

# ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

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STANDARD ECMA-121

8-BIT SINGLE-BYTE  
CODED GRAPHIC CHARACTER SETS

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LATIN/HEBREW ALPHABET

July 1987

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## BRIEF HISTORY

The adoption of ECMA-6 (ISO 646) as the agreed international 7-bit code for information interchange had led to the development of many national, international and application-oriented versions of this code which are in wide use today.

These versions have a number of limitations generally inherent to the size of the code:

- they do not provide all graphic characters which may be needed,
- for some characters, specially for accented letters, it is necessary to resort to BACKSPACE sequences, which creates problems when processing data containing such composite characters,
- interchange among different versions is practically limited to the 82 common graphic characters.

With the advent of 8-bit coding it was possible to increase the number of graphic characters. ISO 6937/2, for example, provides a character set covering the requirements of most languages based on the Latin alphabet. This character set, although well suited for text communication, is difficult to use for processing as some graphic characters are represented by one and others by two bit combinations.

Thus the need was recognized for coded graphic character sets, each of which:

- is the same for all users of a given area,
- provides single-byte coding of all graphic characters thus permitting easy processing,
- takes into account character sets used in the industry.

Since 1982 the urgency of the need for a true 8-bit single-byte coded character set was recognized in ECMA as well as in ANSI/X3L2 and numerous working papers were exchanged between the two groups. In February 1984 ECMA TC1 submitted to ISO/TC97/SC2 a proposal for such a coded character set. At its meeting of April 1984 SC2 decided to submit to TC97 a proposal for a new item of work for this topic. Technical discussions during and after this meeting led TC1 to adopt the coding scheme proposed by X3L2. International Standard ISO 8859/1 is based on this joint ANSI/ECMA proposal. ECMA published the 1st edition of its corresponding Standard ECMA-94 in March 1985.

After this first publication, the work of ECMA TC1 on further coded graphic character sets has led to the following results:

- i) The present Standard for a Latin/Hebrew coded graphic character set. It will be submitted to ISO for processing under the fast-track procedure.
- ii) The second Edition of Standard ECMA-94, dated June 1986, comprising four coded graphic character sets for the Latin script, identified as Latin Alphabets No 1 to No 4. These alphabets have a number of characters in common, in particular those allocated to columns 02 to 07. Latin Alphabet No 2 has been sub-

mitted to ISO and is the subject of International Standard ISO 8859/2. Latin Alphabets No. 3 and No. 4 are processed as ISO DP 8859/3 and DP 8859/4.

iii) A series of ECMA Standards for coded graphic character sets comprising those characters of the Latin Alphabets allocated to columns 02 to 07 and characters of another script for multiple-language applications. These ECMA Standards cover the Cyrillic, Arabic and Greek scripts. They have been submitted to ISO as DIS 8859/5, DIS 8859/6 and DIS 8859/7 respectively, for fast-track processing as ISO standards.

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Adopted as an ECMA Standard by the General Assembly of 25 June 1987.

1. SCOPE

This ECMA Standard defines a set of 153 graphic characters identified as Latin/Hebrew Alphabet, and specifies the coded representation of each of these characters by means of a single 8-bit byte. None of these characters are "non-spacing".

The use of control functions, such as BACKSPACE or CARRIAGE RETURN for the coded representation of composite characters is prohibited by this Standard.

2. FIELD OF APPLICATION

This set of graphic characters, the Latin/Hebrew Alphabet, is intended for use in data and text processing applications and may also be used for information interchange.

This set is suited for multiple-language applications involving the Latin and the Hebrew scripts. It allows handling of data and text expressed in Hebrew.

This set of graphic characters is suitable for use in a version of an 8-bit code according to ECMA-35 or ECMA-43.

3. CONFORMANCE

A set of graphic characters is in conformance with this Standard if it comprises all graphic characters specified herein to the exclusion of any other and if their coded representations are those specified by this Standard.

4. REFERENCES

- ECMA-6 : 7-bit Input/Output Coded Character Set
- ECMA-35 : Code Extension Techniques
- ECMA-43 : 8-bit Coded Character Set - Structure and Rules
- ECMA-48 : Control Functions
- ECMA-94 : 8-bit Single-Byte Coded Graphic Character Sets - Latin Alphabets No 1 to No 4.
- ECMA-113 : 8-bit Single-Byte Coded Graphic Character Sets - Latin/Cyrillic Alphabet
- ECMA-114 : 8-bit Single-Byte Coded Graphic Character Sets - Latin/Arabic Alphabet
- ECMA-118 : 8-bit Single-Byte Coded Graphic Character Sets - Latin/Greek Alphabet

5. DEFINITIONS

For the purpose of this Standard the following definitions apply:

5.1 Bit Combination; Byte

An ordered set of bits that represents a character or is used as a part of the representation of a character.

