

JIS

JAPANESE INDUSTRIAL STANDARD

**Additional Control Functions for
Character-Imaging Devices**

JIS X 0211—1986

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Additional Control Functions for
Character-Imaging Devices

X 0211-1986

1. Scope

1.1 Applied Extension Elements This Japanese Industrial Standard specifies additional control functions for use in an extended 7-bit or 8-bit code structured in accordance with JIS X 0202. This Standard comprises a C 1 set, control functions derived therefrom and a number of single control functions.

1.2 Applied Device The control functions specified in this Standard are intended to be used, in combination with the C0 set composed of function characters specified in JIS X 0201, when these control functions are embedded in character coded data for interchange with character-imaging devices.

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 of producing character image output, i.e. output that can be read by a human being. The character image output is, in general, produced in the form of one or more rectangular arrays of characters 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 locally entered into the device, for example by an associated keyboard.

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 device architecture. These assumptions are as unrestrictive as possible; they are specified in 6.

The control functions shall not only be executed, but also sometimes displayed by graphic symbols.

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

2. Conformance

This Standard addresses a whole class of devices which can vary greatly from each other depending on the application for which a device has been specifically designed. Obviously, a product which implements all facilities described in this Standard—thus being in "full conformance" with it—whilst theoretically possible, is technically and economically impracticable.

Limited conformance does not require the implementation of all control functions, all parameters of control functions, and modes of this Standard, nor does it preclude the use of other control functions and modes. Limited conformance means that all the following conditions are met:

Applicable Standards, Corresponding International Standard and Reference Standards: See page 74.

- (1) A device shall implement a subset of the control functions, the parameters of control functions, and modes specified in this Standard, with the specified coded representation, and with the specified meaning where such meaning is specified in this Standard, so long as no private mode as permitted in (5) is in effect.
- (2) If the implemented subset of the control functions contains a control sequence which has a default value of a parameter specified in this Standard, the device shall be capable of receiving and correctly interpreting that control sequence when the default value is explicitly or implicitly represented.
- (3) Any coded representation for a control function specified in this Standard shall not be used to represent a different control function.
- (4) Any coded representation reserved for future standardization by this Standard shall not be used.
- (5) A device may implement modes other than those specified in this Standard. However, one of the states of each such private mode shall be such that the control functions and modes from this Standard are implemented with the coded representation and the meaning specified in this Standard.
- (6) Any documents claiming that a device conforms to this Standard shall explicitly describe by reference the sections or functions implemented. Statements such as "according to", "based on", etc. shall not be used unless accompanied by such enumeration.

Remark: Full conformance for a standard means that all of its requirements are met. For such conformance to be unique the standard must contain no options. This is typically the case for hardware standards.

This Standard is of a different nature and as a result, it is only practicable to envisage limited conformance to it, as defined above.

3. Notation

Capital letters are used to refer to a specific control function, mode, mode setting, or graphic character.

Informative reference: The codes and the symbols specified in this Standard are determined by corresponding International Standard so that they are identical irrespective of nationality.

4. Definitions

The meanings of principal terms used in this Standard shall be in accordance with JIS X 0001 or otherwise shall be as follows:

- (1) area A string of adjacent character positions that are not necessarily on the same line.

- (2) auxiliary device A device connected to a character-imaging device for the purpose of storing, retrieving, or imaging of data.
- (3) 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 device or printer.
- (4) character path A direction in which graphic characters appear sequentially along a line.
- (5) character position That portion of a display which is imaging or is capable of imaging a graphic symbol.
- (6) control function An action that affects the recording, processing, transmission, or interpretation of data.
- (7) default A value or a state that is to be assumed when no value or state is explicitly specified.
- (8) display The region for visual representation of data on any type of character-imaging device, including printer and cathode ray tube devices.
- (9) field An area the boundaries of which are specified by horizontal tabulation stops.
- (10) final character The character the bit combination of which terminates an escape sequence or a control sequence.
- (11) graphic rendition The visual style of displaying a set of graphic symbols.
- (12) intermediate character
 - (a) A character the bit combination of which occurs between that of the character ESCAPE (ESC) and that of the Final character in an escape sequence consisting of more than two bit combinations.
 - (b) A character, other than a character in a parameter string, the bit combination of which occurs between that of CONTROL SEQUENCE INTRODUCER (CSI) and that of the Final character in a control sequence.
- (13) line progression A direction in which lines appear progressively.
- (14) 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.
- (15) private or experimental use The means of representing a non-standardized control function in a manner compatible with this Standard.

