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Third edition
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Information technology — Control functions for coded character sets

Technologies de l'information — Fonctions de commande pour les jeux de caractères codés

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 6429 was prepared by the European Computer Manufacturers Association (as Standard ECMA-48) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This third edition cancels and replaces the second edition (ISO 6429:1988), which has been technically revised.

Annexes A, B, C, D, E, F and G of this International Standard are for information only.

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Introduction

This International Standard constitutes a repertoire of a large number of control functions the definitions and coded representations of which are thus standardized. For each application the required selection of control functions can be made from this repertoire.

This third edition of ISO/IEC 6429 contains the control functions already standardized in the second edition and, in addition, new control functions needed for handling bi-directional texts, i.e. texts comprising parts written with a left-to-right script and parts written with a right-to-left script. ECMA Technical Report TR/53 gives further information and examples of handling such texts. The inclusion of these specialized control functions has required a corresponding adjustment of the definitions of some of the other control functions. Moreover, the concept of "device" had to be revised.

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Information technology – Control functions for coded character sets

1 Scope

This International Standard defines control functions and their coded representations for use in a 7-bit code, an extended 7-bit code, an 8-bit code or an extended 8-bit code, if such a code is structured in accordance with International Standard ISO 2022.

This International Standard specifies technical means to handle bi-directional texts in character-imaging devices in the case of

- texts in a single script of which specific parts need to be presented in an opposite direction (for example, numbers in Arabic or Hebrew text);
- texts in different scripts presented in opposite directions (like texts in Latin and Arabic or texts in Latin and Hebrew;
- texts like the above with a horizontal line orientation and a top-to-bottom line progression.

The control functions defined in this International Standard are intended to be used embedded in character-coded data for interchange, in particular with character-imaging devices.

In general, the control functions are defined by their effects on a character-imaging input/output device. It is, therefore, necessary to make certain assumptions about the architecture of such a device. These assumptions are as unrestrictive as possible; they are specified in clause 6.

In addition to being performed the control functions may need to be represented by a graphic symbol.

The structure of this International Standard is open-ended, so that more control functions can be included in future editions.

Other standards specifying control functions may define more restricted definitions of them than those in this International Standard.

The devices to which this International Standard applies can vary greatly from each other depending on the application for which a device has been specifically designed. It is technically and economically impractical for one device to implement all the facilities specified in this International Standard. The intention is that in any type of device only a limited selection of the facilities appropriate to the application will be implemented.

2 Conformance

2.1 Types of conformance

Full conformance to a standard means that all of its requirements are met. Conformance will only have a unique meaning if the standard contains no options. If there are options within the standard they must be clearly identified, and any claim of conformance must include a statement that identifies those options that have been adopted.

This International Standard is of a different nature since it specifies a large number of facilities from which different selections may be made to suit individual applications. These selections are not identified in this International Standard, but must be identified at the time that a claim of conformance is made. Conformance to such an identified selection is known as limited conformance.

The facilities selected for a particular application may be registered according to ISO 2375 for ease of reference in information interchange.

2.2 Conformance of information interchange

A CC-data-element within coded information for interchange is in conformance with this International Standard if the coded representations of control functions within that CC-data-element satisfy the following conditions:

a) a coded representation of a control function that is specified in this International Standard shall always represent that control function;

b) a control function that is specified in this International Standard shall always be represented by the coded representation that is specified in this International Standard for that control function;

c) any coded representation that is reserved for future standardization by this International Standard shall not appear.

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c) any coded representation that is reserved for future standardization by this International Standard shall not appear.

Coded representations of control functions and modes not specified in this International Standard may appear in interchanged information subject to the above conditions (see 5.4, 5.4.1 and 7.4).

2.3 Conformance of devices

A device is in conformance with this International Standard if it conforms to the requirements of 2.3.1, and either or both 2.3.2 and 2.3.3. Any claim of conformance shall identify the document which contains the description specified in 2.3.1.

2.3.1 Device description

A device that conforms to this International Standard shall be the subject of a description that:

i) identifies, by reference to the clauses of, or to the control functions specified in this International Standard, the selection of control functions, the coded representations of which the device can originate or can receive and interpret;

ii) identifies the means by which the user may supply the corresponding control functions, or may recognize them, as specified respectively in 2.3.2 and 2.3.3 below.

2.3.2 Originating devices

An originating device shall be capable of transmitting within a CC-data-element the coded representations of an identified selection of control functions, and of their parameter values (including mode selection parameters), conforming to this International Standard.

Such a device shall allow the user to supply any control function that he chooses from among the identified selection for the purpose of transmitting its coded representation over the coding interface.

2.3.3 Receiving devices

A receiving device shall be capable of receiving within a CC-data-element and interpreting the coded representations of an identified selection of control functions, and of their parameter values (including mode selection parameters), conforming to this International Standard.

If the identified selection contains a control sequence for which a default value for a parameter is specified in this International Standard, the identified selection shall include the default value both in explicit and in implicit representations.

Such a device shall make available to the user any control function that is within the identified selection, and the coded representation of which is received over the coding interface, in such a form that the user can recognize it from among the control functions within the identified selection.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1745:1975, *Information processing - Basic mode control procedures for data communication systems.*

ISO 2022:1986, *Information processing – ISO 7-bit and 8-bit coded character sets – Code extension techniques.*

ISO 2375:1985, *Data processing - Procedure for registration of escape sequences.*

ISO 8613-6:1989, *Information processing - Text and office systems - Office Document Architecture (ODA) and interchange format - Part 6: Character content architectures.*

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4 Notation and definitions

4.1 Notation

In this International Standard a convention has been adopted to assist the reader. Capital letters are used to refer to a specific control function, mode, mode setting, or graphic character in order to avoid confusion, for example, between the concept "space" and the character SPACE.

It is intended that this convention and the acronyms of the modes and the control functions be retained in all translations of the text.

This International Standard uses the notation of the form xx/yy, where xx represents the column number 00 to 07 in a 7-bit code table or 00 to 15 in an 8-bit code table, and yy represents the row number 00 to 15.

4.2 Definitions

For the purpose of this International Standard, the following definitions apply.

4.2.1 Active area: The area in the data component which contains the active data position.

The area in the presentation component which contains the active presentation position.

4.2.2 Active field: The field in the data component which contains the active data position.

The field in the presentation component which contains the active presentation position.

4.2.3 Active line: The line in the data component which contains the active data position. The line in the presentation component which contains the active presentation position.

4.2.4 Active page: The page in the data component which contains the active data position. The page in the presentation component which contains the active presentation position.

4.2.5 Active position: The character position which is to image the graphic symbol representing the next graphic character or relative to which the next control function is to be executed.

NOTE - In general, the active position is indicated in a display by a cursor.

Active data position

In the data component the character position which is to receive the next graphic character or the next control function from the data stream and relative to which certain control functions are to be executed.

Active presentation position

In the presentation component the character position which is to receive the next graphic character for graphic image output and relative to which certain control functions are to be executed.

NOTE - In general, the active presentation position is indicated in a display by a cursor.

4.2.6 Area: A series of successive character positions that are not necessarily on the same line.

4.2.7 Auxiliary device: A device connected to a character-imaging device for the purpose of inputting, storing, retrieving, or imaging data.

4.2.8 Bi-directional data: Data containing text strings which are to be presented in different writing directions, like left-to-right and right-to-left.

4.2.9 Bit combination: An ordered set of bits used for the representation of characters.

4.2.10 Byte: A bit string that is operated upon as a unit.

4.2.11 To cancel: To mark data in such a way that it can be ignored in subsequent processing.

4.2.12 Character: A member of a set of elements used for the organization, control or representation of data.

4.2.13 Character-imaging device: A device that gives a visual representation of data in the form of graphic symbols using any technology, for example cathode ray tube or printer.

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4.2.14 Character path: The sequential order of the character positions along a line of the presentation component.

4.2.15 Character position: The portion of a display that is imaging or is capable of imaging a graphic symbol.

In the data component a position available for receiving a graphic character for further presentation processing.

In the presentation component a position available for receiving a graphic character for the rendering of the graphic image output.

4.2.16 Character progression: The sequential order of the character positions along a line of the data component.

4.2.17 To clear: To remove the display of data or the information used for the display of data, for example tabulation stops marking the boundaries between fields.

4.2.18 Coded character set; code: A set of unambiguous rules that establishes a character set and the one-to-one relationship between the characters of the set and their bit combinations.

4.2.19 Coded-character-data-element (CC-data-element): An element of interchanged information that is specified to consist of a sequence of coded representations of characters, in accordance with one or more identified standards for coded character sets.

NOTE 1
In a communication environment according to the reference model for Open Systems Interconnection of ISO 7498, a CC-data-element will form all or part of the information that corresponds to the Presentation-Protocol-Data-Units (PPDU) defined in that International Standard.

NOTE 2
When information interchange is accomplished by means of interchangeable media, a CC-data-element will form all or part of the information that corresponds to the user data, and not that recorded during formatting and initialization.

4.2.20 Code extension: The techniques for the encoding of characters that are not included in the character set of a given code.

4.2.21 Code table: A table showing the character allocated to each bit combination in a code.

4.2.22 Control character: A control function the coded representation of which consists of a single bit combination.

4.2.23 Control function: An action that affects the recording, processing, transmission, or interpretation of data, and that has a coded representation consisting of one or more bit combinations.

4.2.24 Control sequence: A string of bit combinations starting with the control function CONTROL SEQUENCE INTRODUCER (CSI), and used for the coded representation of control functions with or without parameters.

4.2.25 Control string: A string of bit combinations which may occur in the data stream as a logical entity for control purposes.

4.2.26 Cursor: A special indicator used in a display to mark the active presentation position.

4.2.27 Data component: The device component which is used for storing the received data for further presentation processing.

4.2.28 Decimal mark: A graphic symbol, usually a FULL STOP or a COMMA, used to separate the fractional part of a decimal number from the integer part of that number.

4.2.29 Default: A value or a state that is to be assumed when no value or state is explicitly specified.

4.2.30 To delete: To remove the contents from character positions and closing the resulting gap by moving adjacent graphic characters into the empty positions.

4.2.31 To 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.

4.2.32 Device: A component of information processing equipment which can transmit, and/or receive, coded information within CC-data-elements.

NOTE - It may be an input/output device in the conventional sense, or a process such as an application program or gateway function.

4.2.33 Display: The region for visual presentation of data on any type of character-imaging device, including printer, cathode ray tube and similar devices.

4.2.34 Editor function: A control function used for editing, altering or transposing the visual arrangement of data.

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4.2.35 Eligible: The term used to denote an area considered for transmission or transfer.

4.2.36 Environment: The characteristic that identifies the number of bits used for representing a character in a data processing or data communication system or in a part of such a system.

4.2.37 To erase: To remove the contents from character positions and leaving the resulting gap open.

4.2.38 Escape sequence: A string of bit combinations that is used for control purposes in code extension procedures. The first of these bit combinations represents the control function ESCAPE.

4.2.39 Field: An area consisting of the character position at a character tabulation stop (beginning of the field) and the character positions up to, but not including, the character position at the following character tabulation stop (end of the field).

4.2.40 Final Byte: The bit combination that terminates an escape sequence or a control sequence.

4.2.41 Formator function: A control function (format effector or presentation control function) describing how the originator of the data stream wishes the information to be formatted or presented.

4.2.42 Graphic character: A character, other than a control function, that has a visual representation normally hand-written, printed or displayed, and that has a coded representation consisting of one or more bit combinations.

4.2.43 Graphic rendition: The visual style of displaying a set of graphic symbols.

4.2.44 Graphic symbol: A visual representation of a graphic character or of a control function.

4.2.45 Guarded area: A special case of a qualified area, the contents of which may be excluded from transmission as a data stream and from transfer to an auxiliary input/output device.

4.2.46 Initial state: The state a device has after it is made operational. It is the recommended "reset" state of the modes.

4.2.47 Intermediate Byte: a) In an Escape Sequence, a bit combination that may occur between the control function ESCAPE (ESC) and the Final Byte.

b) In a Control Sequence, a bit combination that may occur between the control function CONTROL SEQUENCE INTRODUCER (CSI) and the Final Byte, or between a Parameter Byte and the Final Byte.

4.2.48 To invoke: To cause a designated set of characters to be represented by the prescribed bit combinations whenever those bit combinations occur.

4.2.49 Line: A set of a consecutive character positions.

4.2.50 Line home position: A reference position on a line in the data component ahead of which the active data position can normally not be moved.

A reference position on a line in the presentation component ahead of which the active presentation position can normally not be moved.

4.2.51 Line limit position: A reference position on a line in the data component beyond which the active data position can normally not be moved.

A reference position on a line in the presentation component beyond which the active presentation position can normally not be moved.

4.2.52 Line orientation: The term used to describe the way in which a line will appear in the graphic image output. In this International Standard, line orientation may only be vertical or horizontal.

4.2.53 Line progression: The direction of presentation of successive lines.

4.2.54 Operating system: The software that controls the execution of computer programs and that may provide scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management, and related services.

4.2.55 Page: A set of consecutive lines.

4.2.56 Page home position: A reference position on a page in the data component ahead of which the active line (the line that contains the active data position) can normally not be moved.

A reference position on a page in the presentation component ahead of which the active line (the line that contains the active presentation position) can normally not be moved.

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4.2.57 Page limit position: A reference position on a page in the data component beyond which the active line (the line that contains the active data position) can normally not be moved.

A reference position on a page in the presentation component beyond which the active line (the line that contains the active presentation position) can normally not be moved.

4.2.58 Parameter Byte: In a control sequence, a bit combination that may occur between the control function CONTROL SEQUENCE INTRODUCER (CSI) and the Final Byte, or between CSI and an Intermediate Byte.

4.2.59 Presentation component: The device component which is used for producing the graphic image output.

4.2.60 Private (or experimental) use: The means of representing a non-standardized control function or mode in a manner compatible with this International Standard.

4.2.61 Protected area: A special case of a qualified area, the contents of which are protected against manual alteration and may also be protected against erasure.

4.2.62 Qualified area: A string of character positions with which certain characteristics are associated.

4.2.63 Repertoire: A specified set of characters that are represented by one or more bit combinations of a coded character set.

4.2.64 Scroll: The action whereby all, or part of, the graphic symbols of a display are moved in a specified direction.

4.2.65 Selected area: A string of character positions, the contents of which may be eligible to be transmitted in the form of a data stream or to be transferred to an auxiliary input/output device.

4.2.66 Tabulation: The technique of identifying character positions or lines in a display for the purpose of arranging information systematically.

4.2.67 Tabulation stop: The indication that a character position or a line is to be used for tabulation; a character tabulation stop may also serve as a boundary between fields.

4.2.68 User: A person or other entity that invokes the services provided by a device.

NOTE 1
This entity may be a process such as an application program if the "device" is a code convertor or a gateway function, for example.

NOTE 2
The characters, as supplied by the user or made available to the user, may be in the form of codes local to the device, or of non-conventional visual representations, provided that clause 2.3 above is satisfied.

5 Coded representation

5.1 General

Each control function in this International Standard belongs to one of the following types:

a) elements of the C0 set;
b) elements of the C1 set;
c) control sequences;
d) independent control functions;
e) control strings.

5.2 Elements of the C0 set

These control functions are represented in 7-bit and 8-bit codes by bit combinations from 00/00 to 01/15.

The definitions and the coded representations of the control functions are specified in 8.3 (see also table 1).

The 3-byte escape sequence designating and invoking this C0 set is ESC 02/01 04/00.

NOTE 1
The use of this escape sequence implies that all control functions of this C0 set must be implemented.

NOTE 2
It is assumed that even with no invoked C0 set the control character ESCAPE is available and is represented by bit combination 01/11.

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Table 1 - Bit combinations representing the control functions of the C0 set

Row number	Column number	
	00	01
00	NUL	DLE
01	SOH	DC1
02	STX	DC2
03	ETX	DC3
04	EOT	DC4
05	ENQ	NAK
06	ACK	SYN
07	BEL	ETB
08	BS	CAN
09	HT	EM
10	LF	SUB
11	VT	ESC
12	FF	IS4
13	CR	IS3
14	SO or LS1	IS2
15	SI or LS0	IS1

5.3 Elements of the C1 set

These control functions are represented

a) in a 7-bit code by 2-byte escape sequences of the form ESC Fe, where ESC is represented by bit combination 01/11 and the Final Byte Fe is represented by a bit combination from 04/00 to 05/15;

b) in an 8-bit code by bit combinations from 08/00 to 09/15; however, when the announcer sequence ESC 02/00 04/06 according to International Standard ISO 2022 is used, the control functions of the C1 set are represented by ESC Fe sequences as in a 7-bit code.

The definitions and the coded representations of the control functions are specified in 8.3 (see also table 2a and table 2b).

The unallocated bit combinations are reserved for future standardization and shall not be used. For the bit combinations 04/04 (see table 2a) and 08/04 (see table 2b) see F.8.2 in annex F.

The 3-byte escape sequences designating and invoking this C1 set are ESC 02/06 04/00 and ESC 02/02 04/03.

NOTE - The use of these escape sequences implies that all control characters of this C1 set must be implemented.

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Table 2a - Bit combinations representing the Final Byte Fe for the control functions of the C1 set in the 7-bit code

Row number	Column number	
	04	05
00	-	DCS
01	-	PU1
02	BPH	PU2
03	NBH	STS
04	-	CCH
05	NEL	MW
06	SSA	SPA
07	ESA	EPA
08	HTS	SOS
09	HTJ	-
10	VTS	SCI
11	PLD	CSI
12	PLU	ST
13	RI	OSC
14	SS2	PM
15	SS3	APC

Table 2b - Bit combinations representing the control functions of the C1 set in an 8-bit code

Row number	Column number	
	08	09
00	-	DCS
01	-	PU1
02	BPH	PU2
03	NBH	STS
04	-	CCH
05	NEL	MW
06	SSA	SPA
07	ESA	EPA
08	HTS	SOS
09	HTJ	-
10	VTS	SCI
11	PLD	CSI
12	PLU	ST
13	RI	OSC
14	SS2	PM
15	SS3	APC

5.4 Control sequences

A control sequence is a string of bit combinations starting with the control function CONTROL SEQUENCE INTRODUCER (CSI) followed by one or more bit combinations representing parameters, if any, and by one or more bit combinations identifying the control function. The control function CSI itself is an element of the C1 set.

The format of a control sequence is

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

where

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a) CSI is represented by bit combinations 01/11 (representing ESC) and 05/11 in a 7-bit code or by bit combination 09/11 in an 8-bit code, see 5.3;

b) P ... P are Parameter Bytes, which, if present, consist of bit combinations from 03/00 to 03/15;

c) I ... I are Intermediate Bytes, which, if present, consist of bit combinations from 02/00 to 02/15. Together with the Final Byte F, they identify the control function;

NOTE - The number of Intermediate Bytes is not limited by this International Standard; in practice, one Intermediate Byte will be sufficient since with sixteen different bit combinations available for the Intermediate Byte over one thousand control functions may be identified.

d) F is the Final Byte; it consists of a bit combination from 04/00 to 07/14; it terminates the control sequence and together with the Intermediate Bytes, if present, identifies the control function. Bit combinations 07/00 to 07/14 are available as Final Bytes of control sequences for private (or experimental) use.

The definitions and the coded representations of the control functions are specified in 8.3 (see also tables 3 and 4). Coding examples are shown in clause B.1 in annex B.

Table 3 - Bit combinations representing the Final Byte of control sequences without Intermediate Bytes

Row number	Column number			
	04	05	06	07
00	ICH	DCH	HPA	
01	CUU	SEE	HPR	
02	CUD	CPR	REP	
03	CUF	SU	DA	
04	CUB	SD	VPA	
05	CNL	NP	VPR	Private
06	CPL	PP	HVP	Use
07	CHA	CTC	TBC	
08	CUP	ECH	SM	
09	CHT	CVT	MC	
10	ED	CBT	HPB	
11	EL	SRS	VPB	
12	IL	PTX	RM	
13	DL	SDS	SGR	
14	EF	SIMD	DSR	
15	EA	--	DAQ	

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Table 4 - Bit combinations representing the Final Byte of control sequences with a single Intermediate Byte 02/00

Row number	Column number			
	04	05	06	07
00	SL	PPA	TATE	
01	SR	PPR	TALE	
02	GSM	OOB	TAC	
03	GSS	SPD	TCC	
04	FNT	DTA	TSR	
05	TSS	SLH	SCO	Private
06	JFY	SLL	SRCS	Use
07	SPI	FNK	SCS	
08	QUAD	SPQR	SLS	
09	SSU	SEF	SPH	
10	PFS	PEC	SPL	
11	SHS	SSW	SCP	
12	SVS	SACS	-	
13	IGS	SAPV	-	
14	-	STAB	-	
15	IDCS	GCC	-	

The unallocated bit combinations are reserved for future standardization and shall not be used. Bit combination 06/13 is reserved for use as the Final Byte with the control function IDENTIFY UNIVERSAL CHARACTER SUBSET (IUCS) according to clause 17 of ISO/IEC 10646. See also F.8.3 in annex F.

5.4.1 Parameter representation

A control sequence may contain a string of Parameter Bytes P ... P representing one or more parameters to complete the specification of the control function.

The Parameter Bytes are bit combinations from 03/00 to 03/15. The parameter string is interpreted as follows:

a) If the first bit combination of the parameter string is in the range 03/00 to 03/11, the parameter string is interpreted according to the format described in 5.4.2.

b) If the first bit combination of the parameter string is in the range 03/12 to 03/15, the parameter string is available for private (or experimental) use. Its format and meaning are not defined by this International Standard.

5.4.2 Parameter string format

A parameter string which does not start with a bit combination in the range 03/12 to 03/15 shall have the following format:

a) A parameter string consists of one or more parameter sub-strings, each of which represents a number in decimal notation.

b) Each parameter sub-string consists of one or more bit combinations from 03/00 to 03/10; the bit combinations from 03/00 to 03/09 represent the digits ZERO to NINE; bit combination 03/10 may be used as a separator in a parameter sub-string, for example, to separate the fractional part of a decimal number from the integer part of that number.

c) Parameter sub-strings are separated by one bit combination 03/11.

d) Bit combinations 03/12 to 03/15 are reserved for future standardization except when used as the first bit combination of the parameter string.

e) An empty parameter sub-string represents a default value which depends on the control function.

