

APPENDICES

Appendix A - Hardware Specifications

CPU	Z80A, 4 MHz
Memory	RAM: 256KB (maximum) C-MOS RAM: 2KB (standard, backed up by battery) EPROM for IPL Video RAM: 32KB
Clock	C-MOS real-time clock (backed up by battery)
Speaker	Permanent-magnet speaker
Interfaces	Printer interface (Centronics compatible) RS-232C communication interface Light-pen interface
DMA	7 channels
Interrupt levels	15
Counter/timer	6 channels
FDD	5-1/4" FDD × 2 320KB × 2 drives 48 TPI, double sided, double density
Card slots	5
Display	12" green monitor 640 × 400 dots
Keyboard	ASCII, France, Germany, etc.
Dimensions	Main unit: 508 (W) × 340 (D) × 103 (H) mm Display unit: 312 (W) × 340 (D) × 270 (H) mm Keyboard unit: 508 (W) × 224 (D) × 48 (H) mm Option card: 280 × 80 (mm) Weight: Approx. 18 kg
Environmental conditions	
Temperature:	5 to 40°C (operation) - 30°C to 70° (storage)
Humidity:	10 to 80% (operation, no condensation) 10 to 90% (storage, no condensation)
Resistance to shock:	Max. 1 G, 1 msec (operation) Max. 5 G, 1 msec (storage)
Resistance to vibration:	Max. 0.25 G, 5 to 50 Hz (operation) Max. 3 G, 5 to 50 Hz (storage)

Appendix B - CP/M Reconfigured by MOVCPM

A 26K to 59K CP/M system can be reconfigured using the MOVCPM command. However, some of the BIOS subroutines and console escape sequences cannot be used with this new CP/M system. The subroutines which can be used are as follows.

BOOT	READ
WBOOT	WRITE
CONST	LISTST
CONIN	SECTRN
CONOUT	BEEP
LIST	RSOPEN
PUNCH	RSCLOSE
READER	RSINST
HOME	RSOUTST
SELDSK	RSIN
SETTRK	RSOUT
SETSEC	TIMDAT
SETDMA	

The console escape sequences which can be used in 26K to 59K CP/M reconfigured using the MOVCPM are indicated below.

ESC *	ESC 8
ESC 0	ESC 9
ESC 1	ESC =
ESC 2	ESC T
ESC 3	ESC Y
ESC 6	ESC 7BH
ESC 7	ESC 7DH

Those which result in no operation are as follows.

ESC)	ESC (
-------	-------

Those which are invalid are as follows.

ESC %	ESC 81H
ESC 4	ESC 82H
ESC 5	ESC 90H
ESC <	ESC 91H
ESC >	ESC 0A0H
ESC C	ESC 0A1H
ESC F	ESC 0B0H
ESC L	ESC 0B1H
ESC P	

The following table compares the reconfigured system with standard MF CP/M.

Comparison of 29K-59K CP/M with MF CP/M

	MF CP/M				
	CP/M reconfigured with MOVCPM	Non-MFBASIC		MFBASIC	
		Normal mode	MF mode	WIDTH 80 mode	WIDTH 40 mode
CP/M size	26K to 59K	63K			
Disk blocking	1024 bytes	1024 bytes			
CP/M functions	Limited	Extended			
Console output Functions	Limited	Extended			
Size of screen	80 x 25	40 x 20	80 x 20	40 x 20	
International character set	Not available	Available			
Application	WORD STAR, DATA STAR DBASE II, FORTRAN-80, CIS COBOL, etc.	TYPE (User defined commands)		MFBASIC etc.	
RAM required	64K	128K 64K for disk image RAM E 64K for disk image RAM F	192K 64K for disk image RAM E		
VRAM	32K	32K to 128K (4 pages) (color: 96K to 384K (4 pages))			
Programmable function keys	Supported				
Printout and display of user defined characters	Not available			Available	
RAM DISK	Not available	56K x 2 drives		56K	
RS232C	1 port, no interrupt processing	1 (+ 2 + 2) ports, interrupt processing			
Light pen	Not available	Available			
Color CRT	Not available	Available			

Appendix C - Console Control Codes

Control code	Function	1	2	3
ESC "%"	Access CGROM directly	○ (x)	x	x
ESC "("	No operation	△	△	△
ESC ")"	No operation	△	△	△
ESC "*"	Clear screen	○	○	○
ESC "0"	Reverse on	○	○	○
ESC "1"	Reverse off	○	○	○
ESC "2"	Cursor off	○	○	○
ESC "3"	Cursor on	○	○	○
ESC "4"	Underline	△ (○)	○	○
ESC "5"	Underline off	△ (○)	○	○
ESC "6"	Highlight	○ (x)	x	x
ESC "7"	Highlight off	○ (x)	x	x
ESC "8"	Blink	○ (x)	x	x
ESC "9"	Non blink	○ (x)	x	x
ESC "<"	Push cursor position	x	x	○
ESC "="	Set cursor position	○	○	○
ESC ">"	Pop cursor position	x	x	○
ESC "C"	Change character set & keyboard	○	○	○
ESC "F"	Change character style	x	x	○
ESC "L"	Change CRT color	△ (○)	○	○
ESC "P"	Screen dump	○	○	○
ESC "T"	Erase end of line	○	○	○
ESC "Y"	Erase end of screen	○	○	○
ESC 7BH	Secret	○	○	○
ESC 7DH	Non secret	○	○	○
ESC 81H	1byte char. → 2byte char.	x	x	○
ESC 82H	2byte char. → 1byte char.	x	x	○
ESC 90H	Partial scroll	x	x	○
ESC 91H	Partial scroll	x	x	○
ESC 0A0H	INS LED on	x	x	○
ESC 0A1H	INS LED off	x	x	○
ESC 0B0H	Function key check mode on	○	○	○
ESC 0B1H	Function key check mode off	○	○	○

1: Non-MFBASIC, Normal mode
 2: Non-MFBASIC, MF mode
 3: MFBASIC mode

○: Effective
 x: Not effective
 (): With color CRT
 △: No operation

The console can be controlled by sending the following codes to CON:

- 05H ((5)_D): Erases the screen from the current cursor position to the end of that physical line.
- 07H ((7)_D): Beeps the speaker.
- 08H ((8)_D): Moves the cursor one column to the left (back space).
- 09H ((9)_D): Moves the cursor 8 columns to the right (tab).
- 0AH ((10)_D): Moves the cursor down one line (line feed).
- 0BH ((11)_D): Moves the cursor to the top left corner of the screen (home).
- 0CH ((12)_D): Clears the entire screen and moves the cursor to the home position (clear screen (CLS)).
- 0DH ((13)_D): Moves the cursor to the beginning of the next line (carriage return (CR)).
- 1AH ((26)_D): Erases the screen from the current cursor position to the end of the screen.
- 1CH ((28)_D): Moves the cursor one column to the right (→).
- 1DH ((29)_D): Moves the cursor one column to the left (←).
- 1EH ((30)_D): Moves the cursor up one line (↑).
- 1FH ((31)_D): Moves the cursor down one line (↓).

Entering the ESC code (1BH ((27)_D)) followed by one or more codes performs various functions as shown below.

ESC "%"

This escape code is valid only in the non-MFBASIC normal mode. The CRT character generator ROM of the QX-10 provides the code system shown in the table. Sending the following sequence to the console makes it possible to display 255 different characters.

ESC "% " CHR\$(n)

In the above, n is any integer from 0 to 255.

HEXA- DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	BLANK (SPACE)	∞	BLANK (SPACE)	0	@	P	·	p	+	o	A	ı	π	o	≠	Σ
1	⊙	∩	ı	1	A	Q	∞	q	⊥	♣	∞	ı	∞	o	≠	σ
2	⊕	∩	"	2	B	R	b	r	⊥	♥	∞	ı	i	½	≠	μ
3	•	≡	#	3	C	S	c	s	⊥	♦	∞	∞	∞	¼	≠	τ
4	■	∠	\$	4	D	T	d	t	⊥	♠	∞	∞	ÿ	f	≠	θ
5	⊙	∠	%	5	E	U	e	u	-	♣	∞	∞	B	°	≠	Ω
6	⊙	-	&	6	F	V	f	v	ı	♣	∞	∞	∞	°	||	δ
7	♂	↓	'	7	G	W	g	w	r	♣	∞	∞	∞	∞	≠	∫
8	♀	↑	<	8	H	X	h	x	r	♣	∞	∞	∞	∞	≠	∫
9	♪	↑	>	9	I	Y	i	y	L	♣	∞	∞	∞	∞	≠	≈
A	☀	→	*	:	J	Z	j	z	∫	♣	∞	∞	∞	∞	≠	•
B	◀	←	+	;	K	[	k	{	∞	↑	∞	∞	∞	∞	∞	√
C	▶	↳	,	<	L	\	ı	ı	■	↓	∞	∞	∞	∞	∞	η
D	↕	↔	-	=	M	]	m	}	■	x	∞	∞	∞	∞	∞	∞
E	!!	▲	.	>	N	^	n	~	■	÷	∞	∞	∞	∞	∞	ı
F	∞	▼	/	?	O	_	o	Δ	●	±	ı	∞	∞	∞	∞	∞

ESC "("
No operation.

ESC ")"
No operation.

ESC "*"

This escape sequence clears the CRT screen to the background color and positions the cursor in the upper left hand corner of the screen.

ESC "0"

This escape sequence reverses the display.

ESC "1"

This escape sequence terminates reverse display.

ESC "2"

This escape sequence turns off the cursor.

ESC "3"

This escape sequence turns on the cursor.

ESC "4"

This escape sequence causes characters input to be underlined.

ESC "5"

This escape sequence terminates character underlining.

ESC "6"

This escape sequence initiates highlighted display.

ESC "7"

This escape sequence terminates display highlighting.

ESC "8"

This escape sequence initiates blinking display.

ESC "9"

This escape sequence terminates blinking display.

ESC "<"

This escape sequence saves the cursor position, display attributes (reverse, underline, highlight, etc.) and color and, when the first byte of a 2-byte character has already been sent to the console, saves that byte. Saving is possible up to 8 levels; further entries of the sequence are invalid.

ESC "="

This escape sequence makes it possible to specify the cursor position; this is done as follows.

ESC "=" CHR\$(m + 32) CHR\$(n + 32)

m specifies the vertical cursor position and n specifies the horizontal position. Possible values of m and n are as shown below.

m: 0 to 24 for the non-MFBASIC normal mode

0 to 19 for the non-MFBASIC MF mode, MFBASIC width80 mode, and MFBASIC width40 mode

n: 0 to 79 for the non-MFBASIC normal mode and MFBASIC width80 mode

0 to 39 for the non-MFBASIC MF mode and MFBASIC width 40 mode

ESC ">"

This escape sequence restores the cursor position, attribute, color, and first byte of a 2-byte character most recently saved with ESC "<".

ESC "C"

This escape sequence is used to select one of the eight international character sets and keyboard arrangements as follows.

US ASCII	ESC "CU" or "Cu"
French	ESC "CF" or "Cf"
German	ESC "CG" or "Cg"
English	ESC "CE" or "Ce"
Danish	ESC "CD" or "Cd"
Swedish	ESC "CW" or "Cw"
Italian	ESC "CI" or "Ci"
Spanish	ESC "CS" or "Cs"

ESC "F"

This escape sequence changes the font of 1-byte characters in the MFBASIC width40 mode. This is specified as follows.

ESC "Fn"

Here, n is a 1-digit hexadecimal number.

Example

```
10 PRINT CHR$(27);"F8"  
20 PRINT "abcEPSONdef"  
RUN
```

```
abcEPSONdef  
Ok
```

ESC "L"

This escape sequence changes the foreground or background color of the CRT display. The sequence for changing the foreground color is as follows.

ESC "L0n"

Here, n is an integer with the following meanings.

n	0	1	2	3	4	5	6	7
	Black	Blue	Red	Violet	Green	Light blue	Yellow	White

NOTE:

In the case of the monochrome display, specification of any number other than 0 (black) for n is regarded as equivalent to n = 7 (white).

For the background color, the sequence is as follows.

ESC "L1n"

Here, n is an integer from 0 to 7 with meanings which are the same as indicated above.

NOTE:

This sequence is not effective in the case of the monochrome display (the background color is always black).

ESC "P"

This escape sequence outputs a hard copy of the display screen contents to the printer. (With certain combinations of mode, CRT and Printer, this escape sequence is not effective in other than the non-MFBASIC normal mode.) When a color display is used, color other than background color is printed out.

ESC "T"

This escape sequence clears the current line from the position of the cursor to the line's end.

ESC "Y"

This escape sequence clears the current screen from the position of the cursor to the screen's end.

ESC CHR\$ (&H7B)

This escape sequence causes all characters to be displayed on the screen as blanks (secret mode).

ESC CHR\$ (&H7D)

This escape sequence terminates the secret mode.

ESC CHR\$ (&H81)

This escape sequence is used as follows in the MFBASIC mode to convert 1-byte characters to 2-byte characters.

ESC CHR\$ (&H81) CHR\$ (n) "f"

Here, "n" is a 1-byte character code and "f" is the font (specified as a 1-digit hexadecimal number from 0 to F).

Example

```
PRINT CHR$(&H1B);CHR$(&H81);"A"
```

```
A  
Ok
```

ESC CHR\$ (&H82)

This escape sequence is used as follows in the MFBASIC mode to convert 2-byte characters to 1-byte characters.

ESC CHR\$ (&H82) CHR\$ (n1) CHR\$ (n2)

Here, n1 is the first byte of the 2-byte code, and n2 is the second.

Example

```
PRINT CHR$(&H1B);CHR$(&H81);"A"
```

```
A  
Ok
```

ESC CHR\$ (&H90)

This escape sequence is specified as follows to scroll up part of the CRT screen.

ESC CHR\$ (&H90) CHR\$ (n) CHR\$ (m)

This sequence scrolls up the m lines from line n and displays a blank line at line n+m-1. Here, n is an integer from 0 to 19, and m is an integer from 1 to 20. The total of n+m must not be greater than 20.

