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DEPARTMENT OF DEFENSE

HANDBOOK FOR KEYBOARD ARRANGEMENTS



AMSC N/A

FSC MISC

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DEPARTMENT OF DEFENSE
Washington, D. C. 20301

1. This Military Standard is mandatory for use by all Departments and Agencies of the Department of Defense. Selection for all new engineering and design applications and for repetitive use shall be made from this document.

2. Recommended corrections, additions, or deletions should be addressed to:

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FOREWARD

These military standard keyboard arrangements are intended for general purpose, typewriter-like, alphanumeric keyboards implementing the Military Standard Coded Character Set (Table 1, Appendix I, MIL-STD-188B) which is the USA Standard Code for Information Interchange (ASCII) (USAS X3.4-1967) adapted to military communication systems and the USA Standard Character set for Optical Character Recognition (USASCSOCR) X3.17-1966.

This standard does not imply the adoption of the USA Standard X3.17-1966 as the DOD standard font for OCR but intends to illustrate an OCR keyboard; that is, the DOD may standardize a different font design but in all practicality the individual characters of the set would be the same.

These keyboard arrangements were developed from a study of keyboards already in use by millions of trained operators in the teleprinter, typewriter and related fields. The USA Standard Typewriter Keyboards (USAS X 4.7-1966) and the applicable international standards work also were included in the study. In addition, careful consideration was given to the military requirements for low initial cost, low maintenance cost, minimum space (or size) utilized for each functional equipment (particularly in tactical situations), and the military environment wherein OCR and non-OCR operations are co-located and operators interchanged.

The adoption of this standard does not imply that keyboards which are in operation should be replaced for the sole purpose of complying with this standard.

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1. SCOPE

1.1 Scope. This standard establishes the assignment of the 128 characters of the Military Standard Code for Information Interchange and 54 of the 57 "American" characters of USASCSOCR X3.17-1966 to keys in a typewriter-like keyboard arrangement for application where the textual information has a high alpha content. This standard also establishes the assignment of the same character sets in a typewriter-like keyboard arrangement for application where the textual information usually has a high numeric content. (See Tables I and II.)

1.2 Purpose. The purpose of this standard is to achieve uniformity in keyboard arrangements used by the Department of Defense for the implementation of the Military Standard Code for Information Interchange and Optical Character Recognition in its communication and information processing systems. It is also the purpose of this standard to achieve this uniformity in such a manner that permits the hardware implementation to be of the lowest cost in production and maintenance, to have high reliability in operation, to minimize operator retraining, and to be constructed in the minimum practical area.

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2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids, form a part of this standard to the extent specified herein.

STANDARD

MILITARY

MIL-STD-188 Military Communication System Technical
Standards

(Copies of documents required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer).

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

United States of America Standards Institute

USASCSOCR Standard Character Set for Optical
X3.17-1966 Character Recognition

(Application for copies should be addressed to - the United States of America Standards Institute, 10 East 40th Street, New York, N.Y. 10016)

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3. DEFINITIONS

3.1 Alpha. A descriptive term used to define a set containing the letters of an ethnic alphabet, and generally punctuation marks.

3.2 Numeric. A descriptive term used to define a set containing the digits 0 (ZERO) through 9, and generally a limited number of punctuation marks.

3.3 Control mode. The condition of the keyboard when the control (CTL) is depressed. In this mode the alpha keys, which are also labelled with a control character, generate that associated control character.

3.4 Alphanumeric. A descriptive term used to define a set containing the letters of an ethnic alphabet, the digits 0 (ZERO) through 9, and generally special symbols or punctuation marks.

3.5 Control character. A functional character, as distinct from a graphic character, which is intended to facilitate information interchange by controlling or modifying the function of machines or systems. Control characters are intended to be interpreted by machines rather than human beings; therefore, they are normally non-printing characters. In the MSCII code table they comprise columns 0 and 1.

3.6 Function key. A key, such as the SHIFT key, which initiates or modifies a machine function, but does not generate or represent a coded character in the Military Standard Code for Information Exchange.

3.7 Graphic character. A character intended to be written printed or otherwise displayed in a form which can be read by human beings. In the MSCII code table they comprise columns 2 through 7, including DEL (position 7/15). Note that space is considered a graphic character.

3.8 Keytop. A finger contact member which allows effective operation of the device, also called key.

3.9 Lowercase letters. The "small" letters.

3.10 Uppercase letters. The "capital" letters.

3.11 Keyboard. That area of the device in which the keys associated with characters arranged.

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3.12 Keyboard arrangement. The positioning of keys with relation to each other and their association with specific characters.

3.13 Unshifted mode. The condition of the keyboard when the SHIFT keys are not operated. In this mode the alphabetic keys are associated with the lowercase letters, the numeric keys with the numerals, and other keys with their corresponding lower graphic symbol.

3.14 Shifted mode. The condition of the keyboard when a SHIFT key is operated. In this mode the alphabetic keys are associated with the uppercase letters, and other keys with the corresponding upper graphic symbol.

3.15 Dedicated key. A key which produces one code and is never affected by the position of either the CTL or SHIFT keys.

3.16 New line (NL). A control character which directs a printing or display device to position itself at the first printing or display position in the next line. That is, it causes the device to perform both the carriage return (CR) and the line feed (LF) function. It is standard to assign to NL the same code representation as LF in ITA Nr. 5, ASCII and MSCII.

3.17 ASCII. The American National version of International Alphabet Nr. 5, an eight-bit per-character code in which each 8 bit combination consists of one redundant bit, parity, and seven information bits that discretely define 128 characters. It is the United States of America Standards Institute Standard USAS X3.4-1967.

