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# Ultimate-II Virtual Printer

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User's Guide

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## 1. Introduction

### 1.1. Context

The virtual printer is an Ultimate-II feature since 3.0 firmware. With this functionality you can print from your Commodore 64/128 using a virtual IEC device #4 or #5.

This emulation simulates a Commodore MPS-1550C printer with all the commands that this printer can understand. Not all commands are executed as some of them are hardware related and cannot obviously be implemented. The results are printed to PNG image files, one file per page. You can also choose to bypass the printer emulation and to send the raw data from #4 or #5 IEC device to a file.

The MPS-1550C was a mid-range 4 colors ink ribbon 9 needle matrix printer sold by Commodore in the late 80's.

This printer is compatible with nearly all the usual programs that have been edited for C64/C128. It can interpret 4 printer instruction sets:

- Commodore MPS-801
- Epson FX-80/JX-80
- IBM Graphics Printer
- IBM Proprinter

### 1.2. License

Virtual Printer is released under the GNU General Public License 3.0. A full copy of the license is included in the root of the Ultimate-II firmware sources.

### 1.3. Purpose of this document

This document describes how to use and configure the Ultimate-II embedded virtual printer.

You will also find all the commands and charsets supported by the printer. Then you can add printer facility to your own BASIC programs!

## 2. Configuration

### 2.1. Overview

You will find all the configuration items for the printer in the IEC configuration menu.

### 2.2. Enable the printer


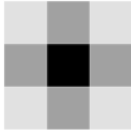
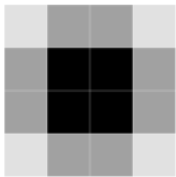
To enable the printer, you need to enable the software IEC feature in the Ultimate-II:

- Use the F2 Menu to enter Ultimate-II configuration and then select “**Software IEC Settings**”
- Then on item “**IEC Drive and Printer**” select “**Enabled**”

### 2.3. Printer configuration items

- **Printer Bus ID:** 4 or 5 (default is 4)  
This will assign device ID 4 or 5 to the printer on IEC bus.
- **Printer output file:** (default is `/SD/printer` on Ultimate II or `/Usb0/printer` on Ultimate II+)  
You can select file base name that the virtual printer will use to create the PNG files. If you choose to generate PNG files they will be named `printer-001.png`, `printer-002.png`, and so on. If you chose the bypass the emulation and write RAW binary data to disk the file will be named `printer` with no extension. When using ASCII filter output, extension `.txt` will be appended to file name.
- **Printer output type:** PNG B&W, PNG COLOR, ASCII or RAW (default is PNG B&W)  
PNG are images created by the printer emulator each time a page is ejected from the printer. If a file with the same name already exists, it will not be overwritten. RAW is the data directly sent by the C64/128 to the IEC port and recorded as binary to a file. ASCII will keep and convert printable characters to ISO8859-1 standard. This output only makes sense if you are printing text as you will only get garbage with bitmap. In both RAW and ASCII output mode, if the file already exists, the new data will be appended to it. Changing from COLOR to B&W and backward will clear the page, the contents are lost.
- **Printer ink density:** Low, Medium or High (default is Medium)  
You can consider this as “how strong is the pin impact on the paper”. *Low* will only print very small dots and *High* larger dots. As a consequence, this will change the resulting contrast. *High* gives the best result for DRAFT character mode. *Medium* may be well suited for NLQ character mode. Just test and see what match your needs. *See table below for samples.*
- **Printer emulation:** Commodore MPS, Epson FX-80/JX-80, IBM Graphics Printer, IBM Proprinter (default is Commodore MPS)  
You can select which instruction set the emulator will recognize. Changing from one emulation to another will reset the printer attributes but the printer head stays at the same place and the page is not ejected.

- Printer Commodore charset:** USA/UK, Denmark, France/Italy, Germany, Spain, Sweden, Switzerland (default is USA/UK)  
 Select which charset to use when using Commodore MPS emulation. If you don't know which one to choose, USA/UK is the one you want. See Commodore charset description on chapter 21.
- Printer Epson charset:** Basic, USA, France, Germany, England, Denmark I, Sweden, Italy, Spain, Japan, Norway, Denmark II (default is Basic)  
 Select which charset to use when using Epson FX-80/JX-80 emulation. See Epson charset description on chapter 10.
- Printer IBM table 2:** International 1, International 2, Israel, Greece, Portugal, Spain (default is International 1)  
 Select which charset to use for Table2 when using IBM Graphics Printer or IBM Proprinter emulation. IBM printers can use 2 charsets: Table 1 and Table2. Table 1 cannot be modified and is the default charset. Table 2 is the one you chose with this parameter. See IBM charset description in chapter 11.

Ink Density	Low	Medium	High
<b>Elementary Dot (x1)</b>	.	.	.
<b>Elementary Dot (x300)</b>			
<b>Draft text</b>	1541 ULTIMATE II	1541 ULTIMATE II	1541 ULTIMATE II
<b>NLQ text</b>	1541 ULTIMATE II	1541 ULTIMATE II	<b>1541 ULTIMATE II</b>
<b>Draft graphic chars</b>	♠ ♡ ♦ ♣	♠ ♡ ♦ ♣	♠ ♡ ♦ ♣
<b>NLQ graphic chars</b>	♠ ♡ ♦ ♣	♠ ♡ ♦ ♣	♠ ♡ ♦ ♣

### 3. Using the printer

#### 3.1. Printing from the C64/C128

Just use your program and tell it that you have a connected printer compatible with MPS Commodore series (e.g.: MPS-801/MPS-803 are the most frequently supported commodore printers).