- (16) scroll The action whereby all or a part of the graphic symbols of a display are moved in a specified direction.
- (17) tabulation The technique identifying character positions or lines in a display for the purpose of arranging information systematically.
- (18) tabulation stop The indication that a character position or a line position is to be used for tabulation; a horizontal tabulation stop may also serve as a boundary between fields.

5. Coded Representation

5.1 General The set of additional control functions in this Standard consists of more control functions than those which can be coded in a C 1 set. Each additional control function belongs to one of the following categories, depending on the method of representation.

- (1) Control functions which are elements of the C 1 set
- (2) Control functions represented by control sequences
- (3) Control functions represented by ESC Fs sequences

This Standard also specifies a method of representations of control functions by means of control strings (refer to 5.6).

5.1.1 Control Functions which are Elements of the C 1 Set As in JIS X 0202 such a control function is represented:

- (1) In an 8-bit code by a bit combination of column 08 or 09.
- (2) In a 7-bit code by a 2-character escape sequence of the form ESC Fe, where Fe is represented by a bit combination of column 4 or 5.

This method of representation permits coding of up to 32 control functions. The corresponding bit combinations are specified in Table 1.

5.1.2 Control Functions Represented by Control Sequences A control sequence consists of CONTROL SEQUENCE INTRODUCER (CSI) followed by one or more characters which identify the control function and, if applicable, represent the parameters of the control function. The control function CSI itself is an element of the C 1 set.

The format of a control sequence shall be

CSI P₁...P_n I₁...I_m F

where:

- (1) CSI is represented by bit combination 09/11 in an 8-bit code and by ESC 5/11 in a 7-bit code (refer to 5.2).

- (2) $P_1 \dots P_n$ correspond to parameter values and are represented by bit combinations of column 3; these bit combinations are omitted if the control function has no parameter, and may be omitted if the default parameter value is to be applied.

There are two types of parameters; numeric and selective (refer to 5.4).

- (3) $I_1 \dots I_m$ are Intermediate characters represented by bit combinations of column 2 which, together with the bit combination representing Final character F, identify the control function; these bit combinations are omitted if the control function is identified only by the bit combination representing the Final character F.

The bit combination representing the Final character of control sequences without Intermediate characters and the bit combination representing the Final character of control sequences with a single Intermediate character 2/0 are respectively given in Tables 2 and 3.

Remark: The number of Intermediate characters is not limited by this Standard; in practice, at most one Intermediate character will be sufficient since over one thousand control functions may be identified using one Intermediate character.

- (4) F is the Final character; it is represented by a bit combination of column 4, 5, 6 or 7 (except 7/15); it terminates the control sequence and, together with the Intermediate characters, if present, identifies the control function (refer to 10).

The Final characters (either used alone or together with Intermediate characters) are classified in two categories:

- (a) Final character represented by a bit combination of columns 4, 5, and 6. The control functions identified thereby are either standardized or reserved for future standardization:
- (b) Final character represented by a bit combination of column 7 (except 7/15). The control functions identified thereby are not standardized and are available for private (or experimental) use.

The occurrence of any bit combinations which do not conform to the above format is an error condition for which recovery is not specified by this Standard.

5.1.3 Control Functions Represented by ESC Fs Sequences As in JIS X 0202, the coded representations of these control functions in 7-bit and 8-bit codes are 2-character escape sequences of the form ESC Fs, where Fs is represented by a bit combination of column 6 or 7 (except 7/15) (refer to 5.5). These control functions are not part of the C 1 set.

