1/11 5/11 3/0 4/3
or 1/11 5/11 4/3

In an 8-bit environment Scroll Right (SR) 28 positions is:

9/11 3/2 3/8 2/0 4/1

In a 7-bit environment Scroll Right (SR) 28 positions is:

1/11 5/11 3/2 3/8 2/0 4/1

In an 8-bit environment a Define Area Qualification (DAQ) which permits numbers and alphabetic characters to be entered into an input area is:

9/11 3/3 3/11 3/4 6/15

In a 7-bit environment a DAQ would be:

1/11 5/11 3/3 3/11 3/4 6/15

12. MODE-CHANGING PARAMETERS.

The selective parameters shown in Table 7 are used with RM (Reset Mode) and SM (Set Mode) control sequences.

Table 7
Mode-Changing Parameters

Parameter Character(s)	Mode Mnemonic	Mode Function
3/0		AN ERROR CONDITION
3/1	GATM	GUARDED AREA TRANSFER MODE
3/2	KAM	KEYBOARD ACTION MODE
3/3	CRM	CONTROL REPRESENTATION MODE
3/4	IRM	INSERTION-REPLACEMENT MODE
3/5	SRTM	STATUS REPORTING TRANSFER MODE
3/6	ERM	ERASURE MODE
3/7	VEM	VERTICAL EDITING MODE
3/8		Reserved for Future Standardization
3/9		Reserved for Future Standardization
3/10		Reserved Separator for Parameters
3/11		Standard Separator for Parameters
3/12 to 3/15		Reserved for Private (Experimental) Use
3/1 3/0	HEM	HORIZONTAL EDITING MODE
3/1 3/1	PUM	POSITIONING UNIT MODE
3/1 3/2	SRM	SEND-RECEIVE MODE
3/1 3/3	FEAM	FORMAT EFFECTOR ACTION MODE
3/1 3/4	FETM	FORMAT EFFECTOR TRANSFER MODE
3/1 3/5	MATM	MULTIPLE AREA TRANSFER MODE
3/1 3/6	TTM	TRANSFER TERMINATION MODE
3/1 3/7	SATM	SELECTED AREA TRANSFER MODE
3/1 3/8	TSM	TABULATION STOP MODE
3/1 3/9	EBM	EDITING BOUNDARY MODE
3/1 3/10		Reserved Separator for Parameters
3/1 3/11		Standard Separator for Parameters
3/1 3/12 to 3/1 3/15		Error condition whose recovery is not specified by this standard
3/2 3/0	LNM	LINE FEED NEW LINE MODE
3/2 3/1 to 3/9 3/9		Reserved for Future Standardization
3/12 3/0 to 3/15 3/15		Reserved for Private (Experimental) Use

The following selective parameters are used with the Select Editing Extent Mode (SEM) Control:

Selective Parameter Character	Mode Function
3/0	EDIT IN DISPLAY (default)
3/1	EDIT IN LINE
3/2	EDIT IN FIELD (BETWEEN HORIZONTAL TAB STOPS)
3/3	EDIT IN QUALIFIED AREA

Examples:

In an 8-bit environment the following control sequence places IRM and EBM in the set state:

9/11 3/4 3/11 3/1 3/9 6/8

In a 7-bit environment the following control sequence places HEM and CRM in the reset state:

1/11 5/11 3/1 3/0 3/11 3/3 6/12

APPENDIXES.

(These Appendixes are not a part of American National Standard Additional Controls for Use with American National Standard Code for Information Interchange, ANSI X3.64-1979, but are included for information purposes only.)

APPENDIX A.

Development Considerations.

This standard was developed primarily to accommodate the foreseeable input/output control needs of two-dimensional character imaging devices, including interactive terminals of both the cathode ray tube and printer types, buffered and nonbuffered, by direct coding and by control sequences, including editing functions, formatting, and the designation and control of special areas, as well as certain status setting and interrogation functions, mode selection, and typesetting composition functions. Present in the set of functions are those needed in the transformation from a text processing language to a data stream driving a composite composition device. Thereby the functions, along with the appropriate graphics, comprise a means for "a linear metarepresentation of text."

Significant aspects of this standard are as follows:

(1) A number of functions have been included that reflect the needs and practices of information interchange involving more than one character size for the displayed or printed images.

(2) The issues surrounding Local Editing functions have been reviewed thoroughly. It has been decided that these functions are often carried in messages from the central logic unit to a character imaging device. Additionally it has been concluded that most functions available at a device through the entry mechanism (keyboard) should be available for validation and test via a remote diagnosing function.

(3) The developers have reviewed the issues surrounding parametric controls. The form of the sequences has been agreed and are described in this standard.

(4) There has been a review of the concept of gathering formal lists of attributes or characteristics of devices. Such publications are very desirable. It is not felt within the scope of a coding committee to develop standards for such attributes. Individuals interested in the attributes work have been encouraged to continue compiling their lists.

(5) "ESCape Fs" are single additional controls represented by the two-character sequence of the form ESC Fs, where Fs is a Final from 6/0 to 7/14 inclusive. Their definitions have been included and are intended to be identical in definition and encoding to the Fs sequences being specified internationally by ISO TC97/SC2.

(6) The developers have considered the problem of interactions of functions and the possibility of narrowing definitions in the areas of interaction. A conclusion has been reached that, as a coding matter, the open-ended definitions are correct. To narrow the definitions would be either a hardware or software specification, not within the purview of the coding groups without specific direction from the duly constituted standards planning and management authorities.

(7) Earlier working papers have been converted into the form of an American National Standard in this document.

(8) This document represents a coordinated effort to develop a single technical standard in the United States and Europe (see ECMA-48 standard entitled Additional Controls for Character Imaging Input/Output Devices).

APPENDIX B.

Device Concepts.

B1. General.

The definitions of the control functions in this standard are based on general assumptions about the architecture of the character imaging input/output device. Examples of input/output devices conforming to these concepts include: a permanent copy terminal, an alphanumeric display device, a printer, a microfilm output device.

This Appendix is written from the point of view of the device. Therefore the term "received data stream" refers to the data stream received by the device and the term "transmitted data stream" refers to the data stream transmitted from the device.

B2. The Received Data Stream.

The received data stream is considered to be a continuous stream received by the device. The received data stream may be structured in messages, records and/or blocks, but this does not affect the operation of the device at the abstract level of description; the logical or physical units of data are regarded as being concatenated to form a continuous stream.