ESC CHR\$ (&H91)

This escape sequence is specified as follows to scroll down part of the CRT screen.

ESC CHR\$ (&H91) CHR\$ (n) CHR\$ (m)

This sequence scrolls down the m lines from line n and displays a blank line at line n. The values of n and m are as indicated above, and the total of n+m must not be greater than 20.

ESC CHR\$(&HA0)

This escape sequence lights the LED built into the INS key.


ESC CHR\$(&HA1)

This escape sequence turns off the LED built into the INS key.

ESC CHR\$(&HB0)

This escape sequence sets the console in the function key check mode (the mode in which a special check is made of the programmable function keys and numeric pad keys) and turns on FUNCFLG ((&HFED1) = &HFF).

In this mode, when a key is pressed, the internal code corresponding to each key is entered when keys are pressed and the C register is set as follows.

Key	Internal code	C register
PFK1	&HE0	&HFF
PFK2	&HE1	&HFF
PFK3	&HE2	&HFF
PFK4	&HE3	&HFF
PFK5	&HE4	&HFF
PFK6	&HE5	&HFF
PFK7	&HE6	&HFF
PFK8	&HE7	&HFF
PFK9	&HE8	&HFF
PFK10	&HE9	&HFF
00	&HF4	&HFF
(German keyboard only)		
000	&HF5	&HFF
	Same as ASCII code	&HFF
*	Same as ASCII code	&HFF
+	Same as ASCII code	&HFF
,	Same as ASCII code	&HFF
-	Same as ASCII code	&HFF
.	Same as ASCII code	&HFF
/	Same as ASCII code	&HFF
0 to 9	Same as ASCII code	&HFF
Other keys Same as ASCII code 0		

ESC CHR\$(&HB1)

This escape sequence resets the function key check mode ((&HFED1) = 0).

The programmable function keys, the "00" key and the "000" key generate more than one code in sequence. For example, the "000" key generates three zeros in sequence.

Appendix D - Printer Escape Sequences

The escape sequences described below are used with EPSON MX printers of types II and III, the FX/80, FX-100, and RX-80; these escape sequences are valid only in the BIT OFF mode.

ESC "a"

This escape sequence causes all 2-byte characters to be printed at constant spacing; the printer's proportional spacing information is disregarded.

ESC "b"

This escape sequence causes 2-byte characters to be printed with proportional spacing. (This is the condition which prevails immediately after a cold start is made.)

Example

```
10 LPRINT CHR$(27);"a";: GOSUB 100
20 LPRINT
30 LPRINT CHR$(27);"b";: GOSUB 100
99 END
100 LPRINT "Quality Personal Computer QX-10"
110 RETURN
Ok
```

Quality Personal Computer QX-10

Quality Personal Computer QX-10

ESC CHR\$ (&H80)

This escape sequence prints spaces of n dots; its format is as follows.

ESC CHR\$ (&H80) CHR\$ (n)

Here, n is an integer from 0 to 255.

ESC CHR\$ (&H81)

This escape sequence affixes a space of n dot's width to the left side of all characters printed. (With double density printing, the default value is 1.) Its format is as follows.

ESC CHR\$ (&H81) CHR\$ (n)

Here, n is an integer from 0 to 255.

ESC CHR\$ (&H82)

This escape sequence affixes a space of n dot's width to the left side of all characters printed. (With double density printing, the default value is 1.) Its format is as follows.

ESC CHR\$ (&H82) CHR\$ (n)

Here, n is an integer from -128 to 127.

ESC CHR\$ (&H90)

This escape sequence sets the position of the print head (with double density printing). (This is accomplished by changing the value of the print buffer pointer to indicate the position which is n dots from the beginning of the buffer.) The format for this sequence is as follows.

ESC CHR\$ (&H90) CHR\$ (n_L) CHR\$ (n_H)

n_L: LSB of n

n_H: MSB of n

NOTE:

The last two escape sequences described above are invalid unless they are included in a print line with the code from 7FH to 9FH, 2-byte characters, spaces printed with the escape sequence described in ESC CHR\$ (&H80), or the head positioning escape sequence described in ESC CHR\$ (&H90).

Appendix E - Example of BDOS Call

A simple program which uses BDOS function 5 is shown below. This program outputs characters from 20H to FFH to the printer. Refer to publications available on CP/M for more sophisticated programs using BDOS functions for file management.

```
0000 =          WBOOT    EQU    0000H
0005 =          BDOS    EQU    0005H
;
0100          ORG      100H
0100 1E20          MVI    E, 20H
0102 D5          STAT   PUSH   D
0103 7B          MOV    A, E
0104 FEFF        CPI    0FFH
0106 CA1301      JZ     SEND
0109 0E05        MVI    C, 5
010B CD0500      CALL   BDOS
010E D1          POP    D
010F 1C          INR   E
0110 C30201      JMP    STAT
0113 C30000      SEND   JMP    WBOOT
0116          BUF    DS    02H
0118          END
```


(2) MultiFont character printout program

```

CR      EQU      0DH
LF      EQU      0AH
ESC     EQU      1BH
CONOUT  EQU      0F60CH
LISTST  EQU      0F62DH
LIST     EQU      0F60FH
MFDEMO:
CALL    LISTST
STA     PRST
LXI    H, TABLE1
SHLD   TSAVE1
MVI    E, 8
MFDEMO1: MVI    D, 3
MFDEMO2: LHL D, TSAVE1
MOV    C, M
INX    H
SHLD   TSAVE1
PUSH   D
CALL   CONOUT
POP    D
DCR    D
JNZ    MFDEMO2
LXI    H, TABLE2
SHLD   TSAVE2
MVI    D, 12
MFDEMO3: LHL D, TSAVE2
MOV    C, M
INX    H
SHLD   TSAVE2
PUSH   D
PUSH   B
CALL   CONOUT
LDA    PRST
ORA    A
JZ     X1
CALL   LISTST
ORA    A
JZ     X2
POP    B
PUSH   B
CALL   LIST
POP    B
POP    D
DCR    D
JNZ    MFDEMO3
PUSH   D
MVI    C, CR
CALL   CONOUT
CALL   LISTST
LDA    PRST
ORA    A
JZ     X3
CALL   LISTST
ORA    A
JZ     X4
MVI    C, CR
CALL   LIST
MVI    C, LF
CALL   CONOUT
LDA    PRST
ORA    A
JZ     X5
CALL   LISTST
ORA    A
JZ     X6
MVI    C, LF
CALL   LIST

```

GET PRNTR STATUS
 OUTPUT ESC SEQ FOR EACH COUNTRY
 OUTPUT CHAR FOR EACH COUNTRY
 WAIT PRNTR READY
 OUTPUT CHAR TO PRNTR
 LINE FEED

```

X5:      POP      D
        DCR      D
        JNZ     D
        JMP     D
        ;
TABLE1:  DB      'SC', 'CU'
        DB      'SC', 'CF'
        DB      'SC', 'CG'
        DB      'SC', 'CE'
        DB      'SC', 'CD'
        DB      'SC', 'CW'
        DB      'SC', 'CI'
        DB      'SC', 'CS'
        ;
TABLE2:  DB      23H, 24H, 40H, 5BH, 5CH, 5DH
        DB      5EH, 60H, 7BH, 7CH, 7DH, 7EH
        ;
TSAVE1:  DW      0
TSAVE2:  DW      0
        ;
PRST:   DB      0
        ;
        END

```

(3) Disk dump program

```

*****
*          DISK DUMP PROGRAM          *
*****
SELDISK EQU 0F61BH          BIOS SELDISK ENTRY
SETTRK EQU 0F61EH          BIOS SETTRK ENTRY
GETTRK EQU 0F621H          BIOS GETTRK ENTRY
SETDMA EQU 0F624H          BIOS SETDMA ENTRY
READ EQU 0F627H           BIOS READ ENTRY

BDOS EQU 5                 BIOS BDOS ENTRY
DSTRING EQU 9             BIOS FUNCTION CODE FOR
                           STRING DISPLAY
CR EQU 0DH                BIOS CARRIAGE RETURN
LF EQU 0AH                BIOS LINE FEED

                           INIT STACK POINTER
                           CLEAR DISP BUFFER

D0:   LXI SP,STACK
      LXI H,DSPBUF
      MVI C,78
      MVI A,0
      MOV M,A
      INX
      DCR C
      JNZ D0
      XRA A
      STA DRIVE
      STA TRACK
      STA SECTOR

D1:   LDA DRIVE
      MOV C,A
      LXI B,MDRIVE
      CALL B2ASCII
      CALL SELDISK
      LDA TRACK
      MOV C,A
      LXI B,MTRACK
      CALL B2ASCII
      MVI B,0
      CALL SETTRK
      LDA SECTOR
      MOV C,A
      LXI B,MSECTOR
      CALL B2ASCII
      CALL SETSEC
      LXI B,DSKBUF
      CALL SETDMA
      CALL READ
      MVI C,DSTRING
      LXI B,HEADMSG
      CALL BDOS
      MVI C,8
      LXI H,DSKBUF

D2:   PUSH B
      PUSH H
      LXI D,DSPBUF+8
      MVI B,16

D3:   MOV C,M
      CALL B2ASCII
      INX
      INX
      DCR B
      JNZ D3
      POP B
      PUSH H
      LXI D,DSPBUF+60
      MVI B,16

D4:   MOV A,M
      ANI 7FH
      CPI 20H
      JNC D5
      MVI A,'.'

D5:   CPI 07FH
      JNZ D55
      MVI A,'.'

D55:  CPI 24H
      JNZ D56
      MVI A,'.'

```

```

D56: STAX      D
      INX      D
      INX      D
      DCR      B
      JNZ      D4
      XTHL
      MVI      C, DSTRING
      LXI      DE, DSPBUF
      CALL    BDOS
      POP      H
      POP      B
      DCR      C
      JNZ      D2
      MVI      C, 2

```

```

*
2 LINE FEEDS

```

```

D6:  PUSH     B
      CALL    NEWLN
      POP     B
      DCR     C
      JNZ     D6
      LDA     SECTOR
      INR     A
      STA     SECTOR
      CPI     40H
      JC      D1
      XRA     A
      STA     SECTOR
      LDA     TRACK
      INR     A
      STA     TRACK
      CPI     28H
      JC      D1
      JMP     0

```

```

INCREMENT SECT NO
IF SECT NO < 40H,
NEXT ACCESS
SECTOR NO = 0
INCREMENT TRK NO
IF TRK NO < 28H,
NEXT ACCESS
JUMP TO SYSTEM

```

BINARY TO ASCII STRING

```

INPUT:  BINARY <C>
        BUFP <DE>
OUTPUT: BUFP <DE>

```

```

B2ASCII: PUSH     B
          MOV     A, C
          RLC
          RLC
          RLC
          RLC
          ANI     1111B
          CALL    B2A
          STAX   D
          INX     D
          POP     B
          MOV     A, C
          ANI     1111B
          CALL    B2A
          STAX   D
          INX     D
          RET

```

```

MOVE UPPER 4 BITS
TO LOWER 4 BITS
MASK WITH 0FH
4 BIT BINARY -> ASCII
SET BUFFER
UPDATE POINTER

```

4BIT BINARY TO ASCII

```

INPUT:  4BIT BINARY <A>
OUTPUT: ASCII <A>

```

```

B2A:    ADI     '0'
          CPI     '9'+1
          RC
          ADI     'A'-'9'-1
          RET

```

```

ADD '0'
END IF '0' TO '9'
ADD '7'

```

MAKE NEW LINE
INPUT/OUTPUT: NONE

```

NEWLN: MVI      C, DSTRING
        LXI      D, NEWMSG
        CALL    BDOS
        RET

```

```

*24L24T
NEWMSG: DB      CR, LF, '$'
HEADMSG: DB      '          DRIVE ('

```

```

MDRIVE: DB      0,0,') TRACK (')
MTRACK: DB      0,0,') SECTOR (')
MSECTOR: DB     0,0,') ,CR,LF, '$'
;
DRIVE:  DB      0
TRACK:  DB      0
SECTOR: DB      0
;
DSKBUF: DS      128
;
DSPBUF: DS      78
        DB      CR,LF, '$'
;
        DS      100
STACK  EQU      $
;
        END

```

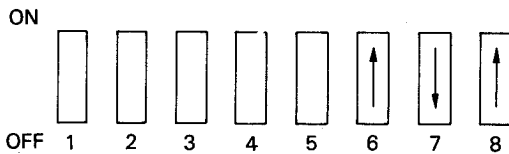
Appendix G - QX-10 diagnostic programs

The QX-10 diagnostic program is supplied as an aid for locating and resolving a problem occurring during use of the QX-10 system. The user can easily check the system failure by executing this program.

1. Preparation

Before executing the diagnostic program, set the DIP switch at the back of the main unit.

The DIP switch position and settings are shown below.




Arrangement of DIP switches

Main memory	V-RAM	DIP switch position							
		1	2	3	4	5	6	7	8
192K	32K	X	X	X	X	X	ON	OFF	ON
	128K	X	X	X	X	X	OFF	OFF	ON
256K	32K	X	X	X	X	X	ON	OFF	OFF
	128K	X	X	X	X	X	OFF	OFF	OFF

X: any position

NOTE

In the explanation below, term "ENTER key" represents the RETURN key .

2. Operating procedures

2.1 Confirming the result of diagnostic program execution upon power-on sequence

- (a) Make sure that the power switch is turned off, insert the power plug to the wall outlet, and turn on the system power switch. Wait for several seconds, the following message is displayed and the red LED on flexible disk drive A turns on.

INSERT DISKETTE

- (b) When the message above is displayed and the red LED on flexible disk drive A turns on, proceed with 2.2.
- (c) When the red LED on the flexible disk drive A turns on but the message above is not displayed, make sure that the connector between the display unit and main unit are properly connected and adjust the brightness control knob at the back of the display unit.
When the message is displayed, proceed with 2.2.; otherwise, turn off the power. In the latter case since trouble with the display unit can be assumed, contact dealers or local offices.
- (d) The following events indicate malfunction of the CPU or trouble with the resident RAM. Turn off the power and contact dealers or local offices.