5.2 Elements of the C 1 Set The following control functions are the elements of the C 1 set:

Acronym	Name
APC	APPLICATION PROGRAM COMMAND
CCH	CANCEL CHARACTER
CSI	CONTROL SEQUENCE INTRODUCER
DCS	DEVICE CONTROL STRING
EPA	END OF GUARDED PROTECTED AREA
ESA	END OF SELECTED AREA
HTJ	HORIZONTAL TABULATION WITH JUSTIFICATION
HTS	HORIZONTAL TABULATION SET
IND	INDEX
MW	MESSAGE WAITING
NEL	NEXT LINE
OSC	OPERATING SYSTEM COMMAND
PLD	PARTIAL LINE DOWN
PLU	PARTIAL LINE UP
PM	PRIVACY MESSAGE
PU 1	PRIVATE USE ONE
PU 2	PRIVATE USE TWO
RI	REVERSE INDEX
SPA	START OF GUARDED PROTECTED AREA
SS 2	SINGLE SHIFT TWO
SS 3	SINGLE SHIFT THREE
SSA	START OF SELECTED AREA
ST	STRING TERMINATOR
STS	SET TRANSMIT STATE
VTs	VERTICAL TABULATION SET

The bit combinations used for their representation are specified in Table 1.

The definitions of the control functions are specified in 8.2.

If a control function is represented by a single 8-bit combination, Table 1 specifies this bit combination by taking A = 08 and B = 09.

If a control function is represented by a 2-character escape sequence (in a 7-bit code), Table 1 specifies the bit combination of the Final character by taking A = 4 and B = 5.

The open positions in Table 1 are reserved for future standardization. They are not available for private (or experimental) use.

The 3-character escape sequence designating and invoking this C 1 set is ESC 2/2 F.

Informative Reference: As a Final character F, 4/3 is assigned.

Table 1. Bit Combination Used for This Representation of the Control Functions of the C 1 Set

Row No.	Column No.	
	A (08 or 4)	B (09 or 5)
0	—	DCS
1	—	PU 1
2	—	PU 2
3	—	STS
4	IND	CCH
5	NEL	MW
6	SSA	SPA
7	ESA	EPA
8	HTS	—
9	HTJ	—
10	VTS	—
11	PLD	CSI
12	PLU	ST
13	RI	OSC
14	SS 2	PM
15	SS 3	APC

5.3 Control Sequences The control functions listed in 5.3.1 and 5.3.2 are represented by control sequences.

The definitions of the control functions are specified in 8.2. The bit combinations representing the Final characters of the control sequences are specified in Tables 2 and 3.

Table 2 specifies the bit combinations representing the Final characters of the control sequences without Intermediate characters.

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Table 2. Bit Combinations Representing the Final Character of Control Sequences without Intermediate Characters

Row No.	Column No.		
	4	5	6
0	ICH	DCH	HPA
1	CUU	SEE	HPR
2	CUD	CPR	REP
3	CUF	SU	DA
4	CUB	SD	VPA
5	CNL	NP	VPR
6	CPL	PP	HVP
7	CHA	CTC	TBC
8	CUP	ECH	SM
9	CHT	CVT	MC
10	ED	CBT	HPB
11	EL	—	VPB
12	IL	—	RM
13	DL	—	SGR
14	EF	—	DSR
15	EA	—	DAQ

Table 3 specifies the bit combinations representing the Final character of the control sequences which contain a single Intermediate character represented by bit combination 2/0.

Table 3. Bit Combinations Representing the Final Character of Control Sequences with a Single Intermediate Character Represented by 2/0

Row No.	Column No.		
	4	5	6
0	SL	PPA	—
1	SR	PPR	—
2	GSM	PPB	—
3	GSS	—	—
4	FNT	—	—
5	TSS	—	—
6	JFY	—	—
7	SPI	—	—
8	QUAD	—	—
9	SSU	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	HTSA	—	—
15	IDCS	—	—

The open position in Tables 2 and 3, as well as all bit combinations of columns 4, 5, and 6 which are used with one or not less than two bit combinations other than one 2/0 for representing Intermediate characters, are reserved for future standardization. All bit combinations of column 7 except 7/15 are available for representing the Final character of a control sequence, with or without Intermediate characters, for private (for experimental) use.