The device may contain a buffer in which the received data are temporarily stored before they are used to produce the character image output, or in which the received data are permanently stored and continuously used to produce the character image output.

B3. The Character Image Output.

The character image output may consist of one or more so-called pages of a predetermined size.
A page is composed of a predetermined number of lines of character positions. The number of lines per page, the number of character positions per line, and the character spacing may be capable of being varied during the operation of the device.

If the character image output is not structured in pages, it may be regarded as consisting of an unlimited number of lines or characters.

The lines constituting a page are numbered 1, 2, 3, ...

The character positions constituting a line are numbered 1, 2, 3, ...

Each character position is either "erased," images "space," images a single graphic symbol, or images two or more superimposed graphic symbols. A graphic symbol represents a graphic character or one of those control characters for which a graphic representation is standardized by American National Standard Graphic Representation of the Control Characters of American National Standard Code for Information Interchange, ANSI X3.32-1973.

If the control character "backspace" is implemented with backward motion, each character position should be capable of imaging a combination of two or more graphic symbols.

The initial status of all character positions is "erased."

The character image output is regarded as being produced in the form of a continuous stream, but it may in actual fact be made available on a character-by-character, line-by-line, or page-by-page basis.

The character positions and lines are numbered relative to the character image (page) output, not to the buffer (if any).

Depending on implementation, there may or may not be a distinction between an "erased" character position and a character position imaging "space."

The character style and font design of

the graphical symbols are not defined by this standard, but their shapes and relative positioning to accommodate overlay of two or more symbols may be influenced by defined actions of control characters in the received data stream.

B4. The Active Position.

At any time, there is a unique character position called the "active" position.

The active position is the character position that is to image the graphic symbol representing the next graphic character of the received data stream or the next control for which a graphic representation is required. The active position is also the reference position when Format effectors or Editor functions are received.

NOTE: In the case of an interactive display device, it is common practice to mark the active position by means of a special indicator called the "cursor."

The line containing the active position is called the "active" line.

Movements of the active position are effected as follows:

(1) Implicit Movement: If the active position is not the last character position of a line, the active position is moved to the next character position of the active line. An implicit movement is performed when a "space" is received or when a graphic character or a control for which a graphical representation is required.

(2) Explicit Movement: The active position is moved to a specified character position. An explicit movement is performed when a control character is received that causes the active position to be moved to a specified position.

NOTES:

(1) In the following situations the effect of an attempt to move the active position is not defined by this standard:

(a) An attempt to perform an implicit movement when the active position is the last character position of a line.

(b) An attempt to perform an explicit movement to a nonexisting character position, for example, beyond the last character position of a line or beyond the last line of a page.

(2) Depending on implementation, the attempt to perform such an active position movement may:

(a) Cause a wraparound movement.

(b) Cause the active position to be blocked (that is, cause a condition in which no graphic symbol can be entered until a valid explicit active position movement is performed).

(c) Cause the active position to remain where it is but permit graphic symbols to be entered, thereby replacing or overstriking the previously entered character.

(d) Cause the cursor to disappear from the operator's viewpoint.

(e) Cause the cursor to move to the opposite end of the display but one row or column offset.

(f) Cause scrolling to occur.

(g) Cause some other implementation-dependent action.

B5. Processing the Received Data Stream.

B5.1 General

A device processes a received data stream one character after the other in the logical steps given in B5.2 through B5.4.

B5.2 Control Characters

If the control character specifies a control function that can be executed by the device, the corresponding operation is performed

according to the definition.

If a graphic representation is required and the active position is not blocked, the graphic symbol currently imaged at the active position is either (depending on the reset or set state of the Insertion-Replacement Mode, IRM) either:

(1) (IRM reset) combined with or replaced by the appropriate graphic symbol depending on implementation; or

(2) (IRM set) moved to the right along with the following symbols up to the extent defined by the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM) before the received graphic is imaged.

Then an implicit active position movement is performed.

Depending on implementation and the setting of the Format Effector Action Mode (FEAM), a Format effector may have an immediate effect or be stored in a buffer in order to postpone the effect until the data are transferred to an auxiliary output device, or both.

When a control sequence is processed which requires one or more parameters to complete the specification of the control function, the characters representing the parameters are collected from the received data stream and processed as a part of the control operation. These characters are not separately processed by step 2 or 3 below.

The occurrence of characters from columns 0, 1, 8 through 15, or the character 7/15 in a control sequence, is an error condition whose recovery is not specified by this standard. A possible recovery when a Cancel Character (CCH) is encountered in a control sequence is to ignore all of the characters from the CSI to the CCH inclusive.

B5.3 Space

If the active position is not blocked, the graphic symbol currently imaged at the active position is (depending on the reset or set state of the Insertion-Replacement Mode) either:

(1) (IRM reset) left unchanged or replaced by "space" (depending on implementation), then an implicit active position movement is performed; or

(2) (IRM set) moved to the right along with the following character positions up to the extent defined by the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM) before the space is imaged and an implicit active position movement is performed.

B5.4 Graphic Characters

If the graphic character specifies a graphic symbol that can be imaged by the device and the active position is not blocked, the graphic symbol currently imaged at the active position is (depending on the reset or set state of the Insertion-Replacement Mode) either:

(1) (IRM reset) combined with or replaced by the appropriate graphic symbol depending on implementation; or

(2) (IRM set) moved to the right along with the following symbols up to the extent defined by the setting of the Editing Extent Mode (see SEM) and the Editing Boundary Mode (EBM) before the received graphic is imaged.

Then an implicit active position movement is performed.

NOTE: In the following situations, the effects of character processing are not defined by this standard:

(1) A control character that specifies a control function that cannot be executed by the device.

(2) A graphic character that specifies a graphic symbol that cannot be imaged by the device.

(3) "Space" or a character for which a graphical representation is required when the active position is blocked.

B6. Editing Operations

B6.1 General

This section is applicable primarily to buffered input/output devices. Editing operations (erasure, deletion, and insertion) are performed either on command of control characters in the received data stream or under control of a keyboard or manual entry device.

B6.2 Erasure

The status of one or more character positions is changed to "erased." Other character positions remain unchanged.