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f) In each parameter sub-string, leading bit combinations 03/00 are not significant and may be omitted. If the parameter sub-string consists of bit combinations 03/00 only, at least one of them must be retained to indicate the zero value of the sub-string.

g) If the parameter string starts with the bit combination 03/11, an empty parameter sub-string is assumed preceding the separator; if the parameter string terminates with the bit combination 03/11, an empty parameter sub-string is assumed following the separator; if the parameter string contains successive bit combinations 03/11, empty parameter sub-strings are assumed between the separators.

h) If the control function has more than one parameter, and some parameter sub-strings are empty, the separators (bit combination 03/11) must still be present. See F.10 in annex F.

Coding examples are shown in clause B.2 in annex B.

5.4.3 Types of parameters

In a control sequence with parameters, each parameter sub-string corresponds to one parameter and represents the value of that parameter. The number of parameters is either fixed or variable, depending on the control function. If the number of parameters is variable, neither the maximum number of values nor the order in which the corresponding actions are performed are defined by this International Standard.

A parameter may be purely numeric or it may be selective, i.e. denoting one of a numbered list of actions the control function can perform.

In the case of selected parameters a particular parameter value may have the same meaning as a combination of two or more separate values.

Unassigned selective parameter values are reserved for future standardization.

5.5 Independent control functions

These control functions are represented in 7-bit and 8-bit codes by 2-byte escape sequences of the form ESC Fs, where ESC is represented by bit combination 01/11 and the Final Byte Fs is represented by a bit combination from 06/00 to 07/14.

The definitions and the coded representations of the control functions are specified in 8.3 (see also table 5).

Table 5 - Independent control functions

Row number	Column number	
	06	07
00	DMI	-
01	INT	-
02	EMI	-
03	RIS	-
04	CMD	-
05	-	-
06	-	-
07	-	-
08	-	-
09	-	-
10	-	-
11	-	-
12	-	LS3R
13	-	LS2R
14	LS2	LS1R
15	LS3	-

The unallocated bit combinations are reserved for future standardization and shall not be used.

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NOTE - ESC Fs sequences are registered in the ISO International Register of Coded Character Sets to be Used with Escape Sequences, which is maintained by the Registration Authority for ISO 2375. Any candidates for ESC Fs sequences have to be approved by ISO/IEC JTC1/SC2 for registration. The coding for the Final Byte, Fs, will then be assigned by the Registration Authority.

5.6 Control strings

A control string is a string of bit combinations which may occur in the data stream as a logical entity for control purposes. A control string consists of an opening delimiter, a command string or a character string, and a terminating delimiter, the STRING TERMINATOR (ST).

A command string is a sequence of bit combinations in the range 00/08 to 00/13 and 02/00 to 07/14.

A character string is a sequence of any bit combination, except those representing START OF STRING (SOS) or STRING TERMINATOR (ST).

The interpretation of the command string or the character string is not defined by this International Standard, but instead requires prior agreement between the sender and the recipient of the data.

The opening delimiters defined in this International Standard are

a) APPLICATION PROGRAM COMMAND (APC)
b) DEVICE CONTROL STRING (DCS)
c) OPERATING SYSTEM COMMAND (OSC)
d) PRIVACY MESSAGE (PM)
e) START OF STRING (SOS)

6 Device concepts

The definitions of the control functions in this International Standard are based on general assumptions about the architecture of a character-imaging device. Examples of devices conforming to these concepts are: an alphanumeric display device, a printer or a microfilm output device.

A character-imaging device is a device which is capable of receiving a data stream that consists of coded control functions and graphic characters, and is capable of producing a graphic image output. This output must be readable by a human being according to the various traditional writing conventions such as left-to-right, right-to-left, top-to-bottom and bottom-to-top. The graphic image output is, in general, produced in the form of one or more rectangular arrays of character positions and lines which are called pages.

If the device is an input/output device rather than merely an output device, it is also capable of transmitting a data stream that consists of coded control functions and graphic characters; the transmitted data stream is, in general, composed of a combination of data which have been sent to the device and data which have been entered locally into the device, for example by an associated keyboard.

A number of facilities for the organization of the graphic image output and for establishing the direction of presented text are provided by this International Standard. A device may support all of these facilities or only a subset of them appropriate to the application.

The definitions in this International Standard assume a bi-directional device which has both a presentation component (see 6.1.1) and a data component (see 6.1.3). In the case of a uni-directional device or a bi-directional device without a data component, all references to active data position, data component, character progression, etc., are to be read as referring to active presentation position, presentation component, character path, etc., resp.

Refer to ECMA Technical Report 53 for more explanation.

6.1 Components

A device consists either of an input component, a presentation component and a data component, or of an input component and a presentation component only.

The input component is capable of receiving the information to be imaged from a manual input device such as a keyboard or from a data stream. This International Standard does not deal with the input component.

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The presentation component which is present in uni-directional as well as in bi-directional devices is used for producing the graphic image output. The output may, for example, be rendered on a display or a printer.

The data component which is generally provided in bi-directional devices only is used to store the received information for further presentation processing.

6.1.1 Presentation component

The presentation component is capable of presenting the information in successive lines; each line consisting of successive character positions. The lines, as well as the character positions, are identified by the consecutive numbers 1, 2, 3 ...

The line orientation in the presentation component is either horizontal or vertical. This defines the way in which a line will appear in the produced graphic image output.

For horizontal line orientation, the direction of the line progression can be:

- top-to-bottom, or
- bottom-to-top.

For vertical line orientation, the direction of the line progression can be:

- left-to-right, or
- right-to-left.

The sequential order of the character positions along a line of the presentation component is called the character path.

The character path along a line can be:

- left-to-right or right-to-left (in the case of horizontal line orientation), or
- top-to-bottom or bottom-to-top (in the case of vertical line orientation).

The lines are numbered according to the established line progression.

The character positions are numbered according to the established character path.

Each character position either is in the erased state or images a graphic symbol. A graphic symbol represents SPACE, a graphic character, or a control function for which a graphical representation is required.

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

Depending on the implementation, there may or may not be a distinction between a character position in the erased state and a character position imaging SPACE.

6.1.2 The active presentation position

At any time, there is a unique character position in the presentation component which is called the active presentation position.

The active presentation position is the character position which is to receive the next graphic character of the data stream for graphic image output or a control function for which a graphical representation is required. The active presentation position in the presentation component is also the character position relative to which certain control functions are to be executed (see 6.4).

The active presentation position can be moved explicitly (see 6.1.7) or indirectly (see 6.1.8). In the case where a device has no data component, the active presentation position can also be moved implicitly (see 6.1.6).

NOTE - In a display it is common practice to mark the active presentation position by means of a special visible indicator which is called the cursor.

The line containing the active presentation position is called the active line; the field containing the active presentation position is called the active field; the area containing the active presentation position is called the active area; the page containing the active presentation position is called the active page.

6.1.3 Data component

In the data component the received data stream is structured into successive lines; each line consisting of successive character positions. The lines, as well as the character positions, are identified by the consecutive numbers 1, 2, 3 ...

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The sequential order of the character positions along a line of the data component is called the character progression.

In this International Standard, the line orientation in the data component is considered to be horizontal, the line progression is considered to be top-to-bottom, the character progression is considered to be left-to-right.

The lines are numbered according to the line progression.

The character positions are numbered according to the character progression.

Each character position either is in the erased state or contains a graphic character, or a control function.

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

Depending on the implementation, there may or may not be a distinction between a character position in the erased state and a character position containing SPACE.

6.1.4 The active data position

At any time, there is a unique character position in the data component which is called the active data position.

The active data position is the character position which is available for the next graphic character or the next control function of the received data stream. The active data position is also the character position relative to which certain control functions are to be executed (see 6.4).

The active data position can be moved implicitly (see 6.1.6) or explicitly (see 6.1.7) or indirectly (see 6.1.8).

The line containing the active data position is called the active line; the field containing the active data position is called the active field; the area containing the active data position is called the active area; the page containing the active data position is called the active page.

6.1.5 Relationship between active data position and active presentation position

In a uni-directional device, whether it has a presentation component only or a presentation component and a data component, there is no difference between the active data position and the active presentation position.

In a bi-directional device, if it has a presentation component and a data component, the active presentation position is the character position in the presentation component that corresponds to the active data position in the data component. Because of the possible differences between character progression and character path, as in some bi-directional environments, the coordinates of the active data position in the data component and of the active presentation position in the presentation component may differ.

Some control functions act on, and affect, the active data position whereas other control functions act on, and affect, the active presentation position. When one of these positions is so modified, the other is updated accordingly. This is referred to as indirect movement (see 6.1.8).

In the situation where a data component is not present in a device then the characteristics of the data component, active data position, active data position movement, character progression, etc., are treated as if they are identical with the respective characteristics of the presentation component, active presentation position, active presentation position movement, character path, etc., resp..

6.1.6 Implicit movement

An implicit movement is a movement of the active data position which is performed after a graphic character is received, or a control function, for which a graphical representation is required. In uni-directional devices the direction of the implicit movement of the active data position in the data component is the same as the direction of the character progression; in devices without a data component the implicit movement applies to the active presentation position in the presentation component and is then the same as the direction of the character path. In bi-directional devices the direction of the implicit movement may be different from the direction of the character progression. The direction is the same as the direction of the character progression until it is modified by an appropriate control function.

If the direction of the implicit movement is the same as that of the character progression and the active data position is not the last character position of the active line, the active data position is moved to the following character position of that line.

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If the direction of the implicit movement is opposite to that of the character progression and the active data position is not the first character position of the active line, the active data position is moved to the preceding character position of that line.

When the active data position has been modified by an implicit movement, the active presentation position in the presentation component is updated accordingly; this is referred to as indirect movement (see 6.1.8).

NOTE - In the following situation, the effect of an attempt to move the active data position is not defined by this International Standard:

– an attempt to perform an implicit movement when the active data position is the last character position of a line and the direction of the implicit movement is the same as that of the character progression, or when the active data position is the first character position of a line and the direction of the implicit movement is opposite to that of the character progression;

Depending on the implementation, an attempt to perform such movements may

1) cause a wrap-around movement;

2) cause the position to be blocked (a condition in which no graphic character can be entered until a valid explicit position movement is performed);

3) cause the position to remain where it is but permit graphic characters to be entered thereby replacing or overstriking the previously entered character;

4) cause the cursor to disappear from the operator's view;

5) cause the cursor to move to the opposite end of the display but one column or row offset;

6) cause scrolling to occur;

7) cause other implementation-dependent action.

6.1.7 Explicit movement

In the data component an explicit movement is a movement of the active data position that is performed when a control function is executed which causes the active data position to be moved to a specified character position in the data component. When the active data position has been modified by an explicit movement, the active presentation position in the presentation component is updated accordingly; this is referred to as indirect movement (see 6.1.8).

In the presentation component an explicit movement is a movement of the active presentation position that is performed when a control function is executed which causes the active presentation position to be moved to a specified character position in the presentation component. When the active presentation position has been modified by an explicit movement, the active data position in the data component is updated accordingly; this is referred to as indirect movement (see 6.1.8).

NOTE - In the following situation, the effect of an attempt to move the active data position or the active presentation position is not defined by this International Standard:

– an attempt to perform an explicit movement to a non-existing character position, for example beyond the last character position of a line, or beyond the last line of a page.

Depending on the implementation, an attempt to perform such movements may

1) cause a wrap-around movement;

2) cause the position to be blocked (a condition in which no graphic character can be entered until a valid explicit position movement is performed);

3) cause the position to remain where it is but permit graphic characters to be entered thereby replacing or overstriking the previously entered character;

4) cause the cursor to disappear from the operator's view;

5) cause the cursor to move to the opposite end of the display but one column or row offset;

6) cause scrolling to occur;

7) cause other implementation-dependent action.

6.1.8 Indirect movement

In the data component an indirect movement is the movement by which the active data position is modified to reflect a modification of the active presentation position by an explicit movement (see 6.1.7) in the presentation component.

In the presentation component an indirect movement is the movement by which the active presentation position is modified to reflect a modification of the active data position by an implicit movement (see 6.1.6) or by an explicit movement (see 6.1.7) in the data component.

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6.2 The data stream

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

6.2.1 Data organization

Text within a data stream can be viewed as being constructed from character strings. Each such string may contain nested strings. Characters within a string are organized in the order in which they are intended to be read.

Each string has a direction associated with it. The direction may be associated with the string using a control function or a higher-level protocol. If the direction is not determined in this way, then the direction is the same as that of the currently established character path.

6.3 The graphic image output

In this International Standard, the graphic image output is regarded as being produced in the form of a continuous stream, but it may eventually be made available character-by-character, line-by-line, or page-by-page.

The graphic image output may consist of one or more pages of a predetermined size.

A page is composed of a predetermined number of lines, each composed of a predetermined number of character positions. During the operation of the device, the number of lines per page, the number of character positions per line, the line spacing, and the character spacing may be changed by appropriate control functions.

The graphic image output is constructed in the presentation component from the data stream stored in the data component, and according to the line orientation and line progression of the presentation component. The presentation of characters along a line in the presentation component is dependent on the character path, the character progression and the direction associated with the string.

The size of a character position may be fixed or may depend on the graphic symbol of the character being imaged.

The font design of the graphic symbols is not defined by this International Standard.

6.4 Formator functions and editor functions

Two classes of control functions have an action on the layout or positioning of information in character-imaging devices. They are formator functions and editor functions. The principal difference between editor functions and formator functions is that the latter are sensitive to the FORMAT EFFECTOR ACTION MODE (FEAM); whereas the former are not (see annex A).

6.4.1 Formator functions

They are format effectors and presentation control functions. Formator functions may be part of the data stream. They describe how the originator of the data stream wishes the information to be formatted or presented.

Therefore, if formator functions are not stored by the receiving device they shall be regenerated by the device for subsequent transmission to additional recipients in order to preserve data integrity.

In uni-directional devices the active presentation position (or the active line, where applicable) is the reference position against which formator functions are performed. In bi-directional devices certain formator functions are performed against the active data position (or the active line, where applicable) in the data component, dependent on the setting of the DEVICE COMPONENT SELECT MODE (DCSM).

Formator functions are processed depending on the setting of the FORMAT EFFECTOR ACTION MODE (FEAM) of the device.

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6.4.2 Composite graphic characters

Composite graphic characters may be obtained by using formator functions only; editor functions shall not be used for this purpose (see clause A.2 in annex A).

6.4.3 Editor functions

The main purpose of editor functions is to edit, alter or transpose the visual arrangement of data.

Editor functions are performed immediately and do not become part of the data stream.

In uni-directional devices the active presentation position (or the active line, where applicable) is the reference position against which editor functions are performed. In bi-directional devices certain editor functions are performed against the active data position (or the active line, where applicable) in the data component, depending on the setting of the DEVICE COMPONENT SELECT MODE (DCSM).

6.5 Selected and qualified areas

This clause is applicable primarily to buffered input/output devices. It may also be applicable to unbuffered input/output devices when the SEND/RECEIVE MODE (SRM) is set to SIMULTANEOUS.

6.5.1 Selected areas

A selected area is a string of character positions in the presentation component, the contents of which may be eligible (see 7.3.1) to be transmitted in the form of a data stream or to be transferred to an auxiliary input/output device (see 6.6).

The beginning of a selected area is established by START OF SELECTED AREA (SSA). The character position in the presentation component which is the active presentation position after the receipt of SSA is the first character position of the selected area.

The end of a selected area is established by END OF SELECTED AREA (ESA). The character position in the presentation component which is the active presentation position before the receipt of ESA is the last character position of the selected area.

The character positions in a line of a selected area are ordered according to the character path of this line.

6.5.2 Qualified areas

A qualified area is a string of character positions in the presentation component with which certain characteristics are associated, such as one or a combination of the following:

a) the contents are protected against manual alteration;

b) the kind of characters which are permitted to be entered is restricted (for example, to numeric or alphabetic characters only);

c) the contents are protected against erasure;

d) a tabulation stop is associated with the first character position;

e) the contents are to be excluded, i.e. guarded (see 6.5.2.2) from transmission as a data stream, or from transfer to an auxiliary input/output device (see 6.6).

The beginning of a qualified area is established by DEFINE AREA QUALIFICATION (DAQ). The character position in the presentation component which is the active presentation position after receipt of DAQ is the first character position of the qualified area. The type of area qualification is specified by the parameter value of DAQ. The end of a qualified area is established by the beginning of the following qualified area.

The order of the character positions in a line of a qualified area can be the same as, or opposite to, the character path of this line.

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6.5.2.1 Protected 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 and may also be protected against erasure depending on the setting of the ERASURE MODE (ERM). A protected area may, in general, be either guarded or unguarded.

6.5.2.2 Guarded areas

A guarded area is a special case of a qualified area. It is a protected area the contents of which are excluded from transmission as a data stream and from transfer to an auxiliary input/output device, depending on the setting of the GUARDED AREA TRANSFER MODE (GATM).

Alternatively to using DEFINE AREA QUALIFICATION (DAQ), START OF GUARDED AREA (SPA) combined with END OF GUARDED AREA (EPA) can be used. The start of a guarded area is then established by START OF GUARDED AREA (SPA). The end of the guarded area is then established by END OF GUARDED AREA (EPA). The character position which is the active presentation position after receipt of SPA is the first character position of the guarded area. The character position which is the active presentation position before the receipt of EPA is the last character position of the guarded area.

NOTE - Interaction between guarded areas established by SPA and EPA, and those established by DAQ is not defined by this International Standard.

6.6 Auxiliary input/output devices

This clause is applicable primarily to buffered input/output devices. It may also be applicable to unbuffered input/output devices when the SEND/RECEIVE MODE (SRM) is set to SIMULTANEOUS.

Data transfer from, or to, an auxiliary input/output device is initiated either by the operation of an appropriate key on a keyboard or by the control function MEDIA COPY (MC) appearing in the received data stream.

If there is more than one auxiliary input/output device, the relevant device is specified by the parameter value of MC.

An input data stream which is received from an auxiliary device is processed in the same way as any other received data stream. The method of terminating the input from the auxiliary device depends on the implementation.

6.7 Tabulation and fields

Tabulation is the technique of identifying character positions or lines, as related to the presentation component, for the purpose of arranging information systematically. A character position or a line which is identified for tabulation is indicated by a tabulation stop.

Tabulation stops in the presentation component introduce fields and act as boundaries between fields. The field is defined as a string of character positions starting at the position of the character tabulation stop (beginning of the field) up to, but not including, the position of the following character tabulation stop (end of the field). The order of character positions within the field as well as the order of tabulation stops within a line in the presentation component is determined by the character path of this line.

A character tabulation stop is assigned to a character position by the control functions CURSOR TABULATION CONTROL (CTC), CHARACTER TABULATION SET (HTS), TABULATION ALIGNED CENTRED (TAC), TABULATION ALIGNED LEADING EDGE (TALE), TABULATION ALIGNED TRAILING EDGE (TATE), TABULATION CENTRED ON CHARACTER (TCC).

A line tabulation stop is assigned to a line by the control function LINE TABULATION SET (VTS).

7 Modes

7.1 The concept of modes

This International Standard is intended to be applicable to a very large range of devices, in which there are variations. Some of these variations have been formalized in the form of modes. They deal with the way in which a device transmits, receives, processes, or images data. Each mode has two states. The reset state is shown first in the definitions in 7.2.

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The states of the modes may be established explicitly in the data stream by the control functions SET MODE (SM) and RESET MODE (RM) or may be established by agreement between sender and recipient. In an implementation, some or all of the modes may have one state only.

To ensure data compatibility and ease of interchange with a variety of equipment the use of modes is deprecated. If modes have to be implemented for backward compatibility it is recommended that the reset state of the modes be the initial state. Otherwise, explicit agreements will have to be negotiated between sender and recipient, to the detriment of "blind" interchange.

7.2 Definition of modes

The modes are set and reset by the control functions SET MODE (SM) and RESET MODE (RM). The parameters of SM or RM specify the modes which are affected. In each of the mode definitions below, the first state is caused by RM, the second one by SM.

The modes are listed in the alphabetical order of their acronyms. It is intended that the acronyms be retained in all translations of the text. See also table 6.

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Table 6 - Mode summary

Acronym	Reset-state set-state	Name	Defined in
BDSM	EXPLICIT IMPLICIT	BI-DIRECTIONAL SUPPORT MODE	7.2.1
CRM	CONTROL GRAPHIC	CONTROL REPRESENTATION MODE	7.2.2
DCSM	PRESENTATION DATA	DEVICE COMPONENT SELECT MODE	7.2.3
ERM	PROTECT ALL	ERASURE MODE	7.2.4
FEAM	EXECUTE STORE	FORMAT EFFECTOR ACTION MODE	7.2.5
FETM	INSERT EXCLUDE	FORMAT EFFECTOR TRANSFER MODE	7.2.6
GATM	GUARD ALL	GUARDED AREA TRANSFER MODE	7.2.7
GRCM	REPLACING CUMULATIVE	GRAPHIC RENDITION COMBINATION MODE	7.2.8
HEM	FOLLOWING PRECEDING	CHARACTER EDITING MODE	7.2.9
IRM	REPLACE INSERT	INSERTION REPLACEMENT MODE	7.2.10
KAM	ENABLED DISABLED	KEYBOARD ACTION MODE	7.2.11
MATM	SINGLE MULTIPLE	MULTIPLE AREA TRANSFER MODE	7.2.12
PUM	CHARACTER SIZE	POSITIONING UNIT MODE	subclause F.4.1 of annex F
SATM	SELECT ALL	SELECTED AREA TRANSFER MODE	7.2.14
SRM	MONITOR SIMULTANEOUS	SEND/RECEIVE MODE	7.2.15
SRTM	NORMAL DIAGNOSTIC	STATUS REPORT TRANSFER MODE	7.2.16
TSM	MULTIPLE SINGLE	TABULATION STOP MODE	7.2.17
TTM	CURSOR ALL	TRANSFER TERMINATION MODE	7.2.18
VEM	FOLLOWING PRECEDING	LINE EDITING MODE	7.2.19
ZDM	ZERO DEFAULT	ZERO DEFAULT MODE	subclause F.4.2 of annex F

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The definitions of the modes cover bi-directional devices which have both a presentation component (see 6.1.1) and a data component (see 6.1.3). In the case of a uni-directional device or a bi-directional device without a data component, all references to active data position, data component, character progression, etc., are to be read as referring to active presentation position, presentation component, character path, etc., resp.

7.2.1 BDSM - BI-DIRECTIONAL SUPPORT MODE

EXPLICIT:
Control functions are performed in the data component or in the presentation component, depending on the setting of the DEVICE COMPONENT SELECT MODE (DCSM).