DIAGNOSTIC CODE 0001	0.01
----------------------	------

- * The message above is displayed and/or the buzzer sounds continuously.
- * When neither the message is displayed, the buzzer sounds, nor the red LED on flexible disk drive A turns on, if the power lamp is turning on, malfunction of the CPU can be assumed. When the power lamp turns off and the fans at the back of the main unit does not move, power unit failure can be assumed. Confirm that the wall outlet is alive by operating another electrical appliance with the outlet before this check.

DIAGNOSTIC CODE 0002	0.01
----------------------	------

The message above indicating that the resident RAM is troubled is displayed and the buzzer sounds for about 1 second. When no message is displayed, check the connection between the display unit and the main unit and adjust the brightness control at the back of the display unit. Then, make sure that the message is normally displayed. If the message is not displayed, display unit trouble can also be assumed.

2.2 Disk insertion

Insert the flexible disk containing the diagnostic program in drive A. The diagnostic program is loaded and started. The display screen is cleared and write/read test for the video RAM is performed. When 128K-byte video RAM is tested, any message is displayed for about 30 seconds (10 seconds for 32K-byte video RAM).

When an error is detected for the video RAM, the buzzer sounds for about 2 seconds. (In this case, contact dealers or local offices.) Upon completion of the video RAM test (after 10 seconds for 32K-byte video RAM or about 30 seconds for 128K-byte video RAM), the following message is displayed.

Diagnostic Start Now.

2.3 Write/read test for the main memory (RAM)

Write/read test for the main memory (RAM) is performed according to the setting of the DIP switch at the back of the main unit. The bank number of the memory being currently accessed is displayed as follows:

MEMEORY TEST. Bank No. 0

If the test for that bank ends normally, "OK" is displayed following the bank number 0.

MEMEORY TEST. Bank No. 0 OK

When an error occurs during memory test, the following message is displayed.

DIAGNOSTIC CODE 0010 XX

XX is a 2-digit hexadecimal number indicating the erroneous RAM with corresponding bit as 1. For example, if XX is 41 (the binary number is 01000001), RAMs corresponding to bits 0 and 6 are troubled.

When an error is detected during memory test, the test for the current bank is terminated. Then, the program proceeds with the next bank indicated by the DIP switch settings. If test for all banks is terminated abnormally, the following message is displayed and the buzzer sounds for about 1 second.

Turn off the power switch and contact dealers or local offices.

DIAGNOSTIC CODE 0010 50

If no error occurs during memory test, proceed with the next test.

2.4 Keyboard auxiliary test

The validity of keys necessary to execute the diagnostic program is checked. The self test and interrupt of the keyboard is performed. If no interrupt or an unexpected interrupt occurs within 10 seconds, the following message is displayed.

DIAGNOSTIC CODE 0030 XX

XX indicates the interrupt condition. 88 indicates that no interrupt from the keyboard is generated.

If XX is neither 00, 88, nor FF, an unexpected interrupt is generated. When a normal interrupt is generated, the message above is not displayed. Then the program proceeds with the next step independently of the result of the keyboard self test.

Press The '1' Key__

Press '1' on the keyboard.

Press The '1' Key 1

The pressed key is displayed as shown above. If a key which is not specified is pressed or if the key code from the keyboard is not accepted normally, the error key is displayed as follows:

DIAGNOSTIC CODE 0035 XX

XX is a hexadecimal number which indicates the error key code. When XX is FF, this message indicates that invalid character code is input. When no operation occurs after an error message is displayed, check the connection between the keyboard and the main unit, press the system reset button at the right front of the main unit, and reexecute the keyboard auxiliary test from the beginning. If the second trial results in the same condition, contact dealers or local offices. Press one key out of numbers from 1 to 9 or alphabetic characters, and press the ENTER key according to the message. When an invalid key is pressed, an error message is displayed, which requests the key entry again.

2.5 Loading the diagnostic program

If no error results when the ENTER key is pressed during keyboard auxiliary test, the next diagnostic program is loaded. In this case, the flexible disk containing the diagnostic program must already be inserted in disk drive A. If the diagnostic program cannot be loaded normally, the following message is displayed.

DIAGNOSTIC CODE 01aa bb

or

DIAGNOSTIC CODE 02aa bb

When either of these messages is displayed, make sure that the flexible disk containing the diagnostic program is inserted properly in the disk drive. Then, press the reset button and reexecute the test from the beginning.

If the second trial results in the same condition, contact dealers or local offices.

When the flexible disk is not inserted in drive A, the following message is displayed and the program waits until the disk is ready.

FDD (Drive A) Not Ready
Insert DIAGNOSTIC FLOPPY In Drive A

When the flexible disk is ready, the program is automatically loaded.

2.6 Diagnostic program options

When the diagnostic program is loaded, the screen is cleared and the following menu is displayed.

```
THE QX-10 DIAGNOSTIC Copyright EPSON CORPORATION -0101083182
Selection An Option
 1 : KEYBOARD TEST
 2 : DISPLAY TEST
 3 : FLOPPY TEST
 4 : PRINTER TEST
 5 : CMOS TEST
 8 : ALL TEST
 9 : EXIT TO SYSTEM FLOPPY DISK
 R : REPEAT TEST
Enter The Action Desired
```

Select one diagnostic program by entering the number of the program. R indicates that the test is executed repeatedly.

Up to 10 items can be entered before pressing the ENTER key. This function allows the tests to be programmed sequentially. When 10th item is entered, the program is automatically executed without accepting the ENTER key. 1 to 5, 8, 9, R, and the ENTER keys can be entered. When the ENTER is pressed without selecting any item, keyboard test, display test, flexible disk test, and printer test are performed for a single time. (This is the same for the case when 1, 2, 3, and 4 are selected.)

When "R" is entered from the keyboard, keyboard test, display test, flexible disk test, and printer test are performed repeatedly. (This is the same for the case when 1, 2, 3, 4, and R are selected.)

When 9 is entered, the diagnostic program execution is terminated and control is ready to be transferred to the CP/M. In this case, the screen is cleared and the following message is displayed.

```
Insert SYSTEM FLOPPY In Drive A And Press ENTER When Ready
```

Insert the system disk in drive A. When the drive is ready, press ENTER. After IPL execution, control is transferred to the CP/M command level.

Select one or more tests and enter the item numbers from the keyboard. When the number of items is 9 or less, be sure to press ENTER.

3. Keyboard test

3.1 Setting the type of keyboard

First, set the type of the keyboard. Once set, it cannot be reset unless IPL is performed.

```
Select KEYBOARD TYPE
  1 : ASCII TYPE
  2 : HASCII TYPE
  3 : JIS TYPE
TYPE (1, 2 Or 3)
```

Enter one of 1, 2 or 3 according to the type of the keyboard. (A number other than 1, 2, and 3 cannot be entered.) Select number 1, and the following confirmation message is displayed.

```
TYPE (1,2 Or 3) = 1 : ASCII TYPE
Type Correct ? (Y/N)
```

When the type of the keyboard is true, enter "Y" and press ENTER. When false, enter "N" and press ENTER. A message for keyboard selection is displayed again, then enter proper number.

When the type of the keyboard is other than ASCII, proceed with the next subsection 3.2.

When ASCII is selected, the following menu for country selection is given.

```
Select ASCII Type
  1 : US ASCII
  2 : ENGLISH
  3 : GERMAN
  4 : FRENCH
  5 : ITALIAN
  6 : SPANISH
  7 : DANISH
  8 : SWEDEN
TYPE = __
```

Select a number from 1 to 8.

```
TYPE = 3 : GERMAN
Type Correct ? (Y/N) __
```

When the confirmation message is displayed, enter the corresponding key (Y or N) and press ENTER. If the N key is pressed, the country selection menu is displayed again.

3.2 The following message for keyboard test is displayed.

```
KEYBOARD TEST          (-0102020183-)
Press Each key (*BREAK/ENTER = Cancel)

* Is The Screen Correct ? (Y/N)___
```

3.3 Execution

Press all keys on the keyboard. Then the following result is displayed on the screen. Typamatic keys blink when pressed continuously.

```
KEYBOARD TEST          (-0101083182-)
PRESS Each Key        (* BREAK/ENTER =Cancel)

      FFFFF FFFFF BPHS          SSSS
      12345 67890 RAED          1234

ESC   1234567890-^ \ BS   H C   */+-
TAB   QWERTYUIOP@[ ]LF   I D   789=
CTRL  ASDFGHJKL;: _ ↑     456,
SHIFT ZXCVBNM,./SHIFT  ← →  123 }
      CL -SPACE- GS      ↓    00.
```

*IS THE SCREEN CORRECT ? (Y/N) _

U.S. ASCII and ENGLISH

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFFF FFFFF BPHH SSSS
12345 67890 RAEC 1234

ESC	1234567890B#^BS	H C	* / + -
TAB	QWERTZUIOPÜ+<LF	I D	7 8 9 =
CTRL	A S D F G H J K L Ö Å ←	↑	4 5 6 ^
SHIFT	Y X C V B N M , . - SHIFT	← →	1 2 3]
	CL -SPACE- GS	↓	0 0 .

*IS THE SCREEN CORRECT ? (Y/N) _

GERMAN

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFFFF FFFFF BPHS SSSS
12345 67890 RAED 1234

ESC 1234567890) - # BS H C * / + -

TAB AZERTYUIOP ^ ' < LF I D 7 8 9 =

CTRL Q S D F G H J K L M N O P Q R S T U V W X Y Z [\] ^ _ ` { | } ~

SHIFT W X C V B N , ; : = SHIFT ← → 1 2 3

CL -SPACE- GS ↓ 0 0 .

*IS THE SCREEN CORRECT ? (Y/N) _

FRENCH

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFFF FFFFF BPHS SSSS
12345 67890 RAEC 1234

ESC 1234567890-^ \BS H C */+-
TAB QWERTYUIOP@°&LF I D 789=
CTRL A S D F G H J K L ; : ← → ↑ ↓ 4 5 6 ,
SHIFT Z X C V B N M , . / SHIFT ← → 1 2 3]
CL -SPACE- GS ↓ 0 0 .

*IS THE SCREEN CORRECT ? (Y/N) _

ITALIAN

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFFF FFFFF BPHS SSSS
12345 67890 RAED 1234

ESC	1234567890-^NBS	H C	*/+-
TAB	QWERTYUIOP@i&LF	I D	789=
CTRL	ASDFGHJKL;:↵	↑	456,
SHIFT	ZXCVBNM,./SHIFT	← →	123┘
	CL -SPACE- GS	↓	00.

*IS THE SCREEN CORRECT ? (Y/N) _

SPANISH

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFF FFFF BPHH SSSS
12345 67890 RAEC 1234

ESC 1234567890-^øBS H C */+-

TAB QWERTYUIOP@Æ&lf I D 789=

CTRL A S D F G H J K L ; : ← ↑ 4 5 6 ,

SHIFT Z X C V B N M , . / SHIFT ← → 1 2 3]

CL -SPACE- GS ↓ 0 0 .

*IS THE SCREEN CORRECT ? (Y/N) _

DANISH

KEYBOARD TEST
PRESS Each Key

(* BREAK/ENTER =Cancel)

(-0101003182-)

FFFFF FFFFF BPHS SSSS
12345 67890 RAED 1234

ESC 1234567890-00BS H C- * / + -
TAB QWERTYUIOPÉÅ&LF I D 789=
CTRL ASDFGHJKL;: ← ↑ 456,
SHIFT ZXCVBNM,./SHIFT → → 123 }
 CL -SPACE- GS ↓ 00.

*IS THE SCREEN CORRECT ? (Y/N) _

SWEDISH

When an invalid key code is accepted, the following message is displayed.

DIAGNOSTIC CODE 0035 aa

“aa” indicates the invalid key code. When the type of the keyboard is not set properly, pressing some keys may result in the same message. In this case, press the reset button and perform keyboard setting. The following message is displayed under the previous message.

* Continue ? (Y/N)

Make sure that the keyboard and the main unit are connected properly. Then, enter “Y” key and press ENTER. The screen is cleared and the keyboard test screen is displayed again. Press any key. If the same message indicating the invalid code is displayed again, press the BREAK and ENTER keys.

Cancel Command Complete

The test is cancelled with the above message. Then the menu is displayed again. Press all keys if screen is displayed as shown previously, enter “Y” and press ENTER and menu is displayed. Otherwise, enter “N” and press ENTER.

If the keyboard test is to be done again, enter “Y” and press ENTER. Otherwise, enter “N” and press ENTER to proceed with the subsequent test specified in the menu. If no test is specified, menu is displayed.

4. Display Test

4.1 Display attribute test

Checks that characters are properly displayed according to the attribute.

Normal characters (020H to 0FFH).

Intensified characters (020H to 0FFH).

Inversed characters (020H to 0FFH).

Blink characters (020H to 0FFH).

If characters are displayed according to the specified attribute, enter Y and press ENTER to proceed with the next subsection 4.2. Otherwise, enter N and press ENTER. In the latter case, the following message is displayed.