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5.3.1 Control Functions with Numeric Parameters The control function with numeric parameters shall be as follows:

Acronym	Name	Bit combination
CBT	CURSOR BACKWARD TABULATION	Table 2
CHA	CURSOR HORIZONTAL ABSOLUTE	Table 2
CHT	CURSOR HORIZONTAL TABULATION	Table 2
CNL	CURSOR NEXT LINE	Table 2
CPL	CURSOR PRECEDING LINE	Table 2
CPR	ACTIVE POSITION REPORT	Table 2
CUB	CURSOR BACKWARD	Table 2
CUD	CURSOR DOWN	Table 2
CUF	CURSOR FORWARD	Table 2
CUP	CURSOR POSITION	Table 2
CUU	CURSOR UP	Table 2
CVT	CURSOR VERTICAL TABULATION	Table 2
DCH	DELETE CHARACTER	Table 2
DL	DELETE LINE	Table 2
ECH	ERASE CHARACTER	Table 2
GSM	GRAPHIC SIZE MODIFICATION	Table 3
GSS	GRAPHIC SIZE SELECTION	Table 3
HPA	HORIZONTAL POSITION ABSOLUTE	Table 2
HPB	HORIZONTAL POSITION BACKWARD	Table 2
HPR	HORIZONTAL POSITION RELATIVE	Table 2
HTSA	HORIZONTAL TABULATION SET ABSOLUTE	Table 3
HVP	HORIZONTAL AND VERTICAL POSITION	Table 2
ICH	INSERT CHARACTER	Table 2
IL	INSERT LINE	Table 2

(Continued)

Acronym	Name	Bit combination
NP	NEXT PAGE	Table 2
PP	PRECEDING PAGE	Table 2
PPA	PAGE POSITION ABSOLUTE	Table 3
PPB	PAGE POSITION BACKWARD	Table 3
PPR	PAGE POSITION RELATIVE	Table 3
REP	REPEAT	Table 2
SD	SCROLL DOWN	Table 2
SL	SCROLL LEFT	Table 3
SPI	SPACING INCREMENT	Table 3
SR	SCROLL RIGHT	Table 3
SU	SCROLL UP	Table 2
TSS	THIN SPACE SPECIFICATION	Table 3
VPA	VERTICAL POSITION ABSOLUTE	Table 2
VPB	VERTICAL POSITION BACKWARD	Table 2
VPR	VERTICAL POSITION RELATIVE	Table 2

5.3.2 Control Functions with Selective Parameters The control functions with selective parameters shall be as follows:

Acronym	Name	Bit combination
CTC	CURSOR TABULATION CONTROL	Table 2
DA	DEVICE ATTRIBUTES	Table 2
DAQ	DEFINE AREA QUALIFICATION	Table 2
DSR	DEVICE STATUS REPORT	Table 2
EA	ERASE IN AREA	Table 2
ED	ERASE IN DISPLAY	Table 2

(Continued)

Acronym	Name	Bit combination
EF	ERASE IN FIELD	Table 2
EL	ERASE IN LINE	Table 2
FNT	FONT SELECTION	Table 3
IDCS	IDENTIFY DEVICE CONTROL STRING	Table 3
JFY	JUSTIFY	Table 3
MC	MEDIA COPY	Table 2
QUAD	QUAD	Table 3
RM	RESET MODE	Table 2
SEE	SELECT EDITING EXTENT	Table 2
SGR	SELECT GRAPHIC RENDITION	Table 2
SM	SET MODE	Table 2
SSU	SELECT SIZE UNIT	Table 3
TBC	TABULATION CLEAR	Table 2

5.4 Parameter Representations A control sequence may contain a string P1 Pn representing one or more parameters to complete the specification of the control function.

The string of bit combinations representing P1 ... Pn contained in a control sequence is called the parameter string. It consists of bit combinations of column 3 and is interpreted as follows:

- (1) If the first bit combination of the parameter string is in the range 3/0 to 3/11, the parameter string is interpreted according to the format described below.
- (2) If the first combination of the parameter string is in the range 3/12 to 3/15, the parameter string is available for private (or experimental) use. Its format and meaning are not defined by this Standard.