IMPLICIT:
Control functions are performed in the data component. All bi-directional aspects of data are handled by the device itself.

7.2.2 CRM - CONTROL REPRESENTATION MODE

CONTROL:
All control functions are performed as defined; the way formator functions are processed depends on the setting of the FORMAT EFFECTOR ACTION MODE (FEAM). A device may choose to image the graphical representations of control functions in addition to performing them.

GRAPHIC:
All control functions, except RESET MODE (RM), are treated as graphic characters. A device may choose to perform some control functions in addition to storing them and imaging their graphical representations.

NOTE - All control functions, except RM, are affected.

7.2.3 DCSM - DEVICE COMPONENT SELECT MODE

PRESENTATION:
Certain control functions are performed in the presentation component. The active presentation position (or the active line, where applicable) in the presentation component is the reference position against which the relevant control functions are performed.

DATA:
Certain control functions are performed in the data component. The active data position (or the active line, where applicable) in the data component is the reference position against which the relevant control functions are performed.

NOTE - Control functions affected are: CPR, CR, DCH, DL, EA, ECH, ED, EF, EL, ICH, IL, LF, NEL, RI, SLH, SLL, SPH, SPL.

7.2.4 ERM - ERASURE MODE

PROTECT:
Only the contents of unprotected areas are affected by an erasure control function.

ALL:
The contents of protected as well as of unprotected areas are affected by an erasure control function.

NOTE - Control functions affected are: EA, ECH, ED, EF, EL.

7.2.5 FEAM - FORMAT EFFECTOR ACTION MODE

EXECUTE:
Formator functions are performed immediately and may be stored in addition to being performed.

STORE:
Formator functions are stored but not performed. In this case, the specified action is intended to be performed by another device when the associated data are transmitted or transferred.

NOTE - Control functions affected are: BPH, BS, CR, DTA, FF, FNT, GCC, GSM, GSS, HPA, HPB, HPR, HT, HTJ, HTS, HVP, JFY, NEL, PEC, PFS, PLD, PLU, PPA, PPB, PPR, PTX, QUAD, RI, SACS, SAPV, SCO, SCS, SGR, SHS, SLH, SLL, SLS, SPD, SPI, SPQR, SRCS, SRS, SSU, SSW, STAB, SVS, TAC, TALE, TATE, TBC, TCC, TSS, VPA, VPB, VPR, VTS.

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7.2.6 FETM - FORMAT EFFECTOR TRANSFER MODE

INSERT:
Formator functions may be inserted in a data stream to be transmitted or in data to be transferred to an auxiliary input/output device.

EXCLUDE:
No formator functions other than those received while the FORMAT EFFECTOR ACTION MODE (FEAM) is set to STORE are included in a transmitted data stream or in data transferred to an auxiliary input/output device.

NOTE - No control functions are affected.

7.2.7 GATM - GUARDED AREA TRANSFER MODE

GUARD:
Only the contents of unguarded areas in an eligible area are transmitted or transferred.

ALL:
The contents of guarded as well as of unguarded areas in an eligible area are transmitted or transferred.

NOTE - No control functions are affected.

7.2.8 GRCM - GRAPHIC RENDITION COMBINATION MODE

REPLACING:
Each occurrence of the control function SELECT GRAPHIC RENDITION (SGR) cancels the effect of any preceding occurrence. Any graphic rendition aspects that are to remain unchanged after an occurrence of SGR have to be re-specified by that SGR.

CUMULATIVE:
Each occurrence of the control function SELECT GRAPHIC RENDITION (SGR) causes only those graphic rendition aspects to be changed that are specified by that SGR. All other graphic rendition aspects remain unchanged.

NOTE - Control function affected is SGR.

7.2.9 HEM - CHARACTER EDITING MODE

FOLLOWING:
If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, a character insertion causes the contents of the active presentation position and of the following character positions in the presentation component to be shifted in the direction of the character path; a character deletion causes the contents of the character positions following the active presentation position to be shifted in the direction opposite to that of the character path.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, a character insertion causes the contents of the active data position and of the following character positions in the data component to be shifted in the direction of the character progression; a character deletion causes the contents of the character positions following the active data position to be shifted in the direction opposite to that of the character progression.

PRECEDING:
If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, a character insertion causes the contents of the active presentation position and of the following character positions in the presentation component to be shifted in the direction opposite to that of the character path; a character deletion causes the contents of the character positions following the active presentation position to be shifted in the direction of the character path.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, a character insertion causes the contents of the active data position and of preceding character positions in the data component to be shifted in the direction opposite to that of the character progression; a character deletion causes the contents of the character positions preceding the active data position to be shifted in the direction of the character progression.

NOTE - Control functions affected are: DCH, ICH.

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7.2.10 IRM - INSERTION REPLACEMENT MODE

REPLACE:
The graphic symbol of a graphic character or of a control function, for which a graphical representation is required, replaces (or, depending upon the implementation, is combined with) the graphic symbol imaged at the active presentation position.

INSERT:
The graphic symbol of a graphic character or of a control function, for which a graphical representation is required, is inserted at the active presentation position.

NOTE - Only control functions for which a graphical representation is required are affected.

7.2.11 KAM - KEYBOARD ACTION MODE

ENABLED:
All or part of the manual input facilities are enabled to be used.

DISABLED:
All or part of the manual input facilities are disabled.

NOTE - No control functions are affected.

7.2.12 MATM - MULTIPLE AREA TRANSFER MODE

SINGLE:
Only the contents of the selected area which contains the active presentation position are eligible to be transmitted or transferred.

MULTIPLE:
The contents of all selected areas are eligible to be transmitted or transferred.

NOTE - No control functions are affected.

7.2.13 PUM - POSITIONING UNIT MODE

See F.4.1 in annex F.

7.2.14 SATM - SELECTED AREA TRANSFER MODE

SELECT:
Only the contents of selected areas are eligible to be transmitted or transferred.

ALL:
The contents of all character positions, irrespective of any explicitly defined selected areas, are eligible to be transmitted or transferred.

NOTE - No control functions are affected.

7.2.15 SRM - SEND/RECEIVE MODE

MONITOR:
Data which are locally entered are immediately imaged.

SIMULTANEOUS:

Local input facilities are logically disconnected from the output mechanism; only data which are sent to the device are imaged.

NOTE - No control functions are affected.

7.2.16 SRTM - STATUS REPORT TRANSFER MODE

NORMAL:
Status reports in the form of DEVICE CONTROL STRINGs (DCS) are not generated automatically.

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DIAGNOSTIC:
Status reports in the form of DEVICE CONTROL STRINGs (DCS) are included in every data stream transmitted or transferred.

NOTE - No control functions are affected.

7.2.17 TSM - TABULATION STOP MODE

MULTIPLE:
Character tabulation stops in the presentation component are set or cleared in the active line (the line that contains the active presentation position) and in the corresponding character positions of the preceding lines and of the following lines.

SINGLE:
Character tabulation stops in the presentation component are set or cleared in the active line only.

NOTE - Control functions affected are: CTC, DL, HTS, IL, TBC.

7.2.18 TTM - TRANSFER TERMINATION MODE

CURSOR:
Only the contents of the character positions preceding the active presentation position in the presentation component are eligible to be transmitted or transferred.

ALL:
The contents of character positions preceding, following, and at the active presentation position are eligible to be transmitted or transferred.

NOTE - No control functions are affected.

7.2.19 VEM - LINE EDITING MODE

FOLLOWING:
If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, a line insertion causes the contents of the active line (the line that contains the active presentation position) and of the following lines in the presentation component to be shifted in the direction of the line progression; a line deletion causes the contents of the lines following the active line to be shifted in the direction opposite to that of the line progression.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, a line insertion causes the contents of the active line (the line that contains the active data position) and of the following lines in the data component to be shifted in the direction of the line progression; a line deletion causes the contents of the lines following the active line to be shifted in the direction opposite to that of the line progression.

PRECEDING:
If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, a line insertion causes the contents of the active line (the line that contains the active presentation position) and of the preceding lines to be shifted in the direction opposite to that of the line progression; a line deletion causes the contents of the lines preceding the active line to be shifted in the direction of the line progression.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, a line insertion causes the contents of the active line (the line that contains the active data position) and of the preceding lines to be shifted in the direction opposite to that of the line progression; a line deletion causes the contents of the lines preceding the active line to be shifted in the direction of the line progression.

NOTE - Control functions affected are: DL, IL.

7.2.20 ZDM - ZERO DEFAULT MODE

See F.4.2 in annex F.

7.3 Interaction between modes

Four groups of modes are specified below. Each group contains two or more modes which interact with one another.

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a) GUARDED AREA TRANSFER MODE (GATM), MULTIPLE AREA TRANSFER MODE (MATM), SELECTED AREA TRANSFER MODE (SATM), and TRANSFER TERMINATION MODE (TTM)

b) CONTROL REPRESENTATION MODE (CRM), and FORMAT EFFECTOR ACTION MODE (FEAM)

c) CHARACTER EDITING MODE (HEM), and INSERTION REPLACEMENT MODE (IRM)

d) BI-DIRECTIONAL SUPPORT MODE (BDSM), and DEVICE COMPONENT SELECT MODE (DCSM)

7.3.1 GUARDED AREA TRANSFER MODE (GATM), MULTIPLE AREA TRANSFER MODE (MATM), SELECTED AREA TRANSFER MODE (SATM), and TRANSFER TERMINATION MODE (TTM)

These modes have a combined effect on the format of a transmitted data stream or of a data stream transferred to an auxiliary input/output device, as described hereafter.

The term "active selected area" is used to denote the selected area in the presentation component containing the active presentation position. The term "eligible" is used for denoting any area which may be considered for transmitting or transferring.

a) If the TTM is set to CURSOR, the SATM to SELECT, and the MATM to SINGLE, then the contents of the active selected area, up to but excluding the active presentation position, are eligible.

b) If the TTM is set to CURSOR, the SATM to SELECT, and the MATM to MULTIPLE, then the contents of any selected area, up to but excluding the active presentation position, are eligible.

c) If the TTM is set to CURSOR and the SATM to ALL, then the contents of the buffer up to but excluding the active presentation position, are eligible.

d) If the TTM is set to ALL, the SATM to SELECT, and the MATM to SINGLE, then the complete contents of the active selected area are eligible.

e) If the TTM is set to ALL, the SATM to SELECT, and the MATM to MULTIPLE, then the complete contents of all selected areas are eligible.

f) If the TTM and the SATM are both set to ALL, then the complete contents of the buffer are eligible.

g) If the GATM is set to GUARD, the contents of the eligible area or areas are transmitted or transferred, except for the contents of guarded areas which are completely contained within an eligible area. In the case where a guarded area is only partly contained within an eligible area, the contents of the part contained in the eligible area may be transmitted or not, depending on the implementation.

h) If the GATM is set to ALL, guarded as well as unguarded data in an eligible area are transmitted or transferred.

If the active presentation position is not within a selected area, the format of the data stream in the first and fourth case above is not defined by this International Standard.

7.3.2 CONTROL REPRESENTATION MODE (CRM) and FORMAT EFFECTOR ACTION MODE (FEAM)

a) If the CRM is set to CONTROL, and the FEAM is set to EXECUTE, all control functions are performed as defined.

b) If the CRM is set to CONTROL, and the FEAM is set to STORE, formator functions are treated as graphic characters.

c) If the CRM is set to GRAPHIC, all control functions except RM are treated as graphic characters.

7.3.3 CHARACTER EDITING MODE (HEM) and INSERTION REPLACEMENT MODE (IRM)

a) If the IRM is set to REPLACE, the HEM influences the control functions DELETE CHARACTER (DCH) and INSERT CHARACTER (ICH) only.

b) If the IRM is set to INSERT, then, in addition, the effect of the receipt of a graphic character or a control function for which a graphical representation is required, depends on the setting of the HEM. If the HEM is set to FOLLOWING, the implicit movement of the active position is performed normally; if it is set to PRECEDING, the active position does not move.

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Whether the active position referred to above is the active data position in the data component or the active presentation position in the presentation component, depends on the setting of the DEVICE COMPONENT SELECT MODE (DCSM).

7.3.4 BI-DIRECTIONAL SUPPORT MODE (BDSM) and DEVICE COMPONENT SELECT MODE (DCSM)

a) If the BDSM is set to EXPLICIT and the DCSM is set to DATA, certain control functions are performed in the data component.

b) If the BDSM is set to EXPLICIT and the DCSM is set to PRESENTATION, certain control functions are performed in the presentation component.

NOTE - Control functions affected are: CPR, CR, DCH, DL, EA, ECH, ED, EF, EL, ICH, IL , LF, NEL, RI, SLH, SLL, SPH, SPL.

c) If the BDSM is set to IMPLICIT, all relevant control functions are performed in the data component; all bi-directional aspects of the data are handled by the device itself. The setting of the DCSM has no effect; it is considered to be set to DATA (the reset state).

7.4 Private modes

A device may implement modes other than those specified in 7.2. Such modes are called Private Modes. See SET MODE (SM) and RESET MODE (RM).

The reset state of a private mode shall permit the selection of coded representations of control functions (including parameters for control of modes) that are identified in accordance with 2.3.1 to have the meanings specified in this Standard.

8 Control functions

8.1 Types of control functions

This International Standard provides for four types of control functions:

a) Control functions that are elements of the C0 set
b) Control functions that are elements of the C1 set
c) Control sequences
d) Independent control functions, represented either

- by ESC Fs sequences, or
- by ESC 02/03 F sequences.

There are also several different forms of control sequences, viz. with parameters or with no parameter.

The notations used for the different types of control functions and for the different forms of control sequences are shown below. They are used in the definitions of the control functions in clause 8.3, and in the listing of control function categories in 8.2. For independent control functions of the type ESC 02/03 F no notation is indicated as it is not expected that they will be included in this International Standard.

a) (C0): Element of the C0 set

b) (C1): Element of the C1 set

c) (NP): Control sequence with no parameter (see clause F.9 in annex F)

d) (Pn): Control sequence with a single numeric parameter

e) (Pn1;Pn2): Control sequence with two numeric parameters

f) (Pn...): Control sequence with any number of numeric parameters

g) (Ps): Control sequence with a single selective parameter

h) (Ps1;Ps2): Control sequence with two selective parameters

j) (Ps...): Control sequence with any number of selective parameters

k) (Fs): Independent control function, represented by an ESC Fs sequence

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8.2 Categories of control functions

The following list groups the control functions defined in this International Standard. This grouping is intended to aid in understanding this International Standard and does not restrict the use of the control functions to the indicated categories.

8.2.1 Delimiters

Acronym	Notation	Name	Defined in
APC	(C1)	APPLICATION PROGRAM COMMAND	8.3.2
CMD	(Fs)	CODING METHOD DELIMITER	8.3.11
DCS	(C1)	DEVICE CONTROL STRING	8.3.27
OSC	(C1)	OPERATING SYSTEM COMMAND	8.3.90
PM	(C1)	PRIVACY MESSAGE	8.3.95
SOS	(C1)	START OF STRING	8.3.129
ST	(C1)	STRING TERMINATOR	8.3.144

8.2.2 Introducers

Acronym	Notation	Name	Defined in
CSI	(C1)	CONTROL SEQUENCE INTRODUCER	8.3.16
ESC	(C0)	ESCAPE	8.3.49
SCI	(C1)	SINGLE CHARACTER INTRODUCER	8.3.110

8.2.3 Shift functions

Acronym	Notation	Name	Defined in
LS0	(C0)	LOCKING-SHIFT ZERO	8.3.76
LS1	(C0)	LOCKING-SHIFT ONE	8.3.77
LS1R	(Fs)	LOCKING-SHIFT ONE RIGHT	8.3.78
LS2	(Fs)	LOCKING-SHIFT TWO	8.3.79
LS2R	(Fs)	LOCKING-SHIFT TWO RIGHT	8.3.80
LS3	(Fs)	LOCKING-SHIFT THREE	8.3.81
LS3R	(Fs)	LOCKING-SHIFT THREE RIGHT8	8.3.82
SI	(C0)	SHIFT-IN	8.3.120
SO	(C0)	SHIFT-OUT	8.3.127
SS2	(C1)	SINGLE-SHIFT TWO	8.3.142
SS3	(C1)	SINGLE-SHIFT THREE	8.3.143

8.2.4 Format effectors

Acronym	Notation	Name	Defined in
BS	(C0)	BACKSPACE	8.3.5
CR	(C0)	CARRIAGE RETURN	8.3.15
FF	(C0)	FORM FEED	8.3.52

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HPA	(Pn)	CHARACTER POSITION ABSOLUTE	8.3.58
HPB	(Pn)	CHARACTER POSITION BACKWARD	8.3.59
HPR	(Pn)	CHARACTER POSITION FORWARD	8.3.60
HT	(C0)	CHARACTER TABULATION	8.3.61
HTJ	(C1)	CHARACTER TABULATION WITH JUSTIFICATION	8.3.62
HTS	(C1)	CHARACTER TABULATION SET	8.3.63
HVP	(Pn1;Pn2)	CHARACTER AND LINE POSITION	8.3.64
LF	(C0)	LINE FEED	8.3.75
NEL	(C1)	NEXT LINE	8.3.87
PLD	(C1)	PARTIAL LINE FORWARD	8.3.93
PLU	(C1)	PARTIAL LINE BACKWARD	8.3.94
PPA	(Pn)	PAGE POSITION ABSOLUTE	8.3.97
PPB	(Pn)	PAGE POSITION BACKWARD	8.3.98
PPR	(Pn)	PAGE POSITION FORWARD	8.3.99
RI	(C1)	REVERSE LINE FEED	8.3.105
TBC	(Ps)	TABULATION CLEAR	8.3.155
TSR	(Pn)	TABULATION STOP REMOVE	8.3.157
VPA	(Pn)	LINE POSITION ABSOLUTE	8.3.159
VPB	(Pn)	LINE POSITION BACKWARD	8.3.160
VPR	(Pn)	LINE POSITION FORWARD	8.3.161
VT	(C0)	LINE TABULATION	8.3.162
VTS	(C1)	LINE TABULATION SET	8.3.163

8.2.5 Presentation control functions

Acronym	Notation	Name	Defined in
BPH	(C1)	BREAK PERMITTED HERE	8.3.4
DTA	(Pn1;Pn2)	DIMENSION TEXT AREA	8.3.37
FNT	(Ps1;Ps2)	FONT SELECTION	8.3.54
GCC	(Ps)	GRAPHIC CHARACTER COMBINATION	8.3.55
GSM	(Pn1;Pn2)	GRAPHIC SIZE MODIFICATION	8.3.56
GSS	(Pn)	GRAPHIC SIZE SELECTION	8.3.57
JFY	(Ps...)	JUSTIFY	8.3.74
NBH	(C1)	NO BREAK HERE	8.3.86
PEC	(Ps)	PRESENTATION EXPAND OR CONTRACT	8.3.91
PFS	(Ps)	PAGE FORMAT SELECTION	8.3.92
PTX	(Ps)	PARALLEL TEXTS	8.3.100
QUAD	(Ps...)	QUAD	8.3.103

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SACS	(Pn)	SET ADDITIONAL CHARACTER SEPARATION	8.3.108
SAPV	(Ps...)	SELECT ALTERNATIVE PRESENTATION VARIANTS	8.3.109
SCO	(Ps)	SET CHARACTER ORIENTATION	8.3.111
SCP	(Ps1;Ps2)	SELECT CHARACTER PATH	8.3.112
SCS	(Pn)	SET CHARACTER SPACING	8.3.113
SDS	(Ps)	START DIRECTED STRING	8.3.115
SGR	(Ps...)	SELECT GRAPHIC RENDITION	8.3.118
SHS	(Ps)	SELECT CHARACTER SPACING	8.3.119
SIMD	(Ps)	SELECT IMPLICIT MOVEMENT DIRECTION	8.3.121
SLH	(Pn)	SET LINE HOME	8.3.123
SLL	(Pn)	SET LINE LIMIT	8.3.124
SLS	(Pn)	SET LINE SPACING	8.3.125
SPD	(Ps1;Ps2)	SELECT PRESENTATION DIRECTIONS	8.3.131
SPH	(Pn)	SET PAGE HOME	8.3.132
SPI	(Pn1;Pn2)	SPACING INCREMENT	8.3.133
SPL	(Pn)	SET PAGE LIMIT	8.3.134
SPQR	(Ps)	SELECT PRINT QUALITY AND RAPIDITY	8.3.135
SRCS	(Pn)	SET REDUCED CHARACTER SEPARATION	8.3.137
SRS	(Ps)	START REVERSED STRING	8.3.138
SSU	(Ps)	SELECT SIZE UNIT	8.3.140
SSW	(Pn)	SELECT SPACE WIDTH	8.3.141
STAB	(Ps)	SELECTIVE TABULATION	8.3.145
SVS	(Ps)	SELECT LINE SPACING	8.3.150
TAC	(Pn)	TABULATION ALIGNED CENTRED	8.3.152
TALE	(Pn)	TABULATION ALIGNED LEADING EDGE	8.3.153
TATE	(Pn)	TABULATION ALIGNED TRAILING EDGE	8.3.154
TCC	(Pn1;Pn2)	TABULATION CENTRED ON CHARACTER	8.3.156
TSS	(Pn)	THIN SPACE SPECIFICATION	8.3.158

8.2.6 Editor functions

Acronym	Notation	Name	Defined in
DCH	(Pn)	DELETE CHARACTER	8.3.26
DL	(Pn)	DELETE LINE	8.3.33
EA	(Ps)	ERASE IN AREA	8.3.38
ECH	(Pn)	ERASE CHARACTER	8.3.39
ED	(Ps)	ERASE IN PAGE	8.3.40
EF	(Ps)	ERASE IN FIELD	8.3.41

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EL	(Ps)	ERASE IN LINE	8.3.42
ICH	(Pn)	INSERT CHARACTER	8.3.65
IL	(Pn)	INSERT LINE	8.3.68

8.2.7 Cursor control functions

Acronym	Notation	Name	Defined in
CBT	(Pn)	CURSOR BACKWARD TABULATION	8.3.7
CHA	(Pn)	CURSOR CHARACTER ABSOLUTE	8.3.9
CHT	(Pn)	CURSOR FORWARD TABULATION	8.3.10
CNL	(Pn)	CURSOR NEXT LINE	8.3.12
CPL	(Pn)	CURSOR PRECEDING LINE	8.3.13
CTC	(Ps...)	CURSOR TABULATION CONTROL	8.3.17
CUB	(Pn)	CURSOR LEFT	8.3.18
CUD	(Pn)	CURSOR DOWN	8.3.19
CUF	(Pn)	CURSOR RIGHT	8.3.20
CUP	(Pn1;Pn2)	CURSOR POSITION	8.3.21
CUU	(Pn)	CURSOR UP	8.3.22
CVT	(Pn)	CURSOR LINE TABULATION	8.3.23

8.2.8 Display control functions

Acronym	Notation	Name	Defined in
NP	(Pn)	NEXT PAGE	8.3.88
PP	(Pn)	PRECEDING PAGE	8.3.96
SD	(Pn)	SCROLL DOWN	8.3.114
SL	(Pn)	SCROLL LEFT	8.3.122
SR	(Pn)	SCROLL RIGHT	8.3.136
SU	(Pn)	SCROLL UP	8.3.148

8.2.9 Device control functions

Acronym	Notation	Name	Defined in
DC1	(C0)	DEVICE CONTROL ONE	8.3.28
DC2	(C0)	DEVICE CONTROL TWO	8.3.29
DC3	(C0)	DEVICE CONTROL THREE	8.3.30
DC4	(C0)	DEVICE CONTROL FOUR	8.3.31

8.2.10 Information separators

Acronym	Notation	Name	Defined in
IS1	(C0)	INFORMATION SEPARATOR ONE	8.3.70
IS2	(C0)	INFORMATION SEPARATOR TWO	8.3.71

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IS3	(C0)	INFORMATION SEPARATOR THREE	8.3.72
IS4	(C0)	INFORMATION SEPARATOR FOUR	8.3.73

NOTE - Each information separator is given two names. The names, INFORMATION SEPARATOR FOUR (IS4), INFORMATION SEPARATOR THREE (IS3), INFORMATION SEPARATOR TWO (IS2), and INFORMATION SEPARATOR ONE (IS1) are the general names. The names FILE SEPARATOR (FS), GROUP SEPARATOR (GS), RECORD SEPARATOR (RS), and UNIT SEPARATOR (US) are the specific names and are intended mainly for applications where the information separators are used hierarchically. The ascending order is then US, RS, GS, FS. In this case, data normally delimited by a particular separator cannot be split by a higher-order separator but will be considered as delimited by any other higher-order separator.