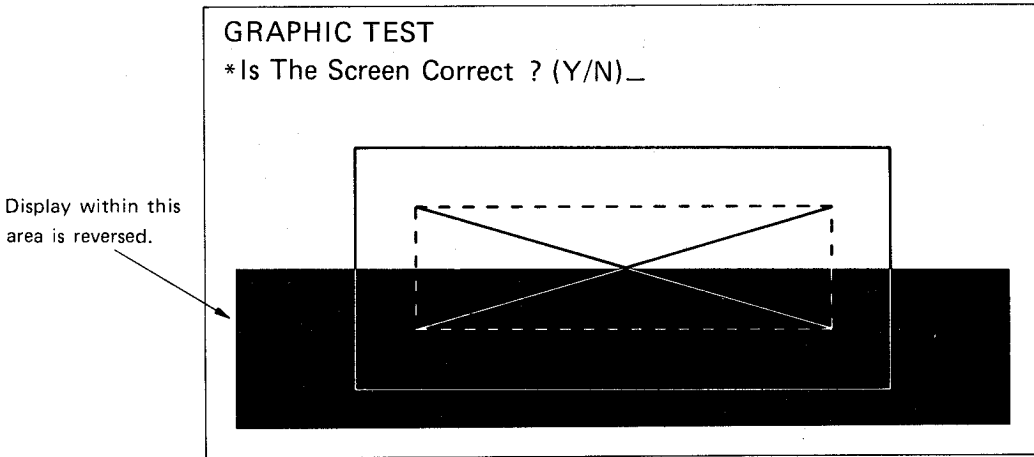
DIAGNOSTIC CODE 0040 10
* Continue ? (Y/N)

When the following display tests (from 4.2 on) are to be performed subsequently, enter Y and press ENTER; otherwise, enter N and press ENTER to proceed with the next test specified in the menu or return to the menu. In addition to Y and N keys, the BREAK key can be entered. When the BREAK key is pressed, the test is cancelled and the following message is displayed; afterwards, the menu is redisplayed.

Cancel Command Complete

4.4 Graphic display

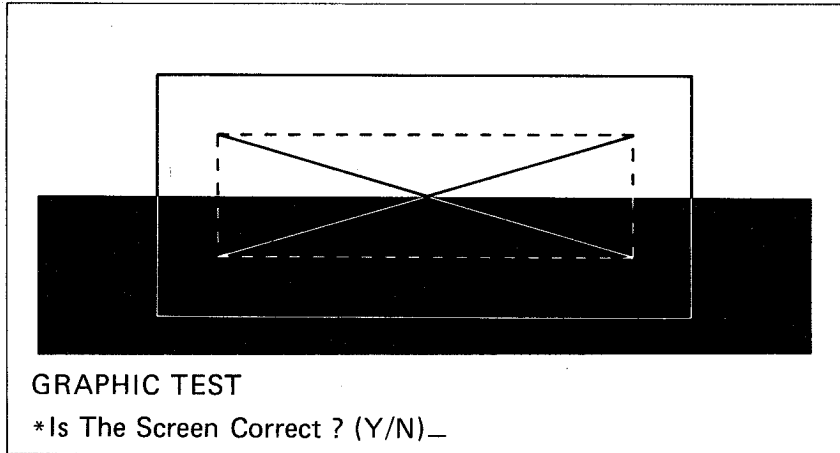
The upper 6 lines are set to be in character mode and the lower 19 lines are set to be in graphic mode. Characters and graphic are displayed simultaneously as shown below.



If the screen is as shown above, enter Y and press ENTER; otherwise, enter N and press ENTER. In the latter case, the screen is cleared and the following message is displayed.

```
DIAGNOSTIC CODE 0040    14  
* Continue ? (Y/N)_
```

When the following display tests are to be performed, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or to return to the menu.



In the former case, the screen is cleared and characters and graphics are displayed simultaneously as shown below.

If the screen is as shown above, enter Y and press ENTER; otherwise, enter N and press ENTER. In the latter case, the screen is cleared and the following message is displayed.

DIAGNOSTIC CODE 0040 14 * Continue ? (Y/N)

When the following display test (from 4.5 on) are to be performed, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or to return to the menu.

If the BREAK key is pressed, the test is cancelled and the following message is displayed; afterwards, the menu is redisplayed.

Cancel Command Complete

4.5 Enlarged character display

Zoom Test

The characters above are enlarged up to 16 times as large as the initial size. When the maximum characters are displayed, the initial size characters are displayed after about 1 second later as follows:

Zoom test
* Is The Screen Correct ? (Y/N)

When enlarged character are displayed, enter Y and press ENTER; otherwise, enter N and press ENTER. In the latter case, the following message is displayed.

DIAGNOSTIC CODE 0040 16
* Continue ? (Y/N)

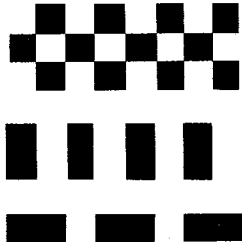
If the following display tests (from 4.6 on) are to be performed, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or return to the menu.

If the BREAK is pressed, the test is cancelled and the following message is displayed; afterwards, the menu is redisplayed.

Cancel Command Complete

4.6 Enlarged graphic pattern display

The graphic pattern below is displayed.



The 8×8 dot pattern is enlarged up to 16 times as large as the original size. About 1 second later since the largest graphic pattern is displayed, the following message is displayed.

* Is The Screen correct ? (Y/N)

If the graphic pattern is displayed properly, enter Y and press ENTER. Otherwise, enter N and press ENTER. In the latter case, the following message is displayed.

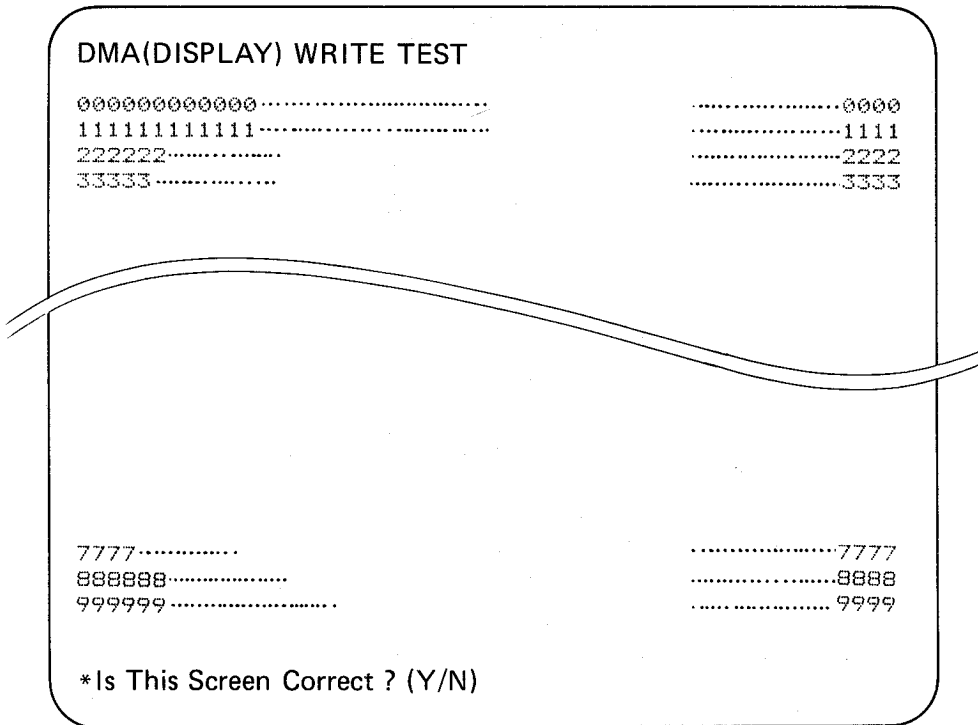
DIAGNOSTIC CODE 0040 18
* Continue ? (Y/N)

If the following display tests (from 4.7 on) are to be performed, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or return to the menu. If the BREAK key is pressed, the test is cancelled and the following message is displayed; afterwards, the menu is redisplayed.

Cancel Command Complete

4.7 Displaying and reading character data by means of direct memory access (DMA)

The following character data is displayed by means of DMA.



If numbers from 0 to 9 are displayed twice (20 lines for total; each number is displayed repeatedly for each line), enter Y and press ENTER. Otherwise, enter N and press ENTER. In the latter case, the following message is displayed.

```
DIAGNOSTIC CODE 0040  20
* Continue ? (Y/N)
```

If the following read test in which DMA is used is to be performed, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or return to the menu. If the BREAK key is pressed, the test is cancelled and the menu is redisplayed.

Next, character data is displayed without using DMA.

4.8 Random data display

The following message is displayed. The screen is still filled with the character data.

DISPLAY RANDOM DATA

Following this message, the defined character set is displayed. Each character is displayed repeatedly for 3 lines ($80 \times 3 = 240$ characters). Undefined codes are not displayed.

Upon completion of random display of the entire character set, 3-line display mode is restarted. This random and 3-line display is performed repeatedly. To end this test, press the BREAK. The display operation is cancelled and the following message is displayed.

* Continue ? (Y/N)

If the test 4.8 is to be performed again, enter Y and press ENTER. Otherwise, enter N and press ENTER to proceed with the next test specified in the menu or return to the menu. If the BREAK key is pressed, the menu is redisplayed.

5. Flexible Disk Test

The flexible disk test is performed by writing data to it. Prepare at least one flexible disk. Initially, the following message is displayed.

```
FLOPPY TEST                                (-0101083182-)
***** WARNING *****
DATA WILL BE DESTROYED

Insert SCRATCH FLOPPY In Drive A And Press ENTER when Ready
_
```

Insert a floppy disk in drive A (the data on the flexible disk can be destroyed) and push the button. When the drive is ready, press ENTER key. If flexible disk test is not performed, press "P" instead of the ENTER key. When the ENTER key is pressed, the disk is formatted and the track number of the track being currently accessed is displayed as follows:

```
Current Track 0 1__
```

All tracks are formatted and data is written and read for all tracks. When an error is detected, the following message is displayed. This message is used commonly for all flexible disk tests.

```
DIAGNOSTIC CODE 01aa bb
or DIAGNOSTIC CODE 02aa bb
or DIAGNOSTIC CODE 03aa bb
```

"aa" and "bb" indicate the condition for error detection.

Following this message, the condition message is displayed.

There are following types of condition messages. See messages in Section 8 for details.

- FDD (Drive X) TIME OUT
- FDD (Drive X) EQUIPMENT CHECK
- FDD (Drive X) BAD ADDRESS MARK
- FDD (Drive X) REC NOT FOUND
- FDD (Drive X) BAD CRC (ID)
- FDD (Drive X) BAD CRC (DATA)
- FDD (Drive X) NO CYLINDER
- FDD (Drive X) BAD CYLINDER
- FDD (Drive X) WRITE PROTECT
- FDD (Drive X) NOT READY

FDD (Drive X) WRITE PROTECT

FDD (Drive X) NOT READY

The following message is displayed for the 2 messages above.

Insert SCRATCH FLOPPY In Drive X And Press ENTER When Ready

This message indicates that a write protect tab is attached to the flexible disk or the disk drive is not ready. Make sure that the disk drive is ready for write operation and press ENTER. In this case, P cannot be entered. If an inconsistency occurs with write data and read data, the following message is displayed.

DATA COMPARE ERROR OCCURED
* Continue ? (Y/N)___

If subsequent tracks are to be tested, enter Y and press ENTER. Otherwise, enter N and press ENTER. Upon completion of test for drive A, perform the same test for drive B.

Insert SCRATCH FLOPPY In Drive B and Press ENTER When Ready

Insert the flexible disk whose data can be discarded in drive B and push the button. When the drive is ready, press ENTER. If test is not performed for disk drive B, enter P instead of the ENTER key. Test for drive B can be done in the same manner as that for drive A. Upon completion of drive B test, copy test for drives A and B is started.

Insert SCRATCH FLOPPY In All Drives And Press ENTER When Ready

Insert flexible disks whose data can be discarded in drives A and B and push the button. When both drives are ready, press ENTER. If test is not performed for drives A and B, enter P instead of the ENTER key.

Proceed with the next random test. Data on disk is copied from drive A to B.

COPY TEST. A → B

When an error is detected, a message is displayed as is the case for drive A test. When copy is completed, the following message is displayed.

Continue ? (Y/N)

Enter Y and press ENTER to copy data from drive B to A; enter N and press ENTER to start the random test. In the former case, the following message is displayed and the copy test is started.

COPY TEST. B → A

Upon completion of copying from drive B to A, the following random test is started.

FDD RANDOM ACCESS TEST

Insert SCRATCH FLOPPY In All Drives And Press ENTER When Ready

Insert flexible disks whose data can be discarded in drives A and B, and push the button. When both drives are ready, press ENTER. If this random test is not performed, enter P instead of the ENTER key.

In this case, the flexible disk test is terminated; afterwards, the next test specified in the menu is started and the menu is redisplayed. If an error is detected during this test, the processing is continued. To terminate the test, press the BREAK key. The number of errors detected is displayed as follows:

Drive A Error Count = aa
Drive B Error Count = bb
* Continue ? (Y/N)

The symbols “aa” and “bb” indicate the numbers of errors detected.

To terminate the test, enter N and press ENTER. The next test specified in the menu is started or the menu is redisplayed.

If Y is entered and the ENTER key is pressed, the random test is performed. During flexible disk test, if the BREAK key is pressed when the keyboard is in a wait state, the test is cancelled and the menu is redisplayed.

6. Printer test

When the printer test is selected, the following will be displayed, asking you to select the size of paper to be used for the test.

```
PRINTER TEST (0101090982-)
Select LIST SIZE
1: 80 Characters/Line
2: 136 Characters/Line
SIZE (1 or 2) =
```

Press 1 to select a paper size of 80 characters per line and 2 to select a paper size of 136 characters per line. ENTER is not necessary.

(1) Reset

Printer reset is performed. This takes approx. 1 sec. The following message is displayed to show that the printer is ready.

```
Press ENTER When Printer Is Ready
```

(2) Test procedure

CR (carriage return), LF (line feed), VT (vertical tab), FF (form feed), Shift In, Shift Out, character and bit image printing as well as continuous character printing are all performed. Continuous printing will continue until BREAK is input.

During the tests described above, the current test item is displayed as follows as each test is performed.

```
CR3   (Carriage return)
LF 3   (Line Feed)
VT 3   (Vertical Tabulation)
FF     (Form Feed)
Shift In
Shift Out
Shift In & Shift Out
Character
Bit Image
Bit Image
* Is The List Correct?
```

(3) Error messages

During print execution, if an error, or a condition in which printing is not possible, is detected, one of the following messages will be displayed.

```
PRINTER OFF LINE
```

The printer is off line.

PRINTER POWER OFF

Power is not being supplied to the printer.