B6.3 Deletion

The data contained in one or more character positions are removed. The contents of a string of character positions following the data to be removed are shifted backward that is in the direction of the first character position) and possibly upward (that is, in the direction of the first line). The data to be removed are overwritten by the shifted part. A string of "erased" positions, equal in length to the deleted string, is created at the end of the shifted part. The extent of the shifted part is defined by the setting of the Editing Extent Mode (see SEM), which can be display, line, field (between horizontal tabulation stops), or qualified area (see DAQ). Furthermore, character positions beyond the current display can be affected if the Editing Boundary Mode (EBM) is set. Thus the erased positions created at the end of the shifted part may not be visible to the operator.

B6.4 Insertion

The contents of a string of character positions at and following the position where the insertion is to be made are shifted forward (that is, in the direction of the last character position) and possibly downward (that is, in the direction of the last line). A string of data, equal in length to the inserted string, is removed at the end of the shifted part.

NOTE: The foregoing descriptions of deletion and insertion assume that the Horizontal Editing Mode (HEM) is in the reset state. If HEM is set, deletion and insertion shift strings are on the opposite side of the active position from that described and in the opposite directions.

The extent of the shifted part is defined by the setting of the Editing Extent Mode (see SEM), which can be display, line, field (between horizontal tabulation stops), or qualified area (see DAQ). Furthermore, character positions beyond the current display can be affected if the Editing Boundary Mode (EBM) is set. Thus the removed data may be retained by the device.

B7. Selected Areas

This section is applicable primarily to buffered input/output devices that are not operating in a simultaneous send-receive mode. A selected area is a string of character positions, the contents of which will be transmitted in the form of a returned data stream when transmission is activated (See Section B.9), or transferred to an auxiliary output device when such a transfer is activated (See Section B.10). The beginning of a selected area is established by the control character "SSA" (Start of Selected Area). The character position that is the active position after receipt of "SSA" is the first character position of the selected area. The end of a selected area is established by the control character "ESA" (End of Selected Area). The character position that is the active position upon receipt of "ESA" is the

last character position of the selected area. The end of selected area may also be indicated by the end of the buffer or, if the Transfer Termination Mode (TTM) is reset, by the active position.

B8. Qualified, Protected, Guarded Areas

B8.1 General

This section is applicable primarily to buffered input/output devices that are not operating in a simultaneous send-receive mode. A qualified area is a string of character positions with which certain characteristics are associated, such as any one or a combination of the following:

(1) The contents of the character positions are protected against manual alterations.

(2) The set of characters that are permitted to be entered is restricted (for example, to numeric or alphabetic characters only).

(3) The character positions are protected from being erased by a control character (for example, "Erase in Line").

(4) A tabulation stop is associated with the first character position.

(5) The character positions are to be excluded from transmission by the device in a data stream (see Section B9).

(6) The character positions are to be excluded from a data transfer to an auxiliary output device (see Section B10).

The beginning of a qualified area is established by the control character "DAQ" (Define Area Qualification). The character position that is the active position after receipt of "DAQ" is the first character position of the qualified area. Whether DAQ occupies any character positions in the visible display depends on implementation. The type of qualified area is specified by the parameter or parameters of "DAQ". The end of a qualified area is established by the next occurrence of the control character "DAQ."

B8.2 Protected and Guarded Areas

A protected area is a special case of a qualified area. It is a string of character positions, the contents of which are protected against manual alteration.

Another special type of a qualified area is a guarded area. It is a protected area to be excluded from transmission of a data stream and from transfer to an auxiliary input/output device. A protected area may, in general, be either guarded or unguarded. The control characters SPA (Start of Protected Area) and EPA (End of Protected Area) provide an alternative to DAQ for establishing the beginning and end of a guarded protected area.

NOTES:

(1) Any interactions between SPA, EPA, and DAQ are not defined by this standard.

(2) The initial area qualification of all character positions and the default area qualification of any character positions preceding the first explicitly defined qualified area depend on implementation.

B8.3 Fields and Horizontal Tab Stops

The boundaries of a field are defined by horizontal tabulation stops. The setting and clearing of horizontal tabulation stops (CTC, HTS, and TBC) may affect all lines or just a single line as specified by the reset or set state of the Tabulation Stop Mode (TSM). A horizontal tabulation stop specified by a Define Area Qualification (DAQ) affects only a single line, independent of TSM. Thus both columnar tabulation stops, such as those of a typewriter, and single-line tabulation stops, such as those of a forms entry device, are provided.

B9. The Transmitted Data Stream

This section is applicable primarily to buffered input/output devices that are not operating in a simultaneous send-receive mode.

The actual initiation of transmission of data in the form of a data stream transmitted from a device is performed by a data communication or input/output interface control procedure that is outside the scope of this standard.

The initiation of the transmission from the device is possible only if the device is in "transmit state." This state is established either by the operation of an appropriate button on a keyboard or by the control character "STS" (Set Transmit State) appearing in the received data stream.

The transmitted data stream is considered to be a continuous stream. The transmitted data stream may be structured in messages, records, or blocks, or a combination thereof, but this does not affect the operation of the device. At the present abstract level of description, the logical or physical units are regarded as being concatenated to form a continuous stream.

The format of a transmitted data stream depends on a number of modes of operation of the device (see 3.5.8) and is described as follows:

(1) If the Selected Area Transfer Mode (SATM) is reset and the Multiple Area Transfer Mode (MATM) is reset, then:

(a) If the Transfer Termination Mode (TTM) is reset, the contents of the active selected area, up to the active position, are transmitted.

(b) If the Transfer Termination Mode (TTM) is set, the contents of the active selected area are transmitted.

The active selected area is the selected area containing the active position; if the active position is not within a selected area, the resulting data stream is not defined by this standard.

(2) If the Selected Area Transfer Mode is reset and the Multiple Area Transfer Mode (MATM) is set, then:

(a) If the Transfer Termination Mode (TTM) is reset, the contents of any selected areas, up to the active position, are transmitted.

(b) If the Transfer Termination Mode (TTM) is set, the contents of all selected areas are transmitted.

(3) If the Selected Area Transfer Mode (SATM) is set, then:

(a) If the Transfer Termination Mode (TTM) is reset, the contents of the buffer, up to the active position, are transmitted.

(b) If the Transfer Termination Mode (TTM) is set, the complete contents of the buffer are transmitted.

In addition, the format of the transmitted data stream is affected by the following three modes:

(4) If the Guarded Area Transfer Mode (GATM) is reset, guarded areas (see B.8.2) are excluded from transmission.