In ISO/IEC 10538, IS3 and IS4 are given the names PAGE TERMINATOR (PT) and DOCUMENT TERMINATOR (DT), respectively and may be used to reset presentation attributes to the default state.

8.2.11 Area definition

Acronym	Notation	Name	Defined in
DAQ	(Ps...)	DEFINE AREA QUALIFICATION	8.3.25
EPA	(C1)	END OF GUARDED AREA	8.3.47
ESA	(C1)	END OF SELECTED AREA	8.3.48
SPA	(C1)	START OF GUARDED AREA	8.3.130
SSA	(C1)	START OF SELECTED AREA	8.3.139

8.2.12 Mode setting

Acronym	Notation	Name	Defined in
RM	(Ps...)	RESET MODE	8.3.107
SM	(Ps...)	SET MODE	8.3.126

8.2.13 Transmission control functions

Acronym	Notation	Name	Defined in
ACK	(C0)	ACKNOWLEDGE	8.3.1
DLE	(C0)	DATA LINK ESCAPE	8.3.34
ENQ	(C0)	ENQUIRY	8.3.45
EOT	(C0)	END OF TRANSMISSION	8.3.46
ETB	(C0)	END OF TRANSMISSION BLOCK	8.3.50
ETX	(C0)	END OF TEXT	8.3.51
NAK	(C0)	NEGATIVE ACKNOWLEDGE	8.3.85
SOH	(C0)	START OF HEADING	8.3.128
STX	(C0)	START OF TEXT	8.3.147
SYN	(C0)	SYNCHRONOUS IDLE	8.3.151

8.2.14 Miscellaneous control functions

Acronym	Notation	Name	Defined in
BEL	(C0)	BELL	8.3.3
CAN	(C0)	CANCEL	8.3.6
CCH	(C1)	CANCEL CHARACTER	8.3.8
CPR	(Pn1;Pn2)	ACTIVE POSITION REPORT	8.3.14

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DA	(Ps)	DEVICE ATTRIBUTES	8.3.24
DEL	---	DELETE	8.3.32
DMI	(Fs)	DISABLE MANUAL INPUT	8.3.35
DSR	(Ps)	DEVICE STATUS REPORT	8.3.36
EM	(C0)	END OF MEDIUM	8.3.43
EMI	(Fs)	ENABLE MANUAL INPUT	8.3.44
FNK	(Pn)	FUNCTION KEY	8.3.53
IDCS	(Ps)	IDENTIFY DEVICE CONTROL STRING	8.3.66
IGS	(Ps)	IDENTIFY GRAPHIC SUBREPERTOIRE	8.3.67
INT	(Fs)	INTERRUPT	8.3.69
MC	(Ps)	MEDIA COPY	8.3.83
MW	(C1)	MESSAGE WAITING	8.3.84
NUL	(C0)	NULL	8.3.89
PU1	(C1)	PRIVATE USE ONE	8.3.101
PU2	(C1)	PRIVATE USE TWO	8.3.102
REP	(Pn)	REPEAT	8.3.104
RIS	(Fs)	RESET TO INITIAL STATE	8.3.106
SEE	(Ps1;Ps2)	SELECT EDITING EXTENT	8.3.116
SEF	(Ps1;Ps2)	SHEET EJECT AND FEED	8.3.117
STS	(C1)	SET TRANSMIT STATE	8.3.146
SUB	(C0)	SUBSTITUTE	8.3.149

8.3 Definition of control functions

The control functions are listed in the alphabetical order of their acronyms. It is intended that the acronyms be retained in all translations of the text.

The definitions of the control functions cover bi-directional devices which have both a presentation component (see 6.1.1) and a data component (see 6.1.3). In the case of a uni-directional device or a bi-directional device without a data component, all references to active data position, data component, character progression, etc., are to be read as referring to active presentation position, presentation component, character path, etc., resp. This also means that the use of the control functions in implementations of earlier versions of this International Standard is not affected by the inclusion of bi-directional capabilities in the Standard.

8.3.1 ACK - ACKNOWLEDGE

Notation: (C0)

Representation: 00/06

ACK is transmitted by a receiver as an affirmative response to the sender.

The use of ACK is defined in ISO 1745.

8.3.2 APC - APPLICATION PROGRAM COMMAND

Notation: (C1)

Representation: 09/15 or ESC 05/15

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APC is used as the opening delimiter of a control string for application program use. The command string following may consist of bit combinations in the range 00/08 to 00/13 and 02/00 to 07/14. The control string is closed by the terminating delimiter STRING TERMINATOR (ST). The interpretation of the command string depends on the relevant application program.

8.3.3 BEL - BELL

Notation: (C0)

Representation: 00/07

BEL is used when there is a need to call for attention; it may control alarm or attention devices.

8.3.4 BPH - BREAK PERMITTED HERE

Notation: (C1)

Representation: 08/02 or ESC 04/02

BPH is used to indicate a point where a line break may occur when text is formatted. BPH may occur between two graphic characters, either or both of which may be SPACE.

8.3.5 BS - BACKSPACE

Notation: (C0)

Representation: 00/08

BS causes the active data position to be moved one character position in the data component in the direction opposite to that of the implicit movement.

The direction of the implicit movement depends on the parameter value of SELECT IMPLICIT MOVEMENT DIRECTION (SIMD).

8.3.6 CAN - CANCEL

Notation: (C0)

Representation: 01/08

CAN is used to indicate that the data preceding it in the data stream is in error. As a result, this data shall be ignored. The specific meaning of this control function shall be defined for each application and/or between sender and recipient.

8.3.7 CBT - CURSOR BACKWARD TABULATION

Notation: (Pn)

Representation: CSI Pn 05/10

Parameter default value: Pn = 1

CBT causes the active presentation position to be moved to the character position corresponding to the n-th preceding character tabulation stop in the presentation component, according to the character path, where n equals the value of Pn.

8.3.8 CCH - CANCEL CHARACTER

Notation: (C1)

Representation: 09/04 or ESC 05/04

CCH is used to indicate that both the preceding graphic character in the data stream, (represented by one or more bit combinations) including SPACE, and the control function CCH itself are to be ignored for further interpretation of the data stream.

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If the character preceding CCH in the data stream is a control function (represented by one or more bit combinations), the effect of CCH is not defined by this International Standard.

8.3.9 CHA - CURSOR CHARACTER ABSOLUTE

Notation: (Pn)

Representation: CSI Pn 04/07

Parameter default value: Pn = 1

CHA causes the active presentation position to be moved to character position n in the active line in the presentation component, where n equals the value of Pn.

8.3.10 CHT - CURSOR FORWARD TABULATION

Notation: (Pn)

Representation: CSI Pn 04/09

Parameter default value: Pn = 1

CHT causes the active presentation position to be moved to the character position corresponding to the n-th following character tabulation stop in the presentation component, according to the character path, where n equals the value of Pn.

8.3.11 CMD - CODING METHOD DELIMITER

Notation: (Fs)

Representation: ESC 06/04

CMD is used as the delimiter of a string of data coded according to International Standard ISO 2022 and to switch to a general level of control.

The use of CMD is not mandatory if the higher level protocol defines means of delimiting the string, for instance, by specifying the length of the string.

8.3.12 CNL - CURSOR NEXT LINE

Notation: (Pn)

Representation: CSI Pn 04/05

Parameter default value: Pn = 1

CNL causes the active presentation position to be moved to the first character position of the n-th following line in the presentation component, where n equals the value of Pn.

8.3.13 CPL - CURSOR PRECEDING LINE

Notation: (Pn)

Representation: CSI Pn 04/06

Parameter default value: Pn = 1

CPL causes the active presentation position to be moved to the first character position of the n-th preceding line in the presentation component, where n equals the value of Pn.

8.3.14 CPR - ACTIVE POSITION REPORT

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 05/02

Parameter default values: Pn1 = 1; Pn2 = 1

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If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, CPR is used to report the active presentation position of the sending device as residing in the presentation component at the n-th line position according to the line progression and at the m-th character position according to the character path, where n equals the value of Pn1 and m equals the value of Pn2.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, CPR is used to report the active data position of the sending device as residing in the data component at the n-th line position according to the line progression and at the m-th character position according to the character progression, where n equals the value of Pn1 and m equals the value of Pn2.

CPR may be solicited by a DEVICE STATUS REPORT (DSR) or be sent unsolicited.

8.3.15 CR - CARRIAGE RETURN

Notation: (C0)

Representation: 00/13

The effect of CR depends on the setting of the DEVICE COMPONENT SELECT MODE (DCSM) and on the parameter value of SELECT IMPLICIT MOVEMENT DIRECTION (SIMD).

If the DEVICE COMPONENT SELECT MODE is set to PRESENTATION and with the parameter value of SIMD equal to 0, CR causes the active presentation position to be moved to the line home position of the same line in the presentation component. The line home position is established by the parameter value of SET LINE HOME (SLH).

With a parameter value of SIMD equal to 1, CR causes the active presentation position to be moved to the line limit position of the same line in the presentation component. The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA and with a parameter value of SIMD equal to 0, CR causes the active data position to be moved to the line home position of the same line in the data component. The line home position is established by the parameter value of SET LINE HOME (SLH).

With a parameter value of SIMD equal to 1, CR causes the active data position to be moved to the line limit position of the same line in the data component. The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

8.3.16 CSI - CONTROL SEQUENCE INTRODUCER

Notation: (C1)

Representation: 09/11 or ESC 05/11

CSI is used as the first character of a control sequence, see 5.4.

8.3.17 CTC - CURSOR TABULATION CONTROL

Notation: (Ps...)

Representation: CSI Ps... 05/07

Parameter default value: Ps = 0

CTC causes one or more tabulation stops to be set or cleared in the presentation component, depending on the parameter values:

0 a character tabulation stop is set at the active presentation position

1 a line tabulation stop is set at the active line (the line that contains the active presentation position)

2 the character tabulation stop at the active presentation position is cleared

3 the line tabulation stop at the active line is cleared

4 all character tabulation stops in the active line are cleared

5 all character tabulation stops are cleared

6 all line tabulation stops are cleared

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In the case of parameter values 0, 2 or 4 the number of lines affected depends on the setting of the TABULATION STOP MODE (TSM).

8.3.18 CUB - CURSOR LEFT

Notation: (Pn)

Representation: CSI Pn 04/04

Parameter default value: Pn = 1

CUB causes the active presentation position to be moved leftwards in the presentation component by n character positions if the character path is horizontal, or by n line positions if the character path is vertical, where n equals the value of Pn.

8.3.19 CUD - CURSOR DOWN

Notation: (Pn)

Representation: CSI Pn 04/02

Parameter default value: Pn = 1

CUD causes the active presentation position to be moved downwards in the presentation component by n line positions if the character path is horizontal, or by n character positions if the character path is vertical, where n equals the value of Pn.

8.3.20 CUF - CURSOR RIGHT

Notation: (Pn)

Representation: CSI Pn 04/03

Parameter default value: Pn = 1

CUF causes the active presentation position to be moved rightwards in the presentation component by n character positions if the character path is horizontal, or by n line positions if the character path is vertical, where n equals the value of Pn.

8.3.21 CUP - CURSOR POSITION

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 04/08

Parameter default values: Pn1 = 1; Pn2 = 1

CUP causes the active presentation position to be moved in the presentation component to the n-th line position according to the line progression and to the m-th character position according to the character path, where n equals the value of Pn1 and m equals the value of Pn2.

8.3.22 CUU - CURSOR UP

Notation: (Pn)

Representation: CSI Pn 04/01

Parameter default value: Pn = 1

CUU causes the active presentation position to be moved upwards in the presentation component by n line positions if the character path is horizontal, or by n character positions if the character path is vertical, where n equals the value of Pn.

8.3.23 CVT - CURSOR LINE TABULATION

Notation: (Pn)

Representation: CSI Pn 05/09

Parameter default value: Pn = 1

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CVT causes the active presentation position to be moved to the corresponding character position of the line corresponding to the n-th following line tabulation stop in the presentation component, where n equals the value of Pn.

8.3.24 DA - DEVICE ATTRIBUTES

Notation: (Ps)

Representation: CSI Ps 06/03

Parameter default value: Ps = 0

With a parameter value not equal to 0, DA is used to identify the device which sends the DA. The parameter value is a device type identification code according to a register which is to be established. If the parameter value is 0, DA is used to request an identifying DA from a device.

8.3.25 DAQ - DEFINE AREA QUALIFICATION

Notation: (Ps...)

Representation: CSI Ps... 06/15

Parameter default value: Ps = 0

DAQ is used to indicate that the active presentation position in the presentation component is the first character position of a qualified area. The last character position of the qualified area is the character position in the presentation component immediately preceding the first character position of the following qualified area.

The parameter value designates the type of qualified area:

0 unprotected and unguarded

1 protected and guarded

2 graphic character input

3 numeric input

4 alphabetic input

5 input aligned on the last character position of the qualified area

6 fill with ZEROs

7 set a character tabulation stop at the active presentation position (the first character position of the qualified area) to indicate the beginning of a field

8 protected and unguarded

9 fill with SPACEs

10 input aligned on the first character position of the qualified area

11 the order of the character positions in the input field is reversed, i.e. the last position in each line becomes the first and vice versa; input begins at the new first position.

This control function operates independently of the setting of the TABULATION STOP MODE (TSM). The character tabulation stop set by parameter value 7 applies to the active line only.

NOTE - The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string or an SDS string.

8.3.26 DCH - DELETE CHARACTER

Notation: (Pn)

Representation: CSI Pn 05/00

Parameter default value: Pn = 1

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If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, DCH causes the contents of the active presentation position and, depending on the setting of the CHARACTER EDITING MODE (HEM), the contents of the n-1 preceding or following character positions to be removed from the presentation component, where n equals the value of Pn. The resulting gap is closed by shifting the contents of the adjacent character positions towards the active presentation position. At the other end of the shifted part, n character positions are put into the erased state.

The extent of the shifted part is established by SELECT EDITING EXTENT (SEE).

The effect of DCH on the start or end of a selected area, the start or end of a qualified area, or a tabulation stop in the shifted part is not defined by this International Standard.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, DCH causes the contents of the active data position and, depending on the setting of the CHARACTER EDITING MODE (HEM), the contents of the n-1 preceding or following character positions to be removed from the data component, where n equals the value of Pn. The resulting gap is closed by shifting the contents of the adjacent character positions towards the active data position. At the other end of the shifted part, n character positions are put into the erased state.

8.3.27 DCS - DEVICE CONTROL STRING

Notation: (C1)

Representation: 09/00 or ESC 05/00

DCS is used as the opening delimiter of a control string for device control use. The command string following may consist of bit combinations in the range 00/08 to 00/13 and 02/00 to 07/14. The control string is closed by the terminating delimiter STRING TERMINATOR (ST).

The command string represents either one or more commands for the receiving device, or one or more status reports from the sending device. The purpose and the format of the command string are specified by the most recent occurrence of IDENTIFY DEVICE CONTROL STRING (IDCS), if any, or depend on the sending and/or the receiving device.

8.3.28 DC1 - DEVICE CONTROL ONE

Notation: (C0)

Representation: 01/01

DC1 is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to restore a device to the basic mode of operation (see also DC2 and DC3), or any other device control function not provided by other DCs.

NOTE - When used for data flow control, DC1 is sometimes called "X-ON".

8.3.29 DC2 - DEVICE CONTROL TWO

Notation: (C0)

Representation: 01/02

DC2 is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to set a device to a special mode of operation (in which case DC1 is used to restore the device to the basic mode), or for any other device control function not provided by other DCs.

8.3.30 DC3 - DEVICE CONTROL THREE

Notation: (C0)

Representation: 01/03

DC3 is primarily intended for turning off or stopping an ancillary device. This function may be a secondary level stop, for example wait, pause, stand-by or halt (in which case DC1 is used to restore normal operation). If it is not required for this purpose, it may be used for any other device control function not provided by other DCs.

NOTE - When used for data flow control, DC3 is sometimes called "X-OFF".

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8.3.31 DC4 - DEVICE CONTROL FOUR

Notation: (C0)

Representation: 01/04

DC4 is primarily intended for turning off, stopping or interrupting an ancillary device. If it is not required for this purpose, it may be used for any other device control function not provided by other DCs.

8.3.32 DEL - DELETE

See F.8.1 in annex F.

8.3.33 DL - DELETE LINE

Notation: (Pn)

Representation: CSI Pn 04/13

Parameter default value: Pn = 1

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, DL causes the contents of the active line (the line that contains the active presentation position) and, depending on the setting of the LINE EDITING MODE (VEM), the contents of the n-1 preceding or following lines to be removed from the presentation component, where n equals the value of Pn. The resulting gap is closed by shifting the contents of a number of adjacent lines towards the active line. At the other end of the shifted part, n lines are put into the erased state.

The active presentation position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH). If the TABULATION STOP MODE (TSM) is set to SINGLE, character tabulation stops are cleared in the lines that are put into the erased state.

The extent of the shifted part is established by SELECT EDITING EXTENT (SEE).

Any occurrences of the start or end of a selected area, the start or end of a qualified area, or a tabulation stop in the shifted part, are also shifted.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, DL causes the contents of the active line (the line that contains the active data position) and, depending on the setting of the LINE EDITING MODE (VEM), the contents of the n-1 preceding or following lines to be removed from the data component, where n equals the value of Pn. The resulting gap is closed by shifting the contents of a number of adjacent lines towards the active line. At the other end of the shifted part, n lines are put into the erased state. The active data position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH).

8.3.34 DLE - DATA LINK ESCAPE

Notation: (C0)

Representation: 01/00

DLE is used exclusively to provide supplementary transmission control functions.

The use of DLE is defined in ISO 1745.

8.3.35 DMI - DISABLE MANUAL INPUT

Notation: (Fs)

Representation: ESC 06/00

DMI causes the manual input facilities of a device to be disabled.

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8.3.36 DSR - DEVICE STATUS REPORT

Notation: (Ps)

Representation: CSI Ps 06/14

Parameter default value: Ps = 0

DSR is used either to report the status of the sending device or to request a status report from the receiving device, depending on the parameter values:

0 ready, no malfunction detected

1 busy, another DSR must be requested later

2 busy, another DSR will be sent later

3 some malfunction detected, another DSR must be requested later

4 some malfunction detected, another DSR will be sent later

5 a DSR is requested

6 a report of the active presentation position or of the active data position in the form of ACTIVE POSITION REPORT (CPR) is requested

DSR with parameter value 0, 1, 2, 3 or 4 may be sent either unsolicited or as a response to a request such as a DSR with a parameter value 5 or MESSAGE WAITING (MW).

8.3.37 DTA - DIMENSION TEXT AREA

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 02/00 05/04

No parameter default value.

DTA is used to establish the dimensions of the text area for subsequent pages.

The established dimensions remain in effect until the next occurrence of DTA in the data stream.

Pn1 specifies the dimension in the direction perpendicular to the line orientation

Pn2 specifies the dimension in the direction parallel to the line orientation

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.38 EA - ERASE IN AREA

Notation: (Ps)

Representation: CSI Ps 04/15

Parameter default value: Ps = 0

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, EA causes some or all character positions in the active qualified area (the qualified area in the presentation component which contains the active presentation position) to be put into the erased state, depending on the parameter values:

0 the active presentation position and the character positions up to the end of the qualified area are put into the erased state

1 the character positions from the beginning of the qualified area up to and including the active presentation position are put into the erased state

2 all character positions of the qualified area are put into the erased state

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If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, EA causes some or all character positions in the active qualified area (the qualified area in the data component which contains the active data position) to be put into the erased state, depending on the parameter values:

0 the active data position and the character positions up to the end of the qualified area are put into the erased state

1 the character positions from the beginning of the qualified area up to and including the active data position are put into the erased state

2 all character positions of the qualified area are put into the erased state

Whether the character positions of protected areas are put into the erased state, or the character positions of unprotected areas only, depends on the setting of the ERASURE MODE (ERM).

8.3.39 ECH - ERASE CHARACTER

Notation: (Pn)

Representation: CSI Pn 05/08

Parameter default value: Pn = 1

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, ECH causes the active presentation position and the n-1 following character positions in the presentation component to be put into the erased state, where n equals the value of Pn.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, ECH causes the active data position and the n-1 following character positions in the data component to be put into the erased state, where n equals the value of Pn.