PRINTER NOT READY

The printer is not in the ready state.

PRINTER PAPER END

There is no paper set in the printer. In the above cases, the following message will be displayed.

Press ENTER When Printer Is Ready

This indicates that you should input ENTER after you have put the printer in the ready state by correcting the condition indicated in the error message.

At this point, input BREAK to cancel the test and perform the next test as specified by a command or the menu.

When the source of the error is a hardware malfunction, one of the following messages will be displayed.

PRINTER HARDWARE ERROR

This indicates a malfunction in the printer.

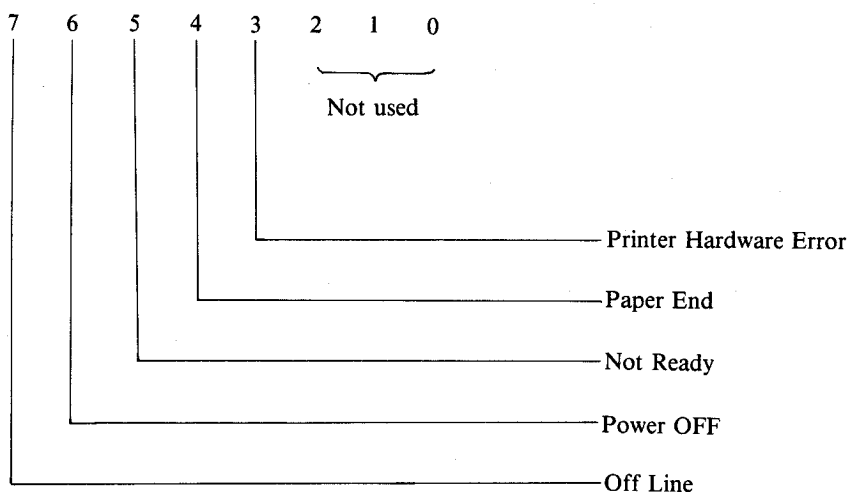
PRINTER TIME OUT

The printer cannot print even after waiting the fixed time. When either of the above errors occur, the following message will be displayed.

DIAGNOSTIC CODE 0050 aa

aa is a two-digit hex code indicating the status of the printer at the time the error occurs.

The values of each bit of aa denote the following.



Then, the following message will be displayed.

* Continue? (Y/N)

If you input Y ENTER, processing will continue.
If you input N ENTER to execute the next test as specified by the menu or a command.
Before each of the printer tests is executed, the contents of the test will be displayed.
When the following message is displayed,

* Is The List Correct?

Input Y ENTER if the list is correct, and N ENTER if it is not. Press BREAK to return to the menu display.

If you input Y ENTER, continuous printing will be performed.
If you input N ENTER, the following message will be displayed.

* Continue? (Y/N)

Input Y ENTER to perform continuous printing and N ENTER to end the test.
The following message is displayed when the BREAK key is pressed during continuous printing.

* Continue? (Y/N)

Press the N key and ENTER to proceed with the subsequent test specified in the menu or to return to the menu.

If the Y key and ENTER are pressed, character codes from 020H ((32)D) to 07EH ((126)D) are printed continuously until the BREAK key is pressed. The following message is displayed when the BREAK key is pressed.

* Continue? (Y/N)

Press the Y key and ENTER to restart the printer test from the beginning.
Press the N key and ENTER to proceed with the next test specified in the menu or to return to the menu.

The results of test execution using an MX-80 TYPE III are shown below.

CR 1 CR 2 CR 3

LF 1
LF 2

LF 3

VT 1
VT 2

VT 3

Form Feed

7. CMOS RAM Test

This is a test for write/read and battery back-up of the CMOS RAM. Since data will be written to CMOS RAM in this test, the following message is displayed to warn you that the data in the CMOS RAM will be lost.

```
CMOS TEST          (-01010927829-)
***** WARNING *****
DATA WILL BE DESTROYED
Press The ENTER Key
```

If you wish to execute the test, press the ENTER key, if you do not wish to execute the test, press the BREAK key to return to the menu display.

(1) Write/read test for the CMOS RAM

In this test, the CMOS RAM is enabled and data FFH is written to all addresses. Then, the data is read to check if FFH has been correctly written into all addresses. If all the addresses contain FFH, data 0 is then written and read for all addresses. The following message appears if the data read is not the same as the data written.

```
DIAGNOSTIC CODE 0060 aa
```

aa is a 2-digit hex code in which only those bits in which there is a discrepancy between the data read and the data written appear as 1s.

Example

aa = 20H = 0010 0000B

This shows that the data read in bit 5 does not match the data written. Also, the following message will be displayed to confirm the error.

```
CMOS WRITE/READ ERROR
Press The ENTER Key
```

At this time, if you press the ENTER key, the next test as specified by the menu or by a command will be executed. Press the BREAK key to return to the menu display. Only input of the above-mentioned keys will be accepted. If the CMOS RAM is found to be in proper state, a test of the battery back-up will be performed.

(2) CMOS RAM battery back-up test

In this test, the following message will be displayed first.

```
Turn OFF The Dip Switch Bit 5
```

Set DIP SW 5 located at the back of the QX-10 to the OFF position. The program will loop until this DIP SW is turned OFF. The following message is displayed when DIP SW 5 is turned OFF.

Turn OFF The Power Switch And Turn ON After 5 Minutes

Turn the power OFF, according to the message.

To cancel this test, return the DIP SW which you had just set to the ON position and press the BREAK key to return to the menu display. Pressing any other keys at this time will cause misoperation.

Turn the power ON again after waiting for 5 minutes, and the menu display will be skipped and the following will be displayed directly.

CMOS TEST
Turn ON The Dip Switch Bit 5

When this is displayed, return DIP SW 5 to the ON position. The CMOS RAM will be enabled and a check will be performed to ascertain whether data 5AH still remains in all addresses. If a value other than 5AH is encountered, the following message will be displayed to show the back-up failure.

DIAGNOSTIC 0065 aa
CMOS (Battery Back-up) FAULT

aa is a 2-digit hex code in which the bits that differ from data 5AH appear as 1s. If the CMOS RAM was properly backed-up, the following message is displayed.

CMOS (Battery Back-up) NORMAL

The following message will be displayed whether an error was detected or not to disable the CMOS RAM and confirm the battery backup test.

Press The ENTER Key

Press the ENTER or BREAK key to return to the menu.

8. Message list

8.1 DIAGNOSTIC CODE aaa bb

aaaa	Meaning	bb	Remarks
0000	Test following power on has been normally completed.	None	
0001	Abnormal CPU operation	None	Test stopped.
0002	Resident RAM W/R error	None	Test stopped.
0010	Main memory W/R error	Hexadecimal number whose "1" bits indicate defective RAM chips in main memory.	
		bb = 50: W/R error in all banks	Test stopped.
0030	Keyboard interrupt error	Error caused by interrupt code	
		bb = 88: Interrupt time out	
0035	Keyboard data error	Error key code	
		bb = EE Input not possible for some key	
0040	Display error	bb = 10: Attribute error	
		bb = 11: Display error for the entire character set	
		bb = 12: Display error for the entire screen	
		bb = 14: Graphic/character display error	
		bb = 16: Character zoom error	
		bb = 18: Graphic zoom error	
		bb = 20: DMA write error	
		bb = 22: DMA read error	
0050	Printer error	Error condition	See Section 6.
0060	CMOS RAM W/R error	Hexadecimal number whose "1" bits indicate defective RAM chips in main memory.	
0065	CMOS RAM battery backup error	Hexadecimal number whose "1" bits indicate defective RAM chips in main memory.	
01aa	Flexible disk drive test error	bb = command, aa = error condition	Explained below.
02aa	Flexible disk drive time out	bb = command, aa = error condition	Explained below.
03aa	Flexible disk drive hardware trouble	bb = command, aa = error condition	Explained below.

8.2. Other printer test error message

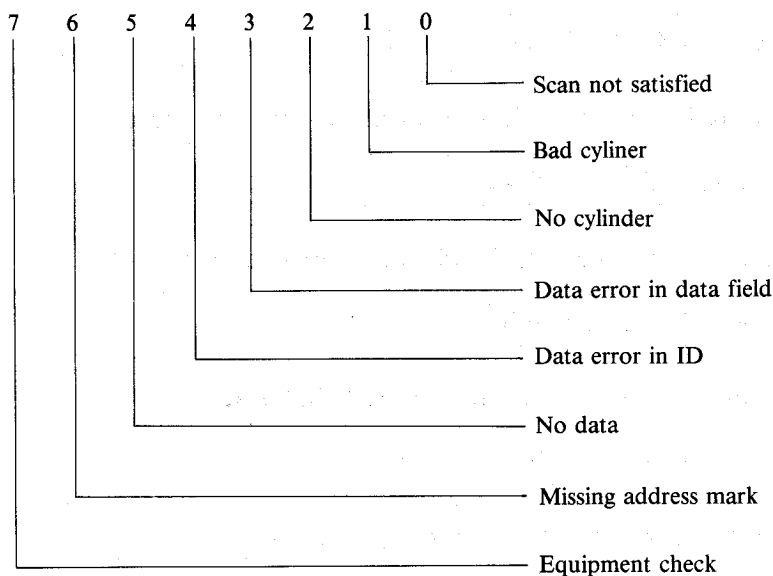
PRINTER TIME OUT

No response was received from the printer within a certain period of time.

8.3 Flexible disk drive test error messages

DIAGNOSTIC CODE 01aa bb
DIAGNOSTIC CODE 02aa bb
DIAGNOSTIC CODE 03aa bb

aa indicates one of the error conditions as shown below.



bb indicates the command which was issued when the error occurred.

- bb = 04 Sense device status
- 07 Recalibrate
- 08 Sense interrupt status
- 0F Seek
- 45 Write
- 46 Read
- 4A Read ID
- 4D Write ID

In the following error messages, x indicates the drive in which the error was detected.

FDD (Drive x) TIME OUT

No response was received from the flexible disk drive within a certain period of time.

FDD (Drive x) EQUIPMENT CHECK

An error was detected in drive x; or, the track 0 signal was not detected within a certain period of time when recalibration was performed.

FDD (Drive x) BAD ADDRESS MARK

The flexible disk was not initialized or the address mark was not detected.

FDD (Drive x) REC NOT FOUND

The object sector was not found or the format of the sector ID is incorrect.

FDD (Drive x) BAD CRC (ID)

A CRC error was detected when the object sector information was read.

FDD (Drive x) BAD CRC (DATA)

A CRC error was detected when data in the object sector was read.

FDD (Drive x) NO CYLINDER

The object cylinder was not found or was not properly initialized.

FDD (Drive x) BAD CYLINER

The object cylinder is defective or was not properly initialized.

FDD (Drive x) WRITE PROTECT

Data writes to the object drive are not possible.

FDD (Drive x) NOT READY

The flexible disk drive was not ready.

Appendix H-CP/M Messages

Messages come from several different sources. CP/M displays error messages when there are errors in calls to the Basic Disk Operating System (BDOS). CP/M also displays messages when there are errors in command lines. Each utility supplied with CP/M has its own set of messages. The following lists CP/M messages and utility messages. One might see messages other than those listed here if one is running an application program. Check the application program's documentation for explanations of those messages.

Message	Meaning
?	This message has four possible meanings: 1) DDT does not understand the assembly language instruction. 2) The file cannot be opened. 3) A checksum error occurred in a HEX file. 4) The assembler/disassembler was overlaid.
ABORTED	You stopped a PIP operation by pressing a key.
ASM Error Messages	D Data error: data statement element cannot be placed in specified data area. E Expression error: expression cannot be evaluated during assembly. L Label error: label cannot appear in this context (might be duplicate label). N Not implemented: unimplemented features, such as macros, are trapped. O Overflow: expression is too complex to evaluate. P Phase error: label value changes on two passes through assembly. R Register error: the value specified as a register is incompatible with the code. S Syntax error: improperly formed expression. U Underlined label: label used does not exist. V Value error: improperly formed operand encountered in an expression.
BAD DELIMITER	Check command line for typing errors.
Bad Load	CCP error message, or SAVE error message.
Bdos Err On d:	Basic Disk Operating System Error on the designated drive: CP/M replaces d: with the drive specification of the drive where the error occurred. This message is followed by one of the four phrases in the situations described below.

Message	Meaning
Bdos Err On d: Bad Sector	This message appears when CP/M finds no disk in the drive, when the disk is improperly formatted, when the drive latch is open, or when power to the drive is off. Check for one of these situations and try again. This could also indicate a hardware problem or a worn or improperly formatted disk. Press CTRL-C to terminate the program and return to CP/M, or press the return key to ignore the error.
Bdos Err On d: File R/O	You tried to erase, rename, or set file attributes on a Read-Only file. The file should first be set to Ready-Write (RW) with the command: "STAT filespec \$R/W."
Bdos Err On d: R/O	Drive has been assigned Read Only status with a STAT command, or the disk in the drive has been changed without being initialized with a CTRL-C. CP/M terminates the current program as soon as you press any key.
Bdos Err on d: Select	CP/M received a command line specifying a nonexistent drive. CP/M terminates the current program as soon as you press any key. Press return key or CTRL-C to recover.
Break "x" at c	<p>"x" is one of the symbols described below and c is the command letter being executed when the error occurred.</p> <ul style="list-style-type: none"> # Search failure. ED cannot find the string specified in an F, S, or N command. ? Unrecognized command letter c. ED does not recognize the indicated command letter, or an E, H, Q, or O command is not alone on its command line. O The file specified in an R command cannot be found. > Buffer full. ED cannot put any more characters in the memory buffer, or the string specified in an F, N, or S command is too long. E Command aborted. A keystroke at the console aborted command execution. F Disk or directory full. This error is followed by either the disk or directory full message. Refer to the recovery procedures listed under these messages.