#### 3.2. Flushing the printer spool

The printer has a very small buffer (256 bytes) and some data may still be in the buffer waiting to be printed when your print job is finished. The printer doesn't know that your job is finished and waits for more data to print until the end of the page.

You need to tell the printer that you want all the buffered data to be printed and to eject the current page. This works as the *Form Feed* button on the real MPS-1550C to eject the page.

Go to F5 Menu and select "**Flush Printer/Eject Page**". In PNG mode, this will make the current page to be written to a file. Next print job will start on a blank page. In RAW and ASCII mode this will write the buffered data to the file.

#### 3.3. Resetting the printer

You may need to reset printer to go back to an initial state. Go to F5 Menu and select "**Reset IEC and Printer**". Current data in printer buffer is lost. Current page that was being printed is also lost.

#### 3.4. Performances

Composing a page full of text and creating the B&W PNG file will need approximatively 15 seconds on the Ultimate-II (28 seconds using NLQ mode). You may think it's slow but this is much faster than a real MPS-1550C printer (1 min in DRAFT mode, 4 min in NLQ mode)! In color mode, creating the PNG file can last three times longer, be patient.

The Ultimate-II middle button becomes unresponsive while composing a page. The green LED on the right of the cartridge is lit when printer is working. Be patient and look at the activity LED to stop blinking.

RAW and ASCII modes are nearly immediate. There is no process time to wait.

At this time, with firmware 3.4c, the virtual printer is slower on Ultimate II+ than on Ultimate II as it is using a slower CPU. In fact, no processor cache is implemented yet in Ultimate II+, this may change in a future firmware as CPU is implemented in FPGA using VHDL.

#### 3.5. Color versus Black & White

Composing a B&W PNG page is faster than composing a color PNG page even if no color is used. That's why there is a PNG B&W output option. Most applications on C64/C128 don't know how to use the



instructions of a color printer. My advice is to enable PNG Color only when you know that you will need a color printer. Color PNG generates also bigger files than B&W PNG, this is due to the pixel depth of the file, 8 bits for color and 2 bits for B&W. Composing a color page also needs 4 times more memory than composing a B&W page but this does not seem to be a problem on Ultimate devices.

## 4. Capabilities

This table summarizes the printer capabilities depending on which printer emulation is active:

	Commodore MPS	Epson FX-80/JX-80	IBM Graphics Printer	IBM Proprinter
<b>Draft</b>	•	•	•	•
<b>Color</b>	•	•	•	•
<b>Double strike</b>	•	•	•	•
<b>Bold</b>	•	•	•	•
<b>Italic</b> ( <i>draft only</i> )	•	•	•*	
<b>NLQ</b>	•	•	•	•
<b>Underline</b>	•	•	•	•
<b>Double width</b>	•	•	•	•
<b>Superscript</b>	•	•	•	•
<b>Subscript</b>	•	•	•	•
<b>Reverse</b>	•			
<b>Overline</b>				•
<b>Backspace</b>		•	•	•
<b>Reverse page feed</b>		•		
<b>CR=CR+LF</b>	•			<i>optional</i>
<b>LF=CR+LF</b>	•	•		
<b>7 dot BIM</b>	•			
<b>8 dot BIM</b>		•	•	•
<b>9 dot BIM</b>		•		
<b>HT Program</b>		•	•	•
<b>VT Program</b>		•		•
<b>60 dpi BIM</b>	• ( <i>double width</i> )	•	•	•
<b>75 dpi BIM</b>		•		
<b>80 dpi BIM</b>		•		
<b>90 dpi BIM</b>		•		
<b>120 dpi BIM</b>		•	•	•
<b>240 dpi BIM</b>		•	•	•
<b>Pica (10cpi)</b>	•	•	•	•
<b>Elite (12cpi)</b>	•	•	•	•
<b>Micro (15cpi)</b>	•			
<b>Condensed (17.1cpi)</b>	•	•	•	•
<b>Pica Compressed (20cpi)</b>	•			
<b>Elite Compressed (24 cpi)</b>	•			
<b>Micro Compressed (30 cpi)</b>	•			

\* Only in Ultimate-II Virtual Printer, not available on a real MPS-1550C printer

## 5. Commodore MPS commands

This chapter describes the commands the printer can understand when using the Commodore MPS emulation. You will find Commodore BASIC examples to explain you how to use them. This printer uses PETASCII.

### 5.1. Simple example

This will print a first line with HELLO WORLD! on it and a second line with HELLO printed with double width characters.

```
10 OPEN1,4
20 PRINT#1,"HELLO WORLD!"
30 PRINT#1,CHR$(14)"HELLO"
40 CLOSE1
```

```
HELLO WORLD!
HELLO
```

### 5.2. Secondary address

Only on Commodore MPS emulation, you can specify an optional secondary address on OPEN :

- **0** : Select PETASCII charset with uppercases and graphic chars
- **7** : Select PETASCII charset with lowercases and uppercases

If no secondary address is specified, 0 is the default.