3.18 Military standard code for information interchange (MSCII). The American Standard Code for Information Interchange (USAS X3.4-1967) adapted to its needs by the Department of Defense.

3.19 Keyboard classification. A categorization to indicate the area of machine application and the kind of textual traffic for which an arrangement is best suited. Type refers to machine application and Class refers to the kind of textual traffic.

3.20 Type I. The arrangement for a keyboard that produces a compound, or encoded, electrical output for the subsequent indirect control of another device, for example a teletypewriter or a computer.

3.21 Type II. The arrangement for a keyboard that directly controls its associated device, for example a typewriter.

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3.22 Class 1. The arrangement for a keyboard for that kind of textual traffic that normally has a high alpha content, for example the usual inter-office correspondence.

3.23 Class 2. The arrangement for a keyboard for that kind of textual traffic that normally has a high numeric content, for example stock lists or data for problem solving.

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4. TYPE I, CLASS 1 ARRANGEMENT

(Standard Keyboard Arrangement for High Alpha Content Text Applications)

4.1 Standard arrangement. Figure 1 shows the standard arrangement of the keys and the characters assigned to them for the Type I, Class 1 keyboard.

4.2 Limits of Figure 1. Figure 1 is intended to express the nominal, relative positions of the keys, and is not intended to define physical factors such as key spacing, keyboard slope, nor the size or shape of the keytops or the space bar. The key position numbers are shown for reference purposes only.

4.3 Character encoding. The means by which keyboards, utilizing this arrangement, are to encode the characters is not prescribed.

4.4 Partial sets. A keyboard of fewer keys or characters than are encompassed by this standard is not in conflict with this standard providing the assigned position of the remaining characters conform to the standard keyboard arrangement.

4.5 Symbol-shift mode relationship. The alphabetic keys are associated with the corresponding lower-case letters when the SHIFT keys are not operated (unshifted mode) and with the corresponding uppercase letters when a SHIFT key is operated (shifted mode). The other graphic keys are associated with the corresponding lower graphic symbol in the unshifted mode, and with the corresponding upper graphic symbol in the shifted mode.

4.6 Omission of key-related graphics. When one of the two characters normally assigned to a key is omitted, the remaining character may optionally be assigned in both shift modes.

4.7 Underline-delete. Key DR8 is associated with underline in both the shifted and unshifted modes, but may optionally be associated with DEL (Delete) in the unshifted mode and underline in the shifted mode.

4.8 Double comma and period. If desired, keys BR3 & BR4 may be associated with comma and period, respectively, in both the shifted and unshifted modes. If this is done, less than (<) and greater than (>), if used, must be assigned to keys CR8 and BR7, respectively.

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4.8.1 BR7 key. If key BR7 is not used as a graphic key or as an area for an enlarged key top, then it may be employed as a second CTL (control) key.

4.9 Alternate assignments for characters on dedicated keys. Keys EL6, ER5, ER9, DL6, DR9, CL6, CR9, BL7, BR8 and AL5-AR5 are dedicated keys with the preferred assignments shown thereon for general purpose usage. When the preferred characters are removed from keys EL6, ER9, DR9, CR9 and BR8 their respective alternate locations inboard are on keys CR1, DR3, DR8, BR2 and CR2. The assignments to keys ER5 and AL5-AR5 shall not be changed.

4.10 Alternate use of dedicated keys. It shall be standard to place other characters on keys EL6, ER9, DR9, DL6, CL6, CR9, BL7, and BR8 provided that the preferred characters are given their alternate assignments or are removed from the arrangement.

4.11 Key top designations. The standard designations to be used on keytops are those shown in Figure 1. This standard defines only the designation for each character. This standard does not define any other physical properties of the keytop construction.

4.12 Equipment printed 64 characters. For printing equipment which is limited to 64 printing characters, the choice of the lower character on keys ER7, ER8, DR6, DR7, DR8 and CR7 shall be the character which the equipment will print.

4.13 "Monocase" arrangement. A "monocase" arrangement for 64 printing characters shall be the same as Figure 1 except that keys ER7, ER8, DR6, DR7, DR8 and CR7 shall be assigned only one graphic character and these keys, plus the alpha keys, shall not be effected by the SHIFT key. The standard state for bit 6 of the 32 keys named above shall be "Ø."

4.14 New line. It shall be standard to replace LF with NL on key BR8 in those devices which are equipped to execute the New Line function.

4.15 Additional dedicated control keys. A keyboard of a greater number of keys dedicated to control characters is not in conflict with this standard providing the dedicated key assignments of this standard, if used, remain in the positions assigned by this standard.

4.16 Control (CTL) key function. It shall be the function of the control (CTL) key to set the keyboard in the control mode while it is operated (depressed), that is cause those non-dedicated keys bearing

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control character designations to generate their respective control codes regardless of the shift mode condition.

4.17 Outboard numeric cluster. A shift-insensitive, numeric cluster may be provided to the right of key CR9 provided that the numerics remain in row E and the arrangement of the cluster is identical to that for the Type I, Class 2 Standard Keyboard Arrangement.

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5. TYPE I, CLASS 2 ARRANGEMENT

(Standard Keyboard Arrangement for High Numeric Content Text Applications)

5.1 Standard arrangement. Figure 2 shows the standard arrangement of the keys and the graphics assigned to them for the Type I, Class 2 keyboard.

5.2 Limits of Figure 2. Figure 2 is intended to express the nominal, relative positions of the keys, and is not intended to define physical factors such as key spacing, keyboard slope, nor the size or shape of the keytops or the space bar. The key position numbers are shown for reference purposes only.

5.3 Character encoding. The means by which keyboards, utilizing this arrangement, are to encode the character is not prescribed.

