ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA - 23

for

KEYBOARDS GENERATING THE CODE COMBINATIONS OF THE CHARACTERS OF THE ECMA 7-BIT CODED CHARACTER SET

2nd Edition - January 1975

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AMENDMENTS TO

STANDARD ECMA - 23

Page 8 - Note 8, Second line: D 13 to read E00
Page 8 - Last line: E 13 to read B00
Page 9 - First line: E 13 to read B00
Page 9 - Second line: E 13 to read B00
Page 9 - Note 9: Delete the entire note
Pages 24 and 25 - The two keyboard layouts of
        Appendix III, fig. A 1 and A 2 should be
        redrawn to show the keys now in positions
        E 13 to D 13, in positions B00 and E00 re-
        spectively, like in fig. 7 and 8.
Page 25 - Note A.2, First line: "the code positions
        indicated" to read "the abbreviations NAT"
Page 25 - Note A.3, Second line: C 12 (shifted mode)
        to read B00 (unshifted mode)
Page 25 - Last line: E 12 to read B00

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FOREWORD

The ECMA 7-Bit Code (Standard ECMA-6) has now been accepted wide-
ly within the Data Processing industry, and other allied indus-
tries. Many of the items of equipment in which it is employed
incorporate keyboards, and hence it is desirable, for many
reasons, to define standard keyboard layouts which satisfy
the requirements of the applications in which this equipment
will be used.

This Standard ECMA-23 defines layouts for the graphic keys of
three types of keyboard, and the principles to be followed in
placing controls in relation to the graphic keys. Appendix I
gives the criteria used in arriving at the definitive areas in
the Standard. For reference, the tables of the ECMA 7-Bit Code
are included as Appendix II. Appendix III gives examples of key-
boards for use where the National Use positions of the ECMA 7-bit
Code are used for alphabetic extention.

BRIEF HISTORY

Standard ECMA-23, developed by TC13, was adopted by the
General Assembly of ECMA on June 12, 1969. Since that time
there has been considerable activity internationally in
the field of keyboard standardization within ISO/TC95/SC14
"Keyboard Arrangements" and it now seems appropriate to
bring the Standard ECMA-23 into line with current inter-
national thinking.

This 2nd Edition supersedes the version dated June 1969.

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1. SCOPE

This Standard defines three types of layout for graphic keys depending upon the type of application for which the keyboard is intended. It is concerned only with the nominal relative positions of the keys. The figures are intended to express the nominal relative positions of the keys, and are not intended to define physical factors, such as key spacing, keyboard slope, size and shape of keytops and of the space bar, nor the way in which the keytops are labelled.

The key position numbers, where shown, are for reference purposes only, and are in accord with the key numbering system currently in use in ISO.

1.1 Type N

1.1.1 This type comprises layouts for the keys of keyboards generating the code combinations of the ECMA 7-bit Code (Standard ECMA-6) for the digits 0 to 9 and for a certain number of other characters. It is for use in those applications where the data is exclusively numeric.

1.1.2 The keys may be arranged squarely behind each other as shown in Figure 1, or may optionally slope to the left or to the right.

1.2 Type A

1.2.1 This type defines the layout for the keys of keyboards generating the code combinations of the graphic characters of the ECMA 7-bit Code (Standard ECMA-6). It is for use in those applications where the data is predominantly alphabetic.

1.2.2 The layout requires at least 47 keys and a SPACE bar to implement all the graphic characters. Rules and recommendations are given on the most suitable way of contracting the standard 47 key graphic area in cases where not all the 95 graphic characters are required.

1.3 Type AN

1.3.1 This type defines the layout for the keys of keyboards generating the code combinations of the graphic characters of the ECMA 7-bit Code (Standard ECMA-6). It is for

use in those applications where the data is both alpha-
betic and numeric, and where a large proportion of the
data is numeric.

1.3.2   This type combines the features of Types A and N re-
ferred to above.

1.3.3   The layout requires at least 47 keys and a SPACE bar to
implement all the alphabetic graphic characters. In ad-
dition to the basic alphabetic graphic layout, the key-
board has an area reserved for shift free keys generating
the code combinations of the digits and associated char-
acters.

1.3.4   Rules and recommendations are given on the most suitable
way of contracting the standard 47 key graphic area in
cases where not all the 95 graphic characters are required.