### 5.3. Commands

#### 5.3.1. Color printing

**ESC B** Select the **Black** ribbon color.

**27 98**

```
1Bh 62h 10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(98);"BLACK"
30 CLOSE1
BLACK
```

**ESC M** Select the **Magenta** ribbon color.

**27 109**

```
1Bh 6Dh 10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(109);"MAGENTA"
30 CLOSE1
MAGENTA
```

**ESC C** Select the **Cyan** ribbon color.

**27 99**

```
1Bh 63h 10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(99);"CYAN"
30 CLOSE1
CYAN
```

**ESC Y**  
**27 121**  
**1Bh 79h**

Select the **Yellow** ribbon color.

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(121);"YELLOW"
30 CLOSE1
```

YELLOW

**ESC R n**  
**27 114 n**  
**1Bh 72h n**

Select the ribbon color depending on parameter "n" as described on this table:

n	COLOR	
0	BLACK	1 pass
1	MAGENTA	1 pass
2	CYAN	1 pass
3	VIOLET	1 pass MAGENTA + 1 pass CYAN
4	YELLOW	1 pass
5	ORANGE	1 pass MAGENTA + 1 pass YELLOW
6	GREEN	1 pass CYAN + 1 pass YELLOW

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(114);CHR$(n);
30 CLOSE1
```

BLACK  
MAGENTA  
CYAN  
VIOLET  
YELLOW  
ORANGE  
GREEN

### 5.3.2. Graphical operations

**ESC g**  
**27 71**  
**1Bh 47h**

Select the **Double Strike** print mode. Characters are printed twice and paper is lifted 1/216" between the two passes.

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(71);"DOUBLE STRIKE"
30 CLOSE1
```

**double strike**

**ESC h**  
**27 72**  
**1Bh 48h**

Disable **Double Strike** print mode

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(72);
30 CLOSE1
```

**EN ON**  
**14**  
**0Eh**

Select the **Double Width** print mode (Enhanced ON)

```
10 OPEN1,4
20 PRINT#1,CHR$(14);"DOUBLE WIDTH"
30 CLOSE1
```

**DOUBLE WIDTH**

<b>EN OFF</b> <b>15</b> <b>0Fh</b>	Disable the <b>Double Width</b> print mode (Enhanced OFF) 10 OPEN1, 4 20 PRINT#1, CHR\$(15); 30 CLOSE1
<b>RVS ON</b> <b>18</b> <b>12h</b>	Select the <b>Reverse</b> print mode. Each character is printed in negative. 10 OPEN1, 4 20 PRINT#1, CHR\$(18);"REVERSE" 30 CLOSE1  <b><u>REVERSE</u></b>
<b>RVS OFF</b> <b>146</b> <b>92h</b>	Disable the <b>reverse</b> print mode 10 OPEN1, 4 20 PRINT#1, CHR\$(146); 30 CLOSE1
<b>ESC - 1</b> <b>27 45 49</b> <b>1Bh 2Dh 31h</b>	Select the <b>Underline</b> print mode for all characters and spaces that follow. 10 OPEN1, 4 20 PRINT#1, CHR\$(27);CHR\$(45);CHR\$(49);"UNDERLINE" 30 CLOSE1  <b><u>UNDERLINE</u></b>
<b>ESC - 0</b> <b>27 45 48</b> <b>1Bh 2Dh 30h</b>	Disable the Underline print mode. 10 OPEN1, 4 20 PRINT#1, CHR\$(27);CHR\$(45);CHR\$(48); 30 CLOSE1
<b>ESC e</b> <b>27 69</b> <b>1Bh 45h</b>	Select the <b>Bold</b> print mode. 10 OPEN1, 4 20 PRINT#1, CHR\$(27);CHR\$(69);"BOLD" 30 CLOSE1  <b><b>BOLD</b></b>
<b>ESC f</b> <b>27 70</b> <b>1Bh 46h</b>	Disable the Bold print mode. 10 OPEN1, 4 20 PRINT#1, CHR\$(27);CHR\$(70); 30 CLOSE1
<b>ESC 4</b> <b>27 52</b> <b>1Bh 34h</b>	Select the <b>Italic</b> print mode. 10 OPEN1, 4 20 PRINT#1, CHR\$(27);CHR\$(52);"ITALIC" 30 CLOSE1

*ITALIC*

**ESC 5** Disable the **Italic** print mode.

**27 53**

**1Bh 35h**

10 OPEN1,4  
20 PRINT#1,CHR\$(27);CHR\$(53);  
30 CLOSE1

**ESC [ n**

**27 91 n**

**1Bh 5Bh n**

Select the spacing mode depending on parameter “n” as described on this table:

n	SPACING	
0	PICA	10 chars/inch
1	ELITE	12 chars/inch
2	MICRO	15 chars/inch
3	CONDENSED	17.1 chars/inch
4	PICA COMPRESSED	20 chars/inch
5	ELITE COMPRESSED	24 chars/inch
6	MICRO COMPRESSED	30 chars/inch

10 OPEN1,4  
20 PRINT#1,CHR\$(27);CHR\$(91);CHR\$(n);  
30 CLOSE1

PICA	Draft Regular
ELITE	Draft Regular
MICRO	Draft Regular
CONDENSED	Draft Regular
PICA COMPRESSED	Draft Regular
ELITE COMPRESSED	Draft Regular
MICRO COMPRESSED	Draft Regular

**ESC s 0**

**27 83 48**

**1Bh 53h 30h**

Select the **Superscript** print mode. Characters are half high than the normal height and are printer on the upper half interline.

