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USA Standard Code for Information Interchange

Sponsor
Business Equipment Manufacturers Association

Approved October 10, 1968
United States of America Standards Institute

USA Standard

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Foreword

(This Foreword is not a part of the USA Standard Code for Information Interchange, X3.4-1968.)

This USA Standard presents the standard coded character set to be used for information interchange among information processing systems, communication systems, and associated equipment.

Other standards will prescribe the means of implementing this standard in media, such as perforated tape, magnetic tape, and punched cards. Further standards will deal with error control, data communication formats, keyboards, graphic representation of control characters, and code extension considerations.

The 7-bit coded character set was developed from a careful review of past work in the field, and, after a comprehensive program of original research and code design, was completed. Careful consideration has been given to the several conflicting code set requirements, and their resolution is reflected in the standard code.

This standard was approved as a USA Standard by the United States of America Standards Institute on October 10, 1968.

Suggestions for improvement gained in the use of this standard will be welcome. They should be sent to the United States of America Standards Institute.

The USA Standards Committee on Computers and Information Processing, X3, which developed this standard, had the following personnel at the time of approval:

C. A. Phillips, *Chairman* A. C. Grove, *Secretary*

Organization Represented	*Name of Representative*
Administrative Management Society	C. S. Everhardt
Air Transport Association	E. C. White
American Bankers Association	N. Stone
American Gas Association	E. Cotty
American Institute of Certified Public Accountants	N. Zakin
American Library Association	H. Avram
American Newspaper Publishers Association	W. D. Rinehart
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	R. F. Clippinger
	D. J. Daugherty
	C. T. Deere
	U. C. S. Dilks
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	R. W. Green
	J. A. Haddad
	R. J. Mindlin
	G. Poorte
	D. J. Reyen
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National Bureau of Standards	J. O. Harrison
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Printing Industries of America	L. P. Chvany
Scientific Apparatus Makers Association	W. B. Schultz
Systems and Procedures Association	E. Tomeski
Telephone Group	L. W. Claussen
USA Standards Committee on Office Machinery, X4	C. E. Ginder
U. S. Department of Defense	G. L. Bowlby

At the time the proposal was developed and processed through the X3.2 Subcommittee on Codes and Input-Output, the subcommittee membership was as follows:

L. L. Griffin, *Chairman*

R. Adams
John F. Auwaerter
E. A. Avakian
T. R. Bousquet
Robert M. Brown
N. Clark
C. Crandall
Robert J. Donohue
S. Erdreich
D. E. Holmes
H. R. Hoots
R. M. Ireland
M. R. Jepson
D. A. Kerr
R. Kudisch
John L. Little
C. E. Mackenzie
W. H. McKenzie
M. Mendelsohn
George L. Murphy
J. K. Nelson
H. Spielman
J. E. Taunt
R. E. Utman
E. F. Vidro, Jr.
G. E. Williams

The Task Group on Code Development, X3.2.4, which developed the proposal, had the following personnel:

John L. Little, *Chairman*

E. A. Avakian
J. B. Booth
E. H. Clamons
N. Clark
W. S. Crosby
R. J. Donohue
W. F. Emmons
S. Erdreich
E. S. Fergusson
H. R. Hoots
W. F. Huf
H. F. Ickes
D. A. Kerr
R. Kudisch
C. N. Mooers
J. K. Nelson
H. Spielman
L. R. Turner
E. F. Vidro, Jr

It should be recognized that although X3.2 and X3.2.4 members are variously affiliated, work on a subcommittee or task group is achieved primarily on an individual competence and experience basis.

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USA Standard Code for Information Interchange

1. Scope

This coded character set is to be used for the general interchange of information among information processing systems, communication systems, and associated equipment.

2. Standard Code

b7 b6 b5 / Bits					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4	b3	b2	b1	COLUMN / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

3. Character Representation and Code Identification

The standard 7-bit character representation, with b_7 the high-order bit and b_1 the low-order bit, is shown below:

EXAMPLE: The bit representation for the character "K," positioned in column 4, row 11, is

b_7	b_6	b_5	b_4	b_3	b_2	b_1
1	0	0	1	0	1	1

The code table position for the character "K" may also be represented by the notation "column 4, row 11" or alternatively as "4/11." The decimal equivalent of the binary number formed by bits b_7, b_6, and b_5, collectively, forms the column number, and the decimal equivalent of the binary number formed by bits b_4, b_3, b_2, and b_1, collectively, forms the row number.

The standard code may be identified by the use of the notation ASCII or USASCII.

The notation ASCII (pronounced as'-key) or USASCII (pronounced you-sas'-key) should ordinarily be taken to mean the code prescribed by the latest issue of the standard. To explicitly designate a particular (perhaps prior) issue, the last two digits of the year of issue may be appended, as, "ASCII 63" or "USASCII 63".

4. Legend

4.1 Control Characters

NUL	Null	DLE	Data Link Escape (CC)
SOH	Start of Heading (CC)	DC1	Device Control 1
STX	Start of Text (CC)	DC2	Device Control 2
ETX	End of Text (CC)	DC3	Device Control 3
EOT	End of Transmission (CC)	DC4	Device Control 4 (Stop)
ENQ	Enquiry (CC)	NAK	Negative Acknowledge (CC)
ACK	Acknowledge (CC)	SYN	Synchronous Idle (CC)
BEL	Bell (audible or attention signal)	ETB	End of Transmission Block (CC)
BS	Backspace (FE)	CAN	Cancel
HT	Horizontal Tabulation (punched card skip) (FE)	EM	End of Medium
LF	Line Feed (FE)	SUB	Substitute
VT	Vertical Tabulation (FE)	ESC	Escape
FF	Form Feed (FE)	FS	File Separator (IS)
CR	Carriage Return (FE)	GS	Group Separator (IS)
SO	Shift Out	RS	Record Separator (IS)
SI	Shift In	US	Unit Separator (IS)
		DEL	Delete[1]

NOTE: (CC) Communication Control
(FE) Format Effector
(IS) Information Separator

[1]In the strict sense, DEL is not a control character. (See 5.2.)

4.2 Graphic Characters

Column/Row	Symbol	Name
2/0	SP	Space (Normally Non-Printing)
2/1	!	Exclamation Point
2/2	"	Quotation Marks (Diaeresis[2])
2/3	#	Number Sign[3,4]
2/4	$	Dollar Sign
2/5	%	Percent
2/6	&	Ampersand
2/7	'	Apostrophe (Closing Single Quotation Mark; Acute Accent[2])
2/8	(	Opening Parenthesis
2/9	)	Closing Parenthesis
2/10	*	Asterisk
2/11	+	Plus
2/12	,	Comma (Cedilla[2])
2/13	-	Hyphen (Minus)
2/14	.	Period (Decimal Point)
2/15	/	Slant
3/10	:	Colon
3/11	;	Semicolon
3/12	<	Less Than
3/13	=	Equals
3/14	>	Greater Than
3/15	?	Question Mark
4/0	@	Commercial At[3]
5/11	[	Opening Bracket[3]
5/12	\	Reverse Slant[3]
5/13	]	Closing Bracket[3]
5/14	^	Circumflex[2,3]
5/15	_	Underline
6/0	`	Grave Accent[2,3] (Opening Single Quotation Mark)
7/11	{	Opening Brace[3]
7/12	|	Vertical Line[3]
7/13	}	Closing Brace[3]
7/14	~	Overline[3] (Tilde[2]; General Accent[2])

[2]The use of the symbols in 2/2, 2/7, 2/12, 5/14, 6/0, and 7/14 as diacritical marks is described in Appendix A, A5.2.
[3]These characters should not be used in international interchange without determining that there is agreement between sender and recipient. (See Appendix B4.)
[4]In applications where there is no requirement for the symbol #, the symbol £ may be used in position 2/3.

5. Definitions

5.1 General

(CC) Communication Control: A functional character intended to control or facilitate transmission of information over communication networks.

(FE) Format Effector: A functional character which controls the layout or positioning of information in printing or display devices.

(IS) Information Separator: A character which is used to separate and qualify information in a logical sense. There is a group of four such characters, which are to be used in a hierarchical order.

5.2 Control Characters

NUL (Null): The all-zeros character which may serve to accomplish time fill and media fill.

SOH (Start of Heading): A communication control character used at the beginning of a sequence of characters which constitute a machine-sensible address or routing information. Such a sequence is referred to as the "heading." An STX character has the effect of terminating a heading.

STX (Start of Text): A communication control character which precedes a sequence of characters that is to be treated as an entity and entirely transmitted through to the ultimate destination. Such a sequence is referred to as "text." STX may be used to terminate a sequence of characters started by SOH.

ETX (End of Text): A communication control character used to terminate a sequence of characters started with STX and transmitted as an entity.

EOT (End of Transmission): A communication control character used to indicate the conclusion of a transmission, which may have contained one or more texts and any associated headings.

ENQ (Enquiry): A communication control character used in data communication systems as a request for a response from a remote station. It may be used as a "Who Are You" (WRU) to obtain identification, or may be used to obtain station status, or both.

ACK (Acknowledge): A communication control character transmitted by a receiver as an affirmative response to a sender.

BEL (Bell): A character for use when there is a need to call for human attention. It may control alarm or attention devices.

BS (Backspace): A format effector which controls the movement of the printing position one printing space backward on the same printing line. (Applicable also to display devices.)

HT (Horizontal Tabulation): A format effector which controls the movement of the printing position to the next in a series of predetermined positions along the printing line. (Applicable also to display devices and the skip function on punched cards.)

LF (Line Feed): A format effector which controls the movement of the printing position to the next printing line. (Applicable also to display devices.) Where appropriate, this character may have the meaning "New Line" (NL), a format effector which controls the movement of the printing point to the first printing position on the next printing line. Use of this convention requires agreement between sender and recipient of data.

VT (Vertical Tabulation): A format effector which controls the movement of the printing position to the next in a series of predetermined printing lines. (Applicable also to display devices.)

FF (Form Feed): A format effector which controls the movement of the printing position to the first predetermined printing line on the next form or page. (Applicable also to display devices.)

CR (Carriage Return): A format effector which controls the movement of the printing position to the first printing position on the same printing line. (Applicable also to display devices.)

SO (Shift Out): A control character indicating that the code combinations which follow shall be interpreted as outside of the character set of the standard code table until a Shift In character is reached.

SI (Shift In): A control character indicating that the code combinations which follow shall be interpreted according to the standard code table.

DLE (Data Link Escape): A communication control character which will change the meaning of a limited number of contiguously following characters. It is used exclusively to provide supplementary controls in data communication networks.

DC1, DC2, DC3, DC4 (Device Controls): Characters for the control of ancillary devices associated with data processing or telecommunication systems, more especially switching devices "on" or "off." (If a single "stop" control is required to interrupt or turn off ancillary devices, DC4 is the preferred assignment.)

NAK (Negative Acknowledge): A communication control character transmitted by a receiver as a negative response to the sender.

SYN (Synchronous Idle): A communication control character used by a synchronous transmission system in the absence of any other character to provide a signal from which synchronism may be achieved or retained.

ETB (End of Transmission Block): A communication control character used to indicate the end of a block of data for communication purposes. ETB is used for blocking data where the block structure is not necessarily related to the processing format.

CAN (Cancel): A control character used to indicate that the data with which it is sent is in error or is to be disregarded.

EM (End of Medium): A control character associated with the sent data which may be used to identify the physical end of the medium, or the end of the used, or wanted, portion of information recorded on a medium.

(The position of this character does not necessarily correspond to the physical end of the medium.)

SUB (Substitute): A character that may be substituted for a character which is determined to be invalid or in error.

ESC (Escape): A control character intended to provide code extension (supplementary characters) in general information interchange. The Escape character itself is a prefix affecting the interpretation of a limited number of contiguously following characters.

FS (File Separator), GS (Group Separator), RS (Record Separator), and US (Unit Separator): These information separators may be used within data in optional fashion, except that their hierarchical relationship shall be: FS is the most inclusive, then GS, then RS, and US is least inclusive. (The content and length of a File, Group, Record, or Unit are not specified.)

DEL (Delete): This character is used primarily to "erase" or "obliterate" erroneous or unwanted characters in perforated tape. (In the strict sense, DEL is not a control character.)

5.3 Graphic Characters

SP (Space): A normally non-printing graphic character used to separate words. It is also a format effector which controls the movement of the printing position, one printing position forward. (Applicable also to display devices.)

6. General Considerations

6.1 This standard does not define the means by which the coded set is to be recorded in any physical medium, nor does it include any redundancy or define techniques for error control. Further, this standard does not define data communication character structure, data communication formats, code extension techniques, or graphic representation of control characters.

6.2 Deviations from the standard may create serious difficulties in information interchange and should be used only with full cognizance of the parties involved.