1.4 Controls

1.4.1   In addition to the graphic keys it will be necessary for
keyboards to include control keys or buttons. This Stand-
ard sets out the philosophy to be adopted in positioning
such controls in relation to the graphic keys.

2. DEFINITIONS

2.1 Controls

2.1.1   Controls will be provided as

i)   KEYS to generate some or all of the control characters
of the Code Table. The keys may also, if necessary,
control the device.

ii) BUTTONS to provide a means for controlling the device
without generating a coded character.

2.1.2   Controls are in general non-printing characters.

2.1.3   In drawing up a keyboard layout no distinction is made
between the above types of controls. Rather, controls
are located in a particular area of the keyboard depend-
ing upon their frequency of use in partitioning the data
stream.

2.1.4   Specific areas are assigned for the most frequently used
controls. The keys in these areas are usually shift free
keys.

2.2 Shift

SHIFT is a facility by means of which the mode of operation of a keyboard is changed so that different sets of characters can be generated by the same set of keys.

2.3 Shift Button

A SHIFT BUTTON is the means by which the alternative modes of operation of the keyboards are selected.

2.4 Shift Lock

A button may be provided which will cause the keyboard to remain continuously in the shifted mode until restored by a further operation. This facility of maintaining a continuous shifted mode is known as the SHIFT LOCK facility.

2.5 Shift Free Keys

Keyboards may contain keys which only produce one character independently of the shift mode which has been selected. Such keys are known as SHIFT FREE KEYS.

2.6 Shift Free Keyboard

A SHIFT FREE KEYBOARD is a keyboard with only one mode of operation and the set of keys provided can produce only one set of characters.

2.7 Single Shift Keyboard

A SINGLE SHIFT KEYBOARD is a keyboard with a shift facility which permits the choice of two modes of operation and thus the generation of two sets of characters. The two modes are called UNSHIFTED MODE and SHIFTED MODE.

2.8 Double Shift Keyboard

A DOUBLE SHIFT KEYBOARD is a keyboard with the facility to change the mode of operation of the keyboard in two ways so that three sets of characters can be produced by the same set of keys. The three modes are called UNSHIFTED MODE, SHIFTED MODE and CONTROL MODE. (The term CONTROL MODE does not imply that the control characters cannot be generated by other means.)

3. KEYBOARD FOR EXCLUSIVELY NUMERIC DATA, TYPE N

3.1 General

A Type N keyboard conforming to the present Standard comprises three parts :

- an array of 3 x 3 keys, to which the digits ONE to NINE
  are allocated

- a ZERO area

- additional optional keys.

3.2 Digits

The digits ONE to NINE are allocated to the 3 x 3 key
array in the order shown in Fig. 1.

```
        01    02    03

   D  [ 7 ] [ 8 ] [ 9 ]

   C  [ 4 ] [ 5 ] [ 6 ]        Fig. 1

   B  [ 1 ] [ 2 ] [ 3 ]
```

NOTE 1: The key position numbers are for ease of reference only, and are in
         accord with key numbering system currently used in ISO.

NOTE 2: The transposition of the characters appearing on keys B01, B02 and
         B03 with those appearing on D01, D02 and D03 respectively is a
         valid alternative within this Standard.

3.3 ZERO Area

The ZERO area is located below the array of 3 x 3 keys.
It may extend to the left and upwards as shown in Fig. 2.

```
       00   01    02    03

   D       [ 7 ] [ 8 ] [ 9 ]

   C       [ 4 ] [ 5 ] [ 6 ]        Fig. 2

   B  ▒▒▒  [ 1 ] [ 2 ] [ 3 ]

   A  ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
```

The digit ZERO must always be allocated to the ZERO area.
This area can comprise either a single key generating ZERO,
or two keys generating ZERO and DOUBLE ZERO, or three keys
generating ZERO, DOUBLE ZERO and TRIPLE ZERO as shown in
Fig. 3a, 3b or 3c.