10 OPEN1,4  
20 PRINT#1,“NORMAL”;CHR\$(27);CHR\$(83);CHR\$(48);“SUPERSCRIP T”  
30 CLOSE1

NORMAL SUPERSCRIP T

**ESC s 1**

**27 83 49**

**1Bh 53h 31h**

Select the **Subscript** print mode. Characters are half high than the normal height and are printer on the lower half interline.

10 OPEN1,4  
20 PRINT#1,“NORMAL”;CHR\$(27);CHR\$(83);CHR\$(49);“SUBSCRIP T”  
30 CLOSE1

NORMAL SUBSCRIP T

<b>ESC t</b> <b>27 84</b> <b>1Bh 54h</b>	Disable Superscript and Subscript print mode. 10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(84); 30 CLOSE1
<b>ESC X n</b> <b>27 120 n</b> <b>1Bh 78h n</b>	If n=0, select standard quality mode (Draft) If n=1, select near letter quality mode (NLQ) 10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(120);CHR\$(n); 30 CLOSE1
<b>NLQ ON</b> <b>31</b> <b>1Fh</b>	Select the Near Letter Quality print mode (NLQ) 10 OPEN1,4 20 PRINT#1,CHR\$(31); 30 CLOSE1
	DRAFT QUALITY NEAR LETTER QUALITY
<b>NLQ OFF</b> <b>159</b> <b>9Fh</b>	Disable the Near Letter Quality print mode (NLQ) 10 OPEN1,4 20 PRINT#1,CHR\$(159); 30 CLOSE1
<b>CRSR DWN</b> <b>17</b> <b>11h</b>	Select PETASCII charset for uppercases/lowercases characters. With this charset, a limited number of graphical characters are available. 10 OPEN1,4 20 PRINT#1,CHR\$(17); 30 CLOSE1
<b>CRSR UP</b> <b>145</b> <b>91h</b>	Select PETASCII charset for uppercases only characters. With this charset, all graphical characters are available. 10 OPEN1,4 20 PRINT#1,CHR\$(145); 30 CLOSE1

### 5.3.3. Paper feeding

**LF**                    A **Line Feed** returns the print head to le left margin and advances the paper to the next line (behavior is LF+CR).  
**10**  
**0Ah**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(10);
30 CLOSE1
```

**CR**                    A **Carriage Return** returns the print head to le left margin and advances the paper to the next line (behavior is CR+LF).  
**13**  
**0Dh**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(13);
30 CLOSE1
```

**FF**                    A **Form Feed** prints the current page to a PNG file and then continues printing on the first line of a new blank page.  
**12**  
**0Ch**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(12);
30 CLOSE1
```

**CS**                    Returns the print head to le left margin but stays in the same line (behavior is CR).  
**141**  
**8Dh**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(141);
30 CLOSE1
```

### 5.3.4. Format control

**ESC c n**            Defines the page length in number of text lines (range 1-127).  
**27 67 n**

**1Bh 43h n**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(67);CHR$(1-127);
30 CLOSE1
```

**ESC c NUL n**        Defines the page length in inches (range 1-22).  
**27 67 0 n**

**1Bh 43h 00h n**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(67);CHR$(0);CHR$(1-22);
30 CLOSE1
```

**ESC n m**            Define the **Bottom of Form** (BOF) in number “m” of interlines at the end of the page that are not used to print and are automatically skipped.  
**27 78 m**

**1Bh 4Eh m**            **This command is ignored by Ultimate-II Virtual Printer.**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(78);CHR$(m);
30 CLOSE1
```

**ESC o**                Disable the **Bottom of Form** (BOF).  
**27 79**

**1Bh 4Fh**              **This command is ignored by Ultimate-II Virtual Printer.**



```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(79);
30 CLOSE1
```

**ESC 8**  
**27 56**  
**1Bh 38h** Disable the end of paper detector to be able to print until the end of the paper.  
 This command is ignored by Ultimate-II Virtual Printer.

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(56);
30 CLOSE1
```

**ESC 9**  
**27 57**  
**1Bh 39h** Enable the end of paper detector.  
 This command is ignored by Ultimate-II Virtual Printer.

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);CHR$(57);
30 CLOSE1
```

**HTAB**  
**9**  
**09h** This is the traditional horizontal tabulation. Head jumps to the next tabulation stop. Stops are located every 8 PICA character position since the beginning of a line. This is fixed, not configurable.

```
10 OPEN1,4
20 PRINT#1,CHR$(9);"THIS IS THE PRINT POSITION 8"
30 CLOSE1
```

**POS n<sub>1</sub> n<sub>2</sub>**  
**16 n<sub>1</sub> n<sub>2</sub>**  
**10h n<sub>1</sub> n<sub>2</sub>** On the current line, jump to the horizontal position corresponding to the n<sub>1</sub>n<sub>2</sub> decimal number of PICA characters since the beginning of the line. Each parameter is a value between 0 and 9. 00 is the position of the first character. n<sub>1</sub>n<sub>2</sub> can range from 00 to 79. Does nothing if current position is already over the n<sub>1</sub>n<sub>2</sub> position.