6.3 The relative sequence of any two characters, when used as a basis for collation, is defined by their binary values.

6.4 No specific meaning is prescribed for any of the graphics in the code table except that which is understood by the users. Furthermore, this standard does not specify a type style for the printing or display of the various graphic characters. In specific applications, it may be desirable to employ distinctive styling of individual graphics to facilitate their use for specific purposes as, for example, to stylize the graphics in code positions 2/1 and 5/14 into those frequently associated with logical OR (|) and logical NOT (¬), respectively.

6.5 The appendixes to this standard contain additional information on the design and use of this code.

Appendixes

(These Appendixes are not a part of USA Standard Code for Information Interchange, X3.4-1968, but are included to facilitate its use.)

Appendix A
Design Considerations for the Coded Character Set

A1. Introduction

The standard coded character set is intended for the interchange of information among information processing systems, communication systems, and associated equipment.

A2. Considerations Affecting the Code

There were many considerations that determined the set size, set structure, character selection, and character placement of the code. Among these were (not listed in order of priority):

(1) Need for adequate number of graphic symbols
(2) Need for adequate number of device controls, format effectors, communication controls, and information separators
(3) Desire for a non-ambiguous code, i.e., one in which every code combination has a unique interpretation
(4) Physical requirements of media and facilities
(5) Error control considerations
(6) Special interpretation of the all-zeros and all-ones characters
(7) Ease in the identification of classes of characters
(8) Data manipulation requirements
(9) Collating conventions
    (a) Logical
    (b) Historical
(10) Keyboard conventions
    (a) Logical
    (b) Historical
(11) Other set sizes
(12) International considerations
(13) Programming languages
(14) Existing coded character sets.

A3. Set Size

A 7-bit set is the minimum size that will meet the requirements for graphics and controls in applications involving general information interchange.

A4. Set Structure

A4.1 In discussing the set structure it is convenient to divide the set into 8 columns and 16 rows as indicated in this standard.

A4.2 It was considered essential to have a dense subset which contained only graphics. For ease of identification this graphic subset was placed in six contiguous columns.

A4.3 The first two columns were chosen for the controls for the following three reasons:

(1) The character NUL by its definition has the location 0/0 in the code table. NUL is broadly considered a control character.

(2) The representations in column 7 were felt to be most susceptible to simulation by a particular class of transmission error—one which occurs during an idle condition on asynchronous systems.

(3) To permit the considerations of graphic subset structure described in A6 to be satisfied, the two columns of controls had to be adjacent.

A4.4 The character set was structured to enable the easy identification of classes of graphics and controls.

A5. Choice of Graphics

A5.1 Included in the set are the numerals 0 through 9, upper and lower cases of the alphabetic letters A through Z, and those punctuation, mathematical, and business symbols considered most useful. The set includes a number of characters commonly encountered in programming languages. In particular, all the COBOL and FORTRAN graphics are included.

A5.2 In order to permit the representation of languages other than English, one diacritical (or accent) mark has been included, and provision has been made for the use of five punctuation symbols alternately as diacritical marks. The pairing of these punctuation symbols with their corresponding diacritical marks was done to facilitate the design of a typeface which would be acceptable for both uses.

These arrangements are:

Col/Row	Code Table Symbol	Use: Punctuation	Use: Diacritical
2/2	"	Quotation Marks	Diaeresis
2/7	'	Apostrophe	Acute Accent
2/12	,	Comma	Cedilla
5/14	^	(None)	Circumflex
6/0	`	Opening Single Quotation Mark	Grave Accent
7/14	~	Overline	Tilde*

*May also be used for other accents not specifically provided.

A5.3 The character *overline* is shown as it is in the code table to suggest a means of avoiding confusion with *underline*, and to reflect its use as *tilde*. The character *vertical line* is shown as it is in the code table to avoid confusion with the solid vertical bar frequently used as a logical operator, which may be found in some systems as a graphic stylization of *exclamation point*.

A6. Graphic Subset Structure

A6.1 The basic structure of the dense graphic subset was influenced by logical collating considerations, the requirements of simply related 6-bit sets, and the needs of typewriter-like devices. For information processing, it is desirable that the characters be arranged in such a way as to minimize both the operating time and the hardware components required for ordering and sequencing operations. This requires that the relative order of characters, within classes, be such that a simple comparison of the binary codes will result in information being ordered in a desired sequence.

A6.2 Conventional usage requires that SP *(space)* be ahead of any other symbol in a collatable set. This permits a name such as "JOHNS" to collate ahead of a name such as "JOHNSON." The requirement that punctuation symbols such as *comma* also collate ahead of the alphabet ("JOHNS, A" should also collate before "JOHNSON") establishes the special symbol locations, including SP, in the first column of the graphic subset.

A6.3 To simplify the design of typewriter-like devices, it is desirable that there be only a common 1-bit difference between characters to be paired on keytops. This, together with the requirements for a contiguous alphabet, and the collating requirements outlined above, resulted in the placement of the alphabet in the last four columns of the graphic subset and the placement of the numerals in the second column of the graphic subset.

A6.4 It is expected that devices having the capability of printing only 64 graphic symbols will continue to be important. It may be desirable to arrange these devices to print one symbol for the bit pattern of both upper and lower case of a given alphabetic letter. To facilitate this, there should be a single bit difference between the upper and lower case representations of any given letter. Combined with the requirement that a given case of the alphabet be contiguous, this dictated the assignment of the alphabet, as shown, in columns 4 through 7.

A6.5 To minimize ambiguity caused by the use of a 64-graphic device as described above, it is desirable, to the degree possible, that each character in column 6 or 7 differ little in significance from the corresponding character in column 4 or 5. In certain cases, this was not possible.

A6.6 The assignment of *reverse slant* and *vertical line*, the *brackets* and *braces*, and *circumflex* and *overline* were made with a view to the considerations of A6.5.

A6.7 The resultant structure of "specials" (S), "digits" (D), and "alphabetics" (A) does not conform to the most prevalent collating convention (S-A-D) because of other more demanding code requirements.

A6.8 The need for a simple transformation from the set sequence to the prevalent collating convention was recognized, and dictated the placement of some of the "specials" within the set. Specifically, those special symbols, viz., *ampersand* (&), *asterisk* (*), *comma* (,), *hyphen* (-), *period* (.), and *slant* (/), which are most often used as identifiers for ordering information and which normally collate ahead of both the alphabet and the numerals, were not placed in the column containing the numbers, so that the entire numeric column could be rotated via a relatively simple transformation to a position higher than the alphabet. The sequence of the aforementioned "specials" was also established to the extent practical to conform to the prevalent collating convention.

A6.9 The need for a useful 4-bit numeric subset also played a role in the placement of characters. Such a 4-bit subset, including the digits and the symbols *asterisk*, *plus* (+), *comma*, *hyphen*, *period*, and *slant*, can easily be derived from the code.

A6.10 Considerations of other domestic code sets, including the Department of Defense former standard 8-bit data transmission code ("Fieldata"-1961), as well as international requirements, played an important role in deliberations that resulted in the code. The selection and grouping of the symbols *dollar sign* ($), *percent* (%), *ampersand* (&), *apostrophe* ('), *less than* (<), *equals* (=), and *greater than* (>) facilitate contraction to either a business or scientific 6-bit subset. The position of these symbols, and of the symbols *comma*, *hyphen*, *period*, and *slant*, facilitates achievement of commonly accepted pairing on a keyboard. The historic pairing of *question mark* and *slant* is preserved and the *less than* and *greater than* symbols, which have comparatively low usage, are paired with *period* and *comma* so that in dual-case keyboard devices where it is desired to have *period* and *comma* in both cases, the *less than* and *greater than* symbols are the ones displaced. Provision was made for the accommodation of alphabets containing more than 26 letters and for 6-bit contraction

by the location of low-usage characters in the area following the alphabet. In addition, the requirement for the digits 10 and 11 used in sterling monetary areas was considered in the placement of the *asterisk, plus, semicolon,* and *colon*, so that the 10 and 11 could be substituted for the *semicolon* and *colon.*

A7. Control Subset Content and Structure

A7.1 The control characters included in the set are those required for the control of terminal devices, input and output devices, format, or communication transmission and switching on a general enough basis to justify inclusion in a standard set.

A7.2 Many control characters may be considered to fall into the following categories:

(1) Communication Controls
(2) Format Effectors
(3) Device Controls
(4) Information Separators.

To the extent practical controls of each category were grouped in the code table. The structure chosen also facilitates the contraction of the set to a logically related 6-bit set.

A7.3 The information separators (FS, GS, RS, US) identify boundaries of various elements of information, but differ from punctuation in that they are primarily intended to be machine sensible. They were arranged in accordance with an expected hierarchical use, and the lower end of the hierarchy is contiguous in binary order with SP (space) which is sometimes used as a machine-sensible separator. Subject to this hierarchy the exact nature of their use within data is not specified..

A7.4 The character SYN (Synchronous Idle) was located so that its binary pattern in serial transmission was unambiguous as to character framing, and also to optimize certain other aspects of its communication usage.

A7.5 ACK (Acknowledge) and NAK (Negative Acknowledge) were located so as to gain the maximum practical protection against mutation of one into the other by transmission errors.

A7.6 The function "New Line" (NL) was associated with LF (rather than with CR or with a separate character) to provide the most useful combinations of functions through the use of only two character positions, and to allow the use of a common end-of-line format for both printers having separate CR-LF functions and those having a combined (i.e., NL) function. This sequence would be CR-LF, producing the same result on printers of both classes, and would be useful during conversion of a system from one method of operation to the other.

Appendix B

Notes on Application

B1. Introduction

B1.1 The standard code was developed to provide for information interchange among information processing systems, communications systems, and associated equipment. In a system consisting of equipment with several local or native codes, maximum flexibility will be achieved if each of the native codes is translated to the standard whenever information interchange is desired.

B1.2 Within any particular equipment, system, or community of activity, it may be necessary to substitute characters. For example, some systems may require special graphic symbols and some devices may require special control codes. (Design efforts on the standard code included consideration of these types of adaptations.) So-called "secular sets" produced by such substitutions, although not conforming to this standard, may nonetheless be consonant with it if substitutions are made in accordance with the guidelines of B2.

B2. Character Substitutions

B2.1 Any character substitution will result in a coded character set which does not conform to this standard.

B2.2 It is recommended that when a character is substituted in the code table for a standard character, the standard character should not be reassigned elsewhere in the table. Such a substitute character, once assigned, should not be subsequently reassigned elsewhere.

B2.3 It is recommended that graphic substitutions be made only in the graphic area and control substitutions only in the control area. Any substitution involving a control should be made only with full cognizance of all possible operational effects.

B2.4 It should be noted that this standard specifies, for each position of the code table, the information represented by the character and not necessarily the precise action taken by the recipient when the character is received. In the case of graphics, considerable variation in the actual shape printed or displayed may be appropriate to different units, systems, or fields of application. In the case of controls, the action performed is dependent upon the use for which the particular system is intended, the application to which it is being put, and a number of conventions established by the user or designer—some system-wide and some unique to a particular unit.

B2.5 Typical examples of diversity in execution not necessarily contrary to this standard are:

(1) A number of graphic symbols, other than that used in the code table, are used for *ampersand* in various type styles; still other symbols may be more appropriate to electronic display devices. The use of such alternate symbols does not in itself constitute deviation from the standard as long as *ampersand* is the concept associated with the character. Note that this does not necessarily restrict the use of such an alternate symbol design to mean "*and*"; in any type style *ampersand* may, of course, be used with arbitrary meaning.

(2) A card punch in one application may "skip" when the character HT (Horizontal Tabulation: used as skip) is presented to it; in another application the character HT may be recorded in the card without further action.

B3. Related Larger and Smaller Sets

Consideration has been given to the relationship between the standard set and sets of other sizes. A number of straightforward logical transformations are possible which result in a variety of sets related to the standard. None of the transformed sets are recognized by this standard.

B4. International Considerations

This standard conforms to the anticipated recommendations of the International Organization for Standardization (ISO) and the International Telegraph and Telephone Consultative Committee (CCITT)* for a 7-bit code. It includes all the character assignments specified by those bodies for international standardization. Their recommendations, however, permit national standardization by the various countries in seven code table positions. Also, the characters in three additional positions have been designated as being replaceable by national characters in only those countries having an extraordinary requirement in this regard.

*An international body which establishes standards and conventions for international telecommunications, especially where the public telegraph and telephone services are governmentally owned and operated. Their recommendations are often embodied in the regulations applying to such services.

The seven national usage positions and their assignments in this standard are shown in the following, as well as the three "supplementary" positions, which are shown in parentheses:

Column/Row	Character (U.S.)
4/0	@
5/11	[
5/12	\
5/13	]
(5/14	^)
(6/0	`)
7/11	{
7/12	|
7/13	}
(7/14	~)

In international interchange of information these 10 characters should not be used except where it is determined that there is agreement between sender and recipient.

In addition, in other countries, the number sign (#) (in position 2/3) may be replaced by "£".