Fig. 3
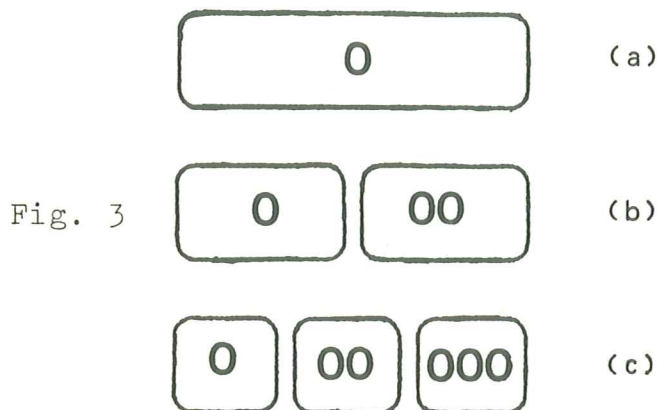
NOTE 3: When the ZERO area comprises two keys (e.g. ZERO and DOUBLE ZERO) the relative
size of the two keys is not constrained by the layout shown above.

3.4 Additional Keys

Optional characters, when required by the specific appli-
cation, are allocated to additional keys as described in
the following sections.

3.4.1 Character DECIMAL SIGN

When the character DECIMAL SIGN is required it can be
allocated only to the right hand end of the ZERO area
(Fig. 4). This Standard does not prescribe the graphic-
al representation of the DECIMAL SIGN, i.e. a COMMA
or a FULL STOP.

Fig. 4
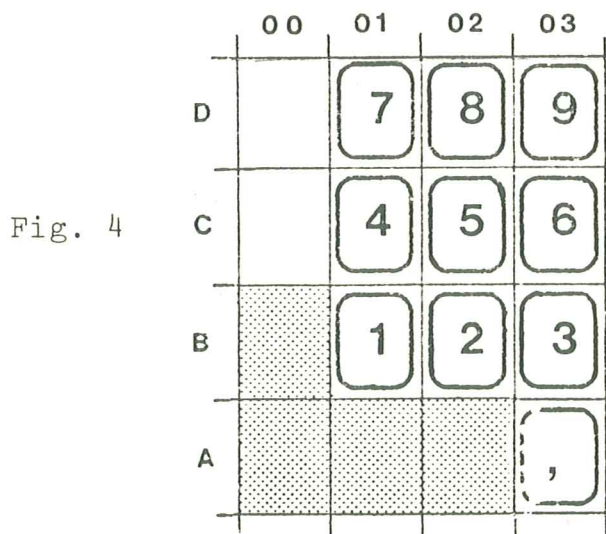
NOTE 4: It should be noted that the characters TRIPLE ZERO and DECIMAL SIGN cannot
be present simultaneously in the same layout since they are allocated to the
same key position.

3.4.2 Character SPACE (SP)

When a character SPACE is required, it can be allocated only to a key to the right of the ZERO area. This key should occupy the area A04 and may extend to the left and/or upward (Fig. 5).

Fig. 5

3.4.3 Character MINUS (-)

When the character MINUS is required, it can be allocated only to the left of the 3 x 3 array. This key should occupy the area C00 and may extend upwards (Fig. 6).

Fig. 6

NOTE 5: It should be noted that the character MINUS mentioned here is not to be confused with the SUBTRACT key traditionally used on adding and calculating machines.

4. KEYBOARD FOR PREDOMINANTLY ALPHABETIC DATA, TYPE A

4.1 General

This keyboard comprises 48 keys and a SPACE bar. The
character set represented is that of the International
Reference Version of Standard ECMA-6 (see Appendix II).

Fig. 7

NOTE 6: On keys E03 and E04, in the shifted mode, the sign # may be replaced by the
sign £ and the sign ¤ by the sign $.

NOTE 7: The character UNDERLINE appears in the shifted position of key D13. The un-
shifted position of key D13 and the shifted position of key E10 are undefined.

NOTE 8: In order to reduce the number of keys required from 48 to 47, the character
UNDERLINE may be placed in the shifted position of key E10, and key D13 omitted.

4.2 Rules for Deriving Layouts of Keyboards Having Less Than 47 Keys

The number of alphanumeric keys included in the keyboard of
a specific machine may vary depending on the available character
set and on other characteristics of the machine itself.

However, in order to limit the possible variants, only the
layouts with the following number of keys are considered:

- 46 keys : obtained by omitting key E13;

- 45 keys : obtained by omitting keys E13 and C12;

- 44 keys : obtained by omitting keys E13, C12 and D12.

The reduced layout may then be derived according to the following rules :

(1) Any of the graphic characters allocated to the omitted keys may be either omitted or reallocated to one of the remaining key positions in place of the graphic character normally allocated to that key position.

(2) Any character replaced by a character from one of the omitted keys is lost. It cannot be reallocated to another key.