```
10 OPEN1,4
20 PRINT#1,CHR$(16);CHR$(2);CHR$(6);"THIS IS THE PRINT POSITION 26"
30 CLOSE1
```

**ESC POS n<sub>1</sub> n<sub>2</sub>**  
**27 16 n<sub>1</sub> n<sub>2</sub>**  
**1Bh 10h n<sub>1</sub> n<sub>2</sub>** On the current line, jump to the horizontal position corresponding to the dot position given by parameters n<sub>1</sub> and n<sub>2</sub> from the beginning of the line. Parameter is calculated using the formula n<sub>1</sub>x256+n<sub>2</sub>. Value range is 0 to 480

Examples:

n <sub>1</sub>	n <sub>2</sub>	POSITION
CHR\$(0)	CHR\$(20)	0 + 20 = 20
CHR\$(1)	CHR\$(0)	256 + 0 = 256
CHR\$(1)	CHR\$(224)	256 + 224 = 480

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(16);CHR$(1);CHR$(6);"THIS IS THE PRINT POSITION 262"
30 CLOSE1
```

5.3.5. Graphic Bitmap

Printer can print graphic data using the Bit Image Mode (BIM). An image is defined by a bit array of 7 rows. Each column is encoded in a byte, LSB is up, MSB is not printed and always set to 1. Horizontal definition is 60 dpi. Vertical definition is 72 dpi.

Example for a 16 columns array:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	□	□	□	■	□	□	□	□	□	□	■	□	□	□	■	□
2	□	□	■	□	■	□	□	□	□	■	■	■	□	□	■	□
4	□	■	□	□	□	■	□	□	■	■	■	■	■	□	□	□
8	■	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■
16	□	■	□	□	□	■	□	□	■	■	■	■	■	□	□	□
32	□	□	■	□	■	□	□	□	□	■	■	■	□	□	■	□
64	□	□	□	■	□	□	□	□	□	□	■	□	□	□	■	□
Total	136	148	162	193	162	148	136	136	156	190	255	190	156	136	235	136

Don't forget that bit 2<sup>7</sup> is always set, this adds 128 to each value.

First byte with 2<sup>7</sup> bit does not set mean that BIM data has ended. Printer is still on BIM mode as long as a printable character has not been sent. Commands with bit 2<sup>7</sup> not set are executed (CR, LF, ...). As BIM is always printed using the double width mode, you can use code **EN OFF** (15 0Fh) to tell the printer that BIM data has ended.

When in BIM, interline is automatically set to 7 dot height.

**BIT IMG** Select the **Bit Image Mode**. Provided data is printed as an array of dots as described above. Maximum BIM data width that can be printed on printable area is 480 dots.

**8**

**08h**

```

10 OPEN1,4,7
20 A$=""
30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 FOR J=1 TO 3
70 PRINT#1,CHR$(8);A$
80 NEXT J
90 CLOSE1
100 END
110 DATA 136,148,162,193,162,148,136,136
120 DATA 156,186,255,186,156,136,235,136
    
```



**BIT IMG SUB n** Repeat n times the next byte while in Bit Image Mode. If you need to send many times the same byte you can use this command to tell how many times to repeat the same byte while in BIM data. If n=0 data will be repeated 256 times. If you need more than 256 repetitions, you will have to call SUB with the same data several times. Printer is still in BIM mode and a second SUB can be sent.

**8 26 n**

**08h 1Ah n**

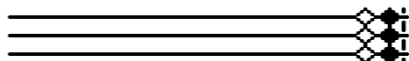
```

10 OPEN1,4,7
20 A$=""
    
```

```

30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 FOR J=1 TO 3
70 PRINT#1,CHR$(8);CHR$(26);CHR$(100);A$
80 NEXT J
90 CLOSE1
100 END
110 DATA 136,148,162,193,162,148,136,136
120 DATA 156,186,255,186,156,136,235,136

```



### 5.3.6. Character creation, Down Line Loading (DLL)

On a MPS-1550C user can create from 1 to 94 custom characters to replace normal characters. These characters are loaded in RAM. Consecutive characters can be defined in a single sequence beginning by the first character. DLL has to be enabled in the configuration of a real MPS-1550C printer and RAM buffer is smaller as a part of the RAM is reserved for DLL.

**On Ultimate-II Virtual Printer, DLL is not available but commands are correctly recognized and skipped with all their data.**

**ESC =** This code has to be followed by parameters **m n c s a p<sub>1</sub> p<sub>2</sub>...p<sub>11</sub>** which represents decimal byte codes to describe characters to load.  
**27 61**  
**1Bh 3Dh**

**m** and **n** are the number of bytes to load. Use the formula  
 $t = (\text{number of chars} \times 13) + 2$   
 then calculate **m** and **n** in order to have  $m + (n \times 256) = t$  using formulas  
 $n = t / 256$  (keep entire part only)  
 $m = t - (n \times 256)$

E.g.: for 94 characters,  
 $t = (94 \times 13) + 2 = 1224$   
 $n = 1224 / 256 = 4$   
 $m = 1224 - (4 \times 256) = 200$

**c** Is the decimal ASCII code of the first character of the sequence. Only decimal codes from 33 to 126 can be used for DDL. Code 65 is "A"

