ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-44

FOR

THE IMPLEMENTATION OF THE ECMA 7-BIT AND 8-BIT CODED CHARACTER SETS ON PUNCHED CARDS

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BRIEF HISTORY

When ECMA adopted their Standard ECMA-6 for the 7-Bit Coded
Character Set for Information Interchange, no proposals for
implementation in media were included. These implementations
were deliberately left as the subject for future standards.

In 1969 Standard ECMA-20 was published which defined the im-
plementation of the 7-bit coded character set on 12-row punched
cards. A year later, in 1970, Standard ECMA-25, an extension
of Standard ECMA-20 to an abstract relationship between hole-
patterns and the 256 possible 8-bit combinations, was published.
With the development within ECMA of code extension techniques
(ECMA-35) and of an 8-bit coded character set, it was felt
that the existence of these two standards as separate documents
was no more justified.

The present Standard ECMA-44 supersedes both, ECMA-20 and
ECMA-25. However, its technical content is identical to that
of these Standards.

ADOPTED BY THE GENERAL ASSEMBLY OF ECMA ON JUNE 19, 1975.

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1. SCOPE

   1.1 The present Standard defines the implementation of the ECMA
       Coded Character Sets, which are the subject of the follow-
       ing Standards :

       - ECMA-6 : defines a set of 128 characters and their
                  coded representation using 7 bits.

       - ECMA-35 : defines the techniques to be utilized in
                   order to enlarge the repertoire of the
                   standard character set of ECMA-6.

       - ECMA-43 : defines a set of 256 characters and their
                   coded representation using 8 bits.

   1.2 This Standard specifies the representation of 7-bit combi-
       nations and 8-bit combinations on 12-row punched cards.
       This representation is derived from, and compatible with
       the code known as "Hollerith Code". It will ensure compa-
       tibility with a large proportion of existing punched card
       files.

       It does not specify any redundancy nor does it define
       techniques for error control.

2. FIELD OF APPLICATION

   This Standard is intended for the general interchange of informa-
   tion among data processing systems, when using 12-Row Punched
   Cards as data carrier.

3. PUNCHED CARDS

   3.1 A punched card, as referred to in this Standard, is an in-
       terchange medium (document) in which characters are repre-
       sented in successive columns, each column having twelve
       possible punching positions.

       This Standard does not define the number of columns in a card,
       nor the shape of the holes punched in a card, nor any of its
       other physical characteristics. The above features are the
       subject of other international or national standards.

       Note : See for example :

               - ISO Recommendation R 1681, Specification for unpunched paper cards.

               - ISO Recommendation R 1682, Dimensions and location for rectangular punched
                                            holes in 80 columns punched paper cards.

3.2 Twelve possible punching positions are available in each column of the card. For the purpose of this Standard, they are designated as :

12   11   0   1   2   3   4   5   6   7   8   9

The hole patterns specified in this Standard are formed by punching the twelve available positions of a given column of a punched card in the following way :

- positions 12   11   0   9   8
  may be punched in any combination, giving $2^5 = 32$ possibilities,

- only one of positions 1   2   3   4   5   6   7
  may be punched, which together with the NO PUNCH condition gives 8 possibilities.

These rules provide for 256 hole patterns (32 x 8).

