

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 646

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

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BRIEF HISTORY

The ISO Recommendation R 646, *6 and 7 bit coded character sets for information processing interchange*, was drawn up by Technical Committee ISO/TC 97, *Computers and information processing*, the Secretariat of which is held by the United States of America Standards Institute (USASI).

Work on this question by the Technical Committee began in 1962 and led, in 1966, to the adoption of a Draft ISO Recommendation.

In October 1966, this Draft ISO Recommendation (No. 1052) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Argentina	Germany	Turkey
Australia	Israel	U.A.R.
Belgium	Italy	United Kingdom
Brazil	Netherlands	U.S.A.
Canada	Sweden	U.S.S.R.
France	Switzerland	

Four Member Bodies opposed the approval of the Draft:

Austria
Japan
Poland
Spain

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in December 1967, to accept it as an ISO RECOMMENDATION.

6 AND 7 BIT CODED CHARACTER SETS FOR INFORMATION PROCESSING INTERCHANGE

1. GENERAL

1.1 Scope

- 1.1.1 This ISO Recommendation describes two character sets for general usage, including letters, figures, punctuation marks, other symbols and controls, with their coded representation.
- 1.1.2 The requirements for graphics and controls in data handling and programming, in accordance with computer and ancillary equipment characteristics, have been taken into account in determining these character sets.
- 1.1.3 This ISO Recommendation consists of two tables with notes, a key, explanatory notes and the definitions of functional characteristics related to control characters.
- 1.1.4 These character sets are primarily intended for the interchange of information among data processing systems and associated equipment. They may be regarded as basic alphabets in an abstract sense.
- 1.1.5 These character sets are applicable to all Latin alphabets.
- 1.1.6 One character set contains 6-bit characters and provides 64 coded characters, the other contains 7-bit characters and provides 128 coded characters. The two sets are compatible in that they are logically related. This facilitates the conversion between the two sets.

1.2 Implementation

- 1.2.1 These character sets may be implemented in various media with logically related codes, as appropriate. For example, this could include punched tapes, punched cards, magnetic tapes and transmission channels, thus permitting interchange of data to take place either indirectly by means of an intermediate recording in a physical medium, or by local electrical connection of various units (such as input and output devices and computers) or by means of data transmission equipment.
- 1.2.2 Other ISO Recommendations describe the means of recording these character sets in physical media and the means of encoding them for transmission while taking into account the need for error checking*.

* For the implementation of codes

- on punched tape, see ISO Recommendation R . . . , *Representation of 6 and 7 bit coded character sets on punched tape* (at present at the stage of draft proposal);
- on punched cards, see ISO Recommendation R . . . , *Implementation of ISO 7 bit coded character set on 12 row punched card* (at present at the stage of draft proposal);
- on 7 and 9 track magnetic tape, see ISO Recommendation R . . . , *Implementation of the 6 and 7 bit coded character sets on 7 track 1/2 in (12.7 mm) magnetic tape* (at present Draft ISO Recommendation No. 1320) and ISO Recommendation R . . . , *Implementation of the 7 bit coded character set on 9 track 1/2 in (12.7 mm) magnetic tape* (at present Draft ISO Recommendation No. 1321).

2.1 6-Bit set table

Bits						Column			
b_6	b_5	b_4	b_3	b_2	b_1	0	0	1	1
Row						0	1	2	3
0	0	0	0	0	0	SP	0	NUL	P
0	0	0	1	1	1	F ₁ (HT)	1	A	Q
0	0	1	0	2	2	F ₂ (LF) ^①	2	B	R
0	0	1	1	3	3	F ₃ (VT)	3	C	S
0	1	0	0	4	4	F ₄ (FF)	4	D	T
0	1	0	1	5	5	F ₅ (CR) ^①	5	E	U
0	1	1	0	6	6	SO	6	F	V
0	1	1	1	7	7	SI	7	G	W
1	0	0	0	8	8	(	8	H	X
1	0	0	1	9	9	)	9	I	Y
1	0	1	0	10	10	*	: ^②	J	Z
1	0	1	1	11	11	+	; ^②	K	(l) ^③
1	1	0	0	12	12	,	< | \$^②	L	(£) ^{② ③}
1	1	0	1	13	13	—	= ^② | %	M	(l) ^③
1	1	1	0	14	14	.	> | &	N	ESC
1	1	1	1	15	15	/	'	O	DEL

NOTES ABOUT

① The controls CR and LF are intended for printer equipment which requires separate combinations to return the carriage and to feed a line.