Whether the character positions of protected areas are put into the erased state, or the character positions of unprotected areas only, depends on the setting of the ERASURE MODE (ERM).

8.3.40 ED - ERASE IN PAGE

Notation: (Ps)

Representation: CSI Ps 04/10

Parameter default value: Ps = 0

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, ED causes some or all character positions of the active page (the page which contains the active presentation position in the presentation component) to be put into the erased state, depending on the parameter values:

0 the active presentation position and the character positions up to the end of the page are put into the erased state

1 the character positions from the beginning of the page up to and including the active presentation position are put into the erased state

2 all character positions of the page are put into the erased state

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, ED causes some or all character positions of the active page (the page which contains the active data position in the data component) to be put into the erased state, depending on the parameter values:

0 the active data position and the character positions up to the end of the page are put into the erased state

1 the character positions from the beginning of the page up to and including the active data position are put into the erased state

2 all character positions of the page are put into the erased state

Whether the character positions of protected areas are put into the erased state, or the character positions of unprotected areas only, depends on the setting of the ERASURE MODE (ERM).

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8.3.41 EF - ERASE IN FIELD

Notation: (Ps)

Representation: CSI Ps 04/14

Parameter default value: Ps = 0

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, EF causes some or all character positions of the active field (the field which contains the active presentation position in the presentation component) to be put into the erased state, depending on the parameter values:

0 the active presentation position and the character positions up to the end of the field are put into the erased state

1 the character positions from the beginning of the field up to and including the active presentation position are put into the erased state

2 all character positions of the field are put into the erased state

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, EF causes some or all character positions of the active field (the field which contains the active data position in the data component) to be put into the erased state, depending on the parameter values:

0 the active data position and the character positions up to the end of the field are put into the erased state

1 the character positions from the beginning of the field up to and including the active data position are put into the erased state

2 all character positions of the field are put into the erased state

Whether the character positions of protected areas are put into the erased state, or the character positions of unprotected areas only, depends on the setting of the ERASURE MODE (ERM).

8.3.42 EL - ERASE IN LINE

Notation: (Ps)

Representation: CSI Ps 04/11

Parameter default value: Ps = 0

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, EL causes some or all character positions of the active line (the line which contains the active presentation position in the presentation component) to be put into the erased state, depending on the parameter values:

0 the active presentation position and the character positions up to the end of the line are put into the erased state

1 the character positions from the beginning of the line up to and including the active presentation position are put into the erased state

2 all character positions of the line are put into the erased state

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, EL causes some or all character positions of the active line (the line which contains the active data position in the data component) to be put into the erased state, depending on the parameter values:

0 the active data position and the character positions up to the end of the line are put into the erased state

1 the character positions from the beginning of the line up to and including the active data position are put into the erased state

2 all character positions of the line are put into the erased state

Whether the character positions of protected areas are put into the erased state, or the character positions of unprotected areas only, depends on the setting of the ERASURE MODE (ERM).

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8.3.43 EM - END OF MEDIUM

Notation: (C0)

Representation: 01/09

EM is used to identify the physical end of a medium, or the end of the used portion of a medium, or the end of the wanted portion of data recorded on a medium.

8.3.44 EMI - ENABLE MANUAL INPUT

Notation: (Fs)

Representation: ESC 06/02

EMI is used to enable the manual input facilities of a device.

8.3.45 ENQ - ENQUIRY

Notation: (C0)

Representation: 00/05

ENQ is transmitted by a sender as a request for a response from a receiver.

The use of ENQ is defined in ISO 1745.

8.3.46 EOT - END OF TRANSMISSION

Notation: (C0)

Representation: 00/04

EOT is used to indicate the conclusion of the transmission of one or more texts.

The use of EOT is defined in ISO 1745.

8.3.47 EPA - END OF GUARDED AREA

Notation: (C1)

Representation: 09/07 or ESC 05/07

EPA is used to indicate that the active presentation position is the last of a string of character positions in the presentation component, the contents of which are protected against manual alteration, are guarded against transmission or transfer, depending on the setting of the GUARDED AREA TRANSFER MODE (GATM), and may be protected against erasure, depending on the setting of the ERASURE MODE (ERM). The beginning of this string is indicated by START OF GUARDED AREA (SPA).

NOTE: The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string or an SDS string.

8.3.48 ESA - END OF SELECTED AREA

Notation: (C1)

Representation: 08/07 or ESC 04/07

ESA is used to indicate that the active presentation position is the last of a string of character positions in the presentation component, the contents of which are eligible to be transmitted in the form of a data stream or transferred to an auxiliary input/output device. The beginning of this string is indicated by START OF SELECTED AREA (SSA).

NOTE - The control function for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string or an SDS string.

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8.3.49 ESC - ESCAPE

Notation: (C0)

Representation: 01/11

ESC is used for code extension purposes. It causes the meanings of a limited number of bit combinations following it in the data stream to be changed.

The use of ESC is defined in International Standard ISO 2022.

8.3.50 ETB - END OF TRANSMISSION BLOCK

Notation: (C0)

Representation: 01/07

ETB is used to indicate the end of a block of data where the data are divided into such blocks for transmission purposes.

The use of ETB is defined in ISO 1745.

8.3.51 ETX - END OF TEXT

Notation: (C0)

Representation: 00/03

ETX is used to indicate the end of a text.

The use of ETX is defined in ISO 1745.

8.3.52 FF - FORM FEED

Notation: (C0)

Representation: 00/12

FF causes the active presentation position to be moved to the corresponding character position of the line at the page home position of the next form or page in the presentation component. The page home position is established by the parameter value of SET PAGE HOME (SPH).

8.3.53 FNK - FUNCTION KEY

Notation: (Pn)

Representation: CSI Pn 02/00 05/07

No parameter default value.

FNK is a control function in which the parameter value identifies the function key which has been operated.

8.3.54 FNT - FONT SELECTION

Notation: (Ps1;Ps2)

Representation: CSI Ps1;Ps2 02/00 04/04

Parameter default values: Ps1 = 0; Ps2 =0

FNT is used to identify the character font to be selected as primary or alternative font by subsequent occurrences of SELECT GRAPHIC RENDITION (SGR) in the data stream. Ps1 specifies the primary or alternative font concerned:

0 primary font
1 first alternative font
2 second alternative font
3 third alternative font

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4 fourth alternative font
5 fifth alternative font
6 sixth alternative font
7 seventh alternative font
8 eighth alternative font
9 ninth alternative font

Ps2 identifies the character font according to a register which is to be established.

8.3.55 GCC - GRAPHIC CHARACTER COMBINATION

Notation: (Ps)

Representation: CSI Ps 02/00 05/15

Parameter default value: Ps = 0

GCC is used to indicate that two or more graphic characters are to be imaged as one single graphic symbol. GCC with a parameter value of 0 indicates that the following two graphic characters are to be imaged as one single graphic symbol; GCC with a parameter value of 1 and GCC with a parameter value of 2 indicate respectively the beginning and the end of a string of graphic characters which are to be imaged as one single graphic symbol.

NOTE - GCC does not explicitly specify the relative sizes or placements of the component parts of a composite graphic symbol. In the simplest case, two components may be "half-width" and side-by-side. For example, in Japanese text a pair of characters may be presented side-by-side, and occupy the space of a normal-size Kanji character.

8.3.56 GSM - GRAPHIC SIZE MODIFICATION

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 02/00 04/02

Parameter default values: Pn1 = 100; Pn2 = 100

GSM is used to modify for subsequent text the height and/or the width of all primary and alternative fonts identified by FONT SELECTION (FNT) and established by GRAPHIC SIZE SELECTION (GSS). The established values remain in effect until the next occurrence of GSM or GSS in the data steam.

Pn1 specifies the height as a percentage of the height established by GSS

Pn2 specifies the width as a percentage of the width established by GSS

8.3.57 GSS - GRAPHIC SIZE SELECTION

Notation: (Pn)

Representation: CSI Pn 02/00 04/03

No parameter default value.

GSS is used to establish for subsequent text the height and the width of all primary and alternative fonts identified by FONT SELECTION (FNT). The established values remain in effect until the next occurrence of GSS in the data stream.

Pn specifies the height, the width is implicitly defined by the height.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.58 HPA - CHARACTER POSITION ABSOLUTE

Notation: (Pn)

Representation: CSI Pn 06/00

Parameter default value: Pn = 1

HPA causes the active data position to be moved to character position n in the active line (the line in the data component that contains the active data position), where n equals the value of Pn.

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8.3.59 HPB - CHARACTER POSITION BACKWARD

Notation: (Pn)

Representation: CSI Pn 06/10

Parameter default value: Pn = 1

HPB causes the active data position to be moved by n character positions in the data component in the direction opposite to that of the character progression, where n equals the value of Pn.

8.3.60 HPR - CHARACTER POSITION FORWARD

Notation: (Pn)

Representation: CSI Pn 06/01

Parameter default value: Pn = 1

HPR causes the active data position to be moved by n character positions in the data component in the direction of the character progression, where n equals the value of Pn.

8.3.61 HT - CHARACTER TABULATION

Notation: (C0)

Representation: 00/09

HT causes the active presentation position to be moved to the following character tabulation stop in the presentation component.

In addition, if that following character tabulation stop has been set by TABULATION ALIGN CENTRE (TAC), TABULATION ALIGN LEADING EDGE (TALE), TABULATION ALIGN TRAILING EDGE (TATE) or TABULATION CENTRED ON CHARACTER (TCC), HT indicates the beginning of a string of text which is to be positioned within a line according to the properties of that tabulation stop. The end of the string is indicated by the next occurrence of HT or CARRIAGE RETURN (CR) or NEXT LINE (NEL) in the data stream.

8.3.62 HTJ - CHARACTER TABULATION WITH JUSTIFICATION

Notation: (C1)

Representation: 08/09 or ESC 04/09

HTJ causes the contents of the active field (the field in the presentation component that contains the active presentation position) to be shifted forward so that it ends at the character position preceding the following character tabulation stop. The active presentation position is moved to that following character tabulation stop. The character positions which precede the beginning of the shifted string are put into the erased state.

8.3.63 HTS - CHARACTER TABULATION SET

Notation: (C1)

Representation: 08/08 or ESC 04/08

HTS causes a character tabulation stop to be set at the active presentation position in the presentation component.

The number of lines affected depends on the setting of the TABULATION STOP MODE (TSM).

8.3.64 HVP - CHARACTER AND LINE POSITION

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 06/06

Parameter default values: Pn1 = 1; Pn2 = 1

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HVP causes the active data position to be moved in the data component to the n-th line position according to the line progression and to the m-th character position according to the character progression, where n equals the value of Pn1 and m equals the value of Pn2.

8.3.65 ICH - INSERT CHARACTER

Notation: (Pn)

Representation: CSI Pn 04/00

Parameter default value: Pn = 1

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, ICH is used to prepare the insertion of n characters, by putting into the erased state the active presentation position and, depending on the setting of the CHARACTER EDITING MODE (HEM), the n-1 preceding or following character positions in the presentation component, where n equals the value of Pn. The previous contents of the active presentation position and an adjacent string of character positions are shifted away from the active presentation position. The contents of n character positions at the other end of the shifted part are removed. The active presentation position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH).

The extent of the shifted part is established by SELECT EDITING EXTENT (SEE).

The effect of ICH on the start or end of a selected area, the start or end of a qualified area, or a tabulation stop in the shifted part, is not defined by this International Standard.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, ICH is used to prepare the insertion of n characters, by putting into the erased state the active data position and, depending on the setting of the CHARACTER EDITING MODE (HEM), the n-1 preceding or following character positions in the data component, where n equals the value of Pn. The previous contents of the active data position and an adjacent string of character positions are shifted away from the active data position. The contents of n character positions at the other end of the shifted part are removed. The active data position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH).

8.3.66 IDCS - IDENTIFY DEVICE CONTROL STRING

Notation: (Ps)

Representation: CSI Ps 02/00 04/15

No parameter default value.

IDCS is used to specify the purpose and format of the command string of subsequent DEVICE CONTROL STRINGs (DCS). The specified purpose and format remain in effect until the next occurrence of IDCS in the data stream.

The parameter values are

1 reserved for use with the DIAGNOSTIC state of the STATUS REPORT TRANSFER MODE (SRTM)

2 reserved for Dynamically Redefinable Character Sets (DRCS) according to International Standard ISO 2022.

The format and interpretation of the command string corresponding to these parameter values are to be defined in appropriate standards. If this control function is used to identify a private command string, a private parameter value shall be used.

8.3.67 IGS - IDENTIFY GRAPHIC SUBREPERTOIRE

Notation: (Ps)

Representation: CSI Ps 02/00 04/13

No parameter default value.

IGS is used to indicate that a repertoire of the graphic characters of ISO/IEC 10367 is used in the subsequent text.

The parameter value of IGS identifies a graphic character repertoire registered in accordance with ISO/IEC 7350.

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8.3.68 IL - INSERT LINE

Notation: (Pn)

Representation: CSI Pn 04/12

Parameter default value: Pn = 1

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, IL is used to prepare the insertion of n lines, by putting into the erased state in the presentation component the active line (the line that contains the active presentation position) and, depending on the setting of the LINE EDITING MODE (VEM), the n-1 preceding or following lines, where n equals the value of Pn. The previous contents of the active line and of adjacent lines are shifted away from the active line. The contents of n lines at the other end of the shifted part are removed. The active presentation position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH).

The extent of the shifted part is established by SELECT EDITING EXTENT (SEE).

Any occurrences of the start or end of a selected area, the start or end of a qualified area, or a tabulation stop in the shifted part, are also shifted.

If the TABULATION STOP MODE (TSM) is set to SINGLE, character tabulation stops are cleared in the lines that are put into the erased state.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, IL is used to prepare the insertion of n lines, by putting into the erased state in the data component the active line (the line that contains the active data position) and, depending on the setting of the LINE EDITING MODE (VEM), the n-1 preceding or following lines, where n equals the value of Pn. The previous contents of the active line and of adjacent lines are shifted away from the active line. The contents of n lines at the other end of the shifted part are removed. The active data position is moved to the line home position in the active line. The line home position is established by the parameter value of SET LINE HOME (SLH).

8.3.69 INT - INTERRUPT

Notation: (Fs)

Representation: ESC 06/01

INT is used to indicate to the receiving device that the current process is to be interrupted and an agreed procedure is to be initiated. This control function is applicable to either direction of transmission.

8.3.70 IS1 - INFORMATION SEPARATOR ONE (US - UNIT SEPARATOR)

Notation: (C0)

Representation: 01/15

IS1 is used to separate and qualify data logically; its specific meaning has to be defined for each application. If this control function is used in hierarchical order, it may delimit a data item called a unit, see 8.2.10.

8.3.71 IS2 - INFORMATION SEPARATOR TWO (RS - RECORD SEPARATOR)

Notation: (C0)

Representation: 01/14

IS2 is used to separate and qualify data logically; its specific meaning has to be defined for each application. If this control function is used in hierarchical order, it may delimit a data item called a record, see 8.2.10.

8.3.72 IS3 - INFORMATION SEPARATOR THREE (GS - GROUP SEPARATOR)

Notation: (C0)

Representation: 01/13

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IS3 is used to separate and qualify data logically; its specific meaning has to be defined for each application. If this control function is used in hierarchical order, it may delimit a data item called a group, see 8.2.10.

8.3.73 IS4 - INFORMATION SEPARATOR FOUR (FS - FILE SEPARATOR)

Notation: (C0)

Representation: 01/12

IS4 is used to separate and qualify data logically; its specific meaning has to be defined for each application. If this control function is used in hierarchical order, it may delimit a data item called a file, see 8.2.10.

8.3.74 JFY - JUSTIFY

Notation: (Ps...)

Representation: CSI Ps... 02/00 04/06

Parameter default value: Ps = 0

JFY is used to indicate the beginning of a string of graphic characters in the presentation component that are to be justified according to the layout specified by the parameter values, see annex C:

0 no justification, end of justification of preceding text
1 word fill
2 word space
3 letter space
4 hyphenation
5 flush to line home position margin
6 centre between line home position and line limit position margins
7 flush to line limit position margin
8 Italian hyphenation

The end of the string to be justified is indicated by the next occurrence of JFY in the data stream.

The line home position is established by the parameter value of SET LINE HOME (SLH). The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

8.3.75 LF - LINE FEED

Notation: (C0)

Representation: 00/10

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, LF causes the active presentation position to be moved to the corresponding character position of the following line in the presentation component.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, LF causes the active data position to be moved to the corresponding character position of the following line in the data component.

8.3.76 LS0 - LOCKING-SHIFT ZERO

Notation: (C0)

Representation: 00/15

LS0 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS0 is defined in International Standard ISO 2022.

NOTE - LS0 is used in 8-bit environments only; in 7-bit environments SHIFT-IN (SI) is used instead.

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8.3.77 LS1 - LOCKING-SHIFT ONE

Notation: (C0)

Representation: 00/14

LS1 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS1 is defined in International Standard ISO 2022.

NOTE - LS1 is used in 8-bit environments only; in 7-bit environments SHIFT-OUT (SO) is used instead.

8.3.78 LS1R - LOCKING-SHIFT ONE RIGHT

Notation: (Fs)

Representation: ESC 07/14

LS1R is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS1R is defined in International Standard ISO 2022.

8.3.79 LS2 - LOCKING-SHIFT TWO

Notation: (Fs)

Representation: ESC 06/14

LS2 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS2 is defined in International Standard ISO 2022.

8.3.80 LS2R - LOCKING-SHIFT TWO RIGHT

Notation: (Fs)

Representation: ESC 07/13

LS2R is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS2R is defined in International Standard ISO 2022.

8.3.81 LS3 - LOCKING-SHIFT THREE

Notation: (Fs)

Representation: ESC 06/15

LS3 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS3 is defined in International Standard ISO 2022.

8.3.82 LS3R - LOCKING-SHIFT THREE RIGHT

Notation: (Fs)

Representation: ESC 07/12

LS3R is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of LS3R is defined in International Standard ISO 2022.

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8.3.83 MC - MEDIA COPY

Notation: (Ps)

Representation: CSI Ps 06/09

Parameter default value: Ps = 0

MC is used either to initiate a transfer of data from or to an auxiliary input/output device or to enable or disable the relay of the received data stream to an auxiliary input/output device, depending on the parameter value:

0 initiate transfer to a primary auxiliary device
1 initiate transfer from a primary auxiliary device
2 initiate transfer to a secondary auxiliary device
3 initiate transfer from a secondary auxiliary device
4 stop relay to a primary auxiliary device
5 start relay to a primary auxiliary device
6 stop relay to a secondary auxiliary device
7 start relay to a secondary auxiliary device

This control function may not be used to switch on or off an auxiliary device.

8.3.84 MW - MESSAGE WAITING

Notation: (C1)

Representation: 09/05 or ESC 05/05

MW is used to set a message waiting indicator in the receiving device. An appropriate acknowledgement to the receipt of MW may be given by using DEVICE STATUS REPORT (DSR).

8.3.85 NAK - NEGATIVE ACKNOWLEDGE

Notation: (C0)

Representation: 01/05

NAK is transmitted by a receiver as a negative response to the sender.

The use of NAK is defined in ISO 1745.

8.3.86 NBH - NO BREAK HERE

Notation: (C1)

Representation: 08/03 or ESC 04/03

NBH is used to indicate a point where a line break shall not occur when text is formatted. NBH may occur between two graphic characters either or both of which may be SPACE.

8.3.87 NEL - NEXT LINE

Notation: (C1)

Representation: 08/05 or ESC 04/05

The effect of NEL depends on the setting of the DEVICE COMPONENT SELECT MODE (DCSM) and on the parameter value of SELECT IMPLICIT MOVEMENT DIRECTION (SIMD).

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION and with a parameter value of SIMD equal to 0, NEL causes the active presentation position to be moved to the line home position of the following line in the presentation component. The line home position is established by the parameter value of SET LINE HOME (SLH).

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With a parameter value of SIMD equal to 1, NEL causes the active presentation position to be moved to the line limit position of the following line in the presentation component. The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA and with a parameter value of SIMD equal to 0, NEL causes the active data position to be moved to the line home position of the following line in the data component. The line home position is established by the parameter value of SET LINE HOME (SLH).

With a parameter value of SIMD equal to 1, NEL causes the active data position to be moved to the line limit position of the following line in the data component. The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

8.3.88 NP - NEXT PAGE

Notation: (Pn)

Representation: CSI Pn 05/05

Parameter default value: Pn = 1

NP causes the n-th following page in the presentation component to be displayed, where n equals the value of Pn.

The effect of this control function on the active presentation position is not defined by this International Standard.

8.3.89 NUL - NULL

Notation: (C0)

Representation: 00/00

NUL is used for media-fill or time-fill. NUL characters may be inserted into, or removed from, a data stream without affecting the information content of that stream, but such action may affect the information layout and/or the control of equipment.

8.3.90 OSC - OPERATING SYSTEM COMMAND

Notation: (C1)

Representation: 09/13 or ESC 05/13

OSC is used as the opening delimiter of a control string for operating system use. The command string following may consist of a sequence of bit combinations in the range 00/08 to 00/13 and 02/00 to 07/14. The control string is closed by the terminating delimiter STRING TERMINATOR (ST). The interpretation of the command string depends on the relevant operating system.

8.3.91 PEC - PRESENTATION EXPAND OR CONTRACT

Notation: (Ps)

Representation: CSI Ps 02/00 05/10

Parameter default value: Ps = 0

PEC is used to establish the spacing and the extent of the graphic characters for subsequent text. The spacing is specified in the line as multiples of the spacing established by the most recent occurrence of SET CHARACTER SPACING (SCS) or of SELECT CHARACTER SPACING (SHS) or of SPACING INCREMENT (SPI) in the data stream. The extent of the characters is implicitly established by these control functions. The established spacing and the extent remain in effect until the next occurrence of PEC, of SCS, of SHS or of SPI in the data stream. The parameter values are

0 normal (as specified by SCS, SHS or SPI)
1 expanded (multiplied by a factor not greater than 2)
2 condensed (multiplied by a factor not less than 0,5)

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8.3.92 PFS - PAGE FORMAT SELECTION

Notation: (Ps)

Representation: CSI Ps 02/00 04/10

Parameter default value: Ps = 0

PFS is used to establish the available area for the imaging of pages of text based on paper size. The pages are introduced by the subsequent occurrence of FORM FEED (FF) in the data stream.