5.4 Partial sets. A keyboard of fewer keys or characters than are encompassed by this standard is not in conflict with this standard providing the assigned position of the remaining characters conforms to the standard keyboard arrangement.

5.5 Symbol-shift mode relationship. The alphabetic keys are associated with the corresponding lower-case letters when the SHIFT keys are not operated (unshifted mode) and with the corresponding uppercase letters when a SHIFT key is operated (shifted mode). The other graphic keys are associated with the corresponding lower graphic symbol in the unshifted mode.

5.6 Omission of key-related graphics. When one of the two characters normally assigned to a key is omitted, the remaining character may optionally be assigned in both shift modes.

5.7 Underline-deletes. Key EL1 is associated with underline in both the shifted and unshifted modes, but may optionally be associated with DEL (Delete) in the unshifted mode and underline in the shifted mode.

5.8 Double comma and period. If desired, keys BR3 and BR4 may be associated with comma and period, respectively, in both the shifted and unshifted modes. If this is done, less than (<) and greater than (>), if used, must be assigned to keys ER3 and ER4, respectively.

5.9 Alternate assignments for characters on dedicated keys. Keys EL6, ER9, DL6, DR9, CL6, CR9, BL7, BR7, ~~BR8~~ and AL5-AR5 are dedicated

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keys with the preferred assignments shown thereon for general purpose usage. When the preferred characters are removed from keys EL6, ER9, DR9, CR9 and BR8 their respective alternate locations inboard are on keys CR1, DR3, EL1, BR2 and CR2. The assignments to keys BR7 and AL5-AR5 shall not be changed.

5.10 Alternate use of dedicated keys. It shall be standard to place other characters on keys EL6, ER9, DL6, DR9, CL6, CR9, BL7 and BR8 provided that the preferred characters are given their alternate assignments or are removed from the arrangement.

5.11 Key top designations. The standard designations to be used on keytops are those shown in Figure 2. This standard defines only the designation for each character. This standard does not define any other physical properties of the keytop construction.

5.12 Equipment printing 64 characters. For printing equipment which is limited to 64 printing characters, the choice of the lower character on keys EL5, EL4, EL3, EL2, EL1 and ER1 shall be the character which the equipment will print.

5.13 "Monocase" arrangement. A "monocase" arrangement for 64 printing characters shall be the same as Figure 2 except keys EL5, EL4, EL3, EL2, EL1 and ER1 shall be assigned only one graphic character and these keys, plus the alpha keys shall not be effected by the SHIFT key. The standard state for bit 6 of the 32 keys named above shall be "Ø."

5.14 Reversal of graphics. The positions of the characters on keys CR5 and ER2, Figure 2 have been reversed from their positions on keys CR5 and CR6, Figure 1, because of their frequent use in highly numeric texts. This reversal places + and * in the same shift mode as the numerics.

5.15 New line. It shall be standard to replace LF with NL on key BR8 in those devices which are equipped to execute the New Line function.

5.16 Additional dedicated control keys. A keyboard of a greater number of keys dedicated to control characters is not in conflict with this standard providing the dedicated key assignments of this standard, if used, remain in the positions assigned by this standard.

5.17 Control (CTL) key function. It shall be the function of the control (CTL) key to set the keyboard in the control mode while it is

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operated (depressed); that is, cause those non-dedicated keys bearing control character designations to generate their respective control codes regardless of the shift mode condition.

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6. TYPE II, CLASS 1 ARRANGEMENT

(Standard Keyboard Arrangement for 46 key OCR Typewriters).

6.1 Standard arrangement. Figure 3 shows the standard arrangement of the keys and the graphics assigned to them for the Type II, Class 1 keyboard.

6.2 Intended use. Figure 3 is intended for office typewriters which are used to prepare documents that, in turn, will be processed through optical character recognition equipment.

6.3 Limits of Figure 3. Figure 3 is intended to express the nominal, relative positions for the keys, and is not intended to define physical factors such as key spacing, keyboard slope, nor the size or shape of the keytops or the space bar. The key position numbers are shown for reference purposes only.

6.4 Character printing. The means by which machines, utilizing this arrangement, are to print the characters is not prescribed.

6.5 Characters outside the USASCSOCR X3.17-1966. The lower case letters, the upper characters on keys EL5, EL3, ER5, ER7 DR6, CR7, BR3 and BR4, and the lower characters on keys ER7, DR6, DR7 and CR7 are not part of the current USA Standard Character Set for Optical Character Recognition (USASCSOCR) X3.17-1966 but are included in order that the associated machine may be adaptable to more general usage. It is expected that designs for these characters will be included in a forthcoming revision of USASCSOCR X3.17-1966.

6.6 Symbol-shift mode relationship. The alphabetical keys are associated with the lower case letters when the SHIFT keys are not operated (unshifted mode), and with the corresponding upper case (OCR) letters when a SHIFT key is operated (shifted mode). The other graphic keys are associated with the corresponding lower graphic symbol in the unshifted mode, and with the corresponding upper graphic symbol in the shifted mode.

6.7 Omission of key-related graphics. When one of the two characters normally assigned to a key is omitted, the remaining character shall be assigned in both modes.

6.8 Key top designations. The standard designations to be used on key tops are those shown in Figure 3. This standard defines only the designation for each character. This standard does not define any physical properties of the key top construction.

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6.9 Character erase. The symbol "character erase" is assigned to the lower position of key DR6.

6.10 Group erase. The symbol "group erase" is assigned to the upper position of key ER5.

6.11 44 Key implementation. Implementation of 44 key machines is not recommended due to the further limitation of graphics. However, if such an implementation is executed, the characters assigned to keys ER7 and CR7 should be the ones eliminated.