For equipment which uses a single control for a combined carriage return and line feed operation,

— in the 6-bit set table, the function F₂ will have the meaning of "New Line" (NL). F₅ will then have the meaning of "Backspace" (BS);

— in the 7-bit set table, the function FE₂ will have the meaning of "New Line" (NL).

These substitutions require agreement between the sender and the recipient of the data.

The use of this function "NL" is not allowed for international transmission on general telecommunication networks (Telex and Telephone networks).

② For international information interchange, \$ and £ symbols do not designate the currency of a given country. The use of the symbols combined with other graphic symbols to designate national currencies may be the subject of other ISO Recommendations.

③ Reserved for National Use. These positions are primarily intended for alphabetic extensions. If they are not required for that purpose, they may be used for symbols and a recommended choice is shown in parenthesis in some cases.

Some restrictions are placed on the use of these characters on the general telecommunication networks for international transmission.

④ Positions 5/14, 6/0 and 7/14 of the 7-bit set table are normally provided for the diacritical signs "circumflex", "grave accent" and "overline". However, these positions may be used for other

NOTES

2.2 7-Bit set table

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

7 BIT SET TABLE

graphical symbols when it is necessary to have 8, 9 or 10 positions for national use.

For international information interchange, position 7/14 of the 7-bit set table is used for the graphical symbol—(overline), the graphical representation of which may vary according to national practice to represent ˆ (tilde) or another diacritical sign provided that there is no risk of confusion with another graphical symbol included in the table.

The graphics in positions 2/2, 2/7, 5/14 of the 7-bit set table have respectively the significance of "quotation mark", "apostrophe" and "upwards arrow"; however, these characters take on the significance of the diacritical signs "diæresis", "acute accent" and "circumflex accent" when they precede or follow the "backspace" character.

⑦ For international information interchange position 2/3 of the 7-bit set table has the significance of the symbol £. Within a country where there is no requirement for the symbol £, the symbol # may be used in that position.

⑧ If 10 and 11 as single characters are needed (for example, for Sterling currency subdivision), they should take the place of "colon" (:) and "semi-colon" (;) respectively. These substitutions require agreement between the sender and the recipient of the data.

On the general telecommunication networks, the characters "colon" and "semi-colon" are the only ones authorized for international transmission.

⑨ Either of the two sets of three symbols shown in these positions in the table may be chosen; the interpretation of the corresponding combinations requires agreement between the sender and the recipient of the data.

3. KEY

3.1 Controls

ACK	ACKNOWLEDGE
BEL	BELL
BS	BACKSPACE
CAN	CANCEL
CR	CARRIAGE RETURN
DC	DEVICE CONTROL
DEL	DELETE
DLE	DATA LINK ESCAPE
EM	END OF MEDIUM
ENQ	ENQUIRY
EOT	END OF TRANSMISSION
ESC	ESCAPE
ETB	END OF TRANSMISSION BLOCK
ETX	END OF TEXT
F	FUNCTION
FE	FORMAT EFFECTOR
FF	FORM FEED
FS	FILE SEPARATOR
GS	GROUP SEPARATOR
HT	HORIZONTAL TABULATION
IS	INFORMATION SEPARATOR
LF	LINE FEED
NAK	NEGATIVE ACKNOWLEDGE
NL	NEW LINE
NUL	NULL
RS	RECORD SEPARATOR
SI	SHIFT-IN
SO	SHIFT-OUT
SOH	START OF HEADING
SP	SPACE
STX	START OF TEXT
SUB	SUBSTITUTE
SYN	SYNCHRONOUS IDLE
TC	TRANSMISSION CONTROL
US	UNIT SEPARATOR
VT	VERTICAL TABULATION