The established image area remains in effect until the next occurrence of PFS in the data stream. The parameter values are (see also annex E):

0 tall basic text communication format
1 wide basic text communication format
2 tall basic A4 format
3 wide basic A4 format
4 tall North American letter format
5 wide North American letter format
6 tall extended A4 format
7 wide extended A4 format
8 tall North American legal format
9 wide North American legal format
10 A4 short lines format
11 A4 long lines format
12 B5 short lines format
13 B5 long lines format
14 B4 short lines format
15 B4 long lines format

The page home position is established by the parameter value of SET PAGE HOME (SPH), the page limit position is established by the parameter value of SET PAGE LIMIT (SPL).

8.3.93 PLD - PARTIAL LINE FORWARD

Notation: (C1)

Representation: 08/11 or ESC 04/11

PLD causes the active presentation position to be moved in the presentation component to the corresponding position of an imaginary line with a partial offset in the direction of the line progression. This offset should be sufficient either to image following characters as subscripts until the first following occurrence of PARTIAL LINE BACKWARD (PLU) in the data stream, or, if preceding characters were imaged as superscripts, to restore imaging of following characters to the active line (the line that contains the active presentation position).

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

8.3.94 PLU - PARTIAL LINE BACKWARD

Notation: (C1)

Representation: 08/12 or ESC 04/12

PLU causes the active presentation position to be moved in the presentation component to the corresponding position of an imaginary line with a partial offset in the direction opposite to that of the line progression. This offset should be sufficient either to image following characters as superscripts until the first following occurrence of PARTIAL LINE FORWARD (PLD) in the data stream, or, if preceding characters were imaged as subscripts, to restore imaging of following characters to the active line (the line that contains the active presentation position).

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

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8.3.95 PM - PRIVACY MESSAGE

Notation: (C1)

Representation: 09/14 or ESC 05/14

PM is used as the opening delimiter of a control string for privacy message use. The command string following may consist of a sequence of bit combinations in the range 00/08 to 00/13 and 02/00 to 07/14. The control string is closed by the terminating delimiter STRING TERMINATOR (ST). The interpretation of the command string depends on the relevant privacy discipline.

8.3.96 PP - PRECEDING PAGE

Notation: (Pn)

Representation: CSI Pn 05/06

Parameter default value: Pn = 1

PP causes the n-th preceding page in the presentation component to be displayed, where n equals the value of Pn. The effect of this control function on the active presentation position is not defined by this International Standard.

8.3.97 PPA - PAGE POSITION ABSOLUTE

Notation: (Pn)

Representation: CSI Pn 02/00 05/00

Parameter default value: Pn = 1

PPA causes the active data position to be moved in the data component to the corresponding character position on the n-th page, where n equals the value of Pn.

8.3.98 PPB - PAGE POSITION BACKWARD

Notation: (Pn)

Representation: CSI Pn 02/00 05/02

Parameter default value: Pn = 1

PPB causes the active data position to be moved in the data component to the corresponding character position on the n-th preceding page, where n equals the value of Pn.

8.3.99 PPR - PAGE POSITION FORWARD

Notation: (Pn)

Representation: CSI Pn 02/00 05/01

Parameter default value: Pn = 1

PPR causes the active data position to be moved in the data component to the corresponding character position on the n-th following page, where n equals the value of Pn.

8.3.100 PTX - PARALLEL TEXTS

Notation: (Ps)

Representation: CSI Ps 05/12

Parameter default value: Ps = 0

PTX is used to delimit strings of graphic characters that are communicated one after another in the data stream but that are intended to be presented in parallel with one another, usually in adjacent lines.

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The parameter values are

0 end of parallel texts
1 beginning of a string of principal parallel text
2 beginning of a string of supplementary parallel text
3 beginning of a string of supplementary Japanese phonetic annotation
4 beginning of a string of supplementary Chinese phonetic annotation
5 end of a string of supplementary phonetic annotations

PTX with a parameter value of 1 indicates the beginning of the string of principal text intended to be presented in parallel with one or more strings of supplementary text.

PTX with a parameter value of 2, 3 or 4 indicates the beginning of a string of supplementary text that is intended to be presented in parallel with either a string of principal text or the immediately preceding string of supplementary text, if any; at the same time it indicates the end of the preceding string of principal text or of the immediately preceding string of supplementary text, if any. The end of a string of supplementary text is indicated by a subsequent occurrence of PTX with a parameter value other than 1.

PTX with a parameter value of 0 indicates the end of the strings of text intended to be presented in parallel with one another.

NOTE - PTX does not explicitly specify the relative placement of the strings of principal and supplementary parallel texts, or the relative sizes of graphic characters in the strings of parallel text. A string of supplementary text is normally presented in a line adjacent to the line containing the string of principal text, or adjacent to the line containing the immediately preceding string of supplementary text, if any. The first graphic character of the string of principal text and the first graphic character of a string of supplementary text are normally presented in the same position of their respective lines. However, a string of supplementary text longer (when presented) than the associated string of principal text may be centred on that string. In the case of long strings of text, such as paragraphs in different languages, the strings may be presented in successive lines in parallel columns, with their beginnings aligned with one another and the shorter of the paragraphs followed by an appropriate amount of "white space".

Japanese phonetic annotation typically consists of a few half-size or smaller Kana characters which indicate the pronunciation or interpretation of one or more Kanji characters and are presented above those Kanji characters if the character path is horizontal, or to the right of them if the character path is vertical.

Chinese phonetic annotation typically consists of a few Pinyin characters which indicate the pronunciation of one or more Hanzi characters and are presented above those Hanzi characters. Alternatively, the Pinyin characters may be presented in the same line as the Hanzi characters and following the respective Hanzi characters. The Pinyin characters will then be presented within enclosing pairs of parentheses.

8.3.101 PU1 - PRIVATE USE ONE

Notation: (C1)

Representation: 09/01 or ESC 05/01

PU1 is reserved for a function without standardized meaning for private use as required, subject to the prior agreement between the sender and the recipient of the data.

8.3.102 PU2 - PRIVATE USE TWO

Notation: (C1)

Representation: 09/02 or ESC 05/02

PU2 is reserved for a function without standardized meaning for private use as required, subject to the prior agreement between the sender and the recipient of the data.

8.3.103 QUAD - QUAD

Notation: (Ps...)

Representation: CSI Ps... 02/00 04/08

Parameter default value: Ps = 0

QUAD is used to indicate the end of a string of graphic characters that are to be positioned on a single line according to the layout specified by the parameter values, see annex C:

0 flush to line home position margin
1 flush to line home position margin and fill with leader
2 centre between line home position and line limit position margins

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3 centre between line home position and line limit position margins and fill with leader
4 flush to line limit position margin
5 flush to line limit position margin and fill with leader
6 flush to both margins

The beginning of the string to be positioned is indicated by the preceding occurrence in the data stream of either QUAD or one of the following formator functions: FORM FEED (FF), CHARACTER AND LINE POSITION (HVP), LINE FEED (LF), NEXT LINE (NEL), PAGE POSITION ABSOLUTE (PPA), PAGE POSITION BACKWARD (PPB), PAGE POSITION FORWARD (PPR), REVERSE LINE FEED (RI), LINE POSITION ABSOLUTE (VPA), LINE POSITION BACKWARD (VPB), LINE POSITION FORWARD (VPR), or LINE TABULATION (VT).

The line home position is established by the parameter value of SET LINE HOME (SLH). The line limit position is established by the parameter value of SET LINE LIMIT (SLL).

8.3.104 REP - REPEAT

Notation: (Pn)

Representation: CSI Pn 06/02

Parameter default value: Pn = 1

REP is used to indicate that the preceding character in the data stream, if it is a graphic character (represented by one or more bit combinations) including SPACE, is to be repeated n times, where n equals the value of Pn. If the character preceding REP is a control function or part of a control function, the effect of REP is not defined by this International Standard.

8.3.105 RI - REVERSE LINE FEED

Notation: (C1)

Representation: 08/13 or ESC 04/13

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to PRESENTATION, RI causes the active presentation position to be moved in the presentation component to the corresponding character position of the preceding line.

If the DEVICE COMPONENT SELECT MODE (DCSM) is set to DATA, RI causes the active data position to be moved in the data component to the corresponding character position of the preceding line.

8.3.106 RIS - RESET TO INITIAL STATE

Notation: (Fs)

Representation: ESC 06/03

RIS causes a device to be reset to its initial state, i.e. the state it has after it is made operational. This may imply, if applicable: clear tabulation stops, remove qualified areas, reset graphic rendition, put all character positions into the erased state, move the active presentation position to the first position of the first line in the presentation component, move the active data position to the first character position of the first line in the data component, set the modes into the reset state, etc.

8.3.107 RM - RESET MODE

Notation: (Ps...)

Representation: CSI Ps... 06/12

No parameter default value.

RM causes the modes of the receiving device to be reset as specified by the parameter values:

1 GUARDED AREA TRANSFER MODE (GATM)
2 KEYBOARD ACTION MODE (KAM)
3 CONTROL REPRESENTATION MODE (CRM)
4 INSERTION REPLACEMENT MODE (IRM)
5 STATUS REPORT TRANSFER MODE (SRTM)

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6 ERASURE MODE (ERM)
7 LINE EDITING MODE (VEM)
8 BI-DIRECTIONAL SUPPORT MODE (BDSM)
9 DEVICE COMPONENT SELECT MODE (DCSM)
10 CHARACTER EDITING MODE (HEM)
11 POSITIONING UNIT MODE (PUM) (see F.4.1 in annex F)
12 SEND/RECEIVE MODE (SRM)
13 FORMAT EFFECTOR ACTION MODE (FEAM)
14 FORMAT EFFECTOR TRANSFER MODE (FETM)
15 MULTIPLE AREA TRANSFER MODE (MATM)
16 TRANSFER TERMINATION MODE (TTM)
17 SELECTED AREA TRANSFER MODE (SATM)
18 TABULATION STOP MODE (TSM)
19 (Shall not be used; see F.5.1 in annex F)
20 (Shall not be used; see F.5.2 in annex F)
21 GRAPHIC RENDITION COMBINATION MODE (GRCM)
22 ZERO DEFAULT MODE (ZDM) (see F.4.2 in annex F)

NOTE - Private modes may be implemented using private parameters, see 5.4.1 and 7.4.

8.3.108 SACS - SET ADDITIONAL CHARACTER SEPARATION

Notation: (Pn)

Representation: CSI Pn 02/00 05/12

Parameter default value: Pn = 0

SACS is used to establish extra inter-character escapement for subsequent text. The established extra escapement remains in effect until the next occurrence of SACS or of SET REDUCED CHARACTER SEPARATION (SRCS) in the data stream or until it is reset to the default value by a subsequent occurrence of CARRIAGE RETURN/LINE FEED (CR LF) or of NEXT LINE (NEL) in the data stream, see annex C.

Pn specifies the number of units by which the inter-character escapement is enlarged.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.109 SAPV - SELECT ALTERNATIVE PRESENTATION VARIANTS

Notation: (Ps...)

Representation: CSI Ps... 02/00 05/13

Parameter default value: Ps = 0

SAPV is used to specify one or more variants for the presentation of subsequent text. The parameter values are

0 default presentation (implementation-defined); cancels the effect of any preceding occurrence of SAPV in the data stream

1 the decimal digits are presented by means of the graphic symbols used in the Latin script

2 the decimal digits are presented by means of the graphic symbols used in the Arabic script

3 when the direction of the character path is right-to-left, each of the graphic characters in the graphic character set(s) in use which is one of a left/right-handed pair (parentheses, square brackets, curly brackets, greater-than/less-than signs, etc.) is presented as "mirrored", i.e. as the other member of the pair. For example, the coded graphic character given the name LEFT PARENTHESIS is presented as RIGHT PARENTHESIS, and vice versa

4 when the direction of the character path is right-to-left, all graphic characters which represent operators and delimiters in mathematical formulae and which are not symmetrical about a vertical axis are presented as mirrored about that vertical axis

5 the following graphic character is presented in its isolated form

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6 the following graphic character is presented in its initial form

7 the following graphic character is presented in its medial form

8 the following graphic character is presented in its final form

9 where the bit combination 02/14 is intended to represent a decimal mark in a decimal number it shall be presented by means of the graphic symbol FULL STOP

10 where the bit combination 02/14 is intended to represent a decimal mark in a decimal number it shall be presented by means of the graphic symbol COMMA

11 vowels are presented above or below the preceding character

12 vowels are presented after the preceding character

13 contextual shape determination of Arabic scripts, including the LAM-ALEPH ligature but excluding all other Arabic ligatures

14 contextual shape determination of Arabic scripts, excluding all Arabic ligatures

15 cancels the effect of parameter values 3 and 4

16 vowels are not presented

17 when the string direction is right-to-left, the italicized characters are slanted to the left; when the string direction is left-to-right, the italicized characters are slanted to the right

18 contextual shape determination of Arabic scripts is not used, the graphic characters - including the digits - are presented in the form they are stored (Pass-through)

19 contextual shape determination of Arabic scripts is not used, the graphic characters - excluding the digits - are presented in the form they are stored (Pass-through)

20 the graphic symbols used to present the decimal digits are device dependent

21 establishes the effect of parameter values 5, 6, 7, and 8 for the following graphic characters until cancelled

22 cancels the effect of parameter value 21, i.e. re-establishes the effect of parameter values 5, 6, 7, and 8 for the next single graphic character only.

8.3.110 SCI - SINGLE CHARACTER INTRODUCER

Notation: (C1)

Representation: 09/10 or ESC 05/10

SCI and the bit combination following it are used to represent a control function or a graphic character. The bit combination following SCI must be from 00/08 to 00/13 or 02/00 to 07/14. The use of SCI is reserved for future standardization.

8.3.111 SCO - SELECT CHARACTER ORIENTATION

Notation: (Ps)

Representation: CSI Ps 02/00 06/05

Parameter default value: Ps = 0

SCO is used to establish the amount of rotation of the graphic characters following in the data stream. The established value remains in effect until the next occurrence of SCO in the data stream.

The parameter values are

0 0°

1 45°

2 90°

3 135°

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4 180°

5 225°

6 270°

7 315°

Rotation is positive, i.e. counter-clockwise and applies to the normal presentation of the graphic characters along the character path. The centre of rotation of the affected graphic characters is not defined by this International Standard.

8.3.112 SCP - SELECT CHARACTER PATH

Notation: (Ps1;Ps2)

Representation: CSI Ps1;Ps2 02/00 06/11

No parameter default values.

SCP is used to select the character path, relative to the line orientation, for the active line (the line that contains the active presentation position) and subsequent lines in the presentation component. It is also used to update the content of the active line in the presentation component and the content of the active line (the line that contains the active data position) in the data component. This takes effect immediately.

Ps1 specifies the character path:

1 left-to-right (in the case of horizontal line orientation), or top-to-bottom (in the case of vertical line orientation)

2 right-to-left (in the case of horizontal line orientation), or bottom-to-top (in the case of vertical line orientation)

Ps2 specifies the effect on the content of the presentation component and the content of the data component:

0 undefined (implementation-dependent)

NOTE - This may also permit the effect to take place after the next occurrence of CR, NEL or any control function which initiates an absolute movement of the active presentation position or the active data position.

1 the content of the active line in the presentation component (the line that contains the active presentation position) is updated to correspond to the content of the active line in the data component (the line that contains the active data position) according to the newly established character path characteristics in the presentation component; the active data position is moved to the first character position in the active line in the data component, the active presentation position in the presentation component is updated accordingly;

2 the content of the active line in the data component (the line that contains the active data position) is updated to correspond to the content of the active line in the presentation component (the line that contains the active presentation position) according to the newly established character path characteristics of the presentation component; the active presentation position is moved to the first character position in the active line in the presentation component, the active data position in the data component is updated accordingly.

8.3.113 SCS - SET CHARACTER SPACING

Notation: (Pn)

Representation: CSI Pn 02/00 06/07

No parameter default value.

SCS is used to establish the character spacing for subsequent text. The established spacing remains in effect until the next occurrence of SCS, or of SELECT CHARACTER SPACING (SHS) or of SPACING INCREMENT (SPI) in the data stream, see annex C.

Pn specifies the character spacing.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

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8.3.114 SD - SCROLL DOWN

Notation: (Pn)

Representation: CSI Pn 05/14

Parameter default value: Pn = 1

SD causes the data in the presentation component to be moved by n line positions if the line orientation is horizontal, or by n character positions if the line orientation is vertical, such that the data appear to move down; where n equals the value of Pn.

The active presentation position is not affected by this control function.

8.3.115 SDS - START DIRECTED STRING

Notation: (Ps)

Representation: CSI Ps 05/13

Parameter default value: Ps = 0

SDS is used to establish in the data component the beginning and the end of a string of characters as well as the direction of the string. This direction may be different from that currently established. The indicated string follows the preceding text. The established character progression is not affected.

The beginning of a directed string is indicated by SDS with a parameter value not equal to 0. A directed string may contain one or more nested strings. These nested strings may be directed strings the beginnings of which are indicated by SDS with a parameter value not equal to 0, or reversed strings the beginnings of which are indicated by START REVERSED STRING (SRS) with a parameter value of 1. Every beginning of such a string invokes the next deeper level of nesting.

This International Standard does not define the location of the active data position within any such nested string.

The end of a directed string is indicated by SDS with a parameter value of 0. Every end of such a string re-establishes the next higher level of nesting (the one in effect prior to the string just ended). The direction is re-established to that in effect prior to the string just ended. The active data position is moved to the character position following the characters of the string just ended.

The parameter values are:

0 end of a directed string; re-establish the previous direction
1 start of a directed string; establish the direction left-to-right
2 start of a directed string; establish the direction right-to-left

NOTE 1
The effect of receiving a CVT, HT, SCP, SPD or VT control function within an SDS string is not defined by this International Standard.

NOTE 2
The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SDS string.

8.3.116 SEE - SELECT EDITING EXTENT

Notation: (Ps)

Representation: CSI Ps 05/01

Parameter default value: Ps = 0

SEE is used to establish the editing extent for subsequent character or line insertion or deletion. The established extent remains in effect until the next occurrence of SEE in the data stream. The editing extent depends on the parameter value:

0 the shifted part is limited to the active page in the presentation component
1 the shifted part is limited to the active line in the presentation component
2 the shifted part is limited to the active field in the presentation component
3 the shifted part is limited to the active qualified area
4 the shifted part consists of the relevant part of the entire presentation component.

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8.3.117 SEF - SHEET EJECT AND FEED

Notation: (Ps1;Ps2)

Representation: CSI Ps1;Ps2 02/00 05/09

Parameter default values: Ps1 = 0; Ps2 = 0

SEF causes a sheet of paper to be ejected from a printing device into a specified output stacker and another sheet to be loaded into the printing device from a specified paper bin.

Parameter values of Ps1 are:

0 eject sheet, no new sheet loaded
1 eject sheet and load another from bin 1
2 eject sheet and load another from bin 2
.
.
.
n eject sheet and load another from bin n

Parameter values of Ps2 are:

0 eject sheet, no stacker specified
1 eject sheet into stacker 1
2 eject sheet into stacker 2
.
.
.
n eject sheet into stacker n

8.3.118 SGR - SELECT GRAPHIC RENDITION

Notation: (Ps...)

Representation: CSI Ps... 06/13

Parameter default value: Ps = 0

SGR is used to establish one or more graphic rendition aspects for subsequent text. The established aspects remain in effect until the next occurrence of SGR in the data stream, depending on the setting of the GRAPHIC RENDITION COMBINATION MODE (GRCM). Each graphic rendition aspect is specified by a parameter value:

0 default rendition (implementation-defined), cancels the effect of any preceding occurrence of SGR in the data stream regardless of the setting of the GRAPHIC RENDITION COMBINATION MODE (GRCM)

1 bold or increased intensity
2 faint, decreased intensity or second colour
3 italicized
4 singly underlined
5 slowly blinking (less then 150 per minute)
6 rapidly blinking (150 per minute or more)
7 negative image
8 concealed characters
9 crossed-out (characters still legible but marked as to be deleted)
10 primary (default) font
11 first alternative font
12 second alternative font
13 third alternative font
14 fourth alternative font
15 fifth alternative font
16 sixth alternative font

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17 seventh alternative font
18 eighth alternative font
19 ninth alternative font
20 Fraktur (Gothic)
21 doubly underlined
22 normal colour or normal intensity (neither bold nor faint)
23 not italicized, not fraktur
24 not underlined (neither singly nor doubly)
25 steady (not blinking)
26 (reserved for proportional spacing as specified in CCITT Recommendation T.61)
27 positive image
28 revealed characters
29 not crossed out
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; intended for setting character foreground colour as specified in ISO 8613-6 [CCITT Recommendation T.416])
39 default display colour (implementation-defined)
40 black background
41 red background
42 green background
43 yellow background
44 blue background
45 magenta background
46 cyan background
47 white background
48 (reserved for future standardization; intended for setting character background colour as specified in ISO 8613-6 [CCITT Recommendation T.416])
49 default background colour (implementation-defined)
50 (reserved for cancelling the effect of the rendering aspect established by parameter value 26)
51 framed
52 encircled
53 overlined
54 not framed, not encircled
55 not overlined
56 (reserved for future standardization)
57 (reserved for future standardization)
58 (reserved for future standardization)
59 (reserved for future standardization)
60 single line below character with horizontal line orientation or single line on the right side of character with vertical line orientation
61 double line below character with horizontal line orientation or double line on the right side of character with vertical line orientation
62 single line above character with horizontal line orientation or single line on the left side of character with vertical line orientation
63 double line above character with horizontal line orientation or double line on the left side of character with vertical line orientation
64 ideogram stress marking
65 cancels the effect of the rendition aspects established by parameter values 60 to 64 and 66 to 69

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66 single line below character with horizontal line orientation or single line on the left side of character with vertical line orientation
67 double line below character with horizontal line orientation or double line on the left side of character with vertical line orientation
68 single line above character with horizontal line orientation or single line on the right side of character with vertical line orientation
69 double line above character with horizontal line orientation or double line on the right side of character with vertical line orientation

NOTE - The usable combinations of parameter values are determined by the implementation.

8.3.119 SHS - SELECT CHARACTER SPACING

Notation: (Ps)

Representation: CSI Ps 02/00 04/11

Parameter default value: Ps = 0

SHS is used to establish the character spacing for subsequent text. The established spacing remains in effect until the next occurrence of SHS or of SET CHARACTER SPACING (SCS) or of SPACING INCREMENT (SPI) in the data stream. The parameter values are

0 10 characters per 25,4 mm
1 12 characters per 25,4 mm
2 15 characters per 25,4 mm
3 6 characters per 25,4 mm
4 3 characters per 25,4 mm
5 9 characters per 50,8 mm
6 4 characters per 25,4 mm

8.3.120 SI - SHIFT-IN

Notation: (C0)

Representation: 00/15

SI is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of SI is defined in International Standard ISO 2022.