5.4.1 Parameter String Format A parameter string shall have the following format:

- (1) A parameter string consists of one or more parameter sub-strings.
- (2) Each parameter sub-string consists of one or more bit combinations from 3/0 to 3/9, representing the digits ZERO to NINE.
- (3) Parameter sub-strings are separated by one bit combination 3/11.
- (4) Bit combination 3/10 is reserved for future standardization as an additional parameter separator.
- (5) Bit combinations 3/12 to 3/15 are reserved for future standardization except when they are used at the top of a parameter string for a private use.
- (6) In each parameter sub-string leading bit combination 3/0 are not significant and may be omitted.
- (7) If the parameter string starts with the bit combination 3/11, an empty parameter sub-string is assumed preceding the separator; if the parameter string terminates with the bit combination 3/11, an empty parameter sub-string is assumed following the separator; if the parameter string contains successive bit combinations 3/11, empty parameter sub-strings are assumed between the separators.
- (8) If the control function has more than one parameter, and some parameter sub-strings are empty, the separators (bit combination 3/11) must still be present. However, if the last parameter sub-string(s) is empty, the separator preceding it may be omitted.

Informative As to an example of omission method of parameter sub-string, reference: refer to 2. of informative reference.

- (9) An empty parameter sub-string or a parameter sub-string which consists of bit combinations 3/0 only represents a default value which depends on the control function.

5.4.2 Types of Parameters In a control sequence representing a control function 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 Standard.

5.4.2.1 Numeric Parameters In a control sequence representing a control function with numeric parameters, each parameter sub-string which has a value other than zero represents a quantity in decimal notation.

5.4.2.2 Selective Parameters In a control sequence representing a control function with selective parameters, each parameter sub-string whilst expressed by digits, is not quantitative i.e. does not represent a quantity in decimal notation. Each value corresponds to one of the actions the control function can perform.

A particular parameter value may have the same meaning as a combination of two or more separate values.

5.5 ESC Fs Sequences The following control functions are represented by ESC Fs sequences in 7-bits and 8-bits according to JIS X 0202.

Table 4. ESC Fs Sequences

Acronym	Name	Coding
DMI	DISABLE MANUAL INPUT	ESC 06/0
EMI	ENABLE MANUAL INPUT	ESC 06/2
INT	INTERRUPT	ESC 06/1
RIS	RESET TO INITIAL STATE	ESC 06/3

The definitions of these control functions are specified in 8.2.

Informative ESC Fs sequences are registered in the ISO International reference: Register of Character Sets to be used with Escape Sequences, which is maintained by the Registration Authority for ISO 2375. When any candidates for ESC Fs sequences have been approved by ISO/TC 97/SC 2 for registration, the coding for the Final character, Fs, will be assigned by the Registration Authority.

5.6 Control Strings A control string is a delimited string of characters 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 and a terminating delimiter, the STRING TERMINATOR (ST). The command string consists of a sequence of characters represented by bit combinations in the range of 0/8 to 0/13 and 2/0 to 7/14 (however, refer to 10.). The occurrence of other bit combinations within a command string is an error condition for which recovery is not specified in this Standard.

The opening delimiter indicates the class of the component of the system which is the sender or recipient of the control string. The interpretation of the command string is not specified by this Standard, but instead requires prior agreement between the sender and the recipient of the data.

The opening delimiters specified in this Standard are:

- (1) APC (APPLICATION PROGRAM COMMAND)
- (2) DCS (DEVICE CONTROL STRING)
- (3) OSC (OPERATING SYSTEM COMMAND)
- (4) PM (PRIVACY MESSAGE)

6. Device Concepts

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

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

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

6.2 The Character Image Output The character image output may consist of one or more pages of a pre-determined size.

A page is composed of a pre-determined number of lines, each being composed of a number of character positions.

The device may have the capability of varying the number of lines per page, the number of character positions per line, and the character spacing during the operation of the device.

If the character image output is not structured in pages, it is regarded as consisting of a single page of an unlimited number of lines.

The lines constituting a page as well as the character positions constituting a line are identified by the natural numbers 1, 2, 3

Each character position is either in the erased state or images SPACE or a graphic symbol. A graphic symbol represents a graphic character or one of the control functions for which a graphic representation is required.