(3) The characters A to Z, 0 to 9, COMMA and FULL STOP are not to be replaced by any of the characters from the omitted keys.

NOTE 9: The positions of the 47th and 48th key are currently under discussion in ISO, and this may result in them being placed in positions other than E13 and D13.

5. KEYBOARD FOR PREDOMINANTLY NUMERIC DATA, TYPE AN

5.1 General

This keyboard comprises an alphanumeric area and, in addition, a numeric area consisting of a block of shift free keys. Thus in one keyboard appears the characteristics of both the Type N and the Type A keyboards.

The keyboard follows the rules for, and is subject to the same conditions as Type A in respect of the alphanumeric area and of Type N in respect of the numeric area.

Fig. 8

5.2 <u>Rules for deriving Layouts with lesser Numbers of Keys</u>

The alphanumeric area may be contracted in accordance with the rules given in section 4.2 above.

5.3 <u>Position of the Numeric Block</u>

The position of the numeric area in relation to the alpha-numeric area is defined only in that the FOUR-FIVE-SIX row should be row C. The number of columns between the alphanumeric area and the numeric area is not defined.

Similarly, the numeric block is not necessarily laid out in the same manner as the keys in the alphanumeric area, and may be square, or may slope to the left or right.

6. <u>PHILOSOPHY OF CONTROL ASSIGNMENT ON KEYBOARDS</u>

6.1 <u>General</u>

In defining the complete layout of a keyboard for specific machines, it is as important to standardize the position of the control keys as it is to specify the position of the graphic keys.

This Standard outlines the general philosophy for the positioning of areas for control keys in relation to the graphic area of all three types of keyboards. It provides guidance for the allocation of the control functions to specific keys, taking into account their frequency of use. Other relevant characteristics influencing the allocation of the control functions are also described and given due consideration.

6.2 <u>Allocation of Control Areas in Keyboards</u>

6.2.1 <u>Numeric Keyboard Type N</u>

(i) The keys on a numeric keyboard are normally operated from left to right with the right hand. Therefore, it is desirable to allocate the controls with a high frequency of operation to the right side of the numeric data area.

(ii) The control area of a numeric keyboard according to the Standard comprises two zones (see Fig. 9):

- a zone Z1 to the right of a numeric block area

- a zone Z2 extending to the left of and above the numeric block area.

Control functions which, in the course of operation need to be used frequently, should be allocated to keys in zone Z1. Other control functions may be allocated to keys in zone Z1 and/or Z2.
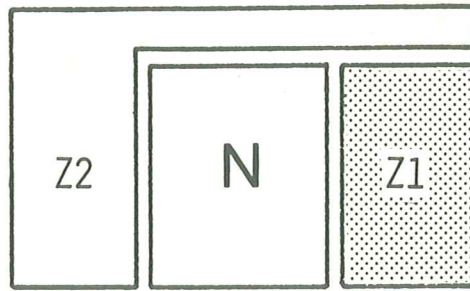
Fig. 9

6.2.2 Alphabetic Keyboards   Type A

(i) The alphabetic keyboard is operated with both hands.
     Therefore, it is desirable that the controls with a
     high frequency of operation should be located close
     to, and on both sides of, the alphabetic data area.

(ii) The control area of an alphanumeric keyboard comprises
     two zones (see Fig. 10):

     - a zone Z3 to the right and to the left of the
       alphanumeric area;

     - a zone Z4 extending to the left of and above the
       alphanumeric area.

     Control functions which in the course of operation
     need to be used frequently, should be allocated to
     keys in zone Z3. Other control functions may be allo-
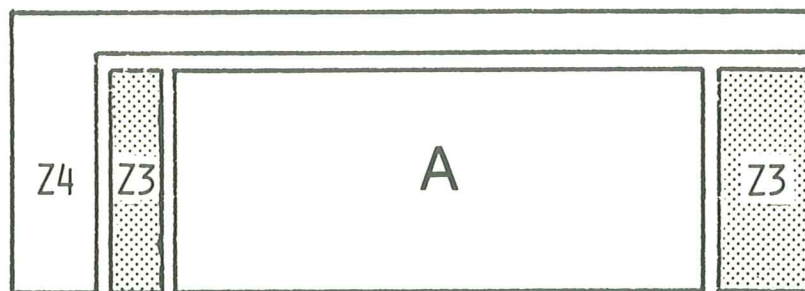   cated to keys in zone Z3 and/or Z4.