**s** Is a constant value 20 (14h) (missing from official documentation but present in all examples)

**a** This parameter tells which needles have to be used to print that character. Head has 9 needles of which 8 can be used here.  
 a = 0 : use the 8 upper needles  
 a = 1 : use the 8 lower needles

**p<sub>1</sub> p<sub>2</sub>...p<sub>11</sub>** Represents the 11 columns defining the dots printed for the character.

	1	2	3	4	5	6	7	8	9	10	11
1	■	□	■	□	■	□	■	□	□	□	□
2	■	□	□	□	□	□	□	□	■	□	□
4	■	□	□	□	□	□	□	□	■	□	□
8	■	□	■	□	■	□	■	□	□	□	□
16	■	□	□	□	□	□	■	□	□	□	□
32	■	□	□	□	□	□	□	■	□	□	□
64	■	□	□	□	□	□	□	□	■	□	□
128	□	□	□	□	□	□	□	□	□	□	□
Total	136	0	9	0	9	0	25	32	70	0	0

This represents the real R character in DRAFT quality. In the 8x11 matrix you have to remind that a dot active in a column cannot be active in the next column to let the head recycle. **Ultimate-II Virtual Printer does not suffer from this limitation.**

*Note from the author: I tested this command on a real MPS-1550C because explanations given by Commodore seems to be false. I can't make it work, example in the MPS-1550C manual prints nothing. Where are the 13 bytes by character? I only count 12 (a p1 p2...p11)*

**ESC i n**  
**27 73 n**  
**1Bh 49h n**

Select the print quality depending on parameter "n"  
 n=0 standard quality (draft) and normal characters  
 n=2 near letter quality (NLQ) and normal characters  
 n=4 standard quality (draft) and special characters created with Down Line Loading (DLL). **Not supported on Ultimate-II Virtual Printer, same behavior as n=0.**  
 n=6 near letter quality (NLQ) and special characters created with Down Line Loading (DLL). **Not supported on Ultimate-II Virtual Printer, same behavior as n=2.**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(73);CHR$(n);
30 CLOSE1
```

DRAFT QUALITY  
**NEAR LETTER QUALITY**

## 6. EPSON FX-80/JX-80 commands

This chapter describes the commands the printer can understand when using the Epson FX-80. JX-80 is the color version of the FX-80. This was one of the most popular printers in the 80's for its powerful graphic instruction set. With this emulation you can reach the maximum graphical resolution the printer can print (240x216dpi). This is still much lower than modern printers. This printer uses ASCII7.

### 6.1. Secondary address

Secondary address on OPEN command is not used by Epson emulation.

### 6.2. Commands

#### 6.2.1. Color printing

ESC r n Select the ribbon color depending on parameter "n" as described on this table:

27 114 n  
1Bh 72h n

n	COLOR	
0	BLACK	1 pass
1	MAGENTA	1 pass
2	CYAN	1 pass
3	VIOLET	1 pass MAGENTA + 1 pass CYAN
4	YELLOW	1 pass
5	ORANGE	1 pass MAGENTA + 1 pass YELLOW
6	GREEN	1 pass CYAN + 1 pass YELLOW

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(114);CHR$(n);
30 CLOSE1
```

```
BLACK
MAGENTA
CYAN
VIOLET
YELLOW
ORANGE
GREEN
```

#### 6.2.2. Graphical operations

ESC G Select the **Double Strike** print mode. Characters are printed twice and paper is lifted 1/216" between the two passes.

27 71  
1Bh 47h

```
10 OPEN1,4
20 PRINT#1,CHR$(27);chr$(71);"DOUBLE STRIKE"
30 CLOSE1
```

```
double strike
```

<b>ESC H</b> <b>27 72</b> <b>1Bh 48h</b>	Disable <b>Double Strike</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(27);chr\$(72); 30 CLOSE1
<b>SO</b> <b>14</b> <b>0Eh</b>	Select the <b>Double Width</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(14);"DOUBLE WIDTH" 30 CLOSE1  <b>DOUBLE WIDTH</b>
<b>DC4</b> <b>20</b> <b>14h</b>	Disable the <b>Double Width</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(20); 30 CLOSE1
<b>ESC SO</b> <b>27 14</b> <b>1Bh 0Eh</b>	Same as <b>SO</b> (Double Width print mode ON).
<b>ESC W 1</b> <b>27 87 1</b> <b>1Bh 57h 01h</b>	Same as <b>SO</b> (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)
<b>ESC W 0</b> <b>27 87 0</b> <b>1Bh 57h 00h</b>	Same as <b>DC4</b> (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)
<b>ESC - 1</b> <b>27 45 49</b> <b>1Bh 2Dh 31h</b>	Select the <b>Underline</b> print mode for all characters and spaces that follow.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(49);"UNDERLINE" 30 CLOSE1  <b>UNDERLINE</b>
<b>ESC - 0</b> <b>27 45 48</b> <b>1Bh 2Dh 30h</b>	Disable the Underline print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(48); 30 CLOSE1
<b>ESC E</b> <b>27 69</b> <b>1Bh 45h</b>	Select the <b>Bold</b> print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(69);"BOLD" 30 CLOSE1  <b>BOLD</b>