B5. Communications Considerations

Certain control characters are designated as "communication controls." They are:

SOH	(Start of Heading)
STX	(Start of Text)
ETX	(End of Text)
EOT	(End of Transmission)
ENQ	(Enquiry)
ACK	(Acknowledge)
DLE	(Data Link Escape)
NAK	(Negative Acknowledge)
SYN	(Synchronous Idle)
ETB	(End of Transmission Block)

These may be used by communication systems for their internal signaling, or for the exchange of information relating to the control of the communication system between that system and its end terminals. Some such systems may impose restrictions on the use of these communication control characters by the end terminals. For example, the use of some of them may be completely prohibited while others may be restricted to use in conformity with the formats and procedures required by the communication system for its operation.

Appendix C

Original Criteria

C1. Introduction

C1.1 This Appendix contains the original criteria upon which the design of the code was based. Not all criteria have been entirely satisfied. Some are conflicting, and the characteristics of the set represent accepted compromises of these divergent criteria.

C1.2 The criteria were drawn from communication, processing, and media recording aspects of information interchange.

C2. Criteria

C2.1 Every character of the code set shall be represented by the same number of bits (i.e., binary digits).

C2.2 The standard set shall be so structured as to facilitate derivation of logically related larger or smaller sets.

C2.3 In a code of n bits, all possible 2^n patterns of ones and zeros will be permitted and considered valid.

C2.4 The number of bits, n, shall be sufficient to provide for the alphabetic and numeric characters, commonly used punctuation marks, and other special symbols, along with those control characters required for interchange of information.

C2.5 The numerals 0 through 9 shall be included within a 4-bit subset.

C2.6 The numerals 0 through 9 shall be so represented that the four low-order bits shall be the binary-coded-decimal form of the particular numeral that the code represents. In the selection of the two characters immediately succeeding the numeral 9, consideration shall be given to their replacement by the graphics 10 and 11 to facilitate the adoption of the code in the sterling monetary area.

C2.7 The interspersion of control characters among the graphic characters shall be avoided. The characters devoted to controls shall be easily separable from those devoted to graphics.

C2.8 Within the standard set, each character shall stand by itself and not depend on surrounding characters for interpretation.

C2.9 An entire case of the alphabet (A through Z) shall be included within a 5-bit subset. Consideration shall be given to the need for more than 26 characters in some alphabets.

C2.10 The letters of each case of the alphabet shall be assigned, in conventional order (A through Z), to successive, increasing binary representations.

C2.11 Suitable control characters required for communication and information processing shall be included.

C2.12 Escape functions that provide for departures from the standard set shall be incorporated.

C2.13 A simple binary comparison shall be sufficient to determine the order within each class of characters. (In this regard, the special graphics, the numerals, and the alphabet are each defined as distinct classes.) Simple binary rules do not necessarily apply between classes when ordering information.

C2.14 Space (i.e., the space between words) must collate ahead of all other graphics.

C2.15 Special symbols used in the ordering of information must collate ahead of both the alphabet and the numerals.

C2.16 Insofar as possible, the special symbols shall be grouped according to their functions; for example, punctuation and mathematical symbols. Further, the set shall be so organized that the simplest possible test shall be adequate to distinguish and identify the basic alphabetic, numeric, and special symbol subsets.

C2.17 Special symbols shall be placed in the set so as to simplify their generation by typewriters and similar keyboard devices This criterion means, in effect, that the codes for pairs of characters that normally appear on the same keytops on a typewriter shall differ only in a common single-bit position.

C2.18 The set shall contain the graphic characters of the principal programming languages.

C2.19 The codes for all control characters shall contain a common, easily recognizable, bit pattern.

C2.20 The Null (000...) and Delete (111...) characters shall be provided.

Appendix D

Terminology

This Appendix is intended to clarify the sense in which certain terms are used.

Bit: Contraction of "binary digit."

Bit Pattern: The binary representation of a character.

Character: A member of a coded character set; the binary representation of such a member and its graphic symbol or control function.

Code: A system of discrete representation of a set of symbols and functions.

USA Standards

on

Computers and Information Processing

X3.1-1962	Signaling Speeds for Data Transmission
X3.2-1963	Print Specifications for Magnetic Ink Character Recognition
X3.3-1963	Bank Check Specifications for Magnetic Ink Character Recognition
X3.4-1968	Code for Information Interchange
X3.5-1968	Flowchart Symbols and Their Usage in Information Processing
X3.6-1965	Perforated Tape Code for Information Interchange
X3.9-1966	FORTRAN
X3.10-1966	Basic FORTRAN
X3.11-1966	Specifications for General Purpose Paper Cards for Information Processing
X3.12-1966	Vocabulary for Information Processing
X3.13-1966	Parallel Signaling Speeds for Data Transmission
X3.14-1969	Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)
X3.15-1966	Bit Sequencing of the USA Standard Code for Information Interchange in Serial-by-Bit Data Transmission
X3.16-1966	Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the USA Standard Code for Information Interchange
X3.17-1966	Character Set for Optical Character Recognition
X3.18-1967	One-Inch Perforated Paper Tape for Information Interchange
X3.19-1967	Eleven-Sixteenths Inch Perforated Paper Tape
X3.20-1967	Take-Up Reels For One-Inch Perforated Tape For Information Interchange
X3.21-1967	Rectangular Holes in Twelve-Row Punched Cards
X3.22-1967	Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)
X3.24-1968	Signal Quality at Interface Between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission
X3.25-1968	Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication
X3.26-1969	Hollerith Punched Card Code

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E. LOHSE, Editor

Editor's Note—The following working document was approved for publication as a tutorial paper by the USA Standards Committee X3, Computers and Information Processing, in its efforts to develop a proposed American Standard. In order that the final version of the proposed standard reflect the largest public consensus, the publication of this document is intended to elicit comment, criticism, and general public reaction, with the understanding that such working document is an intermediate result in the standardization process and is subject to change, modification, or withdrawal, in part or in whole. Comments should be addressed to the X3 Secretary, Business Equipment Manufacturers Association, 235 East 42 Street, New York, N. Y. 10017.—E. L.

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Correspondences of 8-Bit and Hollerith Codes for Computer Environments—A USASI Tutorial

Foreword

The correspondence tables in the document reflect USASCII standard code assignments as well as other codes. Comments that refer to the assignments of characters or character sets in columns 8 through 15 of Table 1 as a basis for standardization are solicited.

Introduction

1.0 This tutorial contains an 8-Bit Code for USASCII, the 8-Bit Code for EBCDIC and a 256-character Hollerith card code, and defines the correspondences between these three codes. This tutorial document suggests, for use by and manufacturers, a complete, consistent, and unambiguous correspondence between 256-character, 8-bit codes and the Hollerith card code, so that hardware or programming translators may be designed on a uniform basis.

2.0 This tutorial does not in any way deprecate the correspondence of these codes to any other codes.

3.0 Definitions

The following terms are defined to facilitate understanding the correspondence:

3.1 USASCII is the name given to the 128-character, 7-bit code called the USA Standard Code for Information Interchange. This code is also called ASCII.

USASCII-8 is the name given to the representation of USASCII in the USA standard for 800 cpi Magnetic Tape (NRZI) which assigns the 7 bits of USASCII to the lower order 7 bits of an 8-bit environment with the eighth bit equal to zero for the 128 USASCII characters. Table 1 shows the eighth bit equal to one for an additional 128 code table position without character assignment, but blocked into control and graphic regions.

X3.2/724 (Rev. of X3.2/662

3.2 EBCDIC is the name given to the 256-character, 8-bit code called the Extended BCD Interchange Code used as the computer system code on many computers.

3.3 HOLLERITH is the name given to the 128-character, 12-row card code called the USA Standard Hollerith Punched Card Code for Information Interchange. This tutorial suggests the expansion of that code to a 256-character, 12-row card code.

3.4 Bit-Pattern is the sequence of binary zeros and ones which make up the binary representation of a character. The binary zero or one is the primary unit of information used in codes.

Example 1: In USASCII-8, the bit pattern for the letter "R" is 01010010, from high to low order bit (see Table 1).

Example 2: In EBCDIC-8, the bit pattern for the letter "R" is 11011001, from high to low order bit (see Table 2).

3.5 Hole-Pattern is the combination of punched holes in a column of a 12-row card which make up the Hollerith representation of the character. The sequence for stating hole-patterns is 12, 11, 0, 9, 8, 1, 2, 3, 4, 5, 6, 7.

Example 3: In Hollerith-256, the hole-pattern for the letter "R" is 11-9 (see Table 3).

3.6 Bit-Number is the number assigned to a bit-position within the string of bits that represent a character. The 8 bits of a USASCII-8 character are U8, U7, U6, U5, U4, U3, U2, U1, from high to low order. The 8 bits of an EBCDIC-8 character are X0, X1, X2, X3, X4, X5, X6, X7, from high to low order.

3.7 Code Table is a way of representing (in, for example, a 16 × 16 tableau) the characters and associated bit-patterns or hole-patterns or a coded character set.

3.7.1 Row and Column Numbers are assigned to the rows and columns of a code table for easy reference. The rows and columns for USASCII-8 are numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. The rows and columns of EBCDIC-8 are numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F (which is called a hexadecimal notation in the literature).

(*Text continues on page 789*)

TABLE 1. USASCII-8

U8 U7 U6 U5	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1	
U4U3U2U1 / COL ROW	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	COL ROW
0000	NUL 12-0-9-8-1	DLE 12-11-9-8-1	SP NO PCH	0 0	@ 8-4	P 11-7	` 8-1	p 12-11-7	K0 11-0-9-8-1	K16 12-11-0-9-8-1	N0 12-0-9-1	N16 12-11-9-8	N32 12-11-0-9-6	N48 12-11-8-7	G0 12-11-0-8	G16 12-11-9-8-4	0
0001	SOH 12-9-1	DC1 11-9-1	! 12-8-7 ①	1 1	A 12-1	Q 11-8	a 12-0-1	q 12-11-8	K1 0-9-1	K17 9-1	N1 12-0-9-2	N17 11-8-1	N33 12-11-0-9-7	N49 11-0-8-1	G1 12-11-0-9	G17 12-11-9-8-5	1
0010	STX 12-9-2	DC2 11-9-2	" 8-7	2 2	B 12-2	R 11-9	b 12-0-2	r 12-11-9	K2 0-9-2	K18 11-9-8-2	N2 12-0-9-3	N18 11-0-9-2	N34 12-11-0-9-8	N50 11-0-8-2	G2 12-11-0-8-2	G18 12-11-9-8-6	2
0011	ETX 12-9-3	DC3 11-9-3	# 8-3	3 3	C 12-3	S 0-2	c 12-0-3	s 11-0-2	K3 0-9-3	K19 9-3	N3 12-0-9-4	N19 11-0-9-3	N35 12-0-8-1	N51 11-0-8-3	G3 12-11-0-8-3	G19 12-11-9-8-7	3
0100	EOT 9-7	DC4 9-8-4	$ 11-8-3	4 4	D 12-4	T 0-3	d 12-0-4	t 11-0-3	K4 0-9-4	K20 9-4	N4 12-0-9-5	N20 11-0-9-4	N36 12-0-8-2	N52 11-0-8-4	G4 12-11-0-8-4	G20 11-0-9-8-2	4
0101	ENQ 0-9-8-5	NAK 9-8-5	% 0-8-4	5 5	E 12-5	U 0-4	e 12-0-5	u 11-0-4	K5 11-9-5	K21 9-5	N5 12-0-9-6	N21 11-0-9-5	N37 12-0-8-3	N53 11-0-8-5	G5 12-11-0-8-5	G21 11-0-9-8-3	5
0110	ACK 0-9-8-6	SYN 9-2	& 12	6 6	F 12-6	V 0-5	f 12-0-6	v 11-0-5	K6 12-9-6	K22 9-6	N6 12-0-9-7	N22 11-0-9-6	N38 12-0-8-4	N54 11-0-8-6	G6 12-11-0-8-6	G22 11-0-9-8-4	6
0111	BEL 0-9-8-7	ETB 0-9-6	' 8-5	7 7	G 12-7	W 0-6	g 12-0-7	w 11-0-6	K7 11-9-7	K23 12-9-8	N7 12-0-9-8	N23 11-0-9-7	N39 12-0-8-5	N55 11-0-8-7	G7 12-11-0-8-7	G23 11-0-9-8-5	7
1000	BS 11-9-6	CAN 11-9-8	(12-8-5	8 8	H 12-8	X 0-7	h 12-0-8	x 11-0-7	K8 0-9-8	K24 9-8	N8 12-8-1	N24 11-0-9-8	N40 12-0-8-6	N56 12-11-0-8-1	G8 12-0-9-8-2	G24 11-0-9-8-6	8
1001	HT 12-9-5	EM 11-9-8-1	) 11-8-5	9 9	I 12-9	Y 0-8	i 12-0-9	y 11-0-8	K9 0-9-8-1	K25 9-8-1	N9 12-11-9-1	N25 0-8-1	N41 12-0-8-7	N57 12-11-0-1	G9 12-0-9-8-3	G25 11-0-9-8-7	9
1010	LF 0-9-5	SUB 9-8-7	* 11-8-4	: 8-2	J 11-1	Z 0-9	j 12-11-1	z 11-0-9	K10 0-9-8-2	K26 9-8-2	N10 12-11-9-2	N26 12-11-0	N42 12-11-8-1	N58 12-11-0-2	G10 12-0-9-8-4	G26 12-11-0-9-8-2	10
1011	VT 12-9-8-3	ESC 0-9-7	+ 12-8-6	; 11-8-6	K 11-2	[12-8-2	k 12-11-2	{ 12-0	K11 0-9-8-3	K27 9-8-3	N11 12-11-9-3	N27 12-11 0-9-1	N43 12-11-8-2	N59 12-11-0-3	G11 12-0-9-8-5	G27 12-11-0-9-8-3	11
1100	FF 12-9-8-4	FS 11-9-8-4	, 0-8-3	< 12-8-4	L 11-3	\ 0-8-2	l 12-11-3	| 12-11	K12 0-9-8-4	K28 12-9-4	N12 12-11-9-4	N28 12-11 0-9-2	N44 12-11-8-3	N60 12-11-0-4	G12 12-0-9-8-6	G28 12-11-0-9-8-4	12
1101	CR 12-9-8-5	GS 11-9-8-5	- 11	= 8-6	M 11-4	] 11-8-2	m 12-11-4	} 11-0	K13 12-9-8-1	K29 11-9-4	N13 12-11-9-5	N29 12-11 0-9-3	N45 12-11-8-4	N61 12-11-0-5	G13 12-0-9-8-7	G29 12-11-0-9-8-5	13
1110	SO 12-9-8-6	RS 11-9-8-6	. 12-8-3	> 0-8-6	N 11-5	^ 11-8-7 ②	n 12-11-5	~ 11-0-1	K14 12-9-8-2	K30 9-8-6	N14 12-11-9-6	N30 12-11 0-9-4	N46 12-11-8-5	N62 12-11-0-6	G14 12-11-9-8-2	G30 12-11-0-9-8-6	14
1111	SI 12-9-8-7	US 11-9-8-7	/ 0-1	? 0-8-7	O 11-6	_ 0-8-5	o 12-11-6	DEL 12-9-7	K15 11-9-8-3	K31 11-0-9-1	N15 12-11-9-7	N31 12-11 0-9-5	N47 12-11-8-6	N63 12-11-0-7	G15 12-11-9-8-7	EO 12-11-0-9-8-7	15