(5) If the Format Effector Transfer Mode (FETM) is reset, then:

(a) The Format effectors CR and LF (Carriage Return and Line Feed) or NL (New Line) are inserted in the data stream to separate successive lines depending on the reset or set state of the Line Feed New Line Mode (LNM) respectively.

(b) Other format effectors may be inserted as appropriate, for example, HT (Horizontal Tabulation) to represent a string of "erased" character positions preceding a tabulation stop.

(6) If the Status Reporting Mode (SRM) is set, a status report in the form of a

Device Control String (see DCS) is included in the data stream.

NOTE: Depending on implementation, the contents of "erased" character positions may or may not be excluded from transmission.

B10. Data to an Auxiliary Output Device

This section is applicable primarily to buffered input/output devices.

Data transfer to an auxiliary output device is initiated either by the operation of an appropriate button on a keyboard or by the control character "MC" (Media Copy) appearing in the received data stream. Depending on the selective parameter either:

(1) The entire contents of the buffer is transferred to the auxiliary device, or

(2) A mode is entered in which all subsequently received data are transferred to the auxiliary device as it is received.

For the set of parameters in (1), the data stream that is transferred to the auxiliary output device is formed by scanning the buffer line by line beginning with the first character position of the first line, according to the procedure specified in Section B9, except that the Status Reporting Transfer Mode (SRTM) is not present.

APPENDIX C

Format Effectors and Editor Functions

C1. General

This section provides guidance to hardware and software implementors on the use of Format effectors and Editor functions. Cursor controls are Editor functions that affect only the active position. Both Format effectors and Cursor controls are intended to change the active position in prescribed ways when received in a data stream by a character imaging device. Contrary to the names, Format effectors are intended to be used on all classes of imaging devices, including cathode ray tube devices, whereas cursor controls are supplemental controls intended primarily for, but not restricted to, cathode ray tube devices. Note that there is no requirement for a device that implements Editor functions to display the active position in a special way, for example, by a cursor, even though many of the Editor functions contain the word "Cursor" in their names.

C2. Received Data Stream

The major distinction between Format effectors and Editor functions in a data stream received by a device is that Format effectors represent new information (such as graphic characters) which is or appears (1) to be appended to, (2) to replace (IRM reset), or (3) to be inserted in (IRM set) previously entered or received information, whereas Editor functions do not represent new information and are intended only (1) to rearrange or (2) to remove previously entered or received information.

C3. Transmitted Data Stream

C3.1 General

The major distinction between Format effectors and Editor functions in a data stream transmitted by a device depends on whether the device is operating in the Monitor Send Receive or Simultaneous Send Receive Mode (see SRM).

C3.2 Monitor Send Receive Mode

In the Monitor Send Receive Mode, devices send primarily Format effectors in the data stream, except in a diagnostic mode of operation.

C3.3 Simultaneous Send Receive Mode

In the Simultaneous Send Receive Mode, devices also send primarily Format effectors along with some supplemental Editor functions in the data stream. These Editor functions are those that the implementor anticipates that the recipient may wish to echo back to the device in order to achieve the indicated editing function.

C4. Recommendation to Implementors

For the widest possible interchange with the largest number of types of devices, it is recommended that software expect to receive Format effectors rather than Cursor Controls in a data stream transmitted from a device. For the same reason software is recommended to send Format effectors rather than Cursor controls in a data stream to be received by a device, except when the software intends to edit previously sent information. Similarly it is recommended that device implementors send and receive Format effectors in preference to Cursor controls. It is recommended that device implementors implement Cursor controls in addition to Format effectors only when the device has the capability to edit or alter previously entered or received data, that is, when it is a buffered device.

C5. Editor Functions

The main purpose of Editor functions is to edit or alter the visual arrangement of previously entered or received information. Specifically, Editor functions edit graphic characters and possibly Format effectors (depending on implementation) that:

(1) Have been previously entered locally, for example, via a keyboard, in a Monitor Send Receive Mode (see SRM).

(2) Have been previously received in a data stream.

(3) Have been previously transferred from an auxiliary device.

(4) Exhibit any combination of (1) through (3).

In most cases Editor functions will be performed immediately by the first recipient and then removed from the data stream. For the Simultaneous Send Receive Mode (see SRM) the Editor functions are provided as a means to encode these keyboard functions since the keyboard is logically uncoupled from the output imaging mechanism of the device.

C6. Permanency of Format Effectors

The primary purpose of Format effectors in a data stream is to be treated as data that happen to have a format representation rather than (or in addition to) a graphic representation. Format effectors permit the sender of a data stream to describe to the recipient either:

(1) the format of the information at the sending device or

(2) how the sender wishes the information to be formatted by the first or subsequent recipients, or both.

Therefore Format effectors usually remain in the data stream as it is sent from recipient to recipient (assuming that the Format Effector Transfer Mode is reset). Each buffered recipient achieves this either by:

(1) not removing Format effectors from the received data stream or

(2) removing them as they are received and by inserting equivalent ones before sending them to another recipient. Whether the recipient performs the Format effectors is independent of strategy (1) or (2) above and depends on the setting of the Format Effector Action Mode (FEAM) or whether the recipient is capable of performing the function, or both.

C7. Relationship to Keyboards

This standard is intended to facilitate information interchange among hardware devices, computers, and software; it is not intended to standardize equipment. Therefore it is not intended to apply directly to keyboards. A single keyboard key may result in more than one bit combination in the data stream. The keytop imprintings do not need to be the same as the control function names or mnemonics in this or any other coding standard. Keyboards are standardized independently by other standards.

For example, a single key can result in one or more escape or control sequences. See also Section C8. As another example, "the big button near the right" may generate both CR and LF control characters while being imprinted with a more familiar term such as Return or New Line.

C8. Composite of Graphic Representations

C8.1 General

A consequence of treating Format effectors as part of the data occurs for the Format effectors that cause movement "up and/or to the left", for example, Backspace (BS). These Format effectors can cause several graphic characters to be imaged together at the same place. Furthermore the composite image may be used to convey a different meaning to the recipient.

For example, the sequence Equals (=), Backspace (BS), Slant (/) may be used to represent Not Equals (≠). This clearly has a different meaning from either Equals or Slant. Thus Backspace can be considered as a means for extending the graphic set.