NOTE - SI is used in 7-bit environments only; in 8-bit environments LOCKING-SHIFT ZERO (LS0) is used instead.

8.3.121 SIMD - SELECT IMPLICIT MOVEMENT DIRECTION

Notation: (Ps)

Representation: CSI Ps 05/14

Parameter default value: Ps = 0

SIMD is used to select the direction of implicit movement of the data position relative to the character progression. The direction selected remains in effect until the next occurrence of SIMD.

The parameter values are:

0 the direction of implicit movement is the same as that of the character progression
1 the direction of implicit movement is opposite to that of the character progression.

8.3.122 SL - SCROLL LEFT

Notation: (Pn)

Representation: CSI Pn 02/00 04/00

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Parameter default value: Pn = 1

SL causes the data in the presentation component to be moved by n character positions if the line orientation is horizontal, or by n line positions if the line orientation is vertical, such that the data appear to move to the left; where n equals the value of Pn.

The active presentation position is not affected by this control function.

8.3.123 SLH - SET LINE HOME

Notation: (Pn)

Representation: CSI Pn 02/00 05/05

No parameter default value.

If the DEVICE COMPONENT SELECT MODE is set to PRESENTATION, SLH is used to establish at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component the position to which the active presentation position will be moved by subsequent occurrences of CARRIAGE RETURN (CR), DELETE LINE (DL), INSERT LINE (IL) or NEXT LINE (NEL) in the data stream; where n equals the value of Pn. In the case of a device without data component, it is also the position ahead of which no implicit movement of the active presentation position shall occur.

If the DEVICE COMPONENT SELECT MODE is set to DATA, SLH is used to establish at character position n in the active line (the line that contains the active data position) and lines of subsequent text in the data component the position to which the active data position will be moved by subsequent occurrences of CARRIAGE RETURN (CR), DELETE LINE (DL), INSERT LINE (IL) or NEXT LINE (NEL) in the data stream; where n equals the value of Pn. It is also the position ahead of which no implicit movement of the active data position shall occur.

The established position is called the line home position and remains in effect until the next occurrence of SLH in the data stream.

8.3.124 SLL - SET LINE LIMIT

Notation: (Pn)

Representation: CSI Pn 02/00 05/06

No parameter default value.

If the DEVICE COMPONENT SELECT MODE is set to PRESENTATION, SLL is used to establish at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component the position to which the active presentation position will be moved by subsequent occurrences of CARRIAGE RETURN (CR), or NEXT LINE (NEL) in the data stream if the parameter value of SELECT IMPLICIT MOVEMENT DIRECTION (SIMD) is equal to 1; where n equals the value of Pn. In the case of a device without data component, it is also the position beyond which no implicit movement of the active presentation position shall occur.

If the DEVICE COMPONENT SELECT MODE is set to DATA, SLL is used to establish at character position n in the active line (the line that contains the active data position) and lines of subsequent text in the data component the position beyond which no implicit movement of the active data position shall occur. It is also the position in the data component to which the active data position will be moved by subsequent occurrences of CR or NEL in the data stream, if the parameter value of SELECT IMPLICIT MOVEMENT DIRECTION (SIMD) is equal to 1.

The established position is called the line limit position and remains in effect until the next occurrence of SLL in the data stream.

8.3.125 SLS - SET LINE SPACING

Notation: (Pn)

Representation: CSI Pn 02/00 06/08

No parameter default value.

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SLS is used to establish the line spacing for subsequent text. The established spacing remains in effect until the next occurrence of SLS or of SELECT LINE SPACING (SVS) or of SPACING INCREMENT (SPI) in the data stream.

Pn specifies the line spacing.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.126 SM - SET MODE

Notation: (Ps...)

Representation: CSI Ps... 06/08

No parameter default value.

SM causes the modes of the receiving device to be set as specified by the parameter values:

1 GUARDED AREA TRANSFER MODE (GATM)
2 KEYBOARD ACTION MODE (KAM)
3 CONTROL REPRESENTATION MODE (CRM)
4 INSERTION REPLACEMENT MODE (IRM)
5 STATUS REPORT TRANSFER MODE (SRTM)
6 ERASURE MODE (ERM)
7 LINE EDITING MODE (VEM)
8 BI-DIRECTIONAL SUPPORT MODE (BDSM)
9 DEVICE COMPONENT SELECT MODE (DCSM)
10 CHARACTER EDITING MODE (HEM)
11 POSITIONING UNIT MODE (PUM) (see F.4.1 in annex F)
12 SEND/RECEIVE MODE (SRM)
13 FORMAT EFFECTOR ACTION MODE (FEAM)
14 FORMAT EFFECTOR TRANSFER MODE (FETM)
15 MULTIPLE AREA TRANSFER MODE (MATM)
16 TRANSFER TERMINATION MODE (TTM)
17 SELECTED AREA TRANSFER MODE (SATM)
18 TABULATION STOP MODE (TSM)
19 (Shall not be used; see F.5.1 in annex F)
20 (Shall not be used; see F.5.2 in annex F)
21 GRAPHIC RENDITION COMBINATION (GRCM)
22 ZERO DEFAULT MODE (ZDM) (see F.4.2 in annex F)

NOTE - Private modes may be implemented using private parameters, see 5.4.1 and 7.4.

8.3.127 SO - SHIFT-OUT

Notation: (C0)

Representation: 00/14

SO is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of SO is defined in International Standard ISO 2022.

NOTE - SO is used in 7-bit environments only; in 8-bit environments LOCKING-SHIFT ONE (LS1) is used instead.

8.3.128 SOH - START OF HEADING

Notation: (C0)

Representation: 00/01

SOH is used to indicate the beginning of a heading.

The use of SOH is defined in ISO 1745.

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8.3.129 SOS - START OF STRING

Notation: (C1)

Representation: 09/08 or ESC 05/08

SOS is used as the opening delimiter of a control string. The character string following may consist of any bit combination, except those representing SOS or STRING TERMINATOR (ST). The control string is closed by the terminating delimiter STRING TERMINATOR (ST). The interpretation of the character string depends on the application.

8.3.130 SPA - START OF GUARDED AREA

Notation: (C1)

Representation: 09/06 or ESC 05/06

SPA is used to indicate that the active presentation position is the first of a string of character positions in the presentation component, the contents of which are protected against manual alteration, are guarded against transmission or transfer, depending on the setting of the GUARDED AREA TRANSFER MODE (GATM) and may be protected against erasure, depending on the setting of the ERASURE MODE (ERM). The end of this string is indicated by END OF GUARDED AREA (EPA).

NOTE - The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string or an SDS string.

8.3.131 SPD - SELECT PRESENTATION DIRECTIONS

Notation: (Ps1;Ps2)

Representation: CSI Ps1;Ps2 02/00 05/03

Parameter default value: Ps1 = 0; Ps2 = 0

SPD is used to select the line orientation, the line progression, and the character path in the presentation component. It is also used to update the content of the presentation component and the content of the data component. This takes effect immediately.

Ps1 specifies the line orientation, the line progression and the character path:

0 line orientation: horizontal
line progression: top-to-bottom
character path: left-to-right

1 line orientation: vertical
line progression: right-to-left
character path: top-to-bottom

2 line orientation: vertical
line progression: left-to-right
character path: top-to-bottom

3 line orientation: horizontal
line progression: top-to-bottom
character path: right-to-left

4 line orientation: vertical
line progression: left-to-right
character path: bottom-to-top

5 line orientation: horizontal
line progression: bottom-to-top
character path: right-to-left

6 line orientation: horizontal
line progression: bottom-to-top
character path: left-to-right

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7 line orientation: vertical
line progression: right-to-left
character path: bottom-to-top

Ps2 specifies the effect on the content of the presentation component and the content of the data component:

0 undefined (implementation-dependent)

NOTE - This may also permit the effect to take place after the next occurrence of CR, FF or any control function which initiates an absolute movement of the active presentation position or the active data position.

1 the content of the presentation component is updated to correspond to the content of the data component according to the newly established characteristics of the presentation component; the active data position is moved to the first character position in the first line in the data component, the active presentation position in the presentation component is updated accordingly

2 the content of the data component is updated to correspond to the content of the presentation component according to the newly established characteristics of the presentation component; the active presentation position is moved to the first character position in the first line in the presentation component, the active data position in the data component is updated accordingly.

8.3.132 SPH - SET PAGE HOME

Notation: (Pn)

Representation: CSI Pn 02/00 06/09

No parameter default value.

If the DEVICE COMPONENT SELECT MODE is set to PRESENTATION, SPH is used to establish at line position n in the active page (the page that contains the active presentation position) and subsequent pages in the presentation component the position to which the active presentation position will be moved by subsequent occurrences of FORM FEED (FF) in the data stream; where n equals the value of Pn. In the case of a device without data component, it is also the position ahead of which no implicit movement of the active presentation position shall occur.

If the DEVICE COMPONENT SELECT MODE is set to DATA, SPH is used to establish at line position n in the active page (the page that contains the active data position) and subsequent pages in the data component the position to which the active data position will be moved by subsequent occurrences of FORM FEED (FF) in the data stream; where n equals the value of Pn. It is also the position ahead of which no implicit movement of the active presentation position shall occur.

The established position is called the page home position and remains in effect until the next occurrence of SPH in the data stream.

8.3.133 SPI - SPACING INCREMENT

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 02/00 04/07

No parameter default values.

SPI is used to establish the line spacing and the character spacing for subsequent text. The established line spacing remains in effect until the next occurrence of SPI or of SET LINE SPACING (SLS) or of SELECT LINE SPACING (SVS) in the data stream. The established character spacing remains in effect until the next occurrence of SET CHARACTER SPACING (SCS) or of SELECT CHARACTER SPACING (SHS) in the data stream, see annex C.

Pn1 specifies the line spacing

Pn2 specifies the character spacing

The unit in which the parameter values are expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

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8.3.134 SPL - SET PAGE LIMIT

Notation: (Pn)

Representation: CSI Pn 02/00 06/10

No parameter default value.

If the DEVICE COMPONENT SELECT MODE is set to PRESENTATION, SPL is used to establish at line position n in the active page (the page that contains the active presentation position) and pages of subsequent text in the presentation component the position beyond which the active presentation position can normally not be moved; where n equals the value of Pn. In the case of a device without data component, it is also the position beyond which no implicit movement of the active presentation position shall occur.

If the DEVICE COMPONENT SELECT MODE is set to DATA, SPL is used to establish at line position n in the active page (the page that contains the active data position) and pages of subsequent text in the data component the position beyond which no implicit movement of the active data position shall occur.

The established position is called the page limit position and remains in effect until the next occurrence of SPL in the data stream.

8.3.135 SPQR - SELECT PRINT QUALITY AND RAPIDITY

Notation: (Ps)

Representation: CSI Ps 02/00 05/08

Parameter default value: Ps = 0

SPQR is used to select the relative print quality and the print speed for devices the output quality and speed of which are inversely related. The selected values remain in effect until the next occurrence of SPQR in the data stream. The parameter values are

0 highest available print quality, low print speed
1 medium print quality, medium print speed
2 draft print quality, highest available print speed

8.3.136 SR - SCROLL RIGHT

Notation: (Pn)

Representation: CSI Pn 02/00 04/01

Parameter default value: Pn = 1

SR causes the data in the presentation component to be moved by n character positions if the line orientation is horizontal, or by n line positions if the line orientation is vertical, such that the data appear to move to the right; where n equals the value of Pn.

The active presentation position is not affected by this control function.

8.3.137 SRCS - SET REDUCED CHARACTER SEPARATION

Notation: (Pn)

Representation: CSI Pn 02/00 06/06

Parameter default value: Pn = 0

SRCS is used to establish reduced inter-character escapement for subsequent text. The established reduced escapement remains in effect until the next occurrence of SRCS or of SET ADDITIONAL CHARACTER SEPARATION (SACS) in the data stream or until it is reset to the default value by a subsequent occurrence of CARRIAGE RETURN/LINE FEED (CR/LF) or of NEXT LINE (NEL) in the data stream, see annex C.

Pn specifies the number of units by which the inter-character escapement is reduced.

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The unit in which the parameter values are expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.138 SRS - START REVERSED STRING

Notation: (Ps)

Representation: CSI Ps 05/11

Parameter default value: Ps = 0

SRS is used to establish in the data component the beginning and the end of a string of characters as well as the direction of the string. This direction is opposite to that currently established. The indicated string follows the preceding text. The established character progression is not affected.

The beginning of a reversed string is indicated by SRS with a parameter value of 1. A reversed string may contain one or more nested strings. These nested strings may be reversed strings the beginnings of which are indicated by SRS with a parameter value of 1, or directed strings the beginnings of which are indicated by START DIRECTED STRING (SDS) with a parameter value not equal to 0. Every beginning of such a string invokes the next deeper level of nesting.

This International Standard does not define the location of the active data position within any such nested string.

The end of a reversed string is indicated by SRS with a parameter value of 0. Every end of such a string re-establishes the next higher level of nesting (the one in effect prior to the string just ended). The direction is re-established to that in effect prior to the string just ended. The active data position is moved to the character position following the characters of the string just ended.

The parameter values are:

0 end of a reversed string; re-establish the previous direction
1 beginning of a reversed string; reverse the direction.

NOTE 1
The effect of receiving a CVT, HT, SCP, SPD or VT control function within an SRS string is not defined by this International Standard.

NOTE 2
The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string.

8.3.139 SSA - START OF SELECTED AREA

Notation: (C1)

Representation: 08/06 or ESC 04/06

SSA is used to indicate that the active presentation position is the first of a string of character positions in the presentation component, the contents of which are eligible to be transmitted in the form of a data stream or transferred to an auxiliary input/output device.

The end of this string is indicated by END OF SELECTED AREA (ESA). The string of characters actually transmitted or transferred depends on the setting of the GUARDED AREA TRANSFER MODE (GATM) and on any guarded areas established by DEFINE AREA QUALIFICATION (DAQ), or by START OF GUARDED AREA (SPA) and END OF GUARDED AREA (EPA).

NOTE - The control functions for area definition (DAQ, EPA, ESA, SPA, SSA) should not be used within an SRS string or an SDS string.

8.3.140 SSU - SELECT SIZE UNIT

Notation: (Ps)

Representation: CSI Ps 02/00 04/09

Parameter default value: Ps = 0

SSU is used to establish the unit in which the numeric parameters of certain control functions are expressed. The established unit remains in effect until the next occurrence of SSU in the data stream. The parameter values are

0 CHARACTER - The dimensions of this unit are device-dependent

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1 MILLIMETRE

2 COMPUTER DECIPOINT - 0,035 28 mm (1/720 of 25,4 mm)
3 DECIDIDOT - 0,037 59 mm (10/266 mm)
4 MIL - 0,025 4 mm (1/1 000 of 25,4 mm)
5 BASIC MEASURING UNIT (BMU) - 0,021 17 mm (1/1 200 of 25,4 mm)
6 MICROMETRE - 0,001 mm
7 PIXEL - The smallest increment that can be specified in a device
8 DECIPOINT - 0,035 14 mm (35/996 mm)

8.3.141 SSW - SET SPACE WIDTH

Notation: (Pn)

Representation: CSI Pn 02/00 05/11

No parameter default value.

SSW is used to establish for subsequent text the character escapement associated with the character SPACE. The established escapement remains in effect until the next occurrence of SSW in the data stream or until it is reset to the default value by a subsequent occurrence of CARRIAGE RETURN/LINE FEED (CR/LF), CARRIAGE RETURN/FORM FEED (CR/FF), or of NEXT LINE (NEL) in the data stream, see annex C.

Pn specifies the escapement.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

The default character escapement of SPACE is specified by the most recent occurrence of SET CHARACTER SPACING (SCS) or of SELECT CHARACTER SPACING (SHS) or of SELECT SPACING INCREMENT (SPI) in the data stream if the current font has constant spacing, or is specified by the nominal width of the character SPACE in the current font if that font has proportional spacing.

8.3.142 SS2 - SINGLE-SHIFT TWO

Notation: (C1)

Representation: 08/14 or ESC 04/14

SS2 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of SS2 is defined in International Standard ISO 2022.

8.3.143 SS3 - SINGLE-SHIFT THREE

Notation: (C1)

Representation: 08/15 or ESC 04/15

SS3 is used for code extension purposes. It causes the meanings of the bit combinations following it in the data stream to be changed.

The use of SS3 is defined in International Standard ISO 2022.

8.3.144 ST - STRING TERMINATOR

Notation: (C1)

Representation: 09/12 or ESC 05/12

ST is used as the closing delimiter of a control string opened by APPLICATION PROGRAM COMMAND (APC), DEVICE CONTROL STRING (DCS), OPERATING SYSTEM COMMAND (OSC), PRIVACY MESSAGE (PM), or START OF STRING (SOS).

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8.3.145 STAB - SELECTIVE TABULATION

Notation: (Ps)

Representation: CSI Ps 02/00 05/14

No parameter default value.

STAB causes subsequent text in the presentation component to be aligned according to the position and the properties of a tabulation stop which is selected from a list according to the value of the parameter Ps.

The use of this control function and means of specifying a list of tabulation stops to be referenced by the control function are specified in other standards, for example ISO 8613-6.

8.3.146 STS - SET TRANSMIT STATE

Notation: (C1)

Representation: 09/03 or ESC 05/03

STS is used to establish the transmit state in the receiving device. In this state the transmission of data from the device is possible.

The actual initiation of transmission of data is performed by a data communication or input/output interface control procedure which is outside the scope of this International Standard.

The transmit state is established either by STS appearing in the received data stream or by the operation of an appropriate key on a keyboard.

8.3.147 STX - START OF TEXT

Notation: (C0)

Representation: 00/02

STX is used to indicate the beginning of a text and the end of a heading.

The use of STX is defined in ISO 1745.

8.3.148 SU - SCROLL UP

Notation: (Pn)

Representation: CSI Pn 05/03

Parameter default value: Pn = 1

SU causes the data in the presentation component to be moved by n line positions if the line orientation is horizontal, or by n character positions if the line orientation is vertical, such that the data appear to move up; where n equals the value of Pn.

The active presentation position is not affected by this control function.

8.3.149 SUB - SUBSTITUTE

Notation: (C0)

Representation: 01/10

SUB is used in the place of a character that has been found to be invalid or in error. SUB is intended to be introduced by automatic means.

8.3.150 SVS - SELECT LINE SPACING

Notation: (Ps)

Representation: CSI Ps 02/00 04/12

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Parameter default value: Ps = 0

SVS is used to establish the line spacing for subsequent text. The established spacing remains in effect until the next occurrence of SVS or of SET LINE SPACING (SLS) or of SPACING INCREMENT (SPI) in the data stream. The parameter values are:

0 6 lines per 25,4 mm
1 4 lines per 25,4 mm
2 3 lines per 25,4 mm
3 12 lines per 25,4 mm
4 8 lines per 25,4 mm
5 6 lines per 30,0 mm
6 4 lines per 30,0 mm
7 3 lines per 30,0 mm
8 12 lines per 30,0 mm
9 2 lines per 25,4 mm

8.3.151 SYN - SYNCHRONOUS IDLE

Notation: (C0)

Representation: 01/06

SYN is used by a synchronous transmission system in the absence of any other character (idle condition) to provide a signal from which synchronism may be achieved or retained between data terminal equipment.

The use of SYN is defined in ISO 1745.

8.3.152 TAC - TABULATION ALIGNED CENTRED

Notation: (Pn)

Representation: CSI Pn 02/00 06/02

No parameter default value.

TAC causes a character tabulation stop calling for centring to be set at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component, where n equals the value of Pn. TAC causes the replacement of any tabulation stop previously set at that character position, but does not affect other tabulation stops.

A text string centred upon a tabulation stop set by TAC will be positioned so that the (trailing edge of the) first graphic character and the (leading edge of the) last graphic character are at approximately equal distances from the tabulation stop.

8.3.153 TALE - TABULATION ALIGNED LEADING EDGE

Notation: (Pn)

Representation: CSI Pn 02/00 06/01

No parameter default value.

TALE causes a character tabulation stop calling for leading edge alignment to be set at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component, where n equals the value of Pn. TALE causes the replacement of any tabulation stop previously set at that character position, but does not affect other tabulation stops.

A text string aligned with a tabulation stop set by TALE will be positioned so that the (leading edge of the) last graphic character of the string is placed at the tabulation stop.

8.3.154 TATE - TABULATION ALIGNED TRAILING EDGE

Notation: (Pn)

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Representation: CSI Pn 02/00 06/00

No parameter default value.

TATE causes a character tabulation stop calling for trailing edge alignment to be set at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component, where n equals the value of Pn. TATE causes the replacement of any tabulation stop previously set at that character position, but does not affect other tabulation stops.

A text string aligned with a tabulation stop set by TATE will be positioned so that the (trailing edge of the) first graphic character of the string is placed at the tabulation stop.

8.3.155 TBC - TABULATION CLEAR

Notation: (Ps)

Representation: CSI Ps 06/07

Parameter default value: Ps = 0

TBC causes one or more tabulation stops in the presentation component to be cleared, depending on the parameter value:

0 the character tabulation stop at the active presentation position is cleared
1 the line tabulation stop at the active line is cleared
2 all character tabulation stops in the active line are cleared
3 all character tabulation stops are cleared
4 all line tabulation stops are cleared
5 all tabulation stops are cleared

In the case of parameter value 0 or 2 the number of lines affected depends on the setting of the TABULATION STOP MODE (TSM)

8.3.156 TCC - TABULATION CENTRED ON CHARACTER

Notation: (Pn1;Pn2)

Representation: CSI Pn1;Pn2 02/00 06/03

No parameter default value for Pn1

Parameter default value: Pn2 = 32

TCC causes a character tabulation stop calling for alignment of a target graphic character to be set at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component, where n equals the value of Pn1, and the target character about which centring is to be performed is specified by Pn2. TCC causes the replacement of any tabulation stop previously set at that character position, but does not affect other tabulation stops.

The positioning of a text string aligned with a tabulation stop set by TCC will be determined by the first occurrence in the string of the target graphic character; that character will be centred upon the tabulation stop. If the target character does not occur within the string, then the trailing edge of the first character of the string will be positioned at the tabulation stop.