<b>ESC F</b> <b>27 70</b> <b>1Bh 46h</b>	Disable the Bold print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(70); 30 CLOSE1
<b>ESC 4</b> <b>27 52</b> <b>1Bh 34h</b>	Select the <b>Italic</b> print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(52);"ITALIC" 30 CLOSE1  <i>ITALIC</i>
<b>ESC 5</b> <b>27 53</b> <b>1Bh 35h</b>	Disable the <b>Italic</b> print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(53); 30 CLOSE1
<b>SI</b> <b>15</b> <b>0Fh</b>	Select the <b>CONDENSED</b> spacing mode (17.1 chars/inch)  10 OPEN1,4 20 PRINT#1,CHR\$(15);"CONDENSED" 30 CLOSE1
<b>ESC SI</b> <b>27 15</b> <b>1Bh 0Fh</b>	Same as <b>SI</b> (Condensed 17.1 chars/inch)
<b>ESC M</b> <b>27 77</b> <b>1Bh 4Dh</b>	Select the <b>ELITE</b> spacing mode (12 chars/inch).  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(77);"PICA" 30 CLOSE1
<b>DC2</b> <b>18</b> <b>12h</b>	Select the <b>PICA</b> spacing mode (10 chars/inch). This is the default spacing.  10 OPEN1,4 20 PRINT#1,CHR\$(18);"PICA" 30 CLOSE1
<b>ESC P</b> <b>27 80</b> <b>1Bh 50h</b>	Same as <b>DC2</b> (PICA 10 chars/inch)

**ESC S 0**  
**27 83 48**  
**1Bh 53h 30h**

Select the **Superscript** print mode. Characters are half high than the normal height and are printer on the upper half interline.

```
10 OPEN1,4
20 PRINT#1,"NORMAL";CHR$(27);CHR$(83);CHR$(48);"SUPERSCRIP"
30 CLOSE1
```

NORMAL SUPERSCRIP

**ESC S 1**  
**27 83 49**  
**1Bh 53h 31h**

Select the **Subscript** print mode. Characters are half high than the normal height and are printer on the lower half interline.

```
10 OPEN1,4
20 PRINT#1,"NORMAL";CHR$(27);CHR$(83);CHR$(49);"SUBSCRIPT"
30 CLOSE1
```

NORMAL SUBSCRIPT

**ESC T**  
**27 84**  
**1Bh 54h**

Disable Superscript and Subscript print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(84);
30 CLOSE1
```

**ESC x n**  
**27 120 n**  
**1Bh 78h n**

If n=0, select standard quality mode (Draft)  
 If n=1, select near letter quality mode (NLQ)

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(120);CHR$(n);
30 CLOSE1
```

DRAFT QUALITY  
 NEAR LETTER QUALITY

**ESC p n**  
**27 112 n**  
**1Bh 70h n**

**Proportional** spacing ON/OFF  
 This command is ignored by Ultimate-II Virtual Printer.

**ESC ! n**  
**27 33 n**  
**1Bh 21h n**

Select graphical layout for text. This is a composite of multiple attributes set by only one command. Value n is taken from this table :

n	U	I	W	S	B	C	E	n	U	I	W	S	B	C	E	n	U	I	W	S	B	C	E
0								86								172							
1							.	87		.		.		.		173	.		.		.		.
2								88		.		.		.		174	.		.		.		.
3							.	89		.		.		.		175	.		.		.		.
4						.	.	90		.		.		.		176	.		.		.		.
5						.	.	91		.		.		.		177	.		.		.		.
6					.	.	.	92		.		.		.		178	.		.		.		.
7					.	.	.	93		.		.		.		179	.		.		.		.
8					.	.	.	94		.		.		.		180	.		.		.		.
9					.	.	.	95		.		.		.		181	.		.		.		.
10					.	.	.	96		.		.		.		182	.		.		.		.
11					.	.	.	97		.		.		.		183	.		.		.		.
12					.	.	.	98		.		.		.		184	.		.		.		.
13					.	.	.	99		.		.		.		185	.		.		.		.
14					.	.	.	100		.		.		.		186	.		.		.		.
15					.	.	.	101		.		.		.		187	.		.		.		.
16					.	.	.	102		.		.		.		188	.		.		.		.
17					.	.	.	103		.		.		.		189	.		.		.		.
18					.	.	.	104		.		.		.		190	.		.		.		.
19					.	.	.	105		.		.		.		191	.		.		.		.
20					.	.	.	106		.		.		.		192	.		.		.		.
21					.	.	.	107		.		.		.		193	.		.		.		.



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222		.		.		.		.	
223		.		.		.		.	
224		.		.		.		.	
225		.		.		.		.	
226		.		.		.		.	
227		.		.		.		.	
228		.		.		.		.	
229		.		.		.		.	
230		.		.		.		.	
231		.		.		.		.	
232		.		.		.		.	
233		.		.		.		.	
234		.		.		.		.	
235		.		.		.		.	
236		.		.		.		.	
237		.		.		.		.	
238		.		.		.		.	
239		.		.		.		.	
240		.		.		.		.	
241		.		.		.		.	
242		.		.		.		.	
243		.		.		.		.	
244		.		.		.		.	
245		.		.		.		.	
246		.		.		.		.	
247		.		.		.		.	
248		.		.		.		.	
249		.		.		.		.	
250		.		.		.		.	
251		.		.		.		.	
252		.		.		.		.	
253		.		.		.		.	
254		.		.		.		.	
255		.		.		.		.	