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

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

Depending on the characteristics of the device, a character position may be capable of imaging a combination of two or more graphic symbols.

The width of a character position may be fixed or may depend on the character being imaged.

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

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

The character style and font design of the graphic symbols are not specified in this Standard.

6.3 The Active Position At any time, there is a unique character position which is called the "active position".

The active position is the character position which is to image the graphic symbol representing the next graphic character of the received data stream or the next control function for which a graphic representation is required. The active position is also the reference position against which certain format effectors or editor functions or editing operations are performed (refer to 6.4 and 6.5).

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

- (1) Implicit Movement If the active position is not the last character position of a line, it is moved to the following character position of the active line.

An implicit movement is performed after SPACE or a graphic character is received or a control function, for which a graphic representation is required, is executed.

- (2) Explicit Movement The active position is moved to a specified character position.

An explicit movement is performed when a control function is executed which causes the active position to be moved to a specified position.

Informative In the case of an interactive display device it is common reference: practice to make the active position by means of a special indicator which is called the "cursor".

Remark: In the following situations, the effect of an attempt to move the active position is not specified in this Standard:

- (a) An attempt to perform an implicit movement when the active position is the last character position of a line.
- (b) An attempt to perform an explicit movement to a non-existing character position, for example, beyond the last character position of a line, or beyond the last line of a page.

Depending on implementation, an attempt to perform such active position movement may:

- cause a wrap-around movement,
- cause the active position to be blocked (a condition in which no graphic symbol can be entered until a valid explicit active position movement is performed),
- cause the active position to remain where it is, but permit graphic symbols to be entered thereby replacing or overstriking the previously entered character,
- cause the cursor to disappear from the operator's view,
- cause the cursor to move to the opposite end of the display but one row or column offset,
- cause scrolling to occur,
- cause other implementation-dependent action.

6.4 Format Effectors and Editor Functions Two clauses of control functions have an action on the layout or positioning of information in character-imaging devices. They are format effectors and editor functions. Format effectors are intended to be used on all classes of imaging devices whilst editor functions are supplementary control functions required only in circumstances for a certain class of devices where an action is to be performed on previously entered data. The principal difference between editor functions and format effectors is that the latter are sensitive to the FORMAT EFFECTOR ACTION MODE, whereas the former are not.

Informative Reference: As to the relation between format effectors and editor functions, refer to 1, of Informative reference.

6.4.1 Format Effectors Format effectors belong to the data stream and describe how the originator of the data stream wishes the information to be formatted.

Therefore, if format effectors 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 in integrity.

Format effectors are processed as follows depending on the setting of the FORMAT EFFECTOR ACTION MODE (refer to 7.2.4) of the device.

If the FORMAT EFFECTOR ACTION MODE is set to EXECUTE, the action specified by the format effector (usually an active position movement) is immediately performed. Depending on implementation, a format effector may be stored in addition to being performed.

If the FORMAT EFFECTOR ACTION MODE is set to STORE, the format effector is treated as a graphic character and stored in the buffer. In this case, the specified action is intended to be performed by an auxiliary input/output device when the associated data are transferred.

6.4.2 Composite Characters To produce composite characters, only format effectors are used; editor functions shall not be used for this purpose.

Informative As to the composition of character, refer reference: to 1.3 of Informative reference.

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 by the first receiver and then removed from the data stream.

6.5 Editing Operations This sub-clause is applicable primarily to buffered input/output devices. Editing operations (erasure, deletion, and insertion) are performed either in execution of control functions in the received data stream, or under control of a keyboard or another manual entry device.

The active position (or the active line, where applicable) is the reference position against which all editing operations are performed.

6.5.1 Erasure The state of one or more character positions is changed to "erased". Other character positions remain unaffected.

6.5.2 Deletion Characters are deleted by removing the contents of the active position and, depending on the parameter of the control function, the contents of adjacent character positions. The resulting gap is closed by shifting the contents of an adjacent string of character strings towards the active position. As a result, a number of character positions equal to the number of deleted characters are put into the erased state at the other end of the shifted part.

Lines are deleted by removing the contents of the active line and depending on the parameter of the control function, the contents of adjacent lines. The resulting gap is closed by shifting the contents of adjacent lines towards the active line. As a result, a number of lines equal to the number of deleted lines are put into the erased state at the other end of the shifted part.