To contrast Format effectors with Cursor controls consider the analogous Cursor Control: Cursor Backward (CUB). The graphic representation of the sequence Equals (=), Cursor Backward (CUB), Slant (/) depends on the setting of the Insertion-Replacement Mode (IRM):

(1) IRM reset replaces the Equal Sign (=) with the Slant (/) or, depending on implementation, combines the Equal Sign (=) with the Slant (/) to form a composite (≠).

(2) IRM set moves the Equal Sign (=) to the right one position (assuming HEM is reset) and inserts the Slant (/).

The three examples shown graphically are:

data stream	display	display(alternate)
= BS /	≠	
= CUB /	/	≠
= CUB /	/=	

Thus Format effectors rather than Cursor controls should be used to represent composites in a transmitted or received data stream.

Implementators of devices that use a technology that currently does not permit the forming of composites are warned to plan for the future. A strategy that anticipates the future is to image and store a Format Effector that cannot be performed as a special graphic rather than ignoring it or treating it as a Cursor control.

C8.2 Keyboards with Nonspacing Keys

In some applications of keyboard devices it is desired to provide some keys that do not appear to advance the active position, for example, to implement diacritical marks for use in non-English languages. It is suggested that terminals implement such a "dead" key in such a way that when the device transmits, the characters sent include the Backspace Format Effector even though the keyboard operator did not actually press a Backspace key. In this way the transmitted data stream is independent of keyboard implementation. For example, a keyboard with a nonspacing key for Apostrophe (') would send ' BS.

C8.3 Character Sets for Composites

It is recommended that designers of application-oriented character sets specify that all graphic characters (bit combinations 2/1 through 7/14 and 10/1 through 15/14 inclusive) implicitly advance the active position one character position after imaging. The use of the Format effector Backspace (BS) or other "up and to the left" Format effectors should be employed to form composites, such as letters with diacritical marks. However, adherence to this recommendation for the design of application-oriented character sets is not a requirement. Applications which have a large number of diacritical marks may wish to include nonspacing graphics. For example, see American National Standard for Bibliographic Information on Magnetic Tape, ANSI Z39.2-1971.

C9. Interaction with Entered Data

Cursor Controls are intended primarily to operate on data that have been previously entered or received. However, since Format effectors are intended to be new information similar to graphics, they can interact with previous data. To see the contrast between Cursor Controls and Format effectors consider Cursor Next Line (CNL) and Next Line (NEL) or equivalently New Line (LF in ANSI X3.4-1977 with NL option). Consider the case where the string ABCDEF has been entered or received and the active position has been moved back to D (for example, with three Cursor Backward controls with no parameter). If a CNL is then received, the active position will move to the beginning of the line following the one containing ABCDEF. If an NEL is received and Insertion Replacement Mode (IRM) is reset, it replaces the D and possibly erases the rest of the line. If an NEL is received and IRM is set, the line is broken at the D. The three results are:

	CNL	NEL(IRM RESET)	NEL(IRM SET)
line 1	ABCDEF	ABC	ABC
line 2			DEF

In all three cases the active position is moved from line 1 character position 4 to line 2 character position 1.

C10. Edit Operations on Format Effectors

Editor functions can be used to edit Format effectors that have been previously entered or received. Consider the Format effector space. If the string

ABC DEF

has been entered or received and the active position has been moved back to the space (for example, with four Cursor Backward controls with no parameter), a Delete Character (DCH) will delete the space and close up the line, giving

ABCDEF

Extending the idea to other Format effectors some implementations may permit DCH to delete a Next Line (NEL) or equivalently a New Line (LF in ANSI X3.4-1977 with NL option) and thereby permit two lines to be joined into one line.

C11. Editor Function vs. Format Effector

Table C1 compares the Editor functions and the Format effectors. The notation (Ps), (Pn), and (Pn ; Pn) following a mnemonic indicate that it is a control sequence with a variable number of selective parameters, one numeric parameter, or two numeric parameters respectively. Mnemonics by themselves indicate that the control is a single character in the C0 or C1 set of controls. Format effectors from ANSI X3.4-1977 are also included.

Table C1
Editor Functions and Format Effectors

Editor Function	Format Effector
CBT (Pn)	
CHA (Pn)	CR, HPA (Pn)
CHT (Pn)	HT
CNL (Pn)	NEL, NL
CPL (Pn)	
CTC (Ps)	HTS, TBC (Ps), VTS
CUB (Pn)	BS
CUD (Pn)	IND, LF, VPR (Pn)
CUF (Pn)	HPR (Pn), SP
CUP (Pn ; Pn)	HVP (Pn ; Pn)
CUU (Pn)	RI
CVT (Pn)	VT
DCH (Pn)	
DL (Pn)	
EA (Ps)	
ECH (Pn)	
ED (Ps)	
EF (Ps)	
EL (Ps)	
	FNT (Pn ; Pn)
	GSM (Pn ; Pn)
	GSS (Pn)
	HTJ
ICH (Pn)	
IL (Pn)	
	JFY (Ps)
NP (Pn)	FF
	PLD
	PLU
PP (Pn)	
	QUAD (Ps)
	SGR (Ps)
	SPI (Pn ; Pn)
SD (Pn)	
SL (Pn)	
SR (Pn)	
SU (Pn)	
	TSS (Pn)
	VPA (Pn)

APPENDIX D

Intermediate Characters

This standard does not limit the number of intermediate characters that may appear in a control sequence. The following table shows the rate at which the repertoire of representative functions expands as the capability to handle each intermediate character is used.

Number of Intermediates	Total Number of Functions		
	Standard	Private	Total
0	48	15	63
1	816	255	1071
2	13104	4095	17199

It appears that the more than one thousand functions available when not more than one intermediate character is used should suffice for all foreseeable practical applications, but provision has been made in this standard for the use of two or more intermediate characters in case a larger number of functions is ever required.

APPENDIX E

Coding Criteria

E1. General

The controls defined in this standard have been allocated to the alternative methods of representation: either directly as an independent set or by means of control sequences, on the basis of the criteria summarized in Sections E2 through E7.

E2. Independent Set

The following categories of controls are represented as proper members of the Independent Set:

(1) Controls that may affect the interpretation of the data stream:

(a) The Cancel Character (CCH)
(b) The string delimiters (APC, DCS, OSC, PM, ST)
(c) The Control Sequence Introducer (CSI)
(d) The shift controls (SS2, SS3)

(2) Controls that may solicit a response from the receiving device: (MW, STS)

(3) Controls for which a representation by a single bit combination may be desirable in order to facilitate their storage in a buffer:

(a) Area delimiters (EPA, ESA, SPA, SSA)
(b) Format effectors (HTJ, HTS, IND, NEL, PLD, PLU, RI, VTS)
(c) Private use controls (PU1, PU2)

All other controls are represented by control sequences.