3.2 Graphical Symbols

Graphical Representation	Name	Position in the code tables †	
		6-bit	7-bit
(Space)	A normally non-printing graphic character	0/0	2/0
!	Exclamation mark	—	2/1
”	Quotation mark. Diaeresis (note ②)	—	2/2
£	Currency symbol £ (note ②)	3/12	2/3
\$	Currency symbol \$ (note ②)	1/12	2/4
%	Percent	1/13	2/5
&	Ampersand	1/14	2/6
'	Apostrophe, Acute accent (note ②)	1/15	2/7
(	Left parenthesis	0/8	2/8
)	Right parenthesis	0/9	2/9
*	Asterisk	0/10	2/10
+	Plus sign	0/11	2/11
,	Comma	0/12	2/12
—	Hyphen, minus sign	0/13	2/13
.	Full stop (period)	0/14	2/14
/	Solidus	0/15	2/15
:	Colon	1/10	3/10
;	Semi-colon	1/11	3/11
<	Less than	1/12	3/12
=	Equals	1/13	3/13
>	Greater than	1/14	3/14
?	Question mark	—	3/15
@	Commercial at	—	4/0
[	Left square bracket	3/11	5/11
]	Right square bracket	3/13	5/13
^	Upwards arrow, Circumflex accent (note ②)	—	5/14
—	Underline	—	5/15
`	Grave accent	—	6/0
—	Overline (note ②)	—	7/14

Notes ② ③ ④ see pages 6-7.

† See clause 4.1 page 10.

4. EXPLANATORY NOTES

4.1 Numbering of the positions in the code tables

Within any one character the bits are identified by $b_7, b_6 \dots b_1$, where b_7 or b_6 is the highest order, or most significant bit, and b_1 is the lowest order, or least significant bit.

If desired these may be given a numerical significance in the binary system, thus:

Bit identification:	b_7	b_6	b_5	b_4	b_3	b_2	b_1
Significance:	64	32	16	8	4	2	1

In the code tables the columns and rows are identified by numbers written in binary and decimal notations.

Any one position in a code table may be identified either by its bit pattern, or by its column and row numbers. For instance, the position containing the figure 1 in the 7-bit set table may be identified:

- by its bit-pattern, e.g. 011 0001
- by its column and row numbers, e.g. 3/1.

4.2 Diacritical signs

In the 7 bit character set, some printing symbols may be designed to permit their use for the composition of accented letters when necessary for general interchange of information. A sequence of three characters, comprising a letter, "backspace" and one of these symbols, is needed for this composition, and the symbol is then regarded as a diacritical sign. It should be noted that these symbols take on their diacritical significance only when they are preceded or followed by the "backspace" character; for example, the symbol corresponding to the code combination 2/7 (') normally has the significance of "apostrophe", but becomes the diacritical sign "acute accent" when it precedes or follows the "backspace" character.

In order to increase efficiency, it is possible to introduce accented letters (as single characters) in the positions marked by note ③ in the code tables. According to national requirements, these positions may contain special diacritical signs.

4.3 Interpretation of graphics

The meaning of the graphics is not defined by this ISO Recommendation. It will be necessary to reach agreement on the meaning and this will depend upon the particular application except in cases where other ISO Recommendations already exist. However no interpretation may be chosen which is contradictory to the customary meaning. A graphical symbol can have more than one meaning, e.g. the graphical symbol—(minus) also can have the meaning of hyphen or separation mark. The font design of the symbols is not part of this ISO Recommendation.

4.4 Dual allocations

A character allocated to a position in the code table may not be placed elsewhere in the table. In the case of positions having two characters allocated to them (1/10 and 1/11 of the 6-bit set table and 2/3, 3/10 and 3/11 of the 7-bit set table), the character not used cannot be placed elsewhere. This applies also to positions showing a preferred graphic. If such a position is filled with a national character the preferred graphic cannot be placed in another code position.