6.5.3 Insertion When characters are inserted, the contents of the active position and of adjacent character positions are shifted away from the active position. As a result, the contents of a number of character positions equal to the number of inserted characters are removed at the other end of the shifted part.

When lines are inserted, the contents of the active line and of the adjacent lines are shifted away from the active line. As a result, a number of lines equal to the number of inserted lines are removed at the other end of the shifted part.

6.5.4 Editing Modes and Insertion/Deletion Whether a character insertion or a character deletion affects the character positions preceding or following the active position depends on the setting of the HORIZONTAL EDITING MODE (refer to 7.2.8).

Whether a line insertion or a line deletion affects the lines preceding or following the active line depends on the setting of the VERTICAL EDITING MODE (refer to 7.2.18).

6.6 Selected and Qualified Areas This sub-clause is applicable primarily to buffered input/output devices. It may also be applicable to unbuffered input/output devices when the SEND/RECEIVE MODE (refer to 7.2.14) is set to SIMULTANEOUS.

6.6.1 Selected Areas A selected area is a string of character positions, the contents of which may be eligible (refer to 7.3.1) to be transmitted in the form of a data stream or to be transferred to an auxiliary input/output device (refer to 6.7).

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

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

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

- (1) The contents of the character positions are protected against manual alteration.
- (2) The set of characters which are permitted to be entered is stricted (for example, to numeric or alphabetic characters only).
- (3) The character positions are protected against erasure.
- (4) A tabulation stop is associated with the first character position.
- (5) The contents of the character positions are to be excluded, i.e. guarded (refer to 6.6.2.2) from transmission as a data stream, or from transfer to an auxiliary input/output device (refer to 6.7).

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

The end of a qualified area is established by the beginning of the following qualified area.

6.6.2.1 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 (refer to 7.2.3). A protected area may, in general, be either guarded or unguarded.

6.6.2.2 Guarded Areas A guarded area is a special case of a qualified area. It is a protected area which may be excluded from transmission as a data stream and from transfer to an auxiliary input/output device depending on GUARDED AREA TRANSFER MODE (refer to 7.2.7).

An alternative way to establish the beginning and end of a guarded protected area is by means of START OF GUARDED PROTECTED AREA (SPA) and END OF GUARDED PROTECTED AREA (EPA).

Remark: Interaction between guarded areas established by SPA and EPA, and those established by DAQ is not specified by this Standard.

6.7 Auxiliary Input/Output Devices This sub-clause is applicable primarily to buffered input/output devices. It may also be applicable to unbuffered input/output devices when the SEND/RECEIVE MODE (refer to 7.2.14) is set to SIMULTANEOUS.

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

If there are more than one auxiliary input/output devices, the relevant device is specified by the parameter 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 implementation.

7. Modes

7.1 The Concept of Modes This Standard is intended to be applicable to a very large range of devices. Within that broad range it is recognized that variation exists. Some of these variations have been formalized in this Standard in the form of modes. They deal with the way in which a device transmits, receives, processes, or images data. Each mode is defined as having two states. The initial state of each mode is defined by the implementation.

The modes may be established explicitly within the data stream or by agreement between sender and recipient. In an implementation, some or all of the modes may have a fixed state incapable of being altered.

7.2 Definition of Modes The modes listed below are specified in this Standard. They are set and reset by the control functions SET MODE (SM) and RESET MODE (RM). The parameter (refer to 8.2.71 and 8.2.66) of SM or RM specifies the mode which is affected. In each of the mode definitions below, the first state is caused by RM, the second one by SM.

7.2.1 Control Representation Mode (CONTROL REPRESENTATION MODE)

- [0] Control (CONTROL) All control functions are performed as defined, subject to the setting of the FORMAT EFFECTOR ACTION MODE in so far as format effectors are concerned (refer to 7.3.2).
- [1] Graphic (GRAPHIC) All control functions, except RESET MODE (RM), are treated as graphic characters.