E3. ESCape Fs Sequences

Four controls were assigned as ESCape Fs sequences and agree in definition and encoding with those being defined internationally by ISO/TC97/SC2. The distinction between ESCape Fs and ESCape Fe sequences is defined in ANSI X3.41-1974. ESCape Fs sequences are available independently of the control set that has been designated as the current C0 or C1 set. Thus functions that are important no matter what control set is being used have been assigned as ESCape Fs sequences. Hence Disable Manual Input (DMI), Interrupt (INT), Enable Manual Input (EMI), and Reset to Initial State (RIS) have been assigned as ESCape Fs sequences. As a convenience to implementors the equivalent functionality was also provided as a mode using Reset Mode (RM) and Set Mode (SM) control sequences (see 5.4).

E4. DAQ, SPA, EPA, SSA, and ESA

As a convenience to implementors the frequently encountered concept of protected and selected areas has been provided in both a simple form utilizing a single character (SPA, EPA, SSA, and ESA) and in the more general Define Area Qualification (DAQ) framework as well. The intent is that they provide equivalent functionality. However, interaction between the two forms is not specified in this standard.

E5. IND, NEL, and LF/NL

The two format effectors Index (IND) and Next Line (NEL) have been provided as being identical to the Line Feed (LF) and New Line (NL - LF with New Line option) specified for the single bit combination 0/10 in ANSI X3.4-1977 respectively. This was done to eliminate the need for a prior agreement between recipients of data interchange whether the New Line option was being exercised or not. The Line Feed New Line Mode provides a way of specifying that the NL option is being used for LF.

E6. Set and Reset Mode Parameter Assignments

The reset state of a mode was selected to be the simpler or more common setting for the mode.

E7. Parameter Structure

The structure of numeric and selective parameters was made identical so that the parameters could be collected by the recipient independent from the Final character. For control sequences having two numeric parameters relating to vertical and horizontal quantities, the vertical quantity was associated with the first parameter and the horizontal quantity with the second parameter.

APPENDIX F

Functional Grouping of Controls

F1. General

The controls defined in this standard and in ANSI X3.4-1977 are grouped according to function in Sections F2 through F14. The grouping is intended solely to aid in understanding the standard. It does not restrict the controls to the indicated uses. Note that some controls appear in more than one grouping.

This Appendix also indicates the form of the control by following the mnemonic with the following notations:

(1) Nothing: the control is a single-character (in an 8-bit environment) or a two-character Fe ESCape Sequence (in a 7-bit environment).
(2) (Pn): Control sequence with one numeric parameter
(3) (Pn ; Pn): Control sequence with two numeric parameters
(4) (Ps): Control sequence with a variable number of selective parameters
(5) (Fs): ESCape Fs Sequence
(6) (m): Mode (see RM, SM)

F2. Software Control for Delimiter String

APC	Application Program Control
OSC	Operating System Control
PM	Privacy Message
ST	String Terminator

F3. Device for Delimiting Control Strings

DCS	Device Control String
ST	String Terminator

F4. Introducers

CSI	Control Sequence Introducer
SS2	Single Shift 2
SS3	Single Shift 3

F5. Format Effectors

BS	Back Space
CR	Carriage Return
FF	Form Feed
HPA (Pn)	Horizontal Position Absolute
HPR (Pn)	Horizontal Position Relative
HT	Horizontal Tabulation
HTJ	Horizontal Tab with Justification
HTS	Horizontal Tabulation Set
HVP (Pn ; Pn)	Horizontal and Vertical Positioning
IND	Index
LF	Line Feed
NEL	Next Line
NL	New Line
PLD	Partial Line Down
PLU	Partial Line Up
RI	Reverse Index
SGR (Ps)	Select Graphic Rendition
TBC (Ps)	Tabulation Clear
VPA (Pn)	Vertical Position Absolute
VPR (Pn)	Vertical Position Relative
VT	Vertical Tabulation
VTS	Vertical Tabulation Set

F6. Typesetting and Composition Devices

FNT (Pn ; Pn)	Font Selection
GSM (Pn ; Pn)	Graphic Size Modification
GSS (Pn)	Graphic Size Selection
JFY (Ps)	Justify
QUAD (Ps)	Quad
SGR (Ps)	Select Graphic Rendition
SPI (Pn ; Pn)	Spacing Increment
TSS (Pn)	Thin Space Specification

F7. Controls to Move Cursor Controls

CBT (Pn)	Cursor Backward Tabulation
CHA (Pn)	Cursor Horizontal Absolute
CHT (Pn)	Cursor Horizontal Tab
CNL (Pn)	Cursor Next Line
CPL (Pn)	Cursor Previous Line
CPR (Pn ; Pn)	Cursor Position Report
CTC (Ps)	Cursor Tabulation Control
CUB (Pn)	Cursor Backward
CUD (Pn)	Cursor Down
CUF (Pn)	Cursor Forward
CUP (Pn ; Pn)	Cursor Position
CUU (Pn)	Cursor Up
CVT (Pn)	Cursor Vertical Tabulation
NP (Pn)	Next Page
PP (Pn)	Preceding Page
SL (Pn)	Scroll Left

SR (Pn)	Scroll Right
SU (Pn)	Scroll Up
SD (Pn)	Scroll Down

F8. Editing to Alter Visual Display

DCH (Pn)	Delete Character
DL (Pn)	Delete Line
EA (Ps)	Erase in Area
ECH (Pn)	Erase Character
ED (Ps)	Erase in Display
EF (Ps)	Erase in Field
EL (Ps)	Erase in Line
ICH (Pn)	Insert Character
IL (Pn)	Insert LIne

F9. Form Filling

DAQ (Ps)	Define Area Qualification
EPA	End of Protected Area
ESA	End of Selected Area
SPA	Start of Protected Area
SSA	Start of Selected Area

Plus Tab setting, clearing, and positioning functions:
CBT, CHT, CTC, CVT, EA, EF, HT, HTJ, HTS, TBC, VTS