The value of Pn2 indicates the code table position (binary value) of the target character in the currently invoked code. For a 7-bit code, the permissible range of values is 32 to 127; for an 8-bit code, the permissible range of values is 32 to 127 and 160 to 255.

8.3.157 TSR - TABULATION STOP REMOVE

Notation: (Pn)

Representation: CSI Pn 02/00 06/04

No parameter default value.

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TSR causes any character tabulation stop at character position n in the active line (the line that contains the active presentation position) and lines of subsequent text in the presentation component to be cleared, but does not affect other tabulation stops. n equals the value of Pn.

8.3.158 TSS - THIN SPACE SPECIFICATION

Notation: (Pn)

Representation: CSI Pn 02/00 04/05

No parameter default value.

TSS is used to establish the width of a thin space for subsequent text. The established width remains in effect until the next occurrence of TSS in the data stream, see annex C.

Pn specifies the width of the thin space.

The unit in which the parameter value is expressed is that established by the parameter value of SELECT SIZE UNIT (SSU).

8.3.159 VPA - LINE POSITION ABSOLUTE

Notation: (Pn)

Representation: CSI Pn 06/04

Parameter default value: Pn = 1

VPA causes the active data position to be moved to line position n in the data component in a direction parallel to the line progression, where n equals the value of Pn.

8.3.160 VPB - LINE POSITION BACKWARD

Notation: (Pn)

Representation: CSI Pn 06/11

Parameter default value: Pn = 1

VPB causes the active data position to be moved by n line positions in the data component in a direction opposite to that of the line progression, where n equals the value of Pn.

8.3.161 VPR - LINE POSITION FORWARD

Notation: (Pn)

Representation: CSI Pn 06/05

Parameter default value: Pn = 1

VPR causes the active data position to be moved by n line positions in the data component in a direction parallel to the line progression, where n equals the value of Pn.

8.3.162 VT - LINE TABULATION

Notation: (C0)

Representation: 00/11

VT causes the active presentation position to be moved in the presentation component to the corresponding character position on the line at which the following line tabulation stop is set.

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8.3.163 VTS - LINE TABULATION SET

Notation: (C1)

Representation: 08/10 or ESC 04/10

VTS causes a line tabulation stop to be set at the active line (the line that contains the active presentation position).

9 Transformation between 7-bit and 8-bit coded representations

The control functions defined in this International 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 International Standard 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 which are formally in disagreement with this International Standard.

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

In an 8-bit code, the bit combinations of columns 10 to 15 are permitted to represent

- Parameter Bytes, Intermediate Bytes, and Final Bytes of a control sequence
- the contents of the command string or the character string as part of a control string (see 5.6)
- the operand of a single-shift control function.

In these situations, the bit combinations in the range 10/00 to 15/14 shall have the same meanings as the corresponding bit combinations in the range 02/00 to 07/14.

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

- between the CONTROL SEQUENCE INTRODUCER (CSI) and the Final Byte of a control sequence,
- between the opening delimiter of a control string and the STRING TERMINATOR (ST),
- between a single-shift control function and its operand.

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

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Annex A

(informative)

Formator functions and editor functions

A.1 Differences between editor functions and formator functions

The contrast between editor functions and formator functions, together with their interaction with certain modes, is illustrated by the following example of the use of the control functions CURSOR NEXT LINE (CNL) and NEXT LINE (NEL).

In the example it is assumed that the direction of the character path is from left to right and the direction of the line progression is from top to bottom.

Furthermore, it is assumed that the string of capital letters

A B C D E F

has been entered or received, and that the active presentation position has been moved back to the letter D, for example, by means of CURSOR LEFT (CUB). Starting from this situation, the following cases are considered:

a) A CURSOR NEXT LINE (CNL) is received. In this case, the active presentation position is moved to the beginning of the next line without affecting the previously received data.

b) With the FORMAT EFFECTOR ACTION MODE (FEAM) set to EXECUTE, a NEXT LINE (NEL) is received. This has the same effect as in case a).

c) With the FORMAT EFFECTOR ACTION MODE (FEAM) set to STORE and the INSERTION REPLACEMENT MODE (IRM) set to REPLACE, a NEXT LINE (NEL) is received. In this case, the letter D is replaced by NEL.

If the data is subsequently forwarded to another device operating with the FORMAT EFFECTOR ACTION MODE (FEAM) set to EXECUTE, the effect is:

A B C

E F

d) With the FORMAT EFFECTOR ACTION MODE (FEAM) set to STORE and the INSERTION REPLACEMENT MODE (IRM) set to INSERT, a NEXT LINE (NEL) is received. In this case, the NEL is inserted between the letters C and D. If the data is subsequently forwarded to another device operating with the FORMAT EFFECTOR ACTION MODE (FEAM) set to EXECUTE, the effect is:

A B C

D E F

Formator functions which have been received while the FORMAT EFFECTOR ACTION MODE (FEAM) is set to STORE can be operated upon with editor functions.

For example, the NEL which has been inserted between **A B C** and **D E F** in case d) can be deleted using DELETE CHARACTER (DCH), resulting in the initial situation being restored.

A.2 Composite graphic characters

Because the formator functions can be stored in a receiving device, as opposed to the editor functions which are immediately performed, formator functions may be used but editor functions shall not be used for the construction of composite graphic characters. For example, if the symbol = is to be composed using = (EQUALS SIGN) and / (SOLIDUS), the sequence:

= CUB /

does not produce the desired effect if received by a device which has no overstrike capability. Such a device may, however, process the sequence:

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= BS /

in such a way that it is preserved and can be forwarded to a device which can indeed produce the intended composite symbol.

This example serves only the purpose of illustrating the difference between the effects of editor and formator functions. Where two or more graphic characters are to be imaged by a single graphic symbol, this should be done by using the control function GRAPHIC CHARACTER COMBINATION (GCC).

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Annex B

(informative)

Coding examples

B.1 Examples of complete control sequences

The general format of a control sequence is:

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

In an 8-bit environment the control function CURSOR RIGHT (CUF) by one position can be represented by

09/11 03/01 04/03 or 01/11 05/11 03/01 04/03

Other examples are

09/11 03/00 03/01 04/03

09/11 04/03

The first example shows that leading ZEROs (03/00) are not significant. The second example uses the fact that a default value for CUF is defined and is equal to 1.

In a 7-bit environment the representation is

01/11 05/11 03/01 04/03

The representation of the two examples above is then

01/11 05/11 03/00 03/01 04/03

01/11 05/11 04/03

In an 8-bit environment the control function SCROLL RIGHT (SR) by 28 positions can be represented for instance by

09/11 03/02 03/08 02/00 04/01 or 01/11 05/11 03/02 03/08 02/00 04/01

In a 7-bit environment the corresponding representation is

01/11 05/11 03/02 03/08 02/00 04/01

In an 8-bit environment the control function DEFINE AREA QUALIFICATION (DAQ) permitting numeric and alphabetic data to be entered into an input area can be represented by

09/11 03/03 03/11 03/04 06/15 or 01/11 05/11 03/03 03/11 03/04 06/15

In a 7-bit environment the corresponding representation is

01/11 05/11 03/03 03/11 03/04 06/15

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B.2 Examples of parameter strings

Character	Bit combination	Explanation
7	03/07	A parameter having the value 7.
98	03/09 03/08	A parameter having thevalue 98.
4;2	03/04 03/11 03/02	Two parameters having the values 4 and 2, respectively.
=3	03/13 03/03	A private parameter string.
6;	03/06 03/11	Two parameters, the first having the value 6 and the second taking the default value.
;5	03/11 03/05	Two parameters, the first taking the default value and the second having the value 5.
1;;4	03/01 03/11 03/11 03/04	Three parameters, the first having the value 1, the second taking the default value, and the third having the value 4.
0007	03/00 03/00 03/00 03/07	A parameter having the value 7.

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Annex C

(informative)

Text composition considerations

Display devices and systems involving text composition may use the control functions JUSTIFY (JFY) and QUAD (QUAD). When working in the field of text composition several words are used with quite specialized meaning. Those words have been used in this Standard with the meaning from the technology of the printing and publishing industry. Explanation is provided in this annex in terms compatible with coded information interchange and the concepts of character-imaging devices.

Both QUAD and JFY deal with the positioning of text (graphic characters and free spaces) between "margins". Margins are areas protected against display at the boundaries of which lines of text may start and terminate. In the general case of a display device with a multiple-page buffer (capable of the QUAD or JFY functions) the margin(s) would be set at arbitrary absolute character positions. The QUAD function deals with single lines of text from the data stream, while the JFY function may deal with more than one line. In both cases it is possible to "flush" text. When text is flush, it starts or ends, as applicable, against a marginal boundary. Flush to line home position margin means start text at the appropriate margin (or first margin line home position in columnar texts). Similarly, flush to line limit position margin means to end text at that appropriate margin. In the process of making text flush, open spaces may be generated.

The action to "fill" open spaces involves a concept particular to the JFY and QUAD functions. The open spaces may be filled with a "leader" in the QUAD function. A leader is a pattern (most often a repeated string of graphic characters) which is inserted into the open area. In the use of the JFY function the fill operation is more complicated and will be described below.

Having considered margins and flush text it is necessary to consider text which is not intended to be flush to the margins. Text which meets this criterion falls into two classes. They are "centred" text and "ragged" text. This Standard deals explicitly with ragged text. Centred text is arranged between margins such that the open space to the line home position margin and to the line limit position margin are as equal as possible. Ragged is the term applied when text is neither centred nor flush to a margin.

The process using the JFY function involves the arrangement of text between margins either being flush (explicitly) or ragged (implicitly). In order to accomplish flush to line home position margin and to line limit position margin, "fill" may be required. The fill may consist of spaces of different width, words, or parts of words. For the purpose of this description a word is considered as including the graphic characters of the word itself and the punctuation mark or SPACE terminating the word. The rules regarding a specific justification process depend on the combination of the parameter values used. A line which is to be justified to line home position margin and line limit position margin with word fill will first be adjusted in length by the addition or removal of text in the form of words until the remaining words fit between the established margins. Words added to a line by such a process will be obtained from the data stream from its following line(s). Words removed from the line will be returned to the data stream in its following lines. Subsequent to having sufficient words to fit between margins the open spaces (between words or graphic characters) may be adjusted to accomplish the combined flush-to-line home position margin and flush-to-line limit position margin action. This spacing is adjusted by intervals, or variable-size spaces according to the implementation. When the word space parameter value has been used the spacing adjustment occurs between words. When the letter space parameter value has been used the spacing adjustment occurs between adjacent graphic characters. When both word space and letter space parameter values have been used the strategy for selecting which spacings are to be adjusted is implementation-dependent. Special cases of the above involve the use of partial words in the fill process. In these cases a hyphenation process is used. If the hyphenation parameter value is used, words may be subdivided according to an implementation strategy at language intervals, often corresponding to syllables. If the Italian hyphenation parameter value is used the first word which will not fit between the margins is truncated, the last character of the line is underlined and the remainder of the word is inserted in the data stream for use in the next line.

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Annex D

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Implementation-dependent features

The following introduces, but does not exhaustively list those matters left to the implementors.

1) The control functions which will be selected for implementation.
2) The number of bits, number of characters, and form of the bit combination or bit combinations generated by a single or multiple key depression.
3) Whether characters entered become immediately visible or are processed (partially or fully) prior to becoming visible.
4) If there is a buffer, whether it has a capacity larger than, identical with, or smaller than, the display area.
5) Whether a control function occupies buffer space, display space or both.
6) At what point(s) in the processing of the data stream control functions are to be executed.
7) What the representation of an erased state may be.
8) Whether certain control sequences remain in their encoded state or are transformed into data in special registers and tables.
9) Whether or not there are implementation-defined values for parametric functions when the Standard does not specify a standardized default value.
10) What action will be taken in error recovery.
11) The initial state of a device upon power-up, including the settings of the modes.
12) Whether the width of a displayed character position is fixed or variable (depending on the character occupying the position).
13) The action to be taken by a device if a control function or a graphic character is received which the device cannot implement, because of design limitation or temporary functional disablement.
14) Whether a change of the setting of the CONTROL REPRESENTATION MODE (CRM) affects the appearance of control functions already entered into, or received by, the device or whether only those control functions are affected that are entered or received subsequently.
15) Whether or not the characters in that part of a guarded area which is contained in an eligible area are transmitted or transferred.

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Annex E

(informative)

Text area formats

E.1 General

The purpose of this annex is to provide supplementary information for the control function PAGE FORMAT SELECTION (PFS) defined in 8.3.91.

E.2 Dimension of the text area

Table E.1 shows the dimensions of the text area corresponding to various values of the parameter of PFS.

NOTE 1
When determining the number of lines per page for the parameter values 0 to 9, account is taken of any additional space needed for an optional "call identification line" (see CCITT Rec. T.60). This space is not included in the text area.

NOTE 2
This annex does not specify the number of lines per page for line spacings of 6 per 30,0 mm used in conjunction with the North American page formats, or for line spacings of 2 or 12 lines per 25,4 mm or 3, 4 of 12 lines per 30,0 mm used in conjunction with any of the page formats.

NOTE 3
This annex does not specify the number of characters per line for spacings of 10 or 15 characters per 25,4 mm used in conjunction with page formats specified by PFS with parameter values 10 to 15, or for spacings of 3 characters per 25,4 mm used in conjunction with the page formats specified by PFS with parameter values 0 to 9.

E.3 Line home position

For the page formats specified by PFS with parameter values 0 to 9, the line home position is, depending on the character spacing,

6 characters per 25,4 mm:
the 4th character position of each line;

10 characters per 25,4 mm:
the 6th character position of each line;

12 characters per 25,4 mm:
the 7th character position of each line;

15 characters per 25,4 mm:
the 8th character position of each line.

NOTE
For the page formats specified by PFS with parameter values 0 to 9, the line home position is specified so as to provide a margin of approximately 20 mm between the line home position and the edge of the paper.

For the page formats specified by PFS with parameter values 10 to 15, the line home position is, depending on the character spacing,

3 characters per 25,4 mm:
the 3rd character position of each line;

6 characters per 25,4 mm:
the 5th character position of each line;

12 characters per 25,4 mm:
the 9th character position of each line.

NOTE
For the page formats specified by PFS with parameter values 10 to 15, the line home position is specified so as to provide a margin of approximately 25 mm between the line home position and the edge of the paper.

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Table E.1 - Dimensions of the text area

PFS parameter value	Meaning	Number of lines per page for spacings of					Number of characters per line for spacings of				
		8	6	4	3	6 per 30 mm	3	6	10	12	15
		per 25,4 mm					per 25,4 mm				
0	Tall basic text communication	73	55	37	28	46		46	77	92	115
1	Wide basic text communication	50	38	25	19	32		62	105	125	156
2	Tall basic A4	78	59	39	30	49		46	77	92	115
3	Wide basic A4	50	38	25	19	32		66	110	132	165
4	Tall North American letter	74	56	37	28			48	80	96	120
5	Wide North American letter	53	40	27	20			62	105	125	156
6	Tall extended A4	88	66	44	33	55		46	77	92	115
7	Wide extended A4	58	44	29	22	36		66	110	132	165
8	Tall North American legal	98	74	49	37			48	80	96	120
9	Wide North American legal	53	40	27	20			80	135	161	201
10	A4 short lines		59	39	30		22	45		89	
11	A4 long lines		36	25	19		32	66		131	
12	B5 short lines		49	33	24		18	38		75	
13	B5 long lines		32	21	16		27	56		111	
14	B4 short lines		75	50	38		27	56		111	
15	B4 long lines		49	33	25		39	79		157	

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Annex F

(informative)

Differences between the third and the second edition of ISO/IEC 6429

F.1 General

In this third edition of ISO/IEC 6429 a number of technical additions and improvements have been introduced; they are listed hereafter. Also editorial improvements have been made like the cancellation of unnecessary repeated references. The elimination of the Latin script bias was already done in the second edition, where some of the terms like "horizontal" and "vertical" or "up" and "down" have been replaced by terms like "character" and "line" or "backward" and "forward". As the acronyms could not be changed because they were already widely implemented and referenced in other standards, some of them are not really acronyms any more, like VPR for LINE POSITION FORWARD (used to be VERTICAL POSITION RELATIVE) or PLU for PARTIAL LINE BACKWARD (used to be PARTIAL LINE UP).

The main technical additions concern modes and control functions for handling bi-directional texts and text communication. The main cancellations concern the modes and control functions listed in annex E of the second edition the use of which was already then deprecated.

F.2 Device concepts

Clause 6 on device concepts has been entirely revised in order to cope with the specific requirements for bi-directional texts.

F.3 New modes

Two new modes, the BI-DIRECTIONAL SUPPORT MODE (BDSM) and the DEVICE COMPONENT SELECT MODE (DCSM) have been introduced.

F.4 Deprecated modes

The use of the POSITIONING UNIT MODE (PUM) and the ZERO DEFAULT MODE (ZDM) is deprecated. Their specifications have been moved from the main text to this annex.

F.4.1 PUM - Positioning unit mode

CHARACTER:
The unit for numeric parameters of the positioning format effectors is one character position.

SIZE:
The unit for numeric parameters of the positioning format effectors is that established by the parameter value of SELECT SIZE UNIT (SSU).

NOTE 1
Control functions affected are: CUB, CUD, CUF, CUU, HPA, HPB, HPR, HVP, SLH, SLL, SSU, VPA, VPB, VPR.

NOTE 2
As the default parameter value of the control function SELECT SIZE UNIT (SSU) is CHARACTER, this mode is redundant and should no longer be used.

F.4.2 ZDM - Zero default mode

ZERO:
A parameter value of 0 of a control function means the number 0.

DEFAULT:
A parameter value of 0 represents a default parameter value which may be different from 0.

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NOTE 1
This mode was provided for implementations of the first edition of this International Standard which specified that "an empty parameter sub-string or a parameter sub-string which consists of bit combinations 03/00 only represents a default value which depends on the control function".

For numeric parameters which are expressed in units established by the parameter value of SELECT SIZE UNIT (SSU) the value 0 could then be specified. For numeric parameters which are effectively repeat counts, a 0 parameter value corresponded to a "no-op". In either instance, non-negative computed numeric parameter values might have been used without treating 0 as a special (unusable) case.

Where an explicit parameter value was not used, implementors were urged to omit a parameter value (use an empty parameter sub-string) to imply a default parameter value.

Control functions affected are: CBT, CHA, CHT, CNL, CPL, CPR, CUB, CUD, CUF, CUP, CUU, CVT, DCH, DL, ECH, GSM, HPA, HPB, HPR, HVP, ICH, IL, NP, PP, PPA, PPB, PPR, REP, SD, SL, SR, SU, TCC, VPA, VPB, VPR.

NOTE 2

Since the publication of the first edition of this International Standard in 1976 more than 15 years have expired. The use of this mode should no longer be required because the definition of default parameter values has been changed.

F.5 Eliminated modes

F.5.1 Editing Boundary Mode (EBM)

The mode EDITING BOUNDARY MODE (EBM) the use of which was already declared deprecated in the second edition of this International Standard has now been removed.

F.5.2 LINE FEED/NEW LINE MODE (LF/NL)

The mode LINE FEED/NEW LINE MODE (LF/NL) the use of which was already declared deprecated in the second edition of this International Standard has now been removed.

F.6 New control functions

Five new control functions have been introduced, viz.:

- three control functions for bi-directional texts:
  - SELECT CHARACTER PATH (SCP)
  - START DIRECTED STRING (SDS)
  - SELECT IMPLICIT MOVEMENT DIRECTION (SIMD)
- and two control functions for text communication:
  - SET PAGE HOME (SPH)
  - SET PAGE LIMIT (SPL)

F.7 Modified control functions

The control functions SELECT ALTERNATIVE PRESENTATION VARIANTS (SAPV), SELECT PRESENTATION DIRECTIONS (SPD) and START REVERSED STRING (SRS) have been amended to take into account their interaction with new control functions.

A second parameter has been added to the control function SHEET EJECT AND FEED (SEF) for the selection of the output stacker.

Whether the control functions CARRIAGE RETURN (CR) and NEXT LINE (NEL) move the active position (the active presentation position in the presentation component, the active data position in the data component) to the line home position or to the line limit position, has been made dependent on the parameter value of the control function SELECT IMPLICIT MOVEMENT DIRECTION (SIMD).

In the definition of many other control functions small adjustments have been made; for example, references to SPD have been cancelled when no more pertinent or required, dependencies on new modes have been included in the definitions of the affected control functions, etc.

For bi-directional devices the cursor control functions are active in the presentation component; they are independent of the setting of the DEVICE COMPONENT SELECT MODE (DCSM). The control functions for character position or line

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position movements are active in the data component; they depend on the setting of the DEVICE COMPONENT SELECT MODE (DCSM). Their dependency on SELECT SIZE UNIT (SSU) was removed.

F.8 Eliminated control functions

F.8.1 DELETE (DEL)

The character DELETE (bit combination 07/15, see ISO/IEC 646, clause 6.5), not being a control function in the strict sense, has been removed from the body of this International Standard.

DEL was originally used to erase or obliterate an erroneous or unwanted character in punched tape. DEL characters may be inserted into, or removed from, a CC-data-element without affecting its information content, but such action may affect the information layout and/or the control of equipment.

F.8.2 INDEX (IND)

The control function INDEX (IND) which was coded as an element of the C1 set (08/04) and the use of which was already declared deprecated in the second edition of this International Standard has now been removed.

F.8.3 CHARACTER TABULATION SET ABSOLUTE (HTSA)

The control function CHARACTER TABULATION SET ABSOLUTE (HTSA) which was coded as a control sequence with any number of numeric parameters (CSI Pn ... 02/00 04/14) and the use of which was already declared deprecated in the second edition of this International Standard has now been removed.

F.9 New type of control functions representing control sequences with no parameter

The earlier editions of this International Standard have implicitly permitted control sequences with no parameter although this type of control sequences was not explicitly specified in clause 8. Moreover, no control functions were defined which would have been represented by such control sequences.

The type of control sequences with no parameter is introduced in this edition of this International Standard. When control functions represented by control sequences of this new type will have to be defined in future Editions of this International Standard, it is intended that they be control sequences with the single Intermediate Byte 02/01.

F.10 Removal of an option

The rules for the parameter string format in 5.4.2 included in h) an option that permitted the omission of the separator preceding the last empty parameter sub-string.

This option has lead to different and incompatible implementations of the same control functions and thus became an obstacle to interchange between otherwise conforming applications; it was therefore removed.

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Annex G

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