7.2.2 Editing Boundary Mode (EDITING BOUNDARY MODE)

- [0] Display (DISPLAY) The effects of the editing control functions are limited to the displayed portion of a multiple-page buffer.
- [1] All (ALL) The editing control functions may affect character positions outside the displayed portion of a multiple-page buffer.

7.2.3 Erasure Mode (ERASURE MODE)

- [0] Protect (PROTECT) Only unprotected data are affected by an erasure control function.
- [1] All (ALL) Protected as well as unprotected data are affected by an erasure control function.

7.2.4 Format Effector Action Mode (FORMAT EFFECTOR ACTION MODE)

- [0] Execute (EXECUTE) A format effector causes the specified action to be performed immediately. Implementations may store format effectors in a buffer in addition to performing them.
- [1] Store (STORE) A format effector is treated as a graphic character. This mode is significant only if the CONTROL REPRESENTATION MODE is set to CONTROL.

7.2.5 Format Effector Transfer Mode (FORMAT EFFECTOR TRANSFER MODE)

- [0] Insert (INSERT) Format effectors are inserted in a transmitted data stream or in data transferred to an auxiliary input/output device:
 - (1) The format effectors CARRIAGE RETURN (CR) and LINE FEED (LF), or NEXT LINE (NEL), are inserted in the data stream to separate successive lines.
 - (2) Other format effectors may be inserted as appropriate, for example, HORIZONTAL TABULATION (HT) to represent a string of character positions in the erased state preceding a tabulation stop.
- [1] Exclude (EXCLUDE) No format effectors other than those received while the FORMAT EFFECTOR ACTION MODE is set to STORE are included in a transmitted data stream or in data transferred to an auxiliary input/output device.

7.2.6 Graphic Rendition Combination Mode (GRAPHIC RENDITION COMBINATION MODE)

- [0] Replacing (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 shall be re-specified by that SGR.
- [1] Cumulative (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.

7.2.7 Guarded Area Transfer Mode (GUARDED AREA TRANSFER MODE)

- [0] Guard (GUARD) Only unguarded data in an eligible area are transmitted or transferred.
- [1] All (ALL) Guarded as well as unguarded data in an eligible area are transmitted or transferred.

7.2.8 Horizontal Editing Mode (HORIZONTAL EDITING MODE)

- [0] Following (FOLLOWING) A character insertion causes the contents of the active position and of the following character positions to be shifted forward; a character deletion causes the contents of character positions following the active position to be shifted backward.

- [1] Preceding (PRECEDING) A character insertion causes the contents of the active position and of preceding character positions to be shifted backward; a character deletion causes the contents of character positions preceding the active position to be shifted forward.

7.2.9 Insertion Replacement Mode (INSERTION REPLACEMENT MODE)

- [0] Replacement (REPLACEMENT) The receipt of a graphic character or a control function for which a graphic representation is required causes the appropriate graphic symbol to replace (or, depending on implementation, to be combined with) the graphic symbol currently imaged at the active position.
- [1] Insert (INSERT) The receipt of a graphic character or a control function for which a graphic representation is required causes the appropriate graphic symbol to be inserted at the active position. The operation of inserting a character is performed as described in 6.5.

7.2.10 Keyboard Action Mode (KEYBOARD ACTION MODE)

- [0] Enabled (ENABLED) All or part of the manual input facilities are enabled to be used.
- [1] Disabled (DISABLED) All or part of the manual input facilities are disabled.

Informative The deletion of KEYBOARD ACTION MODE is under reference: investigation by ISO.

7.2.11 Multiple Area Transfer Mode (MULTIPLE AREA TRANSFER MODE)

- [0] Single (SINGLE) Only the selected area which contains the active position is eligible to be transmitted or transferred (refer to 7.3.1).
- [1] Multiple (MULTIPLE) All selected areas are eligible to be transmitted or transferred.

This mode is significant only if the SELECTED AREA TRANSFER MODE is set to SELECT.

7.2.12 Positioning Unit Mode (POSITIONING UNIT MODE)

- [0] Character (CHARACTER) The unit for numeric parameters of the positioning format effectors is one character position.
- [1] Size (SIZE) The unit for numeric parameters of the positioning format effectors is that established by SELECT SIZE UNIT (SSU).