F10. Miscellaneous Controls

CCH	Cancel Character
DA (Pn)	Device Attributes
DMI (Fs)	Disable Manual Input
DSR (Ps)	Device Status Report
EMI (Fs)	Enable Manual Input
INT (Fs)	Interrupt
MW	Message Waiting
MC (Ps)	Media Copy
PU1	Private Use One
PU2	Private Use Two
REP (Pn)	Repeat
RIS (Fs)	Reset to Initial State
RM (Ps)	Reset Mode
SM (Ps)	Set Mode
STS	Set Transmit State

F11. Device Sending Modes

FETM (m)	Format Effector Transfer Mode
GATM (m)	Guarded Area Transfer Mode
MATM (m)	Multiple Area Transfer Mode
SATM (m)	Selected Area Transfer Mode
SRTM (m)	Status Reporting Transfer Mode
TTM (m)	Transfer Termination Mode

F12. Device Local and Receiving Modes

EBM (m) Editing Boundary Mode
ERM (m) Erasure Mode
FEAM (m) Format Effector Action Mode
HEM (m) Horizontal Editing Mode
IRM (m) Insertion-Replacement Mode
PUM (m) Positioning Unit Mode
SEM (Ps) Select Editing Extent Mode
TSM (m) Tabulation Stop Mode
VEM (m) Vertical Editing Mode

F13. Device Local Modes

CRM (m) Control Representation Mode
KAM (m) Keyboard Action Mode
SRM (m) Send-Receive Mode

F14. Sending, Receiving, and Local Modes

LNM (m) Line Feed New Line Mode

APPENDIX G

Future Standardization

The following areas are potential subjects for future standardization:

(1) A registry of numeric device identification codes for use with Device Attributes (DA) to identify the particular device.
(2) A registry of type fonts to be used with the Font Selection (FNT) control.
(3) Additional parameters for existing controls and new controls as the need arises. This may include the introduction of additional modes. The open-ended nature of the control set allows for the inclusion of additional controls without the need to redefine or eliminate already defined controls.
(4) Specify effect on active position in controls where it has not been specified (IL, DL, NP, PP, QUAD, SD, SL, SR, SU).

APPENDIX H

Related Standards Activity

ANSI X3.64-1979, and ECMA-48, Additional Controls for Character-Imaging I/O Devices, were developed in parallel, with close liaison. ISO DP 6429, Additional Control Functions for Character-Imaging Devices, was developed as a synthesis of X3.64 and ECMA-48. During this process, some control functions as well as additional selective parameters were added. Except for point 1 below, X3.64 is a subset of ISO 6429. Although the two standards use different language, the intent is that the subset is technically identical. X3.64 was balloted and forwarded prior to the final resolution of ISO 6429 and does not incorporate the owkr of ISO/TC97/SC2 in completing ISO 6429. Revision of X3.64 will attempt to incorporate those elements and assumptions of X3.64.

1. X3.64-1979 contains a parameter value for use with SM (Set Mode) and RM (Reset Mode) which is not present in ISO 6429. It is:

   3/2 3/0 LNM Line Feed New Line Mode

2. ISO 6429 contains the following parameter values for use with SGR (Select Graphic Rendition) which are not present in ANSI X3.64-1979.

   8 concealed
   30 black display
   31 red display
   32 green display
   33 yellow display
   34 blue display
   35 magenta display
   36 cyan display
   37 white display
   38 (reserved for future standardization)
   39 (reserved for future standardization)
   40 black background
   41 red background
   42 green background
   43 yellow background
   44 blue background
   45 magenta background
   46 cyan background
   47 white background

3. ISO 6429 contains the control function SSU (SELECT SIZE UNIT) which is not present in ANSI X3.64-1979. Representation: Table 3 - selective parameter; no default value. SSU is a format effector which establishes the unit in which the numeric parameters of the positioning format effectors are expressed when the POSITIONING UNIT MODE is set to SIZE. SSU also establishes the unit for GSS, SPI, and TSS. The unit established remains effective until the occurrence of another SSU in the data stream. The parameter values are:

   1 INTERNATIONAL TYPOGRAPHIC STANDARD (This unit is not yet standardized)
   2 DECIPOINT - 0.0353 mm (1/720 inch)
   3 DIDOT - 0.0376 mm
   4 MILL - 0.0254 mm (1/1000 inch)
   5 METRIC - 0.01 mm

4. ISO 6429 contains a section which assigns meaning to bit patterns in columns 10-15 when encountered in control sequences, SS2 and SS3 sequences and control strings. ANSI X3.6-1977 states that occurrences of such bit patterns are errors whose recovery is not specified by the standard.

   Transformation between 7-bit and 8-bit coded representations - The control functions defined in this standard can be coded in a 7-bit code as well as in an 8-bit code; both forms of coded representation are equivalent and in accordance with ISO 2022.

   However, when data containing these control functions are transformed from a 7-bit to an 8-bit coded representation or vice versa, the transformation algorithm specified in ISO 2022 may produce results that are formally in disagreement with

this standard. In order to make allowance for such unintended but unavoidable deviations, the format rules are extended in the manner described below.

In an 8-bit code, the bit combinations of columns 10 to 15 (except 10/0 and 15/15) are permitted to represent:

- parameters, intermediates, and finals of a control sequence;
- the contents of a control string;
- the operand of a single-shift character.

In these situations, the bit combinations in the range 10/1 to 15/14 have the same meanings as the corresponding bit combinations in the range 2/1 to 7/14.

In a 7-bit code, the control characters SHIFT-OUT (SO) and SHIFT-IN (SI) are permitted to occur:

- between the CONTROL SEQUENCE INTRODUCTER (CSI) and the final bit combination of a control sequence;
- between the opening delimiter of a control string and the STRING TERMINATOR (ST);
- between a single-shift character and its operand.

SHIFT-OUT and SHIFT-IN have no effect on the interpretation of a control sequence, a control string, or the operand of a single-shift character, but they may indeed affect the meanings of bit combinations following in the data stream.

5. ISO 6429 contains the SELECT EDITING EXTENT (SEE) control function which is identical in function and encoding to the Select Editing Extent Mode (SEM) in ANSI X3.64-1979.

EDITORIAL CORRECTIONS

3.5.9.1 Concepts. Change lines 6 and 7 to read:
(SM), Reset Mode (RM), and Select Editing
Extent Mode (SEM) control sequences.