Fig. I

LAYOUT OF PUNCHING POSITIONS
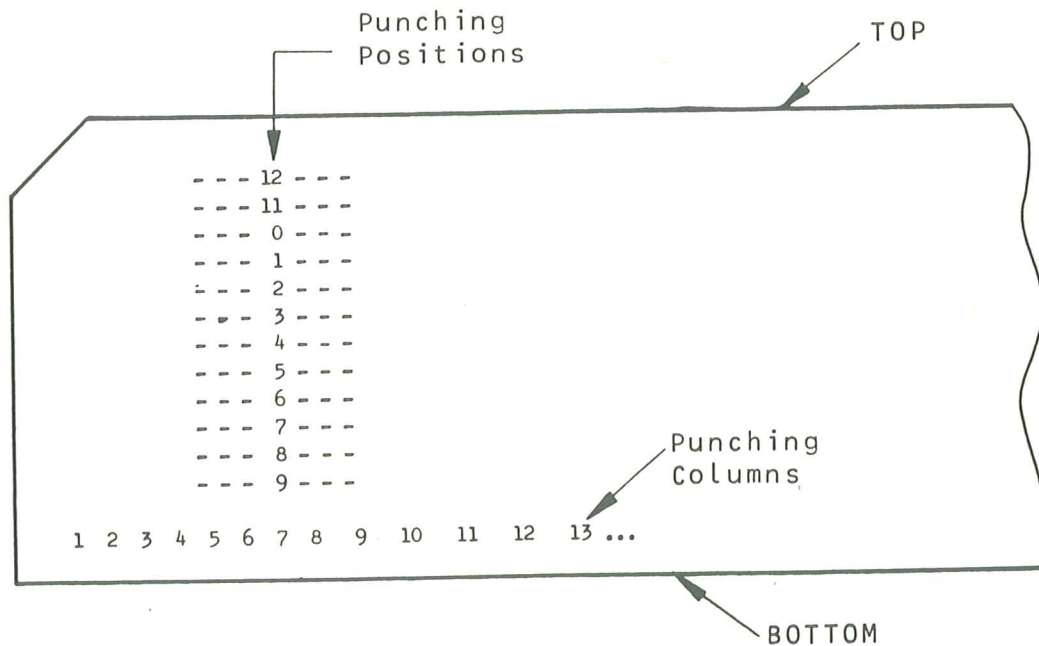
4. SPECIFICATION

4.1 Implementation of the 8-Bit Coded Character Set

Table 1 specifies for each of the 256 8-bit combinations the corresponding hole-pattern.

The columns and rows are numbered in binary and decimal notation. Each position in Table 1 is identified by its column and row number (e.g. 06/11) and by the corresponding bit combination (e.g. 0110 1011). The entries in the table are card hole-patterns.

4.2 Implementation of the 7-Bit Coded Character Set

The hole-patterns shown in the first half of the table (i.e. columns 00 to 07) apply to the 128 7-bit combinations, which are obtained ignoring the most significant eighth bit (b_8).

					00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
b8	b7	b6	b5																	

b4	b3	b2	b1
O	O	O	O
O	O	O	—
O	O	—	O
O	O	—	—
O	—	O	O
O	—	O	—
O	—	—	O
O	—	—	—
—	O	O	O
—	O	O	—
—	O	—	O
—	O	—	—
—	—	O	O
—	—	O	—
—	—	—	O
—	—	—	—

APPENDIX A
_____

For ease of reference, and with a view to helping the
reader, the correspondence defined in Table 1 between
256 8-bit combinations and 256 hole-patterns is shown
hereafter in another form in Table 2.

The layout of Table 2 is as follows:

-   The columns, the left half of the rows and the right
    half of the rows are labelled with card hole-patterns;

-   The entries in the table represent the column/row
    position of a bit-combination of the 8-bit code table.

Example :   The card hole-pattern 12-11-2 corresponds to
            position 06/11 of the code table (i.e. to bit
            pattern 0110 1011).

Table 2

BIT-COMBINATIONS ASSIGNED TO CARD HOLE-PATTERNS

Upper block

hole-pattern	0‑11‑12	11‑0	12‑11	12‑0	(blank)	0	11	12
8‑1‑9	13/08	13/01	12/10	12/03	06/00	11/09	11/01	10/08
1‑9	11/11	09/15	10/09	10/00	09/01	08/01	01/01	00/01
2‑9	11/12	11/02	10/10	10/01	01/06	08/02	01/02	00/02
3‑9	11/13	11/03	10/11	10/02	09/03	08/03	01/03	00/03
4‑9	11/14	11/04	10/12	10/03	09/04	08/04	09/13	09/12
5‑9	11/15	11/05	10/13	10/04	09/05	00/10	08/05	00/09
6‑9	12/00	11/06	10/14	10/05	09/06	01/07	00/08	08/06
7‑9	12/01	11/07	10/15	10/06	00/04	01/11	08/07	07/15
8‑9	12/02	11/08	11/00	10/07	09/08	08/08	01/08	09/07
1‑8‑9	09/00	08/00	01/00	00/00	09/09	08/09	01/09	08/13
2‑8‑9	15/10	15/04	14/14	14/08	09/10	08/10	09/02	08/14
3‑8‑9	15/11	15/05	14/15	14/09	09/11	08/11	08/15	00/11
4‑8‑9	15/12	15/06	15/00	14/10	01/04	08/12	01/12	00/12
5‑8‑9	15/13	15/07	15/01	14/11	01/05	00/05	01/13	00/13
6‑8‑9	15/14	15/08	15/02	14/12	09/14	00/06	01/14	00/14
7‑8‑9	15/15	15/09	15/03	14/13	01/10	00/07	01/15	00/15

Lower block

hole-pattern	0‑11‑12	11‑0	12‑11	0‑12	0	0	11	12
1	11/10	07/13	07/12	07/11	02/00	03/00	02/13	02/06
2	13/09	07/14	06/10	06/01	03/01	02/15	04/10	04/01
3	13/10	07/03	06/11	06/02	03/02	05/03	04/11	04/02
4	13/11	07/04	06/12	06/03	03/03	05/04	04/12	04/03
5	13/12	07/05	06/13	06/04	03/04	05/05	04/13	04/04
6	13/13	07/06	06/14	06/05	03/05	05/06	04/14	04/05
7	13/14	07/07	06/15	06/06	03/06	05/07	04/15	04/06
8	13/15	07/08	07/00	06/07	03/07	05/08	05/00	04/07
9	14/00	07/09	07/01	06/08	03/08	05/09	05/01	04/08
2‑8	14/01	07/10	07/02	06/09	03/09	05/10	05/02	04/09
3‑8	14/02	13/02	12/11	12/04	03/10	05/12	05/13	05/11
4‑8	14/03	13/03	12/12	12/05	02/03	02/12	02/04	02/14
5‑8	14/04	13/04	12/13	12/06	04/00	02/05	02/10	03/12
6‑8	14/05	13/05	12/14	12/07	02/07	05/15	02/09	02/08
7‑8	14/06	13/06	12/15	12/08	03/13	03/14	03/11	02/11
(8)	14/07	13/07	13/00	12/09	02/02	03/15	05/14	02/01