Message	Meaning
CANNOT CLOSE DESTINATION FILE- {filespec}	An output file cannot be closed. You should take appropriate action after checking to see if the correct disk is in the drive and that the disk is not write protected.
Cannot close, R/O CANNOT CLOSE FILES	CP/M cannot write to the file. This usually occurs because the disk is write-protected. An output file cannot be closed. This is a fatal error that terminates ASM execution. Check to see that the disk is in the drive, and that the disk is not write-protected. The disk file written by a W command cannot be closed. This is a fatal error that terminates DDT execution. Check if the correct disk is in the drive and that the disk is not write-protected. This error can occur during SUBMIT file processing. Check if the correct system disk is in the A drive and that the disk is not write-protected. The SUBMIT job can be restarted after rebooting CP/M.
CANNOT READ	PIP cannot read the specified source. Reader may not be implemented.
CANNOT WRITE	The destination specified in the PIP command is illegal. You probably specified an input device as a destination.
Checksum error	A hex record checksum error was encountered. The hex record that produced the error must be corrected, probably by recreating the hex file.
CHECKSUM ERROR LOAD ADDRESS hhhh ERROR ADDRESS hhhh BYTES READ: hhhh:	File contains incorrect data. Regenerate hex file from the source.
Command Buffer Overflow	The SUBMIT buffer allows up to 2048 characters in the input file.
Command too long	A command in the SUBMIT file cannot exceed 125 characters.

Message	Meaning
CORRECT ERROR, TYPE RETURN OR CTRL-Z	A hex record checksum was encountered during the transfer of a hex file. The hex file with the checksum error should be corrected, probably by recreating the hex file.
DESTINATION IS R/O, DELETE (Y/N)?	The destination file specified in a PIP command already exists and it is Read Only. If you type Y, the destination file is deleted before the file copy is done.
Directory full	There is not enough directory space for file being written to the destination disk. You can use the OX filespec command to erase any unnecessary files on the disk without leaving the editor.
Disk full	There is not enough directory space to write the \$\$\$SUB file used for processing SUBMITs. Erase some files or select a new disk and retry.
Disk full	There is not enough disk space for the output file. This error can occur on the W, E, H, or X commands. If it occurs with X command, you can repeat the command prefixing the filename with a different drive.
DISK READ ERROR- {filespec}	The input disk file specified in a PIP command cannot be read properly. This is usually the result of an unexpected end-of-file. Correct the problem in your file.
DISK WRITE ERROR- {filespec}	A disk write operation cannot be successfully performed during a W command, probably due to a full disk. You should either erase some unnecessary files or get another disk with more space.
	A disk write operation cannot be successfully performed during a PIP command, probably due to a full disk. You should either erase some unnecessary files or get another disk with more space and execute PIP again.
	The SUBMIT program cannot write the \$\$\$SUB file to the disk. Erase some files, or select a new disk and try again.
ERROR: BAD PARAMETER	You entered an illegal parameter in a PIP command. Retype the entry correctly.

Message	Meaning
ERROR: CANNOT OPEN SOURCE, LOAD ADDRESS hhhh	Displayed if LOAD cannot find the specified file or if no filename is specified.
ERROR: CANNOT CLOSE FILE, LOAD ADDRESS hhhh	Caused by an error code returned by a BDOS function call. Disk may be write protected.
ERROR: CANNOT OPEN SOURCE, LOAD ADDRESS hhhh	Cannot find source file. Check disk directory.
ERROR: DISK READ, LOAD ADDRESS hhhh	Caused by an error code returned by a BDOS function call.
ERROR: DISK WRITE, LOAD ADDRESS hhhh	Destination Disk is full.
ERROR: INVERTED LOAD ADDRESS, LOAD ADDRESS hhhh	The address of a record was too far from the address of the previously-processed record. This is an internal limitation of LOAD, but it can be circumvented. Use DDT to read the hexfile into memory, then use a SAVE command to store the memory image file on disk.
ERROR: NO MORE DIRECTORY SPACE, LOAD ADDRESS hhhh	Disk directory is full.
Error on line nnn message	The SUBMIT program displays its messages in the format shown above, where nnn represents the line number of the SUBMIT file. Refer to the message following the line number.
FILE ERROR	Disk or directory is full, and ED cannot write anything more on the disk. This is a fatal error, so make sure there is enough space on the disk to hold a second copy of the file before invoking ED.
FILE EXISTS	You have asked CP/M to create or rename a file using a file specification that is already assigned to another file. Either delete the existing file or use another file specification. The new name specified is the name of a file that already exist. You cannot rename a file with the name

Message	Meaning
	of an existing file. If you want to replace an existing file with a newer version of the same file, either rename or erase the existing file, or use the PIP utility.
File exists, erase it	The destination filename already exists when you are placing the destination file on a different disk than the source. It should be erased or another disk selected to receive the output file.
FILE IS READ/ONLY	The file specified in the command to invoke ED has the Read Only attribute. ED can read the file so that the user can examine it, but ED cannot change a Read Only file.
File Not Found	<p>CP/M cannot find the specified file. Check that you have entered the correct drive specification or that you have the correct disk in the drive.</p> <p>ED cannot find the specified file. Check that you have entered the correct drive specification or that you have the correct disk in the drive.</p> <p>STAT cannot find the specified file. The message might appear if you omit the drive specification. Check to see if the correct disk is in the drive.</p>
FILE NOT FOUND- {filespec}	An input file that you have specified does not exist.
Filename required	You typed the ED command without a filename. Reenter the ED command followed by the name of the file you want to edit or create.
hhhh?? = dd	The ?? indicates DDT does not know how to represent the hexadecimal value dd encountered at address hhhh in 8080 assembly language. dd is not an 8080 machine instruction opcode.
Insufficient memory	There is not enough memory to load the file specified in an R or E command.
Invalid Assignment	You specified an invalid drive or file assignment,

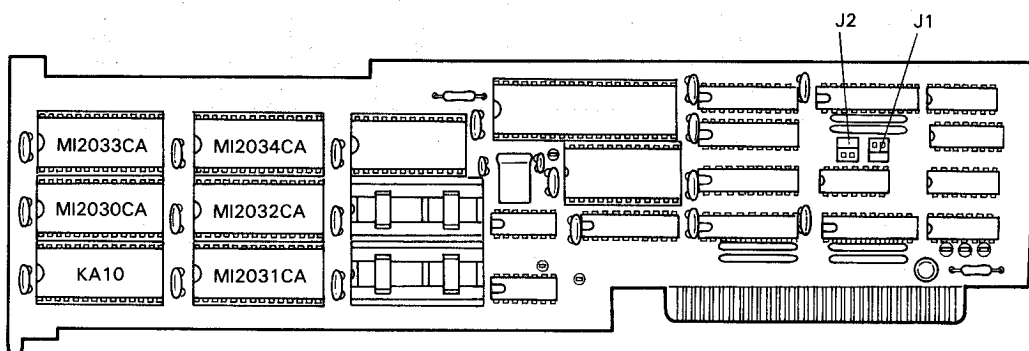
Message	Meaning
	or misspelled a device name. This error message might be followed by a list of the valid file assignments that can follow a filename. If an invalid drive assignment was attempted the message "Use: d: = RO" is displayed, showing the proper syntax for drive assignments.
Invalid control character	The only valid control characters in the SUBMIT files of type SUB are ^A through ^Z. Note that in a SUBMIT file the control character is represented by typing the circumflex, ^, not by pressing the control key.
INVALID DIGIT- {filespec}	An invalid hex digit has been encountered while reading a hex file. The hex file with the invalid hex digit should be corrected, probably by recreating the hex file.
Invalid Disk Assignment	Might appear if you follow the drive specification with anything except = R/O.
INVALID DISK SELECT	CP/M received a command line specifying a nonexistent drive, or the disk in the drive is improperly formatted. CP/M terminates the current program as soon as you press any key.
INVALID DRIVE NAME (Use A, B, C, or D)	SYSGEN recognizes only drives A, B, C and D as valid destinations for system generation.
Invalid File Indicator	Appears if you do not specify RO, RW, DIR, or SYS.
INVALID FORMAT	The format of your PIP command is illegal. See the description of the PIP command.
INVALID HEX DIGIT LOAD ADDRESS hhhh ERROR ADDRESS hhhh BYTES READ: hhhh	File contains incorrect hex digit.
INVALID MEMORY SIZE	Specify a value less than 64K or your computer's actual memory size.
INVALID SEPARATOR	You have placed an invalid character for a separator between two input filenames.

Message	Meaning
INVALID USER NUMBER	You have specified a user number greater than 15. User numbers are in the range 0 to 15.
n?	You specified a number greater than fifteen for a user area number. For example, if you type USER <input type="text" value="18?"/> , the screen displays 18?.
NO DIRECTORY SPACE	The disk directory is full. Erase some files to make room for PRN and HEX files. The directory can usually hold only 64 filenames.
NO DIRECTORY SPACE-{filespec}	There is not enough directory space for the output file. You should either erase some unnecessary files or get another disk with more directory space and execute PIP again.
NO FILE-{filespec}	CP/M cannot find the specified file, or no files exist. The indicated source or include file cannot be found on the indicated drive. The file specified in an R or E command cannot be found on the disk.
NO INPUT FILE PRESENT ON DISK	The file you requested does not exist.
No memory	There is not enough (buffer?) memory available for loading the program specified.
NO SOURCE FILE ON DISK	SYSGEN cannot find CP/M either in CPMxx.com form or on the system tracks of the source disk.
NO SOURCE FILE PRESENT	The assembler cannot find the file you specified. Either you mistyped the filespecification in you command line, or the file is not type ASM.
NO SPACE	Too many files are already on the disk, or no room is left on the disk to save the information.
No SUB file present	For SUBMIT to operate properly, you must create a file with filetype of SUB. The SUB file contains usual CP/M commands. Use one command per line.

Message	Meaning
NOT A CHARACTER SOURCE	The source specified in your PIP commands is illegal. You have probably specified an output device as a source.
NOT DELETED	PIP did not delete the file, which may have had the R/O attribute.
NOT FOUND	PIP cannot find the specified file.
OUTPUT FILE WRITE ERROR	You specified a write-protected diskette as the destination for the PRN and HEX files, or the diskette has no space left. Correct the program before assembling your program.
Parameter error	Within the SUBMIT file of type sub, valid parameters are \$0 through \$9.
PARAMETER ERROR, TYPE RETURN TO IGNORE	If you press return, SYSGEN proceeds without processing the invalid parameter.
QUIT NOT FOUND	The string argument to a Q parameter was not found in your input file.
Read error	An error occurred when reading the file specified in the type command. Check the disk and try again. The STAT filespec command can diagnose trouble.
READER STOPPING	Reader operation interrupted.
Record Too Long	PIP cannot process a record longer than 128 bytes.
START NOT FOUND	The string argument to an S parameter cannot be found in the source file.
SOURCE FILE INCOMPLETE	SYSGEN cannot use your CP/M source file.
SOURCE FILE NAME ERROR	When you assemble a file, you cannot use the wildcard characters * and ? in the filename. Only one file can be assembled at a time.
SOURCE FILE READ ERROR	The assembler cannot understand the information in the file containing the assembly language program

Message	Meaning
	Portions of another file might have been written over your assembly language file, or information was not properly saved on the diskette. Use the TYPE command to locate the error. Assembly language files contain the letters, symbols, and numbers that appear on your keyboard. If your screen displays unrecognizable output or behaves strangely, you have found where computer instructions have crept into your file.
SYNCHRONIZATION ERROR	The MOVCPM utility is being used with the wrong CP/M system.
"SYSTEM" FILE NOT ACCESSIBLE	You tried to access a file set to SYS with the STAT command.
TOO MANY FILES	There is not enough memory for STAT to sort the files specified, or more than 512 files were specified.
UNEXPECTED END OF HEX FILE-{filespec}	An end-of-file was encountered prior to a termination hex record. The hex file without a termination record should be corrected, probably by recreating the hex file.
Unrecognized Destination	Check command line for valid destination.
Use: STAT d: = RO	An invalid STAT drive command was given. The only valid drive assignment in STAT is STAT d: = RO.
VERIFY ERROR: -{filespec}	When copying with the V option, PIP found a difference when rereading the data just written and comparing it to the data in its memory buffer. Usually this indicates a failure of either the destination disk or drive.
XSUB ACTIVE	XSUB has been invoked.
XSUB ALREADY PRESENT	XSUB is already active in memory.
Your input?	If CP/M cannot find the command you specified, it returns the command name you entered followed by a question mark. Check that you have typed the command line correctly, or that the command you requested exists as a .COM file on the default or specified disk.