6.12 Option. It shall be a standard option to replace < (less than) and > (greater than) with, (comma) and (period) on keys BR3 and BR4.

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7. KEYBOARD ARRANGEMENT NOTATIONAL SYSTEM

7.1 Standard notational system. Figure 4 shows the standard notational system for keyboard arrangements.

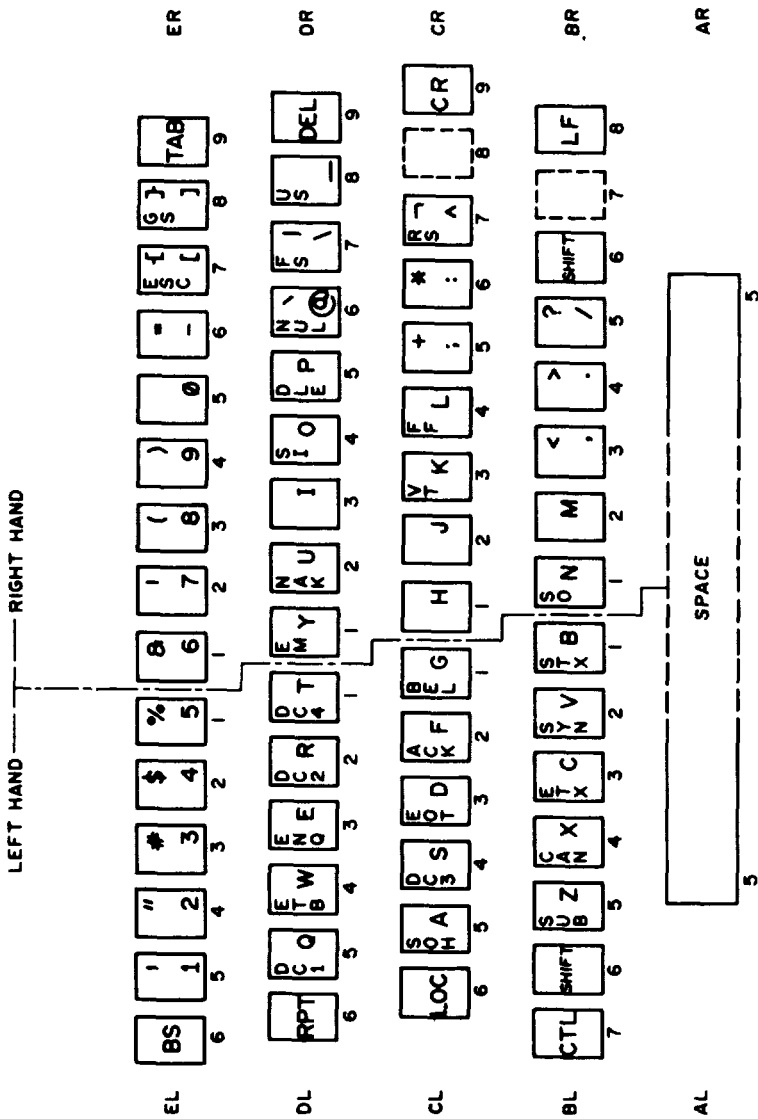
7.2 System base. Figure 4 provides a reference system for the relative location of keys within an arrangement. The rows are designated by letters beginning with "A" for the bottom row. The rows are in left-hand and right-hand sections according to the common practice of touch-typing. Key numbering in each row begins at, and proceeds away from, the common border of the left-hand and right-hand sections.

7.3 Standard notation. The standard notation for a key location is Row, Section, Number. For example in Figure 4 the letter S is located on a key in C row, Left section, Fourth Number; or simply key CL4.

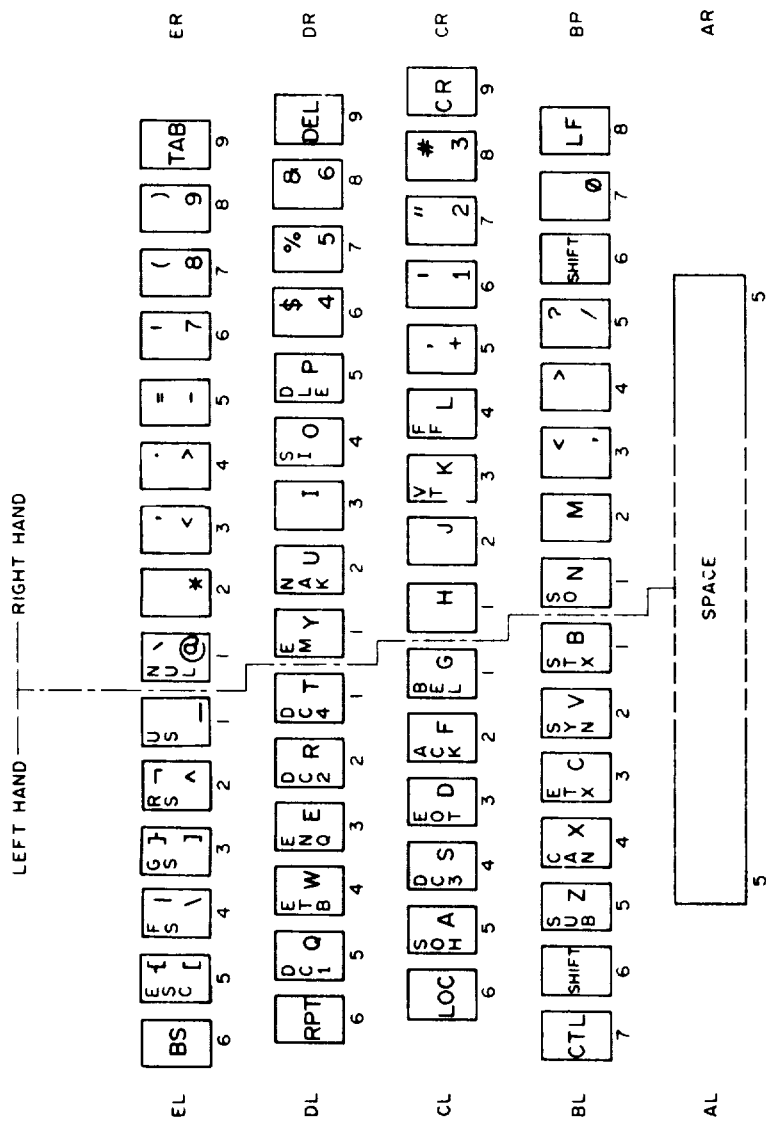
7.4 Key limit. For notational purposes, this standard places no limit on the number of rows or the number of keys per row.