① may be "|" ② may be "¬"

TABLE 2. EBCDIC-8

X0 X1 X2 X3	COL ROW	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	COL ROW	DIGIT PUNCHES
0 0 0 0																			
0 0 0 1																			
0 0 1 1																			
0 1 0 1																			
ZONE PUNCHES: 12						12	12		12	12	12		12	12					
ZONE PUNCHES: 11							11	11	11		11	11	11		11				
ZONE PUNCHES: 0				0		0		0	0	0		0	0			0			
ZONE PUNCHES: 9		9	9	9	9	9	9	9	9										
0000	0	NUL	DLE	K0	K16	SP	&	-	N26	N35	N42	N49	N56	{	}	\	0	0	0
0001	1	SOH	DC1	K1	K17	N0	N9	/	N27	a	j	~	N57	A	J	K31	1	1	1
0010	2	STX	DC2	K2	SYN	N1	N10	N18	N28	b	k	s	N58	B	K	S	2	2	2
0011	3	ETX	DC3	K3	K19	N2	N11	N19	N29	c	l	t	N59	C	L	T	3	3	3
0100	4	K28	K29	K4	K20	N3	N12	N20	N30	d	m	u	N60	D	M	U	4	4	4
0101	5	HT	K5	LF	K21	N4	N13	N21	N31	e	n	v	N61	E	N	V	5	5	5
0110	6	K6	BS	ETB	K22	N5	N14	N22	N32	f	o	w	N62	F	O	W	6	6	6
0111	7	DEL	K7	ESC	EOT	N6	N15	N23	N33	g	p	x	N63	G	P	X	7	7	7
1000	8	K23	CAN	K8	K24	N7	N16	N24	N34	h	q	y	G0	H	Q	Y	8	8	8
1001	9	K13	EM	K9	K25	N8	N17	N25	`	i	r	z	G1	I	R	Z	9	9	9
1010	A	K14	K18	K10	K26	[	]	|	:	N36	N43	N50	G2	G8	G14	G20	G26	A	8-2
1011	B	VT	K15	K11	K27	.	$	,	#	N37	N44	N51	G3	G9	G15	G21	G27	B	8-3
1100	C	FF	FS	K12	DC4	<	*	%	@	N38	N45	N52	G4	G10	G16	G22	G28	C	8-4
1101	D	CR	GS	ENQ	NAK	(	)	_	'	N39	N46	N53	G5	G11	G17	G23	G29	D	8-5
1110	E	SO	RS	ACK	K30	+	;	>	=	N40	N47	N54	G6	G12	G18	G24	G30	E	8-6
1111	F	SI	US	BEL	SUB	|	¬	?	"	N41	N48	N55	G7	G13	G19	G25	EO	F	8-7
ZONE PUNCHES: 12						12				12	12		12	12	12		12		
ZONE PUNCHES: 11							11					11	11		11	11	11		
ZONE PUNCHES: 0				0				0				0	0	0		0	0		
ZONE PUNCHES: 9		9	9	9	9									9	9	9	9		

(1) 12-0-9-8-1
(2) 12-11-9-8-1
(3) 11-0-9-8-1
(4) 12-11-0-9-8-1
(5) NO PUNCHES
(6) 12
(7) 11
(8) 12-11-0
(9) 12-0
(10) 11-0
(11) 0-8-2
(12) 0
(13) 0-1
(14) 11-0-9-1
(15) 12-11

TABLE 3. HOLLERITH-256

	12 11 0 9	12 11 9	12 0 9	12 9	11 0 9	11 9	0 9	9	12 11 0	12 11	12 0	12	11 0	11	0	
	G1 14/1 B9	r 7/2 99	i 6/9 89	I 4/9 C9	z 7/10 A9	R 5/2 D9	Z 5/10 E9	9 3/9 F9	N26 11/10 70	| 7/12 6A	{ 7/11 C0	& 2/6 50	} 7/13 D0	- 2/13 60	0 3/0 F0	SP 2/0 40
1	N27 11/11 71	N9 10/9 51	N0 10/0 41	SOH 0/1 01	K31 9/15 E1	DC1 1/1 11	K1 8/1 21	K17 9/1 31	N57 13/9 B1	j 6/10 91	a 6/1 81	A 4/1 C1	~ 7/14 A1	J 4/10 D1	/ 2/15 61	1 3/1 F1
2	N28 11/12 72	N10 10/10 52	N1 10/1 42	STX 0/2 02	N18 11/2 62	DC2 1/2 12	K2 8/2 22	SYN 1/6 32	N58 13/10 B2	k 6/11 92	b 6/2 82	B 4/2 C2	s 7/3 A2	K 4/11 D2	S 5/3 E2	2 3/2 F2
3	N29 11/13 73	N11 10/11 53	N2 10/2 43	ETX 0/3 03	N19 11/3 63	DC3 1/3 13	K3 8/3 23	K19 9/3 33	N59 13/11 B3	l 6/12 93	c 6/3 83	C 4/3 C3	t 7/4 A3	L 4/12 D3	T 5/4 E3	3 3/3 F3
4	N30 11/14 74	N12 10/12 54	N3 10/3 44	K28 9/12 04	N20 11/4 64	K29 9/13 14	K4 8/4 24	K20 9/4 34	N60 13/12 B4	m 6/13 94	d 6/4 84	D 4/4 C4	u 7/5 A4	M 4/13 D4	U 5/5 E4	4 3/4 F4
5	N31 11/15 75	N13 10/13 55	N4 10/4 45	HT 0/9 05	N21 11/5 65	K5 8/5 15	LF 0/10 25	K21 9/5 35	N61 13/13 B5	n 6/14 95	e 6/5 85	E 4/5 C5	v 7/6 A5	N 4/14 D5	V 5/6 E5	5 3/5 F5
6	N32 12/0 76	N14 10/14 56	N5 10/5 46	K6 8/6 06	N22 11/6 66	BS 0/8 16	ETB 1/7 26	K22 9/6 36	N62 13/14 B6	o 6/15 96	f 6/6 86	F 4/6 C6	w 7/7 A6	O 4/15 D6	W 5/7 E6	6 3/6 F6
7	N33 12/1 77	N15 10/15 57	N6 10/6 47	DEL 7/05 07	N23 11/7 67	K7 8/7 17	ESC 1/11 27	ECT 0/4 37	N63 13/15 B7	p 7/0 97	g 6/7 87	G 4/7 C7	x 7/8 A7	P 5/0 D7	X 5/8 E7	7 3/7 F7
8	N34 12/2 78	N16 11/0 58	N7 10/7 48	K23 9/7 08	N24 11/8 68	CAN 1/8 18	K8 8/8 28	K24 9/8 38	G0 14/15 B8	q 7/1 98	h 6/8 88	H 4/8 C8	y 7/9 A8	Q 5/1 D8	Y 5/9 E8	8 3/8 F8
8-1	K16 9/0 30	DLE 1/0 10	NUL 0/0 00	K13 8/13 09	K0 8/0 20	EM 1/9 19	K9 8/9 29	K25 9/9 39	N56 13/80 B0	N42 12/10 90	N35 12/3 80	N8 10/8 49	N49 13/1 A0	N17 11/1 59	N25 11/9 69	¬ 6/0 79
8-2	G26 15/10 FA	G14 14/14 DA	G8 14/8 CA	K14 8/14 0A	G20 15/4 EA	K18 9/2 1A	K10 8/10 2A	K26 9/10 3A	G2 14/20 BA	N43 12/11 9A	N36 12/4 8A	[5/11 4A	N50 13/2 AA	] 5/13 9A	\ 5/12 E0	: 3/10 7A
8-3	G27 15/11 FB	G15 14/15 DB	G9 14/9 CB	VT 0/11 0B	G21 15/5 EB	K15 8/15 1B	K11 8/11 2B	K27 9/11 3B	G3 14/31 BB	N44 12/12 9B	N37 12/5 8B	. 2/14 4B	N51 13/3 AB	$ 2/4 9B	, 2/12 6B	# 2/3 7B
8-4	G28 15/12 FC	G16 15/0 DC	G10 14/10 CC	FF 0/12 0C	G22 15/6 EC	FS 1/12 1C	K12 8/12 2C	DC4 1/4 3C	G4 14/4 BC	N45 12/13 9C	N38 12/6 8C	< 3/12 4C	N52 13/4 AC	* 2/10 9C	% 2/5 6C	@ 4/0 7C
8-5	G29 15/13 FD	G17 15/1 DD	G11 14/11 CD	CR 0/13 0D	G23 15/7 ED	GS 1/13 1D	ENQ 0/5 2D	NAK 1/5 3D	G5 14/5 BD	N46 12/14 9D	N39 12/7 8D	(2/8 4D	N39 12/7 AD	) 2/9 9D	_ 5/15 6D	' 2/7 7D
8-6	G30 15/14 FE	G18 15/2 DE	G12 14/12 CE	SO 0/14 0E	G24 15/80 EE	RS 1/14 1E	ACK 0/6 2E	K30 9/14 3E	G6 14/6 BE	N47 12/15 9E	N40 12/8 8E	+ 2/11 4E	N54 13/6 AE	; 3/11 9E	> 3/14 6E	= 3/13 7E
8-7	EO 15/15 FF	G19 15/3 DF	G13 14/13 CF	SI 0/15 0F	G25 15/91 EF	US 1/15 1F	BEL 0/7 2F	SUB 1/10 3F	G7 14/7 BF	N48 13/0 9F	N41 12/9 8F	| 2/1 4F	N55 13/7 AF	? 5/14 9F	? 3/15 6F	" 2/2 7F

Character Designation
USASCII-8 Column/Row Numbers
EBCDIC-8 Hexadecimal Column/Row Numbers