Appendix I - MultiFonts Character Generator ROM Card



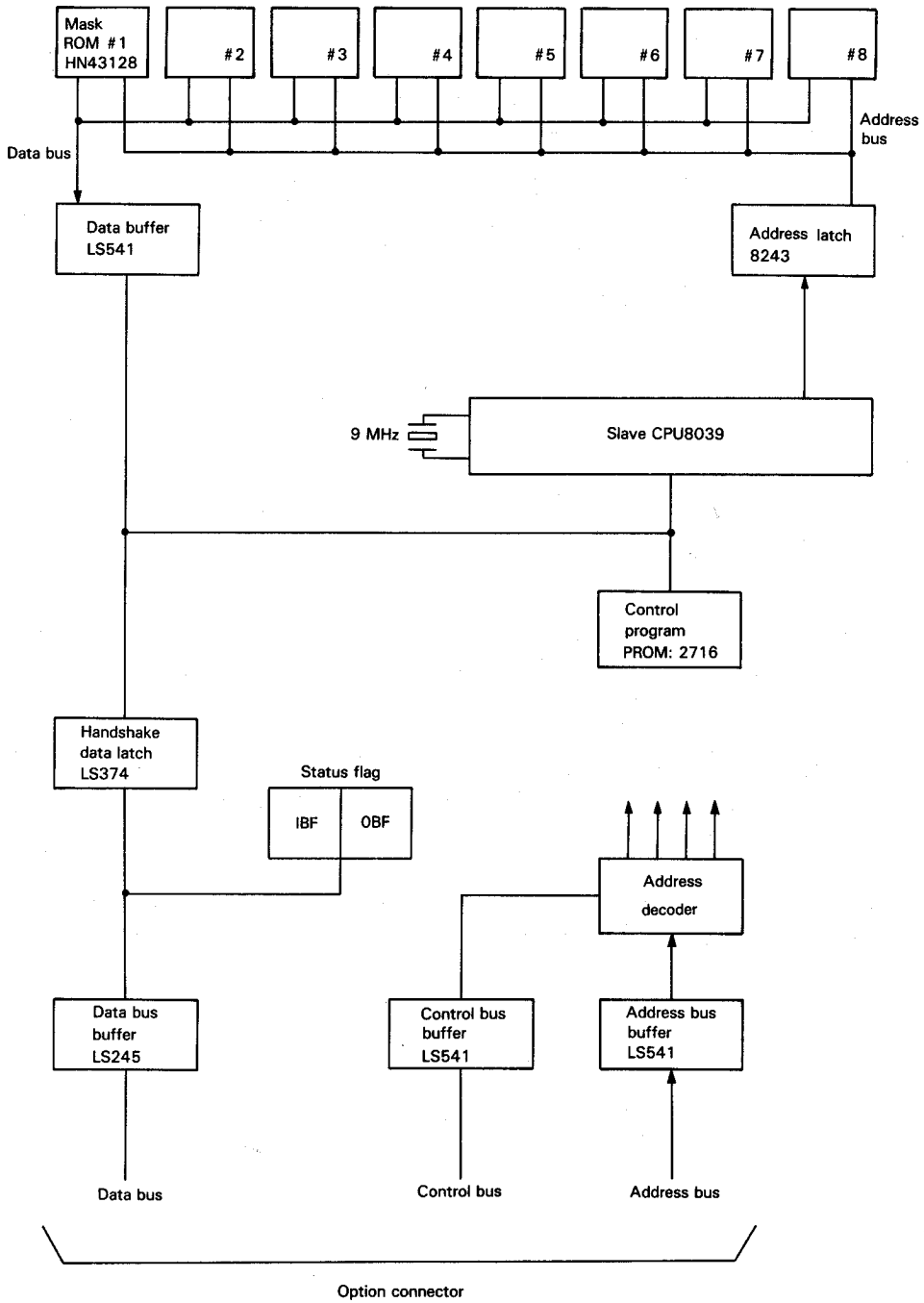
This card is a character generator consisting of six 128K-bit mask ROMs which generate fonts consisting of 14×17 dots. The card is mounted in the option slots of the QX-10.

Characters featured by this card is supported by Epson's MultiFonts CP/M. Also, the multiple fonts in the Q10MF include information necessary for proportional spacing.

The character generator ROM cards are controlled by the 8-bit 8039 slave CPU, with the control program stored on PROM 2716. Each of the mask ROMs includes multiple fonts of 512 characters.

Three flags (IBF, OBF, and ERR) are provided for data communication with the main system, and handshake protocol is used for exchanges of font code and pattern.

Block diagram

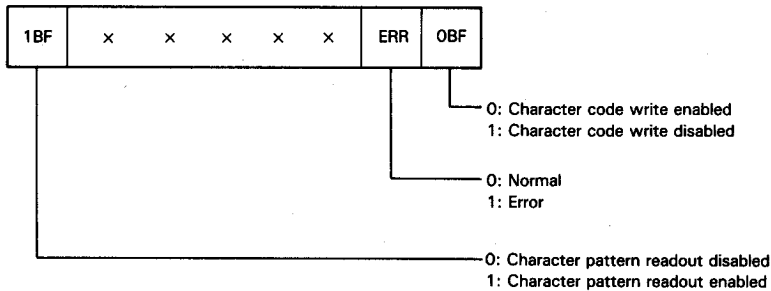


Procedures for using the character generators

Ports with which this option card is provided include status ports and data ports.

(1) Status port (F9H, FBH or FDH as set by the jumper)

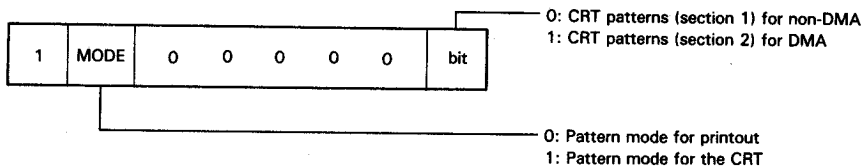
i The following statuses can be read by reading this port.



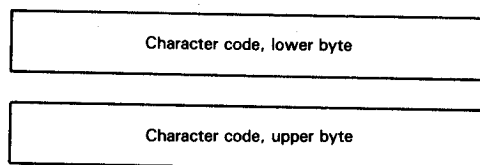
ii Writing data to this port (the contents do not matter) causes a hardware interrupt to be placed on interrupt line INT(L). Since this interrupt signal line is assigned to a different interrupt address for each option slot, it is possible to determine from this interrupt which slot the card is mounted in. This interrupt can be cleared by reading the status port.

(2) Data port (F8H, FAH, or FCH, as set by the jumper)

i Data written to this port consists of the following three bytes.



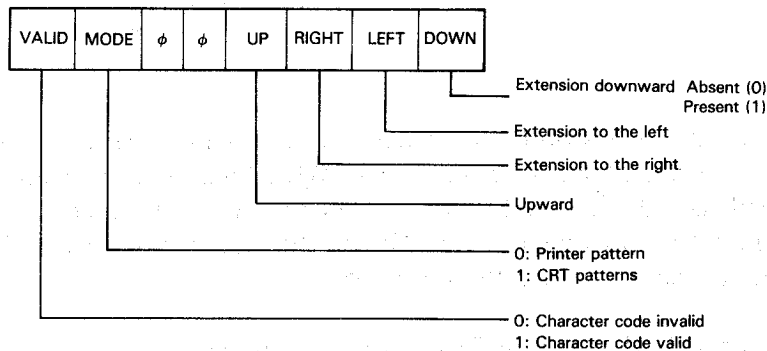
● **Command byte:** Specifies whether the pattern read from the character generator is to be sent to the CRT or the printer.



- **Character code bytes:** The command byte is sent first, followed in sequence by the lower and upper character code bytes. However, the character codes must be in the range from 0000H to 0DFFH; any values outside this range will result in an error.

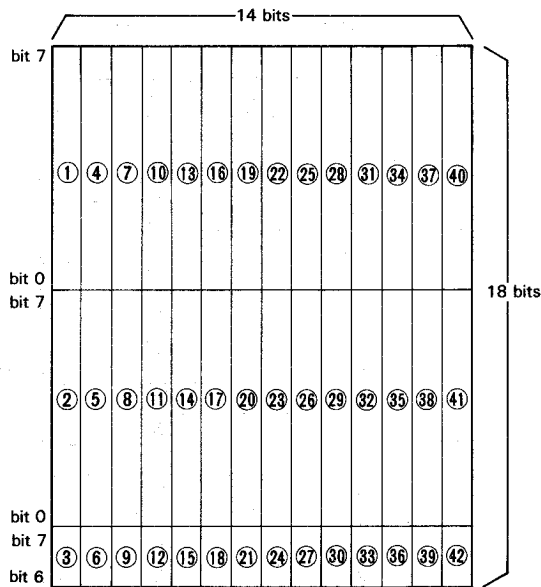
Bit OBF of the status port must be monitored as these three bytes are being written into the option card, and each byte written only when the bit becomes 0. Further, an interrupt is applied to line INT(L) when these three bytes have been read into the option card for preparation to read out the character pattern. (This interrupt can be cleared by reading the status port.)

- ii Character patterns are read out from the data port.

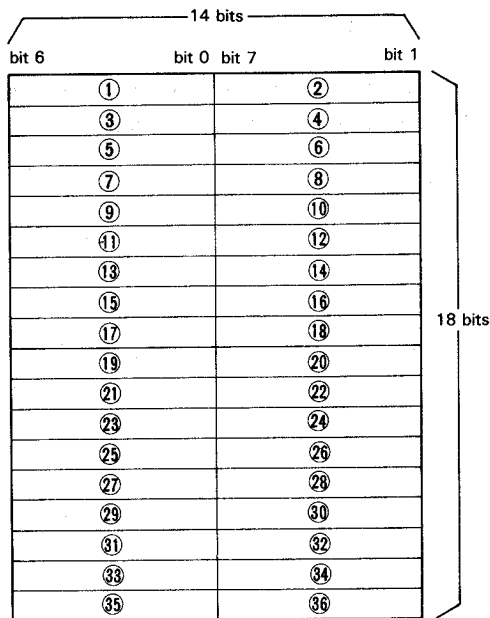


- **Status byte:** This byte contains the status information concerning the character pattern, and must be read out ahead of the character pattern.
- **Character pattern:** The pattern information differs according to the CRT or printer as shown below.

Pattern for printer



Pattern for CRT (1)

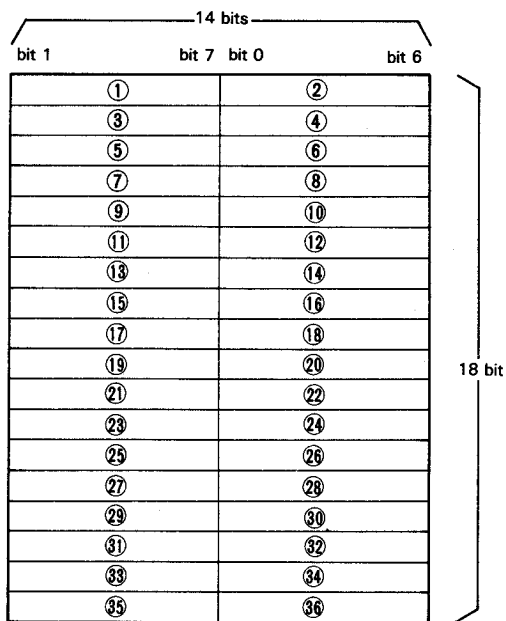


The IBF bit of the status port must be monitored as these patterns are read out, with each byte picked up as IBF becomes 1.

Note:

These patterns are used in the non-DMA mode when bit 0 of the command byte is 0.

Pattern for CRT (2)



This pattern is used in the DMA mode when bit 0 of the command byte is 1. Here, the bit pattern is reversed from that of the first instance.

Appendix J - International Character Sets

The QX-10 provides international character sets for the following eight countries:

United States	England
Germany	France
Italy	Spain
Denmark	Sweden

The characters displayed or printed for the above countries are as follows.

Country Hex. code	U.S.A.	France	Germany	England	Denmark	Sweden	Italy	Spain
23 (A3)	#	#	#	£	#	#	#	Pt
24 (A4)	\$	\$	\$	\$	\$	☉	\$	\$
40 (C0)	@	à	§	@	@	É	@	@
5B (DB)	|	°	Ä	|	Æ	Å	°	í
5C (DC)	\	ç	Ö	\	Ø	Ö	\	Ñ
5D (DD)	]	§	Ü	]	Å	Å	é	¿
5E (DE)	^	^	^	^	^	Ü	^	^
60 (E0)	•	•	•	•	•	é	ù	•
7B (FB)	{	é	ä	{	æ	ä	à	..
7C (FC)	|	ù	ö	|	ø	ö	ò	ñ
7D (FD)	}	è	ü	}	å	å	è	}
7E (FE)	~	..	ß	~	~	ü	ì	~

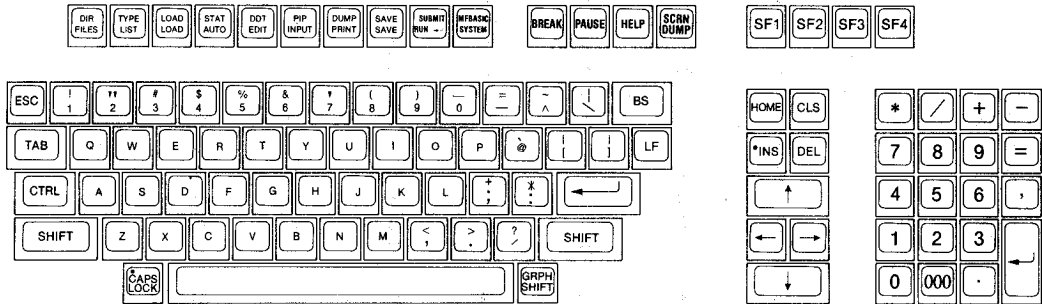
NOTE: Numbers in parentheses are hexadecimal codes.

NOTES:

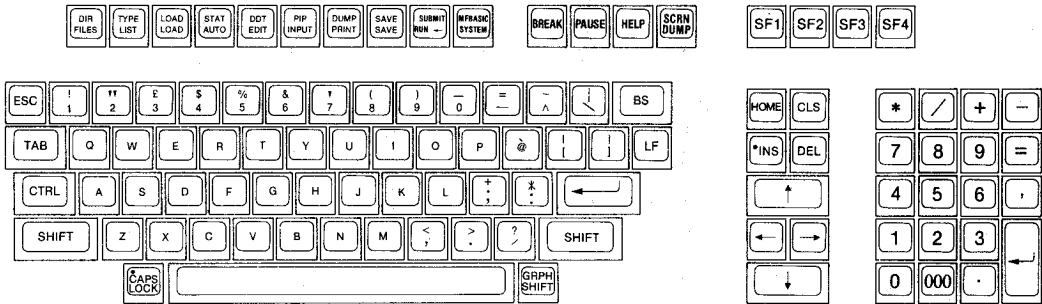
- 1) Numbers in parentheses are apply to the non-MFBASIC mode only.
- 2) In the WIDTH 80 or WIDTH 40 mode of MFBASIC, certain characters are blank when option style 16 (OCR B font) is selected.
- 3) Depending on the international character set selected, certain characters are blank when option style 15 (Old Germany) is selected.