7.5 Illustration. The popular "QWERTY" graphics shown on Figure 4 do not form a part of the notational system but are placed there as a matter of illustration, and possible convenience, for the user.

7.6 Intended use. The notational system is intended solely as a uniform, convenient method of expressing the nominal relative position of keys within any keyboard arrangement. Physical characteristics such as size, shape, skew, spacing, pitch, etc., are not to be inferred.

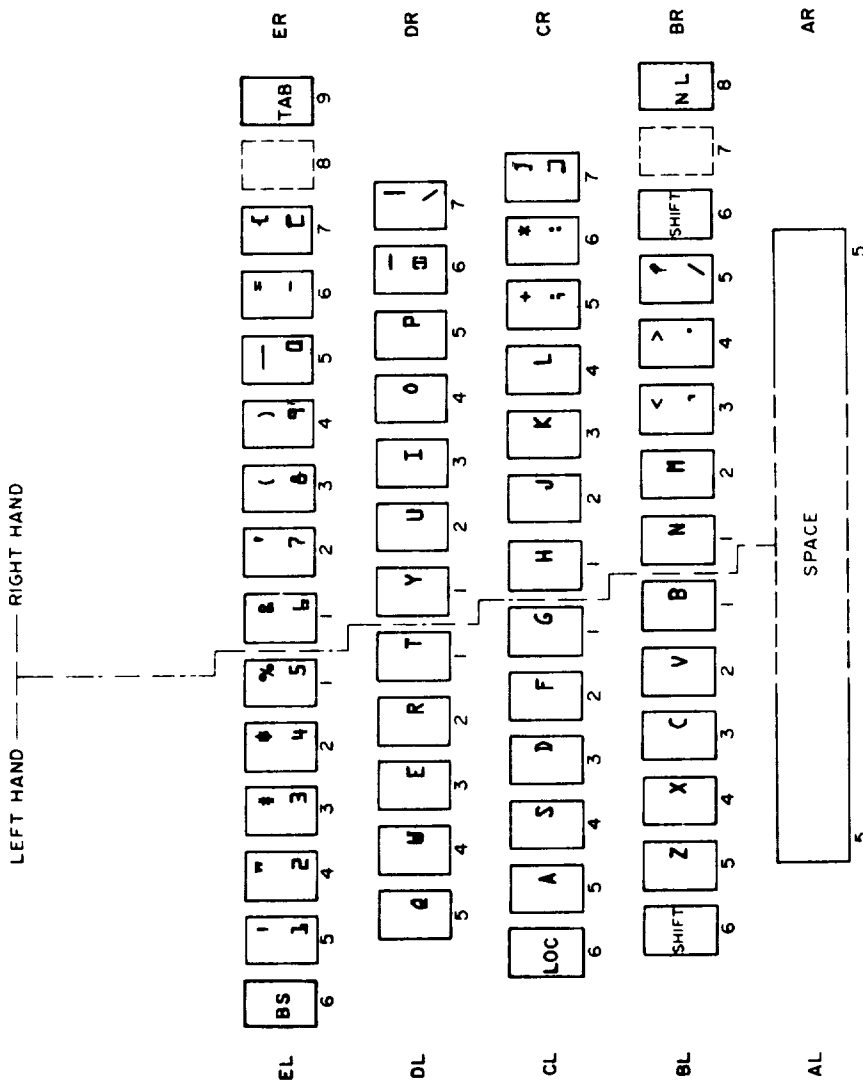


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- NOTES
- 1 PHYSICAL CHARACTERISTICS AND LOCATIONS (i.e. SIZE, SHAPE, SKEW, ETC.) OF SPACE BAR OR KEYS ARE NOT TO BE INFERRED
 - 2 ARRANGEMENT TYPE I, CLASS 2 AS PER MIL-STD-1280