TABLE 4. USASCII-8 TO EBCDIC-8 CORRESPONDENCE

COL / ROW	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL 0/0	DLE 1/0	K0 8/0	K16 9/0	SP 2/0	& 2/6	- 2/13	N26 11/10	N35 12/3	N42 12/10	N49 13/1	N56 13/8	{ 7/11	} 7/13	\ 5/12	0 3/0
1	SOH 0/1	DC1 1/1	K1 8/1	K17 9/1	N0 10/0	N9 10/9	/ 2/15	N27 11/11	a 6/1	j 6/10	~ 7/14	N57 13/9	A 4/1	J 4/10	K31 9/15	1 3/1
2	STX 0/2	DC2 1/2	K2 8/2	SYN 1/6	N1 10/1	N10 10/10	N18 11/2	N28 11/12	b 6/2	k 6/11	s 7/3	N58 13/10	B 4/2	K 4/11	S 5/3	2 3/2
3	EXT 0/3	DC3 1/3	K3 8/3	K19 9/3	N2 10/2	N11 10/11	N19 11/3	N29 11/13	c 6/3	l 6/12	t 7/4	N59 13/11	C 4/3	L 4/12	T 5/4	3 3/3
4	K28 9/12	K29 9/13	K4 8/4	K20 9/4	N3 10/3	N12 10/12	N20 11/4	N30 11/14	d 6/4	m 6/13	u 7/5	N60 13/12	D 4/4	M 4/13	U 5/5	4 3/4
5	HT 0/9	K5 8/5	LF 0/10	K21 9/5	N4 10/4	N13 10/13	N21 11/5	N31 11/15	e 6/5	n 6/14	v 7/6	N61 13/13	E 4/5	N 4/14	V 5/6	5 3/5
6	K6 8/6	BS 0/8	ETB 1/7	K22 9/6	N5 10/5	N14 10/14	N22 11/6	N32 12/0	f 6/6	o 6/15	w 7/7	N62 13/14	F 4/6	O 4/15	W 5/7	6 3/6
7	DEL 7/15	K7 8/7	ESC 1/11	EOT 0/4	N6 10/6	N15 10/15	N23 11/7	N33 12/1	g 6/7	p 7/0	x 7/8	N63 13/15	G 4/7	P 5/0	X 5/8	7 3/7
8	K23 9/7	CAN 1/8	K8 8/8	K24 9/8	N7 10/7	N16 11/0	N24 11/8	N34 12/2	h 6/8	q 7/1	y 7/9	G0 14/0	H 4/8	Q 5/1	Y 5/9	8 3/8
9	K13 8/13	EM 1/9	K9 8/9	K25 9/9	N8 10/8	N17 11/1	N25 11/9	\ 6/0	i 6/9	r 7/2	z 7/10	G1 14/1	I 4/9	R 5/2	Z 5/10	9 3/9
A	K14 8/14	K18 9/2	K10 8/10	K26 9/10	[5/11	] 5/13	| 7/12	: 3/10	N36 12/4	N43 12/11	N50 13/2	G2 14/2	G8 14/8	G14 14/14	G20 15/4	G26 15/10
B	VT 0/11	K15 8/15	K11 8/11	K27 9/11	. 2/14	$ 2/4	, 2/12	# 2/3	N37 12/5	N44 12/12	N51 13/3	G3 14/3	G9 14/9	G15 14/15	G21 15/5	G27 15/11
C	FF 0/12	FS 1/12	K12 8/12	DC4 1/4	< 3/12	* 2/10	% 2/5	@ 4/0	N38 12/6	N45 12/13	N52 13/4	G4 14/4	G10 14/10	G16 15/0	G22 15/6	G28 15/12
D	CR 0/13	GS 1/13	ENQ 0/5	NAK 1/5	(2/8	) 2/9	_ 5/15	' 2/7	N39 12/7	N46 12/14	N53 13/5	G5 14/5	G11 14/11	G17 15/1	G23 15/7	G29 15/13
E	SO 0/14	RS 1/14	ACK 0/6	K30 9/14	+ 2/11	; 3/11	> 3/14	= 3/13	N40 12/8	N47 12/15	N54 13/6	G6 14/6	G12 14/12	G18 15/2	G24 15/8	G30 15/14
F	SI 0/15	US 1/15	BEL 0/7	SUB 1/10	| 2/1	¬ 5/14	? 3/15	" 2/2	N41 12/9	N48 13/0	N55 13/7	G7 14/7	G13 14/13	G19 15/3	G25 15/9	EO 15/15

Character Designation
USASCII-8 Column/Row Numbers

TABLE 5. EBCDIC-8 TO USASCII-8 CORRESPONDENCE

COL / ROW	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	NUL	DLE	SP	0	@	P	`	p	K0	K16	N0	N16	N32	N48	G0	G16
	00	10	4/0	F0	7C	D7	79	97	20	30	41	58	76	9F	B8	DC
1	SOH	DC1	! ①	1	A	Q	a	q	K1	K17	N1	N17	N33	N49	G1	G17
	01	11	4F	F1	C1	D8	81	98	21	31	42	59	77	A0	B9	DD
2	STX	DC2	"	2	B	R	b	r	K2	K18	N2	N18	N34	N50	G2	G18
	02	12	7F	F2	C2	D9	82	99	22	1A	43	62	78	AA	BA	DE
3	ETX	DC3	#	3	C	S	c	s	K3	K19	N3	N19	N35	N51	G3	G19
	03	13	7B	F3	C3	E2	83	A2	23	33	44	63	80	AB	BB	DF
4	EOT	DC4	$	4	D	T	d	t	K4	K20	N4	N20	N36	N52	G4	G20
	37	3C	5B	F4	C4	E3	84	A3	24	34	45	64	8A	AC	BC	EA
5	ENQ	NAK	%	5	E	U	e	u	K5	K21	N5	N21	N37	N53	G5	G21
	2D	3D	6C	F5	C5	E4	85	A4	15	35	46	65	8B	AD	BD	EB
6	ACK	SYN	&	6	F	V	f	v	K6	K22	N6	N22	N38	N54	G6	G22
	2E	32	50	F6	C6	E5	86	A5	06	36	47	66	8C	AE	BE	EC
7	BEL	ETB	'	7	G	W	g	w	K7	K23	N7	N23	N39	N55	G7	G23
	2F	26	7D	F7	C7	E6	87	A6	17	08	48	67	8D	AF	BF	ED
8	BS	CAN	(	8	H	X	h	x	K8	K24	N8	N24	N40	N56	G8	G24
	16	18	4D	F8	C8	E7	88	A7	28	38	49	68	8E	B0	CA	EE
9	HT	EM	)	9	I	Y	i	y	K9	K25	N9	N25	N41	N57	G9	G25
	05	19	5D	F9	C9	E8	89	A8	29	39	51	69	8F	B1	CB	EF
10	LF	SUB	*	:	J	Z	j	z	K10	K26	N10	N26	N42	N58	G10	G26
	25	3F	5C	7A	D1	E9	91	A9	2A	3A	52	70	90	B2	CC	FA
11	VT	ESC	+	;	K	[	k	{	K11	K27	N11	N27	N43	N59	G11	G27
	0B	27	4E	5E	D2	4A	92	C0	2B	3B	53	71	9A	B3	CD	FB
12	FF	FS	,	<	L	\	l	¦	K12	K28	N12	N28	N44	N60	G12	G28
	0C	1C	6B	4C	D3	E0	93	6A	2C	04	54	72	9B	B4	CE	FC
13	CR	GS	-	=	M	]	m	}	K13	K29	N13	N29	N45	N61	G13	G29
	0D	1D	60	7E	D4	5A	94	D0	09	14	55	73	9C	B5	CF	FD
14	SO	RS	.	>	N	^ ②	n	~	K14	K30	N14	N30	N46	N62	G14	G30
	0E	1E	4B	6E	D5	5F	95	A1	0A	3E	56	74	9D	B6	DA	FE
15	SI	US	/	?	O	_	o	DEL	K15	K31	N15	N31	N47	N63	G15	EO
	0F	1F	61	6F	D6	6D	96	07	1B	E1	57	75	9E	B7	DB	FF

① may be "|" ② may be " ¬"

Character Designation
EBCDIC-8 Hexadecimal Column/Row Numbers

3.7.2 Conventions. The position of a character in a code table is stated according to two conventions.

3.7.3 USASCII Convention. The USASCII convention is to give a code table position as "x/y", where "x" is code table column number, and "y" is the code table row number.

Example 4: In Table 1 the letter "R" is in position 5/2.

3.7.4 EBCDIC Convention. The EBCDIC (or hexadecimal) convention is to give a code table position as "xy", where "x" is the column hexadecimal number, and "y" is the row hexadecimal number.

Example 5: In Table 2 the letter "R" is in position D9.

3.7.5 Bit-Pattern from Column/Row Numbers. The 8-bit bit-pattern may be calculated from the column/row numbers, or from the hexadecimal numbers. The numbers are translated to their 4-bit binary equivalents according to Figure 1.

EBCDIC Hexadecimal Number	USASCII Row or Column Number	4-Bit Binary Equivalent
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
A	10	1010
B	11	1011
C	12	1100
D	13	1101
E	14	1110
F	15	1111

FIG. 1. The four high-order bits of the 8-bit bit-pattern come from the column number for USASCII-8, or the column hexadecimal number for EBCDIC-8, and the four low-order bits of the 8-bit bit-pattern come from the row number for USASCII-8, or from the row hexadecimal number for EBCDIC-8.

Example 6: USASCII-8

Character	Column Number	Binary Equivalent	Row Number	Binary Equivalent	8-bit Bit Pattern
R	5	0101	2	0010	0101 0010

Example 7: EBCDIC-8

Character	Hex Column Number	Binary Equivalent	Hex Row Number	Binary Equivalent	8-bit Bit Pattern
R	D	1101	9	1001	1101 1001

4.0 Code Tables

4.1 USASCII-8

4.1.1 The 8-bit Code for USASCII (USASCII-8) is shown in Table 1. The high-order 4-bits are shown along the top, the low-order 4-bits along the left. Column and row numbers are shown. Bit numbers are shown. In the body of the table are shown the 256 characters and the corresponding Hollerith hole-patterns.

4.1.2 The 128 characters of USASCII (USASCII-7) are shown in columns 0 through 7.

4.1.3 Thirty-two characters, K0 through K31, are shown in columns 8 and 9. No function has yet been assigned to these characters, but it is expected that control functions will be assigned.

4.1.4 Sixty-four characters, N0 through N63 are shown in columns 10 through 13. No function has yet been assigned to these characters but it is expected that non-Latin alphabets (Katakana, Cyrillic, Hebraic, Arabic, etc.) will be assigned.

4.1.5 Thirty-one characters, G0 through G30, are shown in columns 14 and 15. No functions have been assigned to these characters, but it is expected that special graphic characters will be assigned.

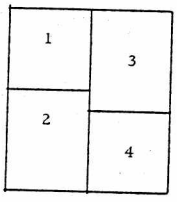
4.1.6 The character "Eight Ones", "E0", is shown in position 15/15.

4.2 EBCDIC-8

4.2.1 The 8-Bit Code for EBCDIC (EBCDIC-8) is shown in Table 2. The 4 high-order bits are shown along the top, the 4 low-order bits along the left. Hexadecimal column and row numbers are shown. In the body of the table are shown the 256 characters from USASCII-8.

4.2.2 The Hollerith hole-patterns are shown around the outside of the table. To find the hole-pattern for a character, the following scheme is used.

To find the card hole patterns for most characters, partition the 256-position table into four blocks as follows:



Block 1: Zone punches at top of table; digit punches at left
Block 2: Zone punches at bottom of table; digit punches at left
Block 3: Zone punches at top of table; digit punches at right
Block 4: Zone punches at bottom of table; digit punches at right

Fifteen positions in the table are exceptions to the above arrangement. These positions are indicated by small numbers in the upper right corners of their boxes in the table. The card hole patterns for these positions are given at the bottom of the table. Bit-position numbers, bit patterns, and hexadecimal representations for these positions are found in the usual manner.

Figure 2 shows some examples of the use of the EBCDIC chart.

Character	Type	Bit Pattern 01 23 4567	Hex	Hole Pattern: Zone Punches	Hole Pattern: Digit Punches
K28	Control Character	00 00 0100	04	12 - 9	-4
%	Special Graphic	01 10 1100	6C	0	-8-4
R	Upper Case	11 01 1001	D9	11	-9
a	Lower Case	10 00 0001	81	12 - 0	-1
K16	Control Character	00 11 0000	30	12 - 11 -0- 9	-8-1

FIG. 2. Examples of Use of EBCDIC Chart

4.3 Hollerith-256

4.3.1 The 256 Hollerith hole-patterns are shown in Table 3. The zone-punches are shown along the top, the digit-punches along the left. In the body of the table are shown the 256 characters of USASCII-8 and EBCDIC-8 according to the following scheme.

Character Designation.
USASCII-8 column/row numbers
EBCDIC-8 hexadecimal column/row numbers

4.3.2 It is to be noted that the USASCII-8 8-bit pattern can be calculated from the column/row numbers, and that the EBCDIC-8 8-bit bit-pattern can be calculated from the hexadecimal column/row numbers, as described in item 3.8.5.

5.0 Correspondence Between the Codes

5.1 USASCII-8 to EBCDIC-8 Correspondence

5.1.1 The correspondence for translating from USASCII-8 to EBCDIC-8 is shown in Table 4. The characters are in the EBCDIC-8 tableau (see Table 2). Hexadecimal column numbers are shown along the top, row numbers along the left. In the body of the table are shown the 256 characters of USASCII-8 and EBCDIC-8 according to the following scheme.

Character Designation.
USASCII-8 column/row numbers

5.1.2 It is noted that the EBCDIC-8 8-bit bit-pattern can be calculated from the hexadecimal column and row numbers (at the top and left of table), and that the USASCII-8 8-bit bit-pattern can be calculated from the column/row numbers (in the body of the table), as described in item 3.8.5.