5.2 Character

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

5.3 Coded Character Set; Code

A set of unambiguous rules that establishes a character set and the one-to-one relationship between each character of the set and its coded representation.

5.4 Code Table

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

5.5 Graphic Character

A character, other than a control function, that has a visual representation normally handwritten, printed or displayed, and that has a coded representation consisting of one or more bit combinations.

Note 1

In this Standard a single bit combination is used to represent each character.

5.6 Graphic Symbol

A visual representation of a graphic character.

5.7 Position

That part of a code table identified by its column and row co-ordinates.

6. NOTATION, CODE TABLE AND NAMES

6.1 Notation

The bits of the bit combinations of the 8-bit code are identified by  $b_8, b_7, b_6, b_5, b_4, b_3, b_2$  and  $b_1$ , where  $b_8$  is the highest-order, or most-significant bit and  $b_1$  is the lowest-order, or least-significant bit.

The bit combinations may be interpreted to represent numbers in binary notation by attributing the following weights to the individual bits:

Bit	$b_8$	$b_7$	$b_6$	$b_5$	$b_4$	$b_3$	$b_2$	$b_1$
Weight	128	64	32	16	8	4	2	1

Using these weights, the bit combinations of the 8-bit code represent numbers in the range 0 to 255.

In this Standard, the bit combinations are identified by notations of the form  $xx/yy$ , where  $xx$  and  $yy$  are numbers in the range 00 to 15. The correspondence between the notations of the form  $xx/yy$  and the bit combinations consisting of the bits  $b_8$  to  $b_1$ , is as follows:

- $xx$  is the number represented by  $b_8, b_7, b_6$  and  $b_5$  where these bits are given the weights 8, 4, 2 and 1 respectively;
- $yy$  is the number represented by  $b_4, b_3, b_2$  and  $b_1$  where these bits are given the weights 8, 4, 2 and 1 respectively.

6.2 Layout of the Code Table

An 8-bit code table consists of 256 positions arranged in 16 columns and 16 rows. The columns and the rows are numbered 00 to 15.

The code table positions are identified by notations of the form  $xx/yy$ , where  $xx$  is the column number and  $yy$  is the row number.

The positions of the code table are in one-to-one correspondence with the bit combinations of the code. The notation of a code table position, of the form  $xx/yy$ , is the same as that of the corresponding bit combination.

6.3 Names and Meanings

This Standard assigns at least one name to each character. In addition, it specifies a graphic symbol for each graphic character. By convention only capital letters, the graphic symbols of small letters and hyphens are used for writing the names of the characters.

The names chosen to denote graphic characters are intended to reflect their customary meaning. However, except for SPACE (SP), NO-BREAK SPACE (NBSP) and SOFT HYPHEN (SHY), this Standard does not define and does not restrict the meanings of graphic characters. Neither does it specify a particular style or font design for imaging graphic characters.

6.3.1 SPACE (SP)

This character may be interpreted as a graphic character, a control character or as both. As a graphic character it has the visual representation consisting of the absence of a graphic symbol.

6.3.2 NO-BREAK SPACE (NBSP)

A graphic character the visual representation of which consists of the absence of a graphic symbol, for use when a line break is to be prevented in the text as presented.

6.3.3 SOFT HYPHEN (SHY)

A graphic character that is imaged by a graphic symbol identical with, or similar to, that representing HYPHEN, for use when a line break has been established within a word.

7. SPECIFICATION OF THE CODED CHARACTER SET

This Standard specifies 153 characters allocated to the bit combinations of the Code Table.

7.1 Characters of the Set and their Coded Representation

Bit Combination	Name
02/00	SPACE
02/01	EXCLAMATION MARK
02/02	QUOTATION MARK
02/03	NUMBER SIGN
02/04	DOLLAR SIGN
02/05	PERCENT SIGN
02/06	AMPERSAND
02/07	APOSTROPHE
02/08	LEFT PARENTHESIS
02/09	RIGHT PARENTHESIS
02/10	ASTERISK
02/11	PLUS SIGN
02/12	COMMA
02/13	HYPHEN, MINUS SIGN
02/14	FULL STOP
02/15	SOLIDUS
03/00	DIGIT ZERO
03/01	DIGIT ONE
03/02	DIGIT TWO
03/03	DIGIT THREE
03/04	DIGIT FOUR
03/05	DIGIT FIVE
03/06	DIGIT SIX
03/07	DIGIT SEVEN
03/08	DIGIT EIGHT
03/09	DIGIT NINE
03/10	COLON
03/11	SEMICOLON
03/12	LESS-THAN SIGN
03/13	EQUALS SIGN
03/14	GREATER-THAN SIGN