3.5.9.2 Classification. Add the following as the last line in Subsection (1):
TTM Transfer Termination Mode

4.2 Editing Functions and Format Effectors. Change line 19 to read:
intended to be interpreted and

5.19 DA DEVICE ATTRIBUTES. Change line 2 in Subsection (2) to read:
5.19 (1). This form is derived by the

5.24 DMI DISABLE MANUAL INPUT
Place "Coded as 1/11 6/0 (ESCape Fs Control)" on one line

5.32 EMI ENABLE MANUAL INPUT
Place "Coded as 1/11 6/2 (ESCape Fs Control)" on one line.

5.37 FETM FORMAT EFFECTOR TRANSFER MODE. Change line 8 to read:
transmitted data stream and not to be

5.50 IND INDEX
5.59 NEL NEXT LINE
5.62 PLD PARTIAL LINE DOWN
5.63 PLU PARTIAL LINE UP

In each of these sections, change "Causes the active position to move . . ." to "Moves the active position . . ."

5.51 INT INTERRUPT. Combine the last two lines as:
"Coded as 1/11 6/1 (ESCape Fs Control)"

5.72 RIS RESET TO INITIAL STATE. Combine lines 8 and 11 on a single line as:
"Coded as 1/11 6/3 (ESCape Fs Control)"

5.73 RM RESET MODE. In line 2, change "3.5.8" to "3.5.9."

Section 7. In line 4 of the notes, change "Fut. std." to "fut. std."

B5.2 Control Characters. In the sixth paragraph on page B-3, change "by step 2 or 3 below" to "by B5.3 or B5.4"

Section B9. In the fifth paragraph, change "3.5.8" to "3.5.9."

Section E3. In the last line, change "5.4" to "5.54."

Section F1. In item (1), change
". . . two-character Fe ESCape . . ." to ". . . two-character ESCape Fe . . ."

American National Standards for Information Processing

X3.1-1976 Synchronous Signaling Rates for Data Transmission
X3.2-1970 (R1976) Print Specifications for Magnetic Ink Character Recognition
X3.3-1970 (R1976) Bank Check Specifications for Magnetic Ink Character Recognition
X3.4-1977 Code for Information Interchange
X3.5-1970 Flowchart Symbols and Their Usage in Information Processing
X3.6-1965 (R1973) Perforated Tape Code for Information Interchange
X3.9-1978 FORTRAN
X3.11-1969 Specification for General Purpose Paper Cards for Information Processing
X3.14-1973 Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)
X3.15-1976 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission
X3.16-1976 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.17-1977 Character Set and Print Quality for Optical Character Recognition (OCR-A)
X3.18-1974 One-Inch Perforated Paper Tape for Information Interchange
X3.19-1974 Eleven-Sixteenths-Inch Perforated Paper Tape for Information Interchange
X3.20-1967 (R1974) Take-Up Reels for One-Inch Perforated Tape for Information Interchange
X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards
X3.22-1973 Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)
X3.23-1974 Programming Language COBOL
X3.24-1968 Signal Quality at Interface between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission
X3.25-1976 Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.26-1980 Hollerith Punched Card Code
X3.27-1978 Magnetic Tape Labels and File Structure for Information Interchange
X3.28-1976 Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Communication Links
X3.29-1971 Specifications for Properties of Unpunched Oiled Paper Perforator Tape
X3.30-1971 Representation for Calendar Date and Ordinal Date for Information Interchange
X3.31-1973 Structure for the Identification of the Counties of the United States for Information Interchange
X3.32-1973 Graphic Representation of the Control Characters of American National Standard Code for Information Interchange
X3.34-1972 Interchange Rolls of Perforated Tape for Information Interchange
X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment
X3.37-1980 Programming Language APT
X3.38-1972 (R1977) Identification of States of the United States (Including the District of Columbia) for Information Interchange
X3.39-1973 Recorded Magnetic Tape for Information Interchange (1600 CPI, PE)
X3.40-1976 Unrecorded Magnetic Tape for Information Interchange (9-Track 200 and 800 CPI, NRZI, and 1600 CPI, PE)
X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange
X3.42-1975 Representation of Numeric Values in Character Strings for Information Interchange
X3.43-1977 Representations of Local Time of the Day for Information Interchange
X3.44-1974 Determination of the Performance of Data Communication Systems
X3.45-1974 Character Set for Handprinting
X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)
X3.47-1977 Structure for the Identification of Named Populated Places and Related Entities of the States of the United States for Information Interchange
X3.48-1977 Magnetic Tape Cassettes for Information Interchange (3.810-mm [0.150-in] Tape at 32 bpmm [800 bpi], PE)
X3.49-1975 Character Set for Optical Character Recognition (OCR-B)
X3.50-1976 Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets
X3.51-1975 Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange
X3.52-1976 Unrecorded Single-Disk Cartridge (Front Loading, 2200 BPI), General, Physical, and Magnetic Requirements
X3.53-1976 Programming Language PL/I
X3.54-1976 Recorded Magnetic Tape for Information Interchange (6250 CPI, Group Coded Recording)
X3.55-1977 Unrecorded Magnetic Tape Cartridge for Information Interchange, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded
X3.56-1977 Recorded Magnetic Tape Cartridge for Information Interchange, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded
X3.57-1977 Structure for Formatting Message Headings for Information Interchange Using the American National Standard Code for Information Interchange for Data Communication Systems Control
X3.58-1977 Unrecorded Eleven-Disk Pack, General, Physical, and Magnetic Requirements
X3.60-1978 Programming Language Minimal BASIC
X3.61-1978 Representation of Geographic Point Locations for Information Interchange
X3.62-1979 Paper Used in Optical Character Recognition (OCR) Systems
X3.64-1979 Additional Controls for Use with American National Standard Code for Information Interchange
X3.66-1979 Advanced Data Communication Control Procedures (ADCCP)
X3.73-1980 Single-Sided Unformatted Flexible Disk Cartridge (for 6631-BPR Use)
X3.77-1980 Representation of Pocket Select Characters in Information Interchange
X3.79-1981 Determination of Performance of Data Communications Systems That Use Bit-Oriented Communication Control Procedures
X3.82-1980 One-Sided Single-Density Unformatted 5.25-Inch Flexible Disk Cartridge (for 3979-BPR Use)
X3.83-1980 ANSI Sponsorship Procedures for ISO Registration According to ISO 2375
X3.86-1980 Optical Character Recognition (OCR) Inks

X3/TR1-77 Dictionary for Information Processing (Technical Report)

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