FIGURE 2 TYPE I, CLASS 2 STANDARD KEYBOARD ARRANGEMENT

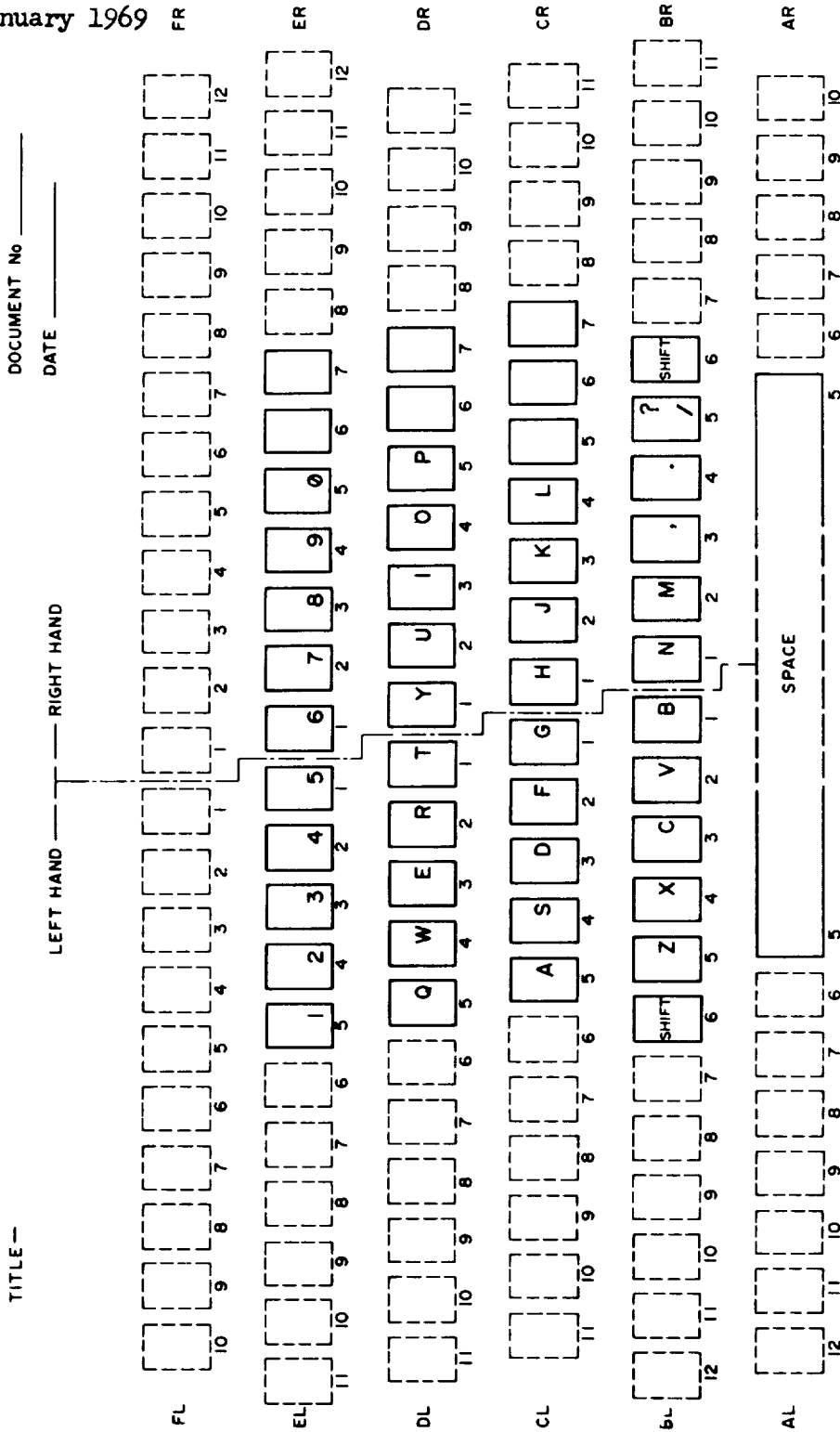


- NOTES
- 1 PHYSICAL CHARACTERISTICS AND LOCATIONS (i.e. SIZE SHAPE, SKEW, ETC) OF SPACE BAR OR KEYS ARE NOT TO BE INFERRED
 - 2 SOLID KEY OUTLINES CORRESPOND TO USAS X47-1966
 - 3 THE UPPER CHARACTER ON KEY ER5 WILL BE THE "GROUP ERASE" WHICH WILL APPEAR IN A REVISION OF USAS X317-1966

FIGURE 3 TYPE II, CLASS I STANDARD KEYBOARD ARRANGEMENT

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TITLE _____
DOCUMENT No _____
DATE _____

LEFT HAND ——— RIGHT HAND

NOTES
1 PHYSICAL CHARACTERISTICS AND LOCATIONS (i.e. SIZE, SHAPE, SKEW, ETC) OF SPACE BAR OR KEYS ARE NOT TO BE INFERRED
2 SOLID KEY OUTLINES CORRESPOND TO USAS X47-1966

FIGURE 4 KEYBOARD ARRANGEMENT NOTATIONAL SYSTEM

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Table I.

MILITARY STANDARD CODE FOR INFORMATION INTERCHANGE

| 128-SYMBOL PRINTING SET | | | | | | | | | | | |
|-------------------------|--------------|-------------|-------------|---------------------------|-------------|-------------|-------------|-------------|-------|-----|----|
| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | ROW ↓ | | |
| b7 b6 b5 | 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 | NON-PRINTING | | | 96-SYMBOL PRINTING SUBSET | | | | | | | |
| 0 0 0 0 | NUL | \ | DLE | ⊖ | SP | ⊖ | @ | P | · | p | ⊖ |
| 0 0 0 1 | SOH | Γ | DC1 | ⊖ | ! | 1 | A | Q | a | q | 1 |
| 0 0 1 0 | STX | ⊥ | DC2 | ⊖ | " | 2 | B | R | b | r | 2 |
| 0 0 1 1 | ETX | ⊥ | DC3 | ⊖ | # | 3 | C | S | c | s | 3 |
| 0 1 0 0 | EOT | ⊥ | DC4 | ⊖ | \$ | 4 | D | T | d | t | 4 |
| 0 1 0 1 | ENQ | + | NAK | ⊖ | % | 5 | E | U | e | u | 5 |
| 0 1 1 0 | ACK | - | SYN | ⊖ | & | 6 | F | V | f | v | 6 |
| 0 1 1 1 | BEL | ⊠ | ETB | ⊖ | ' (APOS) | 7 | G | W | g | w | 7 |
| 1 0 0 0 | BS | ◀ | CAN | ⊖ | (| 8 | H | X | h | x | 8 |
| 1 0 0 1 | HT | ▶ | EM | ⊖ |) | 9 | I | Y | i | y | 9 |
| 1 0 1 0 | LF | ≡ | SUB | ⊖ | * | : | J | Z | j | z | 10 |
| 1 0 1 1 | VT | ∇ | ESC | ⊖ | + | ; | K | [| k | { | 11 |
| 1 1 0 0 | FF | ∇ | FS | ⊖ | , | < | L | \ | l | | 12 |
| 1 1 0 1 | CR | « | GS | ⊖ | - | = | M |] | m | } | 13 |
| 1 1 1 0 | SO | ⊠ | RS | ⊖ | . | > | N | ^ | n | ~ | 14 |
| 1 1 1 1 | SI | ∇ | US | ⊖ | / | ? | O | _ | o | DEL | 15 |