APPENDIX B

CONSIDERATION OF NATIONAL USAGES

For some national versions of the 7-bit or 8-bit codes,
the implementation specified in this Standard results
in character/hole-pattern relations which, for a few
characters, may differ from established practice.

Appendix C

ECMA 7-bit Coded Character Set (ECMA-6)

b7 →				0	0	0	0	1	1	1	1
b6 →				0	0	1	1	0	0	1	1
b5 →				0	1	0	1	0	1	0	1
b4	b3	b2	b1	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	0	0	0	**0** NUL	TC₇ (DLE)	SP	0	ⓝ	P	` ④	p
0	0	0	1	**1** TC₁ (SOH)	DC₁	!	1	A	Q	a	q
0	0	1	0	**2** TC₂ (STX)	DC₂	" ⑥	2	B	R	b	r
0	0	1	1	**3** TC₃ (ETX)	DC₃	£(#) ②	3	C	S	c	s
0	1	0	0	**4** TC₄ (EOT)	DC₄	$(¤) ②	4	D	T	d	t
0	1	0	1	**5** TC₅ (ENQ)	TC₈ (NAK)	%	5	E	U	e	u
0	1	1	0	**6** TC₆ (ACK)	TC₉ (SYN)	&	6	F	V	f	v
0	1	1	1	**7** BEL	TC₁₀ (ETB)	' ⑥	7	G	W	g	w
1	0	0	0	**8** FE₀ (BS)	CAN	(	8	H	X	h	x
1	0	0	1	**9** FE₁ (HT)	EM	)	9	I	Y	i	y
1	0	1	0	**10** FE₂ (LF)①	SUB	*	:	J	Z	j	z
1	0	1	1	**11** FE₃ (VT)①	ESC	+	;	K	ⓝ	k	ⓝ
1	1	0	0	**12** FE₄ (FF)①	IS₄ (FS)	, ⑥	<	L	ⓝ	l	ⓝ
1	1	0	1	**13** FE₅ (CR)①	IS₃ (GS)	-	=	M	ⓝ	m	ⓝ
1	1	1	0	**14** SO	IS₂ (RS)	.	>	N	^ ④⑤	n	‾ ④⑤
1	1	1	1	**15** SI	IS₁ (US)	/	?	O	_	o	DEL

APPENDIX D

ECMA 8-Bit Coded Character Set (ECMA-43)

b8				b7	b6	b5		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
								0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
b4	b3	b2	b1					00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0	0	0	0	00				NUL	TC7 (DLE)	SP	0	③	P	`④	p			⑧					
0	0	0	1	01				TC1 (SOH)	DC1	!	1	A	Q	a	q								
0	0	1	0	02				TC2 (STX)	DC2	" ⑥	2	B	R	b	r								
0	0	1	1	03				TC3 (ETX)	DC3	£(#)②	3	C	S	c	s								
0	1	0	0	04				TC4 (EOT)	DC4	$(¤)②	4	D	T	d	t								
0	1	0	1	05				TC5 (ENQ)	TC8 (NAK)	%	5	E	U	e	u								
0	1	1	0	06				TC6 (ACK)	TC9 (SYN)	&	6	F	V	f	v								
0	1	1	1	07				BEL	TC10 (ETB) ⑥	'	7	G	W	g	w								
1	0	0	0	08				FE0 (BS)	CAN	(	8	H	X	h	x								
1	0	0	1	09				FE1 (HT)	EM	)	9	I	Y	i	y								
1	0	1	0	10				①FE2 (LF)	SUB	*	:	J	Z	j	z								
1	0	1	1	11				①FE3 (VT)	ESC	+	;	K	③	k	③								
1	1	0	0	12				①FE4 (FF)	IS4 (FS)	⑥ ,	<	L	③	l	③								
1	1	0	1	13				①FE5 (CR)	IS3 (GS)	-	=	M	③	m	③								
1	1	1	0	14				⑦SO	IS2 (RS)	.	>	N	^④⑥	n	‾④⑤								
1	1	1	1	15				⑦SI	IS1 (US)	/	?	O	_	o	DEL								⑧

|←——— ⑨ ———→|←——————— ⑩ ———————→|