Fig. 10

6.2.3 Composite keyboards   Type AN

(i) A composite keyboard results from combining the
     numeric and alphabetic keyboards mentioned above,

the numeric section being located to the right of
the alphanumeric area. Therefore, the control area
comprises the four zones Z1 to Z4 described above.
The zones Z2 and Z3 being side by side, tend to look
like a single control zone; however, from the func-
tional point of view, they can still be regarded as
separate. Control functions which, in the course of
operation of the alphanumeric section need to be used
frequently, should be allocated to keys in zone Z3,
and control functions which, in the course of opera-
tion of the numeric sections need to be used frequent-
ly, should be allocated to keys in zone Z1.

(ii) Control functions which, in the course of operation of
both sections need to be used frequently, may be either
duplicated in both zones or, if preferred, allocated
to keys in the zone within easy reach from both areas,
i.e. that part of zone Z3 to the right of the alpha-
numeric area or that part of zone Z2 to the left of
the numeric block area. Other control functions may
be allocated to keys in zone Z1, Z2, Z3 and/or Z4.
The zones are shown in Fig. 11 below.

Fig. 11

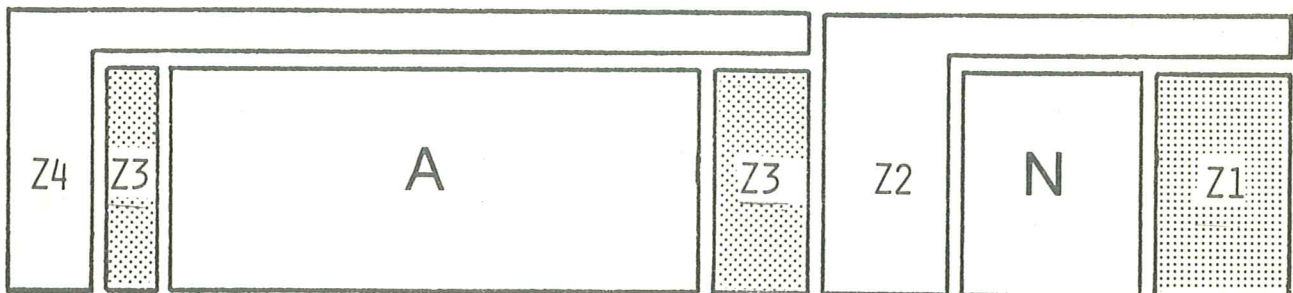## 6.3 Positioning Controls within Zones

Areas Z1 and Z3 have been designed for the allocation of the
frequently used controls respectively in conjunction with
the numeric and alphanumeric areas. In addition to that, the
following considerations apply.

6.3.1 Zone Z1

(i) The most frequently used control should be located
to the right of the lower row of digits and may ex-
tend to the right and/or downwards.

(ii)   The next most frequently used control should be located above the most frequently used control.

(iii) Other frequently used controls should be located in the remaining part of the zone.

6.3.2   Zone Z3

(i)   The most frequently used control should be located to the right of row C and may extend downwards and/or upwards.

(ii)   The next most frequently used control, if placed on the right, should be located above the most frequently used control.

(iii) Other frequently used controls should be located in the remaining part of the zone.

6.4   Shift Free Keys

The control keys allocated to the zones defined above should normally not be affected by the operation of the shift keys used in conjunction with the alphabetic area, i.e. the control keys should normally be shift free. This requirement is mandatory for zones Z1 and Z3.

6.5   Control Mode

Additionally or alternatively, some or all of the characters in columns 0 and 1 of the Code Table may be allocated to graphic keys in the Control Mode. The Standard does not specify the code combinations, if any, generated in the Control Mode by the keys which have no such allocation.

If a control mode is provided, the following pairings are recommended:

NUL	4/0	DLE	P
SOH	A	DC1	Q
STX	B	DC2	R
ETX	C	DC3	S
EOT	D	DC4	T
ENQ	E	NAK	U
ACK	F	SYN	V
BEL	G	ETB	W
FE0	H	CAN	X
FE1	I	EM	Y
FE2	J	SUB	Z
FE3	K	ESC	5/11
FE4	L	IS4	5/12
FE5	M	IS3	5/13
SO	N	IS2	
SI	O	IS1	_

APPENDIX I

This Appendix contains the criteria and other design considerations that were used in the development of this Standard.