NOTES: (1) Columns 0 & 1 show the mnemonic abbreviations and the printing symbols for the control characters.
(2) The diamond (⊖) is printed to indicate the detection of an error.
(3) The heart (⊖) may be printed to indicate a character of the control character sub-set.

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REV 07-13-67

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Table. II. Optical Character Set.

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
0123456789
. , : ; = + / \$ * " & |
' - { } % ?

The 54 standard characters are:

| | |
|--------------------------|-------------------|
| 26 Letters: | A through Z |
| 10 Numerals: | 0 through 9 |
| 17 Symbols: | Ampersand |
| | Apostrophe |
| | Asterisk |
| | Colon |
| | Comma |
| | Dollar Sign |
| | Equals |
| | Left Parenthesis |
| | Minus |
| | Percent |
| | Period |
| | Plus |
| | Question Mark |
| | Quotation Mark |
| | Right Parenthesis |
| | Semi-Colon |
| | Slant |
| 1 Information Separator: | Vertical Line |

APPENDIX A

10. TYPE I KEYBOARD ARRANGEMENT

10.1 Scope. This appendix contains the criteria and other design considerations that were used in the development of the standard.

10.2 Purpose. This appendix is not a part of MIL-STD-1280 but is included to facilitate its understanding and use.

10.3 Criteria. The following criteria were adopted (not listed in order of priority) to reflect the needed transitions from historically developed divergent keyboard designs to a standard that would be compatible with the MSCII character set and an OCR character set. This standard represents good technical compromise where conflicts in criteria exist.

10.3.1 Exclusion of physical characteristics. The standard should exclude physical characteristics associated with keyboards other than the nominal relative location of the keys.

10.3.2 Character complement. The keyboard arrangement should accommodate all 128 (graphic and control) MSCII characters.

10.3.3 Location of characters. The location of a specific character should remain unchanged in keyboard arrangements accommodating fewer than 128 MSCII characters.

10.3.4 Use with USASCOCR X3.17-1966. The keyboard arrangement should be suitable for use with the optical Character Recognition Set (USASCOCR X3.17-1966), or similar character set.

10.3.5 Textual material accommodation. The keyboard arrangement should be satisfactory in the applications where the textual material is predominantly alpha and in the applications where the textual material is predominantly numeric.

10.3.6 Design and logistical features. The keyboard arrangement should:

- a. Facilitate simplicity of design.
- b. Provide ease of operation.
- c. Minimize operator training.
- d. Be acceptable for international standardization.
- e. Have maximum resemblance to present office electric typewriter keyboard arrangements.
- f. Minimize the total number of function and dedicated keys.

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10.3.7 Keyboard area requirement. The keyboard arrangement should be accommodated in a minimum practical area to meet tactical requirements.

10.4 Specific design considerations for Type I keyboard arrangements.

10.4.1 Analysis of keyboard devices. After a thorough analysis of national and international keyboard devices, it was decided that a four-row arrangement was the most practical approach for implementing the character set.

10.4.2 "QWERTY" or "SHOLES" keyboard. The "QWERTY" or "SHOLES" keyboard arrangement of the alphabet that has evolved over the years was used as a basis for the standard. In addition to the many typewriters in use, this keyboard arrangement also has been used by many teleprinters and similar alphabet keyboard devices. As a result, much time and money has been invested for training and texts for operating keyboards using this arrangement.

10.4.3 Keyboard review. Different keyboard arrangements have been reviewed extensively to determine any advantages that these might have over the "QWERTY" keyboard. An analysis was also made of the study previously made by Dr. E. P. Strong, Pennsylvania State University, entitled "A Comparative Training" which concluded that potential productivity was higher with the "QWERTY" keyboard than with the then most prominent alternative arrangement.

10.4.4 Standard position notation system. As a result of experience in other keyboard standards work it was decided that a standard positional notation was needed for quick and easy reference to indicate key positions on which characters were to be placed. This notation system is the reference system of this standard. The letter "A" was specified for key position CL5. The "QWERTY" arrangement was then placed in relation to key CL5.

10.4.5 Minimum number of keys. A four-row, 48 key keyboard would provide a minimum number of keys for generation of all the graphics of the MSCII. However, in deference to the traditional electric keyboard arrangement, and consequently satisfying several of the other established criteria, an arrangement of keys was specified in which the alphabet, numerals and other symbols were placed to resemble the USA Standard Electric Typewriter Keyboard as closely as possible within the limits imposed by the MSCII logical pairings.