5.2 EBCDIC-8 to USASCII-8 Correspondence

5.2.1 The correspondence for translation from EBCDIC-8 to USASCII-8 is shown in Table 5. The characters are in the USASCII-8 tableau (see Table 1). Column and row numbers are shown along the top and left. In the body of the table are shown the 256 characters of EBCDIC-8 and USASCII-8 according to the following scheme.

Character Designation.
EBCDIC-8 hexadecimal column/row numbers

5.2.2 It is to be noted that the USASCII-8 8-bit bit-pattern can be calculated from the column and row numbers (at top and left of table), and that the EBCDIC-8 8-bit bit-pattern can be calculated from the hexadecimal column and row numbers (in the body of the table), as described in item 3.8.5.

REPORT

ON THE ACTIVITIES OF

THE INTERNATIONAL TELECOMMUNICATION UNION

in

1968

Published by the
INTERNATIONAL TELECOMMUNICATION UNION
GENEVA, 1969

Date	Purpose of the meeting	Meeting place
6-7 June	SG III (General tariff principles)	Geneva
10-21 June	SG II (Telephone operation and tariffs)	Geneva
12-14 June	WP of SG Sp.A (Definitions for data transmission)	Geneva
18-19 June	GAS 5 (Economic conditions and telecommunication development)	Geneva
24-27 June	Meeting of Chairmen and Vice-Chairmen on C.C.I.T.T. organization and methods of working	Geneva

In all, 26 meetings were held for a total of 137 days (counting simultaneous meetings by several working parties or sub-groups). The results obtained at these meetings are described in the report on the IVth Plenary Assembly.

2. *IVth Plenary Assembly*

2.1 *Organization and proceedings*

The IVth Plenary Assembly of the C.C.I.T.T. and the final meetings of the Study Groups which preceded the Assembly were held at Mar del Plata (Argentine Republic) from 23 September to 25 October 1968. The excellent arrangements made by the host Administration greatly contributed to the success of the meetings.

The Study Groups met from 23 September to 11 October, each of them for a few days under its Chairman, in order to finalize their reports to the Plenary Assembly. These various meetings were attended in all by 602 delegates, representatives, experts or observers, representing 72 administrations, 26 recognized private operating agencies, 36 scientific or industrial organizations and 15 international organizations.

The Plenary Assembly proper met from 14 to 25 October: 72 administrations, 26 recognized private operating agencies and 15 international organizations were represented, making a total of 309 delegates, representatives or observers.

In accordance with the General Regulations annexed to the International Telecommunication Convention, the chairmanship of the Plenary Assembly was held by the Head of the Argentine delegation, Lt. Col. R. R. Albariño, Director-General of Coordination in the Office of the Secretary of State for Communications.

Mr. Albariño was assisted by five Vice-Chairmen elected by the Assembly and drawn from the five geographical regions of the I.T.U.: Messrs. M. Ben Abdellah (Morocco), R. T. Black (United States), T. Kashiwagi (Japan), A. B. Bjürel (Sweden) and A. Poukhalski (U.S.S.R.).

The Assembly set up four Committees to prepare and submit proposals on various problems of major importance:

Committee A (Organization of the Study Groups and methods of work)
Chairman and Vice-Chairman, Messrs. M. B. Williams (United Kingdom) and Z. Szpigler (Poland);

Committee B (Programme of work of the Study Groups)
Chairman and Vice-Chairman, Messrs. R. C. Sueur (France) and Saw Mamadou Aliou (Mali);

Committee C (Budget control)
Chairman and Vice-Chairman, Messrs. O. H. Mohamed (Pakistan) and J. A. Wiltgen (Brazil);
Committee D (Technical Cooperation)
Chairman and Vice-Chairman, Messrs. Ingedayehu Girmaw (Ethiopia) and G. E. de Silva Ellawela (Ceylon).

The inaugural meeting of the Plenary Assembly, held on 14 October, was honoured by the presence of the Minister of the Interior, the Secretary of State for Communications and other eminent persons. The Secretary of State for Communications also attended the closing meeting on 25 October.

The secretariat of the meetings was provided by a staff of 167, roughly half of which were I.T.U. staff members or recruited from Geneva, while the other half was recruited locally or seconded free of charge by the host administration. The local staff displayed exemplary competence and devotion.

The work of the Plenary Assembly falls into two quite distinct groups:

— consideration and approval of Study Group Reports with the issue of the corresponding recommendations and choice of new questions for study;

— discussions and adoption of proposals on general administration of the C.C.I.T.T. (organization, programmes, methods of work, financial needs), emanating either from Plenary Assembly Committees A, B, C and D or from other sources.

The main results obtained in these two fields are reviewed below.

2.2 *Results of the work of Study Groups*

2.2.1 *Telegraphy and data transmission*

Following a study conducted jointly by the C.C.I.T.T. and the International Organization for Standardization, the IVth Plenary Assembly adopted a new telegraph alphabet No. 5 for use in message and data transmission. This alphabet corresponds to a two-condition, seven-unit code with an additional unit for error detection. It is initially intended for use on leased circuits and not as a substitute for alphabet No. 2. The conditions of its use in synchronous and start-stop systems were defined.

The C.C.I.T.T. has taken a definite trend towards data transmission with ever higher data signalling rates, and, while leaving freedom of choice to leased circuit users, studied and described two modulator/demodulators (modems) operating at 2400 bits per second and issued a recommendation on the use of a group for data transmission at 48 000 bits/second.

It may be hoped that a lasting standardization has been reached for the interface between the modem and the data processing equipment, regardless of the bit rate, mode of transmission or even type of circuit.

For the future development of data transmission, the Plenary Assembly decided to study two types of network: telegraph-type networks using alphabet No. 5 and high modulation speeds and integrated networks using the new technique of pulse code modulation.

For telegraphy proper, recommendations were issued on the formats to be used in message retransmission networks and on links between gentex and message retransmission networks.

Studies have been launched on automatic calculation of the number of words which could be performed by computers installed in switching centres, after some adjustment of the present regulations governing word counting.

On the operating side, mention should be made of the agreements reached on the use and layout of credit cards, the duration of automatic telex calls for inclusion in international accounts and the adoption of the minute charged as the basis for traffic evaluation. A draft revision of the Telegraph Regulations has also been produced for submission to a forthcoming Administrative Conference; this draft will be finalized during the period 1969-72.

With regard to special telegraph circuits, a system of synchronous transmission on long submarine cables has been standardized and a charging system established based on the real duration of automatic telex calls on HF circuits with ARQ.

Finally, in facsimile telegraphy, the C.C.I.T.T. standardized the characteristics of an automatic black and white transmission service between telephone subscribers, improved the standardized test chart and decided to study transmission in colour.

2.2.2 *Telephone transmission*

Study Group XII amended the recommendation on the permissible propagation time in an international telephone connexion, raising this time from 250 to 400 milliseconds, an extremely important decision for the development of satellite communication. The Study Group, however, specified the conditions to be observed and precautions to be taken with connexions where the mean one-way propagation time is between 300 and 400 milliseconds.

The limits for the reference equivalents in national systems which were applicable to 95% of international calls are now recommended for 97% of them.

The new " transmission plan ", concerning which C.C.I.T.T. recommendations were issued in 1964 on the basis of studies entrusted to Study Group XVI from 1960 onwards, may now be regarded as practically complete so far as switched circuits in the public telephone network are concerned. Study Group XVI is to pursue the study of integration in this network of circuits set up via communication satellites and circuits using pulse code modulation systems; it will also study the transmission characteristics of leased circuits.

Study Group XV amplified the recommendations concerning carrier systems on coaxial pairs in land and submarine cables.

For the first time the C.C.I.T.T. issued a recommendation on systems employing pulse code modulation (PCM) and was able to list certain fundamental characteristics of some of the systems. As will be seen later, a new Study Group has been set up to conduct studies in this field which will cover the transmission of all types of signal (telephone, telegraph, facsimile, data, sound and television broadcasting) and deal with the structure of any integrated networks in which digital transmission and time division switching may be closely associated.

Special Autonomous Working Party No. 3 prepared for publication in 1969 a handbook which will be entitled " Economic and technical aspects of the choice of transmission systems " and may be expected to be of great use to the developing countries.

2.2.3 *Telephone operation and switching*

In telephone operation the main question studied by Study Group II was the definition of new procedures for international accounting between administrations (or private operating agencies). The new basic principles introduced are, on the one hand, remuneration on the basis no longer of traffic units but of the circuits provided and, on the other hand, the limitation of remuneration to the first transit centre when a call passes by automatic switching through several of such centres. These provisions, which constitute a radical departure from the present rules, will considerably simplify the implementation of the international routing plan.

Subj File

GENERAL ELECTRIC COMPANY

13430 NORTH BLACK CANYON HIGHWAY, PHOENIX, ARIZONA 85029 . . . AREA CODE 602, 941-2900

Information Systems
Advanced Development and Resources Planning Division

1969 August 19

Mr. D. Hekimi
Secretary General
ECMA
Rue du Rhone 114
1204 Geneva,
SWITZERLAND

Dear Mr. Hekimi:

Accented Letters TC1/69/58

May I suggest the following additions and changes. Unfortunately, I am not qualified to guarantee exhaustiveness:

1. On page 1 the breve is missing. There is a subtle difference between the ˇ and ˘ (haček and breve). The first modifies a consonant; the second a vowel.

2. The following (rarely used) letters are missing:

   Ð đ Þ þ (Icelandic)

3. The following (rarely used) accented letters are missing:

   Dutch: Circumflex is used to show contraction of syllables not only for ê (liên for lieden), but also for other vowels, e.g., â (daân for daden).

   Finnish: In addition to å used for Swedish versions of Finnish proper names, š and ž are also used in proper names (Russian).

   Portugese: The trema is used, e.g., ü is pronounced like w in wet.

4. I suggest that the Table on page 2 show categories:

   absolutely necessary

   desirable

   not too important

NMAIT 31/9

5. In these categories and also in practice the usage of capital letters is sometimes different from small letters.

6. I suggest the addition of Turkish:

   Â â Ç ç Ğ ğ or Ğ ğ İ ı İ i Ö ö Ş ş Û û Ü ü

7. There are many other European languages, such as Croatian, Lithuanian, Estonian, Latvian and also African and Asian languages which must be considered. Document X3.2/836 might serve as a beginning; it contains many of the diacritical marks and special symbols in use.

Finally, I'd like to suggest that document TC1/69/58 be checked and amplified by language experts. We made a mistake once in not being careful enough to study variations of the character sets when the ISO 7-bit code was designed. We can't be careful enough this time.

Very truly yours,

Eric H. Clamons

Eric H. Clamons

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USA STANDARDS INSTITUTE TO CHANGE NAME AND ADDRESS

The United States of America Standards Institute, Inc, is changing its name to American National Standards Institute, Inc, and is moving to 1430 Broadway, New York, N.Y. 10018. Change in name becomes effective October 6, when the Institute takes over its new headquarters.

New Name: American National Standards Institute, Inc

New Address: 1430 Broadway, New York, N.Y. 10018

New Telephone: (212) 868-1220

Effective Date: October 6, 1969

Association Française
de Normalisation
Tour EUROPE
92 - COURBEVOIE

Tél. PARIS (1) 788 11-11

I S O

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION

ISO/TC 97/SC 2
CHARACTER SETS AND CODING

Secretariat
AFNOR (France)

ISO/TC 97/SC 2
(U.K - 23) 416

December, 1969.

A UNITED KINGDOM CONTRIBUTION

CONCERNING

THE AMENDMENT OF ISO/R 646

(POSITIONS 2/3 AND 2/4 OF THE ISO 7-BIT CODE TABLE)

Introduction

1 - At the time of the meeting of Sub-committee ISO/TC 97/SC 2 in Naples in May 1969, the United Kingdom was opposed to the amendment of ISO/R 646 that was suggested in document 97/2 N 364 for the following reasons :

(a) The wording of Note 7 proposed by the CCITT would have altered the application of the code to international exchanges whereas the United Kingdom was prepared to consider only changes relating to the use of the code within any one country.

(b) The wording of the Note proposed by CCITT did not appear to be entirely clear or to be easy to interpret in any actual application.

2 - Since the meeting in Naples, and in the light of Resolution No. 8 adopted at that meeting (Document 97/2 N 402), further consideration has been given to the question of amending ISO/R 646. The United Kingdom is not now opposed to certain changes in the international application of the code and believes that a form of words can be found which will overcome the shortcomings of the previous text.

3 - The proposals made in this paper :

(a) maintain the symbol £ as the character primarily assigned to position 2/3 and the symbol $ as the character primarily assigned to Position 2/4;

(b) recognize that in some applications an alternative symbol may be required in either or both of these positions;

(c) should be capable of unambiguous interpretation in international exchanges of information;

MJH/CL

NMAH 311/1

...

(d) permit National Versions of the ISO 7-bit code to choose one from four assignments to Positions 2/3 and 2/4.