1. Criteria

    1.1 The keyboard arrangement should:

        1.1.1 Facilitate simplicity of design

        1.1.2 Provide ease of operation

        1.1.3 Minimize operator training and retraining

        1.1.4 Facilitate exchange of operators within and outside national boundaries

        1.1.5 Take account of present international office equipment keyboard arrangement proposals.

    1.2 It is essential that the common part of the alphanumeric and numeric keyboards are internationally standardized, that national letters and symbols are nationally standardized.

    1.3 General hardware and application requirements - and not specific ones - should be the basis for keyboard arrangements standardization to ensure that the number of potential keyboard arrangements for potential areas of application are minimized.

2. Applications of the Keyboards

There are a large number of potential applications for the keyboards under discussion. Some examples of the applications which have to be considered are:

a)   The creation of reference files in commercial applications;

b)   The creation of current data in commercial applications;

c)   Program creation, including programming languages ;

d)   Scientific/mathematical data;

e)   Enquiry stations;

f)   On-line and remote computer consoles.

The equipment with which the keyboards will be used can include

for example:

> Data Entry Devices
> Data Transmission Equipment
> Visual Display Devices
> Printing Devices
> etc....

3. Character Sets

From the above examples, it is possible to define, in outline, the character sets required. In the case of example a) the information to be coded is primarily alphabetic, but includes numeric data and possibly some symbols. In b) the great majority of the data is numeric, although occasionally letters and other symbols may be required.

Example c) requires the equal use of alphabetic and numeric characters and all the characters in columns 2 and 3 of the Code Table. The use envisaged in example d) would require the digits and symbols, including possibly the optional symbols in the National Use positions.

In every case, and particularly in example e), there may be a requirement for the creation of controls.

In example f) the generation of all 128 code combinations may be required.

In the examples quoted, the applications are not mutually exclusive. The same keyboard, in the same location, may be required for use with any combination of applications at one time or another, and due consideration has to be given to this fact.

Consequently, with the exception of keyboards designed to handle basically numeric data, it is necessary to be able to generate all the graphic characters of the Code Table, and optionally to be able to omit one of the cases of the alphabet. In all applications, it may be necessary to generate control characters.

4. Range of Keyboards

Since the applications, and combinations of applications, are so varied, it is suggested that a small family of related keyboards be defined from which the keyboard most suited to a particular situation can be selected. The keyboards are related in that the layouts of corresponding areas of the different keyboards are as similar as possible.

Type N - This is for use with numeric data, and may be based on either the ISO DIS 1092 for Adding Machines or the CCITT Preliminary Recommendation for Touch Tone Telephones.

Type A - This is for use with alphanumeric data which is predominantly alphabetic. Its layout will be consistent with those discussed in ISO/TC95.

Type AN - This is for use with alphanumeric data where a large proportion of the data is numeric. The main characteristic of this keyboard is that it will have a block of numeric keys (similar to Type N layout) at the right hand end of the keyboard, and the remainder of the keyboard will be as similar as possible to Type A layout.

5. National Use Positions

National Use positions are used by some countries for alphabetic extenders, by others to provide extra symbols. Allowance must be made for these alternative uses.

The 7-bit code allows the characters UPWARD ARROW HEAD, QUOTATION MARK and APOSTROPHE to have a dual meaning in those countries requiring accented letters where these accented letters are not available as national characters. These three characters have then the meaning CIRCUMFLEX ACCENT, DIARESIS and ACUTE ACCENT. The implementation of these three characters in the different national versions is likely to ease the generation of other letters as well as of foreign accented letters. Thus the domain of application of the keyboard is expanded.

6. Pairing

Where pairing of characters on the same key is found to be necessary, due attention is to be given to the implication of the implementation on mechanical and electrical keyboards, to the convenience of operation in likely applications, as well as to existing practice.

As a first approach the principle of simple bit inversion can be applied, e.g. the characters of columns 2,4 and 5 are to be paired with those of columns 3,6 and 7 respectively. Similar consideration can apply to controls.

Another approach which can be considered, is the logical pairing of characters which require a similar implementation such as MINUS and UNDERLINE on a repeating key.

7. Allocation of 7-Bit Code Graphics

    7.1   The basic requirement is for a layout which will be capable of implementing the 95 graphic characters of the 7-bit code.