03/15	QUESTION MARK
04/00	COMMERCIAL AT
04/01	CAPITAL LETTER A
04/02	CAPITAL LETTER B
04/03	CAPITAL LETTER C
04/04	CAPITAL LETTER D
04/05	CAPITAL LETTER E
04/06	CAPITAL LETTER F
04/07	CAPITAL LETTER G
04/08	CAPITAL LETTER H
04/09	CAPITAL LETTER I
04/10	CAPITAL LETTER J
04/11	CAPITAL LETTER K
04/12	CAPITAL LETTER L
04/13	CAPITAL LETTER M
04/14	CAPITAL LETTER N
04/15	CAPITAL LETTER O
05/00	CAPITAL LETTER P
05/01	CAPITAL LETTER Q
05/02	CAPITAL LETTER R
05/03	CAPITAL LETTER S
05/04	CAPITAL LETTER T
05/05	CAPITAL LETTER U
05/06	CAPITAL LETTER V
05/07	CAPITAL LETTER W
05/08	CAPITAL LETTER X
05/09	CAPITAL LETTER Y
05/10	CAPITAL LETTER Z
05/11	LEFT SQUARE BRACKET
05/12	REVERSE SOLIDUS
05/13	RIGHT SQUARE BRACKET
05/14	CIRCUMFLEX ACCENT
05/15	LOW LINE
06/00	GRAVE ACCENT
06/01	SMALL LETTER a
06/02	SMALL LETTER b
06/03	SMALL LETTER c
06/04	SMALL LETTER d

06/05	SMALL LETTER e
06/06	SMALL LETTER f
06/07	SMALL LETTER g
06/08	SMALL LETTER h
06/09	SMALL LETTER i
06/10	SMALL LETTER j
06/11	SMALL LETTER k
06/12	SMALL LETTER l
06/13	SMALL LETTER m
06/14	SMALL LETTER n
06/15	SMALL LETTER o
07/00	SMALL LETTER p
07/01	SMALL LETTER q
07/02	SMALL LETTER r
07/03	SMALL LETTER s
07/04	SMALL LETTER t
07/05	SMALL LETTER u
07/06	SMALL LETTER v
07/07	SMALL LETTER w
07/08	SMALL LETTER x
07/09	SMALL LETTER y
07/10	SMALL LETTER z
07/11	LEFT CURLY BRACKET
07/12	VERTICAL LINE
07/13	RIGHT CURLY BRACKET
07/14	TILDE
10/00	NO-BREAK SPACE
10/01	This position shall not be used
10/02	CENT SIGN
10/03	POUND SIGN
10/04	CURRENCY SIGN
10/05	YEN SIGN
10/06	BROKEN BAR
10/07	PARAGRAPH SIGN
10/08	DIAERESIS
10/09	COPYRIGHT SIGN
10/10	MULTIPLICATION SIGN
10/11	LEFT ANGLE QUOTATION MARK

10/12	NOT SIGN
10/13	SOFT HYPHEN
10/14	REGISTERED TRADE MARK SIGN
10/15	LINE ABOVE
11/00	DEGREE SIGN
11/01	PLUS-MINUS SIGN
11/02	SUPERSCRIP TWO
11/03	SUPERSCRIP THREE
11/04	ACCUTE ACCENT
11/05	MICRO SIGN
11/06	PILCROW SIGN
11/07	MIDDLE DOT
11/08	CEDILLA
11/09	SUPERSCRIP ONE
11/10	DIVISION SIGN
11/11	RIGHT ANGLE QUOTATION MARK
11/12	VULGAR FRACTION ONE QUARTER
11/13	VULGAR FRACTION ONE HALF
11/14	VULGAR FRACTION THREE QUARTERS
11/15	This position shall not be used
12/00	This position shall not be used
12/01	This position shall not be used
12/02	This position shall not be used
12/03	This position shall not be used
12/04	This position shall not be used
12/05	This position shall not be used
12/06	This position shall not be used
12/07	This position shall not be used
12/08	This position shall not be used
12/09	This position shall not be used
12/10	This position shall not be used
12/11	This position shall not be used
12/12	This position shall not be used
12/13	This position shall not be used
12/14	This position shall not be used
12/15	This position shall not be used
13/00	This position shall not be used
13/01	This position shall not be used