Country Hex. code (Dec code)	U.S.A.	France	Germany	England	Denmark	Sweden	Italy	Spain
A0A3 (160-163)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0A4 (160-164)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0C0 (160-192)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0DB (160-219)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0DC (160-220)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0DD (160-221)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0DE (160-222)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0E0 (160-224)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0FB (160-251)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0FC (160-252)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0FD (160-253)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A0FE (160-254)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1A3 (161-163)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1A4 (161-164)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1C0 (161-192)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1DB (161-219)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1DC (161-220)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1DD (161-221)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1DE (161-222)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1E0 (161-224)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1FB (161-251)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1FC (161-252)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1FD (161-253)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A1FE (161-254)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2A3 (162-163)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2A4 (162-164)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2C0 (162-192)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2DB (162-219)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2DC (162-220)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2DD (162-221)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2DE (162-222)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2E0 (162-224)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2FB (162-251)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2FC (162-252)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2FD (162-253)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A2FE (162-254)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3A3 (163-163)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3A4 (163-164)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3C0 (163-192)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3DB (163-219)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3DC (163-220)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3DD (163-221)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3DE (163-222)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3E0 (163-224)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3FB (163-251)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3FC (163-252)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3FD (163-253)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$
A3FE (163-254)	# \$	# \$	# \$	£ \$	# \$	# \$	# \$	\$

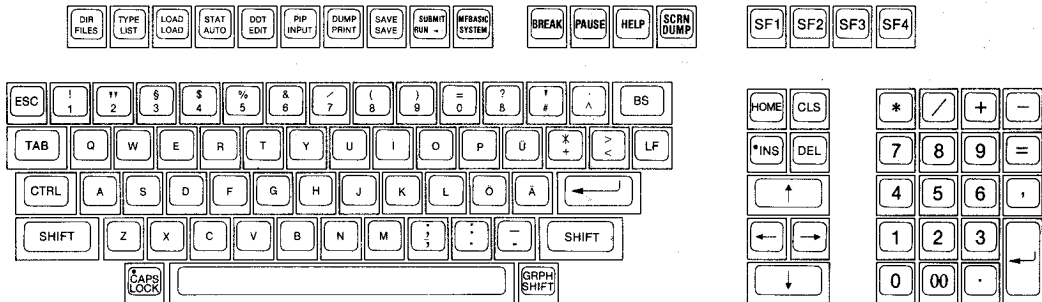
Appendix K - Layout of 8 Language Keyboards



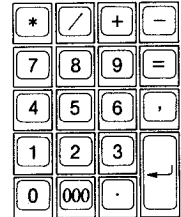
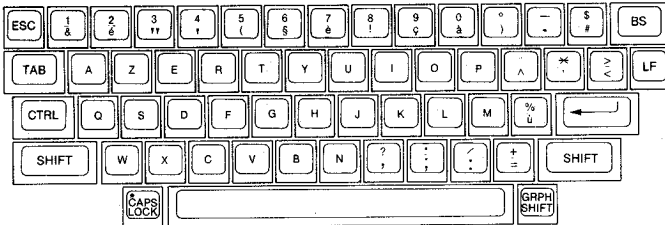
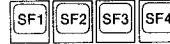
USASCII Keyboard



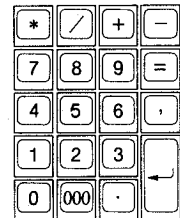
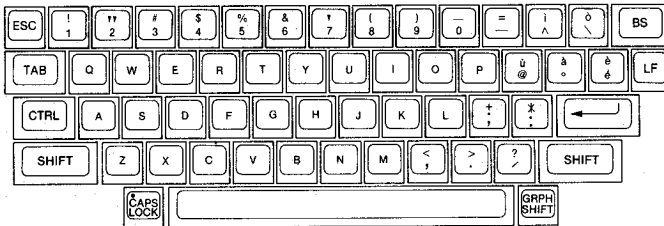
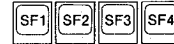
English Keyboard



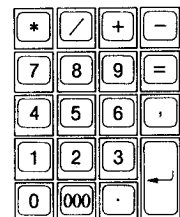
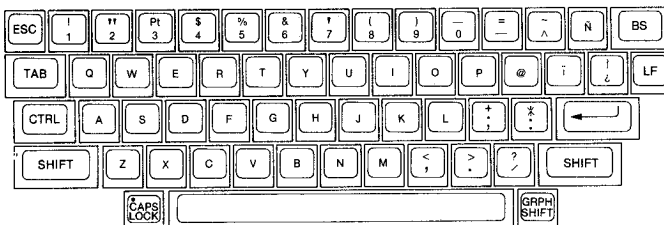
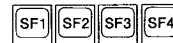
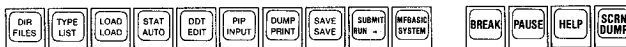
German Keyboard



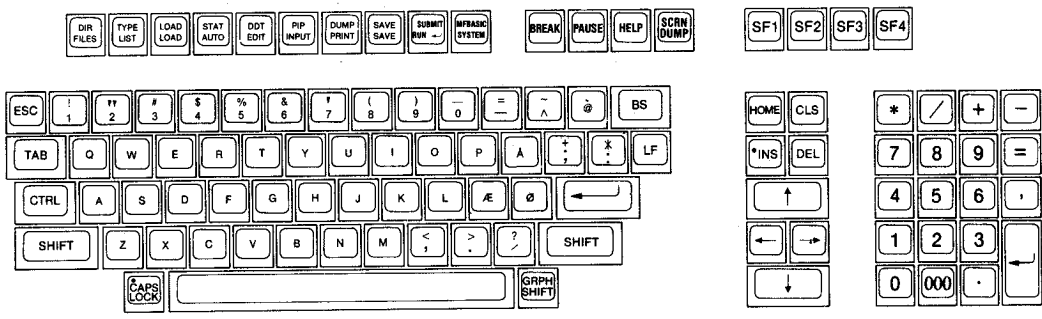
French Keyboard



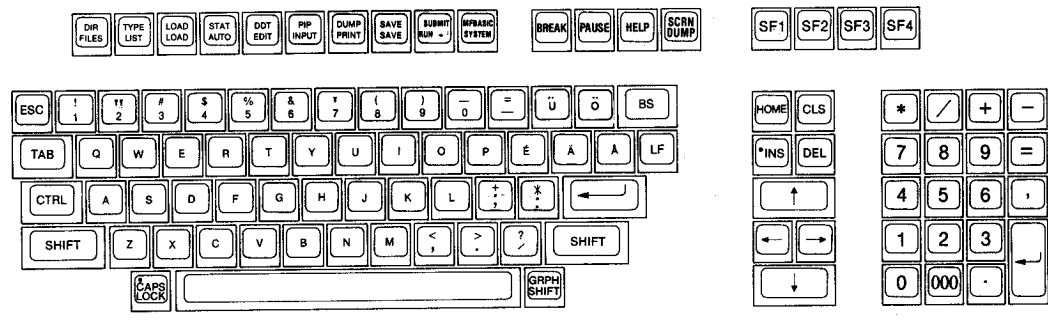
Italian Keyboard



Spanish Keyboard



Danish Keyboard



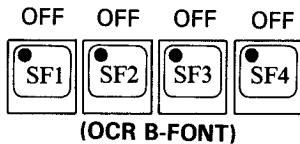
Swedish Keyboard

Appendix L - Multiple Fonts Style Selection

Characters printed or displayed are as shown at right when the style selection keys are set as shown at left.

Style Selection

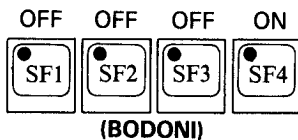
0:



```

! " # $ % & ' ( ) * + , - . /
0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z [ \ ] ^ _
` a b c d e f g h i j k l m n o
p q r s t u v w x y z { | }
    
```

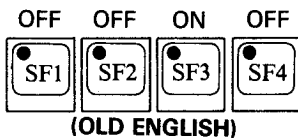
1:



```

! " # $ % & ' ( ) * + , - . /
0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z [ \ ] ^ _
` a b c d e f g h i j k l m n o
p q r s t u v w x y z { | } ~ Δ
    
```

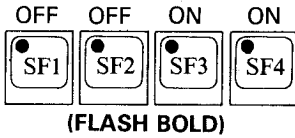
2:



```

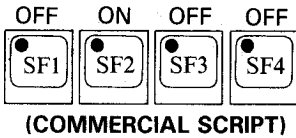
! " # $ % & ' ( ) * + , - . /
0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z [ \ ] ^ _
` a b c d e f g h i j k l m n o
p q r s t u v w x y z { | } ~ Δ
    
```

3:



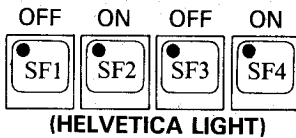
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

4:



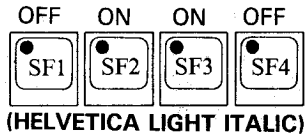
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

5:



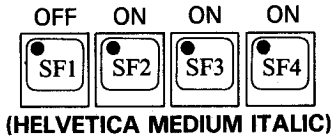
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

6:



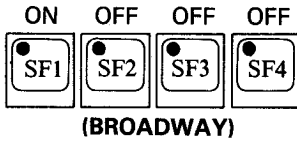
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

7:



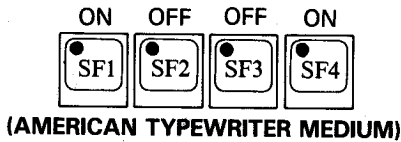
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

8:



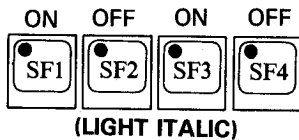
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

9:



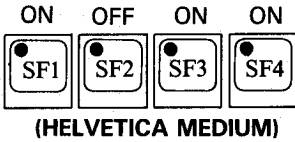
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

A:



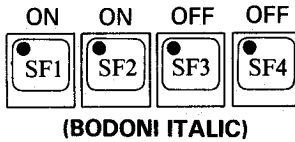
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

B:



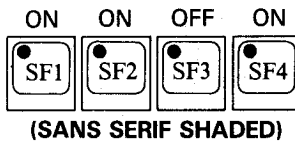
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

C:



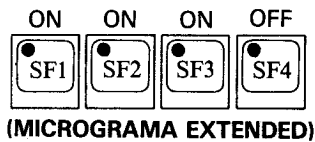
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

D:



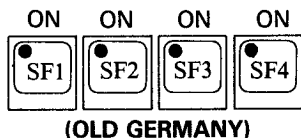
!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

E:



!"#\$%&'()*+,-./
 0123456789:;<=>?
 @ABCDEFGHIJKLMNO
 PQRSTUVWXYZ[\]^_
 'abcdefghijklmnop
 pqrstuvwxyz{!}~Δ

F:



! " # \$ % & ' () * + , - . /
0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z [\] ^ _
' a b c d e f g h i j k l m n o
p q r s t u v w x y z { | } ~ Δ

Appendix M - Character Code Tables

1. USASCII in Non-MFBASIC Mode

Hex. No.	Hex. No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex. No.	Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	0	16	SPACE	0	8	P	"	p	t	o	SPACE	O	@	P	"	p
1	0001	1	17	!	1	A	Q	a	q	l	•	!	1	A	Q	a	q
2	0010	2	18	"	2	B	R	b	r	τ	♥	"	2	B	R	b	r
3	0011	3	19	#	3	C	S	c	s	†	♦	#	3	C	S	c	s
4	0100	4	20	\$	4	D	T	d	t	‡	♣	\$	4	D	T	d	t
5	0101	EL	5	%	5	E	U	e	u	-	♠	%	5	E	U	e	u
6	0110	6	22	&	6	F	V	f	v	‡	♠	&	6	F	V	f	v
7	0111	BEL	7	'	7	G	W	g	w	‡	♠	'	7	G	W	g	w
8	1000	BS	8	(	8	H	X	h	x	‡	♠	(	8	H	X	h	x
9	1001	TAB	9	)	9	I	Y	i	y	‡	♠	)	9	I	Y	i	y
A	1010	LF	ES	*	:	J	Z	j	z	‡	♠	*	:	J	Z	j	z
B	1011	HOME	ESC	+	;	K	[	k	{	‡	♠	+	;	K	[	k	{
C	1110	CLS	→	<	<	L	\	l	|	‡	♠	<	L	\	l	|	
D	1101	←	←	=	=	M	]	m	}	‡	♠	=	M	]	m	}	
E	1110	↑	•	>	>	N	^	n	~	‡	♠	>	N	^	n	~	
F	1111	↓	/	?	?	O	_	o	Δ	‡	♠	/	?	O	_	o	Δ

USASCII in Non-MFBASIC Mode

2. USASCII in MFBASIC Mode

Hex. No.	Hex. No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex. No.	Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000			SPACE	0	@	P	‘	p	+	o						
1	0001	0	16	32	48	64	80	96	112	128	144						
2	0010	1	17	33	49	65	81	97	113	129	145						
3	0011	2	18	34	50	66	82	98	114	130	146						
4	0100	BREAK	PAUSE	#	3	C	S	c	s	†	♦						
5	0101	4	20	36	52	68	84	100	116	132	148						
6	0110	EL	5	21	37	53	69	85	101	117	133	149					
7	0111	6	22	38	54	70	86	102	118	134	150						
8	1000	BEL	7	23	39	55	71	87	103	119	135	151					
9	1001	BS	8	24	40	56	72	88	104	120	136	152					
A	1010	TAB	9	25	41	57	73	89	105	121	137	153					
B	1011	LF	ES	*	:	J	Z	j	z	J	*	154					
C	1100	HOME	ESC	+	;	K	[	k	[	*	↑	155					
D	1101	CLS	←	→	<	L	\	l	!	■	↓	156					
E	1110	←	→	←	→	=	M	J	m	J	■	x	157				
F	1111	↑	↓	↑	↓	>	N	^	n	~	■	±	158				
		15	31	47	63	79	95	111	127	143	159						

Graphic symbols
Multiple fonts
User-defined characters

USASCII in MFBASIC Mode

NOTES:

1. (0)_D through (31)_D are control characters.
2. (32)_D through (127)_D are ASCII characters.
3. (128)_D through (159)_D are graphic symbols.
4. (160)_D through (255)_D are multiple font characters.

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