The United Kingdom proposal

4 - The United Kingdom proposes that Note 7 should be amended, that a similar but separate Note should be applied to Position 2/4, and that Note 2 should be amended.

5 - It is proposed that Note 7 should still be applicable only to Position 2/3 and should be amended to read as follows :

(7) In the absence of any agreement to the contrary, Position 2/3 of the 7-bit code table has the significance of the symbol £. In an application of the code in which there is no requirement for the symbol £, the symbol # may be used in Position 2/3. In an exchange of data, this substitution requires the prior agreement of the sender and the recipient.

6 - It is proposed that the following additional Note should be applicable to Position 2/4 :

(10) In the absence of any agreement to the contrary, Position 2/4 of the 7-bit code table has the significance of the symbol $. In an application of the code in which there is no requirement for the symbol $, the symbol ¤ may be used in Position 2/4. In an exchange of data, this substitution requires the prior agreement of the sender and the recipient.

7 - It is proposed that Note 2 should be amended to read as follows :

(2) For international information interchange, the symbols £ , $ and ¤ do not designate the currency of a given country. The use of these symbols combined with other graphic symbols to designate national currencies may be the subject of other ISO Recommendations. The meanings to be assigned to the symbols £, $, # and ¤ require agreement (see clause 4.3).

Comment

8 - It will be seen that the proposed Notes 7 and 10 are independent of each other. Thus, in the absence of any agreement to the contrary, Positions 2/3 and 2/4 have the significances £ and $ respectively.
Nevertheless, it may be agreed for any given application of the code that their respective meanings shall be £ and ¤, or # and $, or # and ¤.

...

Application in national standards and in some international exchanges

9 - A number of national standards have been published or are being prepared allocating characters to the seven "national use" positions in accordance with Note 3 of ISO/R 646.

10 - At the same time, but based on Notes 5 and 7 of ISO/R 646, some of these standards indicate the choice, for adoption as a national standard in their respective countries, between the alternative graphic characters permitted by ISO/R 646 in Positions 2/3 and 7/14.

11 - If the proposals made in this paper are adopted, Position 2/4 will become another position with a permitted alternative graphic character. The United Kingdom invites SC2 to confirm that the "agreements" referred to in Notes 7 and 10 include the establishment of any one of the four pairs (see paragraph 8 above) as the definite assignments to Positions 2/3 and 2/4 in a "National Version" of the ISO Code. The internal requirements of a country could thus be met within the framework set by ISO/R 646.

12 - Similar arrangements could apply to the use of the code in international applications regulated by an appropriate authority such as CCITT. The United Kingdom believes that these proposals fully meet the requirements of the CCITT set out in Document N 364, even though the wording of the note proposed in that document is not maintained.

Application to international exchanges in general

13 - However, these arrangements will not apply to international exchanges which are not regulated by authorities such as the CCITT. In international exchanges in general, Positions 2/3 and 2/4 would have the significance £ and $ respectively, unless an agreement were made to substitute one of the permitted alternative pairs.

14 - In this connection, it should be noted that the character printed or displayed in response to a given code combination will almost certainly be the character assigned to that code position in the National Version of the code applicable in the country in which the printer or display equipment is situated. Allowance should be made for this, or special arrangements must be made for the graphic display of the characters represented.

Designation of the alternatives

15 - A choice between the alternative pairs of characters to be assigned to Positions 2/3 and 2/4 in accordance with these proposals could usefully be indicated by code extension and code expansion procedures.

...

Conclusions

16 - Sub-committee ISO/TC 97/SC 2 is invited :

(a) to agree that Note 7 of ISO/R 646 should be amended as indicated in paragraph 5 of this paper;

(b) to agree that ISO/R 646 should be amended by the addition of a new Note, applicable to Position 2/4, as indicated in paragraph 6 of this paper.

(c) to agree that Note 2 of ISO/R 646 should be amended as indicated in paragraph 7 of this paper.

(d) to agree with the application of the code to national uses and to certain international uses that is oulined in paragraphs 11 and 12 of this paper;

(e) to agree with the application of the code to general international uses that is outlined in paragraphs 13 an 14 of this paper;

(f) to request the Experts Group to make provision for indicating a choice between the four pairs of characters which may be assigned to Positions 2/3 and 2/4.

X3.2/893
Revision of X3.2/866

Secretariat: AFNOR

ISO/TC97/SC2 (USA-)
December 1, 1969

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

WORKING PAPER FOR THE ASSIGNMENT OF CHARACTERS TO COLUMNS 8 THROUGH 15 OF 8-BIT CODES

THIS DOCUMENT WAS PREPARED ON THE IBM MAGNETIC TAPE SELECTRIC COMPOSER

1. This paper contains a list of criteria and a preliminary weighting factor, a suggested set of graphics, and a discussion of the classes of controls for a preferred primary set.

2. CRITERIA

NOTE: Not all of the criteria will be able to be satisfied since some are conflicting.

M = MEDIUM N = NOT APPLICABLE

Weighting factor: H-High, L-Low

M H 2.1 The character assignments to Columns 0 through 7 shall be identical with those of the ISO 7-Bit Code.

M H 2.2 Controls shall be assigned to Columns 8 and 9.

M H 2.3 Graphics shall be assigned to Columns 10 through 15.

H 2.4 Collation shall not be a major criterion.

N H 2.5 There shall be no constraint to define one and only one character set; i.e., more than one character set may be defined.

*H 2.6 ~~A preferred or primary~~ THIS set shall relate to data processing.

H 2.7 There shall be a maximum correspondence between similar graphics in the right and left-hand halves.

L H 2.8 ~~alphabetic and~~ numeric sets shall appear in their normal collating sequence.

H 2.9 Letters of non-Latin alphabets shall be in positions which correspond phonetically to their Latin counterparts.

H 2.10 Characters displaced by national assignments or substitution shall not be reassigned elsewhere in the table. Conversely, graphics assigned to columns 10 to 15 shall not be assigned to the 7-bit code.

H L 2.11 Control functions associated with remote terminals shall have first priority.

L 2.12 Controls for manipulating, editing, and preparing text for graphical arts composition shall be assigned.

H 2.13 No space shall be reserved for the assignment of additional transmission controls since such assignments would be in conflict with code expansion and contraction philosophies.

H 2.14 Characters having the highest frequency of usage shall be assigned.

H 2.15 Characters having the widest usage in as many areas of application as possible shall be assigned.

N ~~H~~ 2.16 Human factors shall be considered in all character assignments.

L 2.17 Symbols shall be placed in the set so as to simplify their generation by keyboard devices.

N ~~L~~ 2.18 Two character sequences shall be permissible to invoke highly used graphic characters not in the set.

* Considered to be most pertinent criteria at this time.

2.19 A means of unambiguous code extension, expansion, and contraction shall be provided in the 8-bit set.

2.20 No character assignment shall be made which would jeopardize the incorporation of a comprehensive ESCAPE doctrine for the ISO 7-Bit Code and 8-Bit sets.

H 2.21 Space shall be reserved in rows 14 and 15 of columns 8 and 9 for data delimiters to invoke other coding concepts if these are required.

2.22 Means to secure characters within a device should be provided, as for example, assigning all of the characters in the left half to the right half.

2.23 Every character of the code set shall be represented by the same number of bits.

2.24 All possible patterns of ones and zero bits in the 8-Bit Code shall be permitted and considered valid.

H 2.25 Within the set, each character shall stand by itself and not depend on surrounding characters for interpretation.

3. GRAPHIC CHARACTER SET

3.1 The graphic set includes:

a. The lower case of the Greek alphabet and those upper case Greek characters frequently used in mathematics.
b. Commonly used mathematical symbols.
c. Small digits and symbols for super and subscripts.
d. Commonly used logic symbols.
e. Charting symbols.
f. Miscellaneous symbols in general or wide usage.

3.2 Legend

⩽	Less than or equal to
⩾	Greater than or equal to
≠	Not equal to
×	Multiplied by
÷	Divided by
±	Plus or Minus
¤	Lozenge
b	Word Separator
√	Radical Sign
⌞	Lower left corner (charting)
⌟	Lower right corner (charting)
⌝	Upper right corner (charting)
⌜	Upper left corner (charting)
+	Plotting cross
|	Long vertical line
—	Extended dash

(	Left parenthesis
)	Right parenthesis
+	Plus
-	Hyphen (Minus)
/	Slant
0-10	Digits

} Superscript and subscript symbols

∧	Logical AND (Caret)
∨	Logical OR
¬	Logical NOT
Γ	Gamma
Δ	Delta
⊃	Logical implication
≡	Logical equivalence
≠	Logical EXCLUSIVE OR
//	Logical concatenation
<	Left broken bracket
>	Right broken bracket
Λ	Lambda
∘	Plotting circle
▫	Plotting square
¶	Paragraph
§	Section
Π	Pi
~	Difference
Σ	Sigma
∇	Nabla
∞	Infinity
∫	Integral
∂	Partial differentiation
≈	Approximately
Ω	Omega
←	Left-directed replacement operator
→	Right-directed replacement operator
1/4	Fraction
1/16	Fraction
7/8	Fraction
5/8	Fraction
1/32	Fraction
1/2	Fraction
1/8	Fraction
3/4	Fraction
3/8	Fraction
°	Degree
α · ω	Lower case Greek alphabet
≪	Shift left
≫	Shift right
EO	Eight-bit all ones character
" "	Opening and closing quotation marks
¢	Cent sign
CR	Credit
DB	Debit
↑	Up arrow
↓	Down arrow
⊥	Perpendicular

⌊	Brackets for "Least integer in"
⌋	Brackets for "Least integer in"
⌈	Brackets for "Greatest integer in"
⌉	Brackets for "Greatest integer in"
⌣	Space substitute
⌓	Hook
⍋	Fork
⍌	Chair
⍊	Long vertical mark
¤	International currency symbol
⁻⁰-⁻⁹	Signed digits
⁺⁰-⁺⁹	Signed digits
⊂	Set manipulation notation
⊃	Set manipulation notation
⊆	Set manipulation notation
⊂	Set manipulation notation

4. CONTROLS

4.1 A specific set of controls has not yet been developed by the USA for submission to 97/2. However, an initial review indicates that the following classes of functions and controls and the specific functions and controls within the classes should be considered for assignment to Columns 8 and 9:

4.1.1 Formatting Functions

Additional formatting functions have been identified-- these fall into two general categories; viz., (1) those applicable to printing or visual display devices in general, and (2) those associated only with visual display devices.

4.1.1.1 General Formatting Functions

In the area of general formatting functions, a separation is made between those functions of a page or display device which have either a horizontal or vertical motion (but not both) and those which have both a horizontal and vertical motion.*

The following functions fall into the first class:

HTS	Horizontal tabulation set
HTC	Horizontal tabulation clear
VTS	Vertical tabulation set
VTC	Vertical tabulation clear
RLF	Reverse line feed
FHL	Forward half line feed
RHL	Reverse half line feed

The following functions fall into the second class:

NL	New line
NF	New form
NVT	New vertical tab
NLR	New line reverse

* If printing point or cursor is at left margin, resulting motion will be vertical only.

4.1.1.2 Visual Display Formatting Functions

CUH Cursor home

4.1.2 Device Controls

Device controls may also be separated into those common to both printing and visual display devices and those unique to visual display devices.

4.1.2.1 Common Device Controls

HN	Highlight on
HF	Highlight off
SS	Selective suppress
RES	Restore

4.1.2.2 Visual Display Device Controls

CLS	Clear screen
SU	Scroll up
SD	Scroll down
NP	Next page
PP	Previous page
PFN	Protected format on
PFF	Protected format off
CP	Cursor position

4.1.3 Information Separators

4.1.4 Transmission Controls

4.1.5 CPU Peripheral Controls

4.1.6 Data Delimiters

BPD	Beginning of packed decimal
EPD	End of packed decimal
BTD	Beginning of transparent data

4.1.7 Additional Display Controls

There appear to be enough additional display controls to warrant a class of controls for this purpose alone. The following display controls are not considered to be sufficiently necessary in general applications to require assignment in the basic control set.

CUU	Cursor up
CUD	Cursor down
CUR	Cursor right
CUL	Cursor left
CRR	Cursor return
CRU	Cursor return and up
CRD	Cursor return and down
CSC	Clear screen from cursor
LE	Line erase
LI	Line insert
LD	Line delete
CI	Character insert
CD	Character delete

4.1.8 Miscellaneous

GRE Graphic Escape

4.2 The above is not an exhaustive list of classes and examples but should serve to provoke additional research.

4.3 Definitions

Preliminary weighting factors have been assigned to the control characters below. The factors run from highest priority 1 to a lowest priority of 5. The ultimate assignment of characters in columns 08 and 09 should take into account the criteria, in particular, 2.6, 2.14, 2.15, 2.18, 2.19, and 2.20.

Preliminary weighting factor

2 HTS Horizontal tabulation set: A control character which causes a horizontal tabulation stop to be set at the currently addressed horizontal position.

2 HTC Horizontal tabulation clear: A control character which causes the clearing of all horizontal tab stops at and to the right and below the currently addressed position.