13/02	This position shall not be used
13/03	This position shall not be used
13/04	This position shall not be used
13/05	This position shall not be used
13/06	This position shall not be used
13/07	This position shall not be used
13/08	This position shall not be used
13/09	This position shall not be used
13/10	This position shall not be used
13/11	This position shall not be used
13/12	This position shall not be used
13/13	This position shall not be used
13/14	This position shall not be used
13/15	DOUBLE LOW LINE
14/00	HEBREW LETTER ALEPH
14/01	HEBREW LETTER BET
14/02	HEBREW LETTER GIMEL
14/03	HEBREW LETTER DALET
14/04	HEBREW LETTER HE
14/05	HEBREW LETTER WAW
14/06	HEBREW LETTER ZAIN
14/07	HEBREW LETTER CHET
14/08	HEBREW LETTER TET
14/09	HEBREW LETTER YOD
14/10	HEBREW LETTER TERMINAL KAPH
14/11	HEBREW LETTER KAPH
14/12	HEBREW LETTER LAMED
14/13	HEBREW LETTER TERMINAL MEM
14/14	HEBREW LETTER MEM
14/15	HEBREW LETTER TERMINAL NUN
15/00	HEBREW LETTER NUN
15/01	HEBREW LETTER SAMECH
15/02	HEBREW LETTER AYIN
15/03	HEBREW LETTER TERMINAL PE
15/04	HEBREW LETTER PE
15/05	HEBREW LETTER TERMINAL ZADE
15/06	HEBREW LETTER ZADE
15/07	HEBREW LETTER QOPH

15/08	HEBREW LETTER RESH
15/09	HEBREW LETTER SHIN
15/10	HEBREW LETTER TAW
15/11	This position shall not be used
15/12	This position shall not be used
15/13	This position shall not be used
15/14	This position shall not be used
15/15	This position shall not be used

7.2 Code Table

The Code Table shows the characters listed at the position in the code table corresponding to the specified bit combination.

The shaded positions correspond to bit combinations that do not represent graphic characters. Their use is outside the scope of this Standard, it is specified in other ECMA Standards, e.g. ECMA-6 or ECMA-48.

The 38 cross-hatched positions indicate bit combinations that are reserved for future standardization (see 9.).

8. DESIGNATION OF THE CHARACTER SET

The graphic characters of this Standard constitute a single coded character set. However, when this character set is implemented together with other coding standards such as ECMA-35 or ECMA-43, the Code Table of this Standard shall be considered to consist of the following components:

- The character SPACE represented by bit combination 02/00.
- A 94-character G0 graphic character set represented by bit combinations 02/01 to 07/14.
- A 96-character G1 graphic character set represented by bit combinations 10/00 to 15/15.

When required by other coding standards, e.g. ECMA-35 or ECMA-43 the following pair of escape sequences shall be used:

ESC 02/08 04/02  
 ESC 02/13 04/08

to designate the G0 and the G1 sets, respectively. According to ECMA-35 the character SPACE does not require designation.

9. BIT COMBINATIONS NOT TO BE USED

Bit combinations 10/01, 11/15 to 13/14 and 15/11 to 15/15 are reserved for future standardization and shall not be used. The corresponding positions are cross-hatched in the Code Table.

Any allocation of characters to these positions is incompatible with this Standard.

LATIN/HEBREW ALPHABET

b.	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1		
b.	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1		
b.	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1		
b.	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1		
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15		
b.	b.	b.	b.			SP	0	@	P	`	p			NBSP	°		א	נ
0	0	0	0	00		!	1	A	Q	a	q			±			ב	ס
0	0	1	0	02		"	2	B	R	b	r			¢	²		ג	ע
0	0	1	1	03		#	3	C	S	c	s			£	³		ד	ף
0	1	0	0	04		\$	4	D	T	d	t			α	'		ה	פ
0	1	0	1	05		%	5	E	U	e	u			¥	μ		ו	ץ
0	1	1	0	06		&	6	F	V	f	v			!	¶		ז	צ
0	1	1	1	07		'	7	G	W	g	w			§	·		ח	ק
1	0	0	0	08		(	8	H	X	h	x			"	‚		ט	ר
1	0	0	1	09		)	9	I	Y	i	y			©	¹		י	ש
1	0	1	0	10		*	:	J	Z	j	z			×	÷		ך	ת
1	0	1	1	11		+	;	K	[	k	{			«	»		כ	
1	1	0	0	12		/	<	L	\	l				¬	¼		ל	
1	1	0	1	13		-	=	M	]	m	}			SHY	½		ם	
1	1	1	0	14		.	>	N	^	n	~			®	¾		מ	
1	1	1	1	15		/	?	O	_	o				—			ו	