    7.2   In order to implement the 95 graphic characters of the 7-bit code on a keyboard with a single shift, the minimum number of keys required is 47, plus a SPACE bar.

    7.3   The minimum number of 47 keys does not take account of requirements for locating controls or the provision of a numeric block in addition to a basic alphanumeric keyboard.

    7.4   In a keyboard dealing with alphanumeric data, general agreement exists with the layout at present agreed by ISO/TC95 in respect of the QWERTY arrangement, the location of digits 1 to 9 and ZERO on the upper row of keys, the COMMA and the FULL STOP to the right of the lower row.

    7.5   The location of the National Use positions, where these are used to represent alphabetic extensions, must relate closely to the other letter keys.

    7.6   Since it should be possible for keyboards with less than 47 keys to be used when it is not required to implement all the 95 graphic characters of the 7-bit code, rules by which a 47 key keyboard may be reduced in content must be established, in order to maintain compatibility between keyboards of varying numbers of keys.

8. Criteria for the Assignment of Control Functions to Keys

Controls may be needed on keyboards:

(i)   to be operated together with the graphic characters in order to perform locally functional operations like positioning, formatting, editing, etc.

(ii)   to be operated together with the graphic characters in order to perform similar functional operations remotely or successively in situations such as:

     - telecommunications through data transmission channels

     - data interchange through physical media

     - data flow within a processing system.

(iii) to perform local functions on the machine of which the keyboard is a component, without interference with other functions the machine may be performing.

In drawing up a keyboard layout, no distinction should be made between the above type of functional effects. Rather, controls should be allocated to keys depending upon the criteria outlined below.

8.1 Frequency of Use or Operation

Frequency of use or operation should be the main criterion for the allocation of the control functions to keys.

8.2 Frequency of Occurrence

In the preceding section the phrase "frequency of use or operation" was used in the sense of referring to the frequency with which the control is used. A further factor to be considered is the frequency of provision of a particular control on a certain type of equipment. This may be referred to as the frequency of occurrence of such a control.

For example, a control may occur on all the keyboards of one type of machine whereas another control may only appear in some cases.

If controls are positioned strictly according to the frequency of operation, then in the example quoted the same keyboard location may be allocated to whichever control is the most frequently used.

It may be considered preferable in a case like this to provide a fixed position for the most frequently occurring control even though the less frequently occurring control may well be the most frequently operated when it is provided.

8.3 Traditional Placings

There are some controls on typewriters, calculating machines and accounting machines (e.g. SPACE bar) which are commonly placed in "standard" psoitions, and such positions should receive careful attention in any attempt to define specific locations for such controls.

This is not to say that traditional placings are mandatory. For example, if tradition places an infrequently-used control, then tradition may be discarded because little hardship will result from a change of location of an infrequently-used key. Similarly if tradition places a frequently-used key in an area defined for infrequently-used controls, then again tradition may be discarded, since the frequent use of such a control will make its re-positioning familiar in a short space of time.

8.4 Methods of Operation

There are constraints on the position of controls due to the way in which they are used. In particular, where two control keys have to be used together, or where a control key has to be used in conjunction with another key (control or graphic) then it may not be advisable to place them in the positions which would otherwise be dictated by their frequency of occurrence or of use.

TABLE 1

BASIC CODE TABLE

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC₇ (DLE)	SP	0	ⓐ	P	`	p
0	0	0	1	1	TC₁ (SOH)	DC₁	!	1	A	Q	a	q
0	0	1	0	2	TC₂ (STX)	DC₂	"	2	B	R	b	r
0	0	1	1	3	TC₃ (ETX)	DC₃	£(#)	3	C	S	c	s
0	1	0	0	4	TC₄ (EOT)	DC₄	$(¤)	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)	'	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)	,	<	L	ⓐ	l	ⓐ
1	1	0	1	13	FE₅ (CR)①	IS₃ (GS)	−	=	M	ⓐ	m	ⓐ
1	1	1	0	14	SO	IS₂ (RS)	.	>	N	^	n	‾
1	1	1	1	15	SI	IS₁ (US)	/	?	O	_	o	DEL