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10.4.6 MCSII code table. The arrangement of the MCSII code table (see Table I) intentionally makes practical the pairing of corresponding characters of columns 2 and 3, columns 4 and 6, and columns 5 and 7, so that, in a keyboard giving a binary coded output, the inversion of a single bit (b₅ or b₆ as appropriate) can affect the "shift" for any key. This standard arrangement follows such a pairing. When a SHIFT key is operated the appropriate bit is changed from "1" to "0" except for the keys bearing characters

= ` < > ?
- @ , . /

where the inversion is of the opposite sense. These five were so arranged owing to the relatively higher usage of - @ , . and /. SP (space) was not paired with zero due to the severe conflict this would have produced with present practice. UNDERLINE is normally unpaired since DEL (delete), its logical mate, is assigned to a dedicated key.

10.4.7 The 48 key graphic cluster. The 46-key graphic key cluster of USAS XA.7-1966 was used as the foundation for the 48 key graphic key cluster of this standard. Key positions ER8 and DR8 were considered the logical place for the needed 47th and 48th keys.

10.4.8 Character clusters. Within the new characters provided by MCSII, two graphic pairs and four information separating control characters may be grouped. Bit pairing dictates a common key assignment for one character of each of the pairs and one information separator. These are grouped for pairing the graphics [, [and] , } on keys ER7 and ER8 and an orderly cluster of the information separators on keys DR7, ER8, CR7 and DR8.

10.4.9 Keys CR and LF. LF and CR were placed on BR8 and CR9 to provide for either the option of 4.8 or for oversize key tops and to make possible the arrangement of Figure 2 without repositioning dedicated keys.

10.4.10 Consideration of international requirements. Consideration was given to incorporating international requirements in the keyboard arrangements. In considering the placement of graphics, required primarily for languages other than English, it was decided that it would be impractical to include all of the graphics designated as national usage graphics (in the ISO 7 bit code) within the arrangement for a keyboard intended primarily for American use.

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10.4.11 Consideration of non-English OCR characters. Consideration was given to other than English characters contained in USASCSOCR X3.17-1966. It was decided that it would be impractical to include non-English characters within a keyboard arrangement intended primarily for American use.

10.4.12 High numeric vs. high alpha applications. In considering the area of applications where the textual material content is predominantly numeric, it became quite clear that arranging the numerics in a row would not satisfy the needs of this area. Therefore, the arrangements of Figures 1 and 2 were jointly developed to better satisfy the criteria, particular criterion 10.2.5. The two arrangements have in common the properties of physical size, character set and principle of operation which make it feasible to construct inter-changeable keyboard assemblies. It was considered more realistic and practical to provide a standard better suited to this large and growing area than to ignore this area. Of the three numeric cluster arrangements in prominent use, the standard adding machine arrangement was selected as the one which represents the best compromise to fulfill all of the criteria considered in developing the Type I, Class 2 arrangement.

APPENDIX B

20. TYPE II KEYBOARD ARRANGEMENT

20.1 Scope. This appendix contains the criteria and other design considerations that were used in the development of the standard.

20.2 Purpose. This appendix is not part of MIL-STD-1280 but is inclosed to facilitate its understanding and use.

20.3 Criteria. The following criteria were adopted (not listed in order of priority) to reflect the needed transition from historically developed divergent keyboard designs to a standard that would be compatible with the MSCII character set and implement an OCR character set. Not all criteria have been satisfied by this standard.

20.3.1 Exclusion of physical characteristics. The standard should exclude physical characteristics associated with keyboards other than the nominal relative location of the keys.

20.3.2 Character complement. The keyboard arrangement should accommodate the characters of the OCR set used in message preparation.

20.3.3 Usage. The keyboard arrangement should provide for general usage as well as for preparation of OCR text.

20.3.4 Design and logistic features. The keyboard arrangement should:

- a. Facilitate simplicity of design.
- b. Provide ease of operations.
- c. Minimize operator training.
- d. Have maximum resemblance to present office typewriter keyboard arrangements.
- e. Be capable of implementation in presently available typewriter machines.
- f. Have maximum identity with the MSCII coded keyboard arrangement.

20.4 Specific design considerations for OCR keyboard arrangement.

20.4.1 Common keyboard considerations. Serious consideration was given to the expressed desire of the Army, Navy and Air Force for a common keyboard for MSCII and OCR, the DoD need for the lowest practical cost coded keyboards, the presence of many office typewriters in DoD,

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and the training and human factors problems associated with divergent keyboard arrangements in interchanging operators. It was decided that the long term advantage in an OCR keyboard arrangement lay in using the character pairing of the coded keyboard to the extent that it could be implemented in an office typewriter machine.

20.4.2 Keyboard arrangement identity. The 46 key typewriter offered the best opportunity for the greatest identity of arrangement, and therefore, was selected as the base of the OCR keyboard arrangement.

20.4.3 Character complement. Ninety-two of the assigned graphics are contained in the MSCII graphic set. The 93rd graphic is the "group erase" peculiar to OCR and is assigned to key ER5 in the upper position. The ASCII graphics commercial at, accent grave, circumflex and overline were not assigned in this arrangement because available office typewriters are limited to 92 printing graphics.

20.4.4 Special character. The OCR special characters fork, chair and hook were not included because they are not required in "state of the art" message handling in DoD according to the ES panel of MCEB and MIL-STD-188C.

20.4.5 Notational system. The notational system of Figure 4 was also used for Figure 3, both for utility and consistency.

20.4.6 Excluded arrangement. It was decided not to provide an arrangement best suited to highly numeric text since this would, within the capabilities of available office machines, preclude a dual case alphabet. A single case alphabet in an office typewriter would make it very undesirable for general usage.

Custodians:

Army - EL
Navy - SH
Air Force - 17

Preparing Activity:

Army - EL
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Review Activities:

Army: EL, GL
Navy: SH
Air Force: 17

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