2 VTS Vertical tabulation set: A control character which causes a vertical tab stop to be set at the currently addressed vertical position.

2 VTC Vertical tabulation clear: A control character which causes the clearing of all vertical tab stops at and below the currently addressed position.

3 RLF Reverse line feed: A control character which causes a change of the vertical position addressed to a position one line above the position currently addressed.

2 FHL Forward half line feed: A control character which causes a change of the vertical position addressed to a position one half line below the position currently addressed.

3 NL New line: A control character which causes the combined effects of line feed (LF) and carriage return (CR). In environments which include this control character, the LF must not be used to cause carriage return.

* NF New form: A control character which causes the combined effects of form feed (FF) and carriage return (CR).

5 NVT New vertical tab: A control character which causes the combined effects of vertical tab (VT) and carriage return (CR).

5 NLR New line reverse: A control character which causes the combined effects of reverse line feed (RLF) and carriage return (CR).

4 CUH Cursor home: A control character which causes the cursor to be positioned to the upper left position.

1 HN Highlight on: A control character which causes a uniformly defined and discernable change in the rendering of all graphic characters; e.g., printing in an alternate color.

1	HF	Highlight off: A control character which causes the normal rendering of graphic characters to be restored.
3	SS	Selective suppress: A control character which deactivates associated printers and other display devices and causes the succeeding control characters except Restore (RES), End of Transmission (EOT), and End of Transmission Block (ETB) to be ignored.
3	RES	Restore: A control character which terminates the Selective suppress mode of operation.
3	CLS	Clear screen: A control character which clears all characters on a display and returns the cursor to the home position.
4	SU	Scroll up: A control character which moves lines on a display up one line. (The first line is removed and a new line moves into the last line location.)
4	SD	Scroll down: A control character which moves lines on a display down one line. (The last line is removed and a new line moves into the first line location.)
4	NP	Next page: A control character which causes the next page of a multiple page store to be displayed.
4	PP	Previous page: A control character which causes the previous page of a multiple page store to be displayed.
1	PFN	Protected format on: A control character which causes selected characters, areas or sections of a display to be inaccessible.
1	PFF	Protected format off: A control character which terminates the protected format mode.
2	CP	Cursor position: A control character which marks the location of the cursor.
3	GRE	Graphic Escape: A non-locking shift out control character requiring private agreement.
4	CUU	Cursor up: A control character which causes the cursor to move up one vertical position.
4	CUD	Cursor down: A control character which causes the cursor to move down one vertical position.
4	CUR	Cursor right: A control character which causes the cursor to move one character position to the right.
4	CUL	Cursor left: A control character which causes the cursor to move one character position to the left.
4	CRR	Cursor return: A control character which causes the cursor to move to the left margin of the same line as the position currently addressed.
4	CRU	Cursor return and up: A control character which causes the combined effects of cursor up (CUU) and cursor return (CRR).
2	RHL	Reverse half line feed: A control character which causes a change of the vertical position addressed to a position one half line above the position currently addressed.

4 CRD Cursor return and down: A control character which causes the combined effects of cursor down (CUD) and cursor return (CRR).

4 CSC Clear screen from cursor: A control character which clears all characters on a display from the position currently addressed to the end of display; the cursor does not move.

4 LE Line erase: A control character which clears all characters on a line from the cursor to the end of line; the cursor does not move.

4 LI Line insert: A control character which causes the line in which the cursor currently resides and all successive lines to move down one line. Cursor is positioned to start of line.

4 LD Line delete: A control character which causes the line in which the cursor currently resides to be cleared and all lines below move up one line. Cursor is positioned to start of the line.

4 CI Character insert: (The definition of this control character will be dependent on selection of one of two possible modes of operation for character insertion.)

4 CD Character delete: A control character which causes the character at the cursor position to be deleted; all remaining characters on the line to the right of the cursor move one position to the left.

5. CLOSING REMARKS

The USA will continue to review and develop their position relating to the assignment of characters to the 8-bit code(s). To the extent that significant or substantial developments result, the USA will prepare additional working papers to supplement and/or supersede this working paper.

198 Allendale Rd., King of Prussia, Pennsylvania 19406
(215) 962-5868

1970 March 21

Mr. D. Hekimi
European Computer Mfg. Assoc.
114 Rue du Rhone
1204 Geneva, Switzerland

Dear Mr. Hekimi:

The long vertical bar has long been an enigma to us. It is an arbitrary decision; the best solution depends on the immediate environment in which it is used.

1. If LVL "need not be coded", then it may be. For example, IBM does encode all shapes it recognizes and formats data by program. A code for LVL is needed.

2. If LVL is coded, it should be a printable character. This is required if an audit trail is printed - (this could be the "!").

3. There are applications which require the insertion of LVL from the printing device (mostly typewriters - high speed printers may have difficulty printing it).

4. Most printers are limited to 64 characters. If LVL is to be printable, it must be a member of the "64-character subset" or you get the same problems as the "punched card oriented" subset (12-0, 11-0 part of a 64-character subset).

5. The Logical OR - exclamation point compromise is not based on ration; it was that or no ASCII! (You see, I do need an exclamation point worse than a Logical OR in correspondence).

6. The vertical bar in ASCII is only represented as "¦ " so as not to confuse it with Logical OR but is not called a "broken" vertical bar! (twice now)

7. The possibility of combining "!" and "¦ " in one code was rejected because Logical OR looks like "| ".

8. Finally, the promise of achieving one-to-one correspondence with EBCDIC brought the USA to a state of euphoria: Unanimity.

PLVM could be encoded in one of three places: 2/1, 7/12 or control. Each has its virtues and flaws.

	2/1	7/12	Control	Not Coded
64-character subset	X			
95-character subset		X		
non-graphic			X	
audit trail	X	(X)		
printable	X	(X)		
non-printable			X	X
not coded				X

IBM chose for the (P)LVM one of the graphic characters of EBCDIC. In ASCII this would be non-printable SO X SI. Had they chosen a 6-bit computer for their product line, they wouldn't have made that choice because that 3-character sequence is simply not expressable in a 6-bit computer; but 2/1 is - and that is the overwhelming argument. In a 6-bit computer all characters are graphics. The 2/1 prints "!" but interprets PLVM in that spot. It must forego the luxury of any "!"! All other arguments prevent the 6-bit computer and therefore many installations from ever converting to ASCII.

Quot Erat Demonstrandum

Best personal regards,

Eric H. Clamons

EHC/jas

P.S. This is not the opinion of the chairman of X3.2 who preserves the neutrality of his office.

ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

1204 GENEVA RUE DU RHÔNE 114
CABLE ADDRESS EUCOMANUFAS GENÈVE
PHONE 022 35 36 34
TELEX: EUCOMANUFAS GVE 22288

Mr. E.H. CLAMONS
RD 1
NORTH WALES, Pa. 19454
U S A

OUR REF. He/mb YOUR REF. DATE March 10, 1970

RE: Coding of OCR Abstract Symbols

Dear Mr. Clamons,

I am writing to you with regard to appendix B of document X3.2/924. Whilst I feel that the choice made for HOOK, FORK, CHAIR - in that correct order as you taught me - is very convenient, I feel that the suggestion for the Long Vertical Line is confusing:

i) in a number of OCR applications the LVL whilst requested is not recognized as a character and therefore needs not to be coded;

ii) it has been allocated to pos. 2/1 in 97/2/N 348 because this document deals with an incomplete character set, smaller than the 7 bit coded character set and not comprising an Exclamation Mark. Such a specific set could be invoked by means of an ESC sequence. If it is intended to complete the OCR-A character set up to 95 graphics, so that it becomes identical to the 7 bit coded, I do not see then how LVM could be coded in 2/1.

iii) Already the permission given in the ASCII standard to "design the shape" of Exclamation Mark so that it practically looks like a vertical line (to be used as OR) led to the design of the so-called "broken bar" in 7/12. What should be broken (a stroke and a point) has become solid and what should be solid (a full stroke) has become broken.

This question has also been debated newly in ECMA TC4 because a new character "Preprinted Long Vertical Mark" (PLVM) will be introduced in OCR-B. Please let me know the eventual decision of X3.2 so that I can report accordingly when TC4 (or TC1) will be discussing this matter.

Sincerely yours,

D. Hekimi
Secretary General

X3.2/964

REPLY TO:

Charles D. Card
Univac Division, Sperry Rand
P. O. Box 500
Blue Bell, Pa. 19422

american national standards institute, inc · 1430 broadway, new york, n.y. 10018 · (212) 868-1220

April 7, 1970

TO: X3.2 Members, Alternates, and Consultants

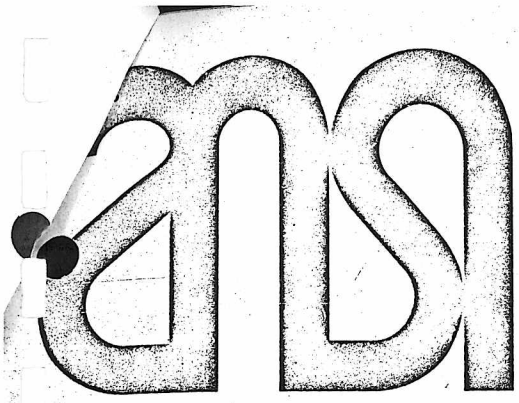
SUBJECT: Future of Acronyms ASCII and USASCII

This memorandum is being circulated as a result of direction by X3.2 at the Phoenix meeting on March 6, 1970. The attachment consists of X3.2/964. The text of the statement represents the understanding reached in discussions at the above meeting. The information contained may well provide some status and direction to a technically trivial, yet persistent question being asked of X3.2 members. It may be that the attached paper should be circulated more broadly. If such is the case, that action can be taken when convenient.

Charles D. Card
Member X3.2

CDC:pmp

NMAH 311/4



american national standards institute, inc · 1430 broadway, new york, n.y. 10018 · (212) 868-1220

X3.2/964

April 3, 1970

SUBJECT: The Acronyms ASCII and USASCII in Future Publications

The following statement is promulgated in keeping with the policy of the American National Standards Institute (ANSI) on acronyms, and to answer numerous questions received.

The American National Standard X3.4-1968 concerns itself with the code for information interchange. This code has been referenced as ASCII and later as USASCII. The policies prohibit the use of ANS as a prefix or part of an acronym. For the future, when referencing the standard code, the preferred acronym will be ASCII. USASCII, having been used, will be recognized. Future publications should use ASCII. USASCII should not be used in new documents. No one is requested to re-work existing publications to effect the change. Gradual elimination of the USASCII acronym will be the desired goal. In no event should a new acronym starting with ANS gain any stature.

IBM

Department B18/Building 931

International Business Machines Corporation

Box 390, Poughkeepsie, N. Y. 12602
914/463-1234
Direct Dialing No.: (914) 485-8575

1970 April 1

Mr. Charles D. Card
UNIVAC
Mail Station 4D3
P. O. Box 8100
Philadelphia, Pennsylvania
19101

Dear Charlie,

Enclosed is the set of instructions which I said I would send. I found to my dismay, when I got home, that the document was prepared by IBM from material provided by the publications editor at ANSI, rather than by ANSI itself (see footnote on page 2).

I understand that there are discussions going on between ANSI and BEMA regarding the formal issuance of such an instruction. I feel certain that the instruction will be issued. In the meantime, the attached document should serve a useful purpose.

Very truly yours,

James L. Smith

JLS/jan
Enclosure

1) Name of Institute

As of October 6, 1969, the name of the organization which approves and publishes American National Standards is:

American National Standards Institute, Inc.

When the context is clear the following short forms of the name may be used:

ANSI
the Standards Institute
the Institute

When the short form ANSI is used in a sentence, it is never preceded by the word "the".

2) ANSI Authority

The act by which ANSI establishes an American National Standard is approval and that noun or one of its verb forms must always be used in sentences such as "American National Standard COBOL was approved by ANSI on August 23, 1968."

The Institute does have a certification program and the term certification is used when the Institute certifies that a product complies with an American National Standard.

3) Designation of Standards

Each standard approved by ANSI has a formal and unique name. For example:

American National Standard COBOL, X3.23-1968

This is the preferred name, although the following is also acceptable:

American National Standard X3.23-1968, COBOL

A first reference to a standard must use the formal name.

When the context is clear the following short forms of the name may be used:

American National Standard COBOL
ANSI X3.23-1968

The term ANS, since it will be confused with Army-Navy Specification or American Nuclear Society, must not be used.

The term such as ANSI COBOL must not be used, since the Institute wishes the preferred term:

American National Standard COBOL

4) Allowable Acronyms

The following standards may be referred to by the indicated acronyms:

ANSI X3.4-1967 ASCII

The acronym should not be introduced by simply appending it, even if parenthesized or set off by commas, to the name of the standard.

5) Standards Committees

The committees which develop standards such as X3 are to be designated as:

"American National Standards Committees"

When the context is clear the term ANSC X3 may be used.

This material was provided to IBM by the publications editor at ANSI on November 13, 1969.