TABLE 2

INTERNATIONAL REFERENCE VERSION

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC_7 (DLE)	SP	0	@	P	`	p
0	0	0	1	1	TC_1 (SOH)	DC_1	!	1	A	Q	a	q
0	0	1	0	2	TC_2 (STX)	DC_2	"	2	B	R	b	r
0	0	1	1	3	TC_3 (ETX)	DC_3	#	3	C	S	c	s
0	1	0	0	4	TC_4 (EOT)	DC_4	¤	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)	'	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)	SUB	*	:	J	Z	j	z
1	0	1	1	11	FE_3 (VT)	ESC	+	;	K	[	k	{
1	1	0	0	12	FE_4 (FF)	IS_4 (FS)	,	<	L	\	l	¦
1	1	0	1	13	FE_5 (CR)	IS_3 (GS)	-	=	M	]	m	}
1	1	1	0	14	SO	IS_2 (RS)	.	>	N	^	n	‾
1	1	1	1	15	SI	IS_1 (US)	/	?	O	_	o	DEL

1.6 Notes on the Table 1

① The Format Effectors are intended for equipment in which horizontal and vertical movements are effected separately. If equipment requires the action of CARRIAGE RETURN to be combined with a vertical movement, the Format Effector for that vertical movement may be used to effect the combined movement. For example, if NEW LINE (symbol NL, equivalent to CR + LF) is required, FE_2 shall be used to represent it. This substitution requires agreement between the sender and the recipient of the data.

The use of these combined functions may be restricted for international transmission on general switched telecommunication networks (telegraph and telephone networks).

② The symbol £ is assigned to position 2/3 and the symbol $ is assigned to position 2/4. In a situation where there is no requirement for the symbol £ the symbol # (number sign) may be used in position 2/3. Where there is no requirement for the symbol $ the symbol ¤ (currency sign) may be used in position 2/4. The chosen allocations of symbols to these psoitions for international information interchange shall be agreed between the interested parties. It should be noted that, unless otherwise agreed between sender and recipient, the symbols £, $ or ¤ do not designate the currency of a specific country.

③ National use positions. The allocation of characters to these positions lies within the responsibility of national standardization bodies. These positions are primarily intended for alphabet extensions. If they are not required for that purpose, they may be used for symbols.

④ Position 5/14, 6/0 and 7/14 provide for the characters UPWARD ARROW HEAD, GRAVE ACCENT and OVERLINE. However, these positions may be used for other graphic characters when it is necessary to have 8, 9 or 10 positions for national use.

⑤ Position 7/14 is used for the character ‾ (OVERLINE), the graphic representation of which may vary according to national use to represent ~ (TILDE) or another diacritical sign provided that there is no risk of confusion with another graphic symbol included in the Table.

⑥ The graphic characters in positions 2/2, 2/7, 2/12 and 5/14 have respectively the significance of QUOTATION MARK, APOSTROPHE, COMMA and UPWARD ARROW HEAD, however,

these characters take on the significance of the dia-
critical signs DIAERESIS, ACUTE ACCENT, CEDILLA and
CIRCUMFLEX ACCENT when they are preceded or followed
by BACKSPACE (pos. 0/8), (see Explanatory Note 2).

APPENDIX III

TYPE A and TYPE AN Keyboards for character sets including alphabetic extenders

1. For those countries and those applications in which the National Use positions of the ECMA 7-bit Code are required for alphabetic extenders, rather than the symbols of the International Reference Version, it will usually be desirable to re-arrange the layout of some of the keys in order to obtain a closer grouping of the alphabetic extenders and the existing alphabetic keys.

2. In those countries where a well-established national standard exists for other types of keyboard, it may be preferable to make the re-arrangement conform to the existing standard in so far as the constraints of the character set will allow.

3. For those countries, and those situations, where it is desirable to bring together as closely as possible the keyboards implementing the extended alphabet with those implementing the International Reference Version, and where alternative standards do not exist or are not applicable, the following layouts are proposed.

TYPE A

Fig. Al

TYPE AN

Fig. A2

NOTE A.1 : On keys E03 and E04, in the shifted mode, the sign £ may be replaced by the sign # and the sign $ by the sign ¤ .

NOTE A.2 : On keys C10, C11 and D11 the code positions indicated refer to the national alphabetic extenders, which will actually appear on the key tops.

NOTE A.3 : If further alphabetic extenders are required these may be placed on key E12 (shifted or unshifted mode) or on key C12 (shifted mode).

4. These layouts maintain the positions of the majority of the keys defined in the implementation of the International Reference Version, three pairs of keys only having been interchanged. These are C10 with D12, C11 with C12, D11 with E12.