U: Underline, I:Italic, W:Double width, S:Double strike, B:Bold, C:Condensed, E:Elite

### 6.2.3. Paper feeding

LF  
10  
0Ah

A **Line Feed** returns the print head to the left margin and advances the paper to the next line (behavior is LF+CR).

```
10 OPEN1,4
20 PRINT#1,CHR$(10);
30 CLOSE1
```

<b>CR</b> <b>13</b> <b>0Dh</b>	A <b>Carriage Return</b> returns the print head to the left margin but stays on the same line (behavior is CR only, no LF).  10 OPEN1,4 20 PRINT#1,CHR\$(13); 30 CLOSE1
<b>FF</b> <b>12</b> <b>0Ch</b>	A <b>Form Feed</b> prints the current page to a PNG file and then continues printing on the first line of a new blank page.  10 OPEN1,4 20 PRINT#1,CHR\$(12); 30 CLOSE1
<b>ESC 0</b> <b>27 48</b> <b>1Bh 30h</b>	Select vertical spacing <b>1/8"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(48); 30 CLOSE1
<b>ESC 1</b> <b>27 49</b> <b>1Bh 31h</b>	Select vertical spacing <b>7/72"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(49); 30 CLOSE1
<b>ESC 2</b> <b>27 50</b> <b>1Bh 32h</b>	Select vertical spacing <b>1/6"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(50); 30 CLOSE1
<b>ESC 3 n</b> <b>27 51 n</b> <b>1Bh 32h n</b>	Select vertical spacing <b>n/216"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(51);CHR\$(37)"37/216 inch" 30 CLOSE1
<b>ESC A n</b> <b>27 65 n</b> <b>1Bh 41h n</b>	Select vertical spacing <b>n/72"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(65);CHR\$(8)"8/72 inch for one pass BIM" 30 CLOSE1
<b>ESC J n</b> <b>27 74 n</b> <b>1Bh 4Ah n</b>	Skip down <b>n/216"</b> of paper.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(74);CHR\$(70)"70/216 inch skipped" 30 CLOSE1

**ESC j n** Reverse paper feed **n/216"** up.  
**27 106 n**  
**1Bh 6Ah n** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(106);CHR\$(70)"70/216 inch up"  
 30 CLOSE1

#### 6.2.4. Format control

**BS** **Backspace**, go back one character. Left character is not erased and next character will be printed over it. You can combine characters this way.

**8**  
**08h** 10 OPEN1,4  
 20 PRINT#1,"a";CHR\$(8)"^ to print a with a circumflex";  
 30 CLOSE1

**ESC C n** Defines the page length in number of lines (range 1-127). Current line spacing is used to calculate form length.

**27 67 n**  
**1Bh 43h n** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(1-127);  
 30 CLOSE1

**ESC C NUL n** Defines the page length in inches (range 1-22).

**27 67 0 n**  
**1Bh 43h 00h n** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(0);CHR\$(1-22);  
 30 CLOSE1

**ESC l n** Defines the left margin in number of characters. Current char pitch is used to calculate margin position in the line.

**27 108 n**  
**1Bh 6Ch n** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(108);CHR\$(10)  
 30 PRINT#1,"MARGIN LEFT AT 10"  
 40 CLOSE1

**ESC Q n** Defines the right margin in number of characters. Current char pitch is used to calculate margin position in the line.

**27 81 n**  
**1Bh 51h n** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(81);CHR\$(70)  
 30 PRINT#1,"RIGHT MARGIN AT 70"  
 40 CLOSE1

**ESC N m** Define the **Bottom of Form** (BOF) in number "m" of lines at the end of the page that are skipped to jump over perforations when using continuous paper.

**27 78 m** **This command is ignored by Ultimate-II Virtual Printer.**

**1Bh 4Eh m** 10 OPEN1,4,7  
 20 PRINT#1,CHR\$(27);CHR\$(78);CHR\$(m);  
 30 CLOSE1

**ESC O** Disable the **Bottom of Form** (BOF).

**27 79** **This command is ignored by Ultimate-II Virtual Printer.**

**1Bh 4Fh**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(79);
30 CLOSE1
```

**ESC 8****27 56****1Bh 38h**

Disable the end of paper detector to be able to print until the end of the paper.

**This command is ignored by Ultimate-II Virtual Printer.**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(56);
30 CLOSE1
```

**ESC 9****27 57****1Bh 39h**

Enable the end of paper detector.

**This command is ignored by Ultimate-II Virtual Printer.**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(57);
30 CLOSE1
```

**TAB****9****09h**

This is the traditional **horizontal tabulation**. Head jumps to the next tabulation stop. Default stops are located every 8 PICA character position since the beginning of a line.

```
10 OPEN1,4
20 PRINT#1,CHR$(9);"THIS IS THE PRINT POSITION 8"
30 CLOSE1
```

**VT****11****0Bh**

Jump to next **vertical tabulation** stop. There is no Carriage Return. No default stops are defined. If no vertical stops are defined, it will jump one line, same as LF.

```
10 OPEN1,4
20 PRINT#1,CHR$(11);"JUMPED TO NEXT VERTICAL TAB STOP"
30 CLOSE1
```

**ESC B n<sub>1</sub> ... 0****27 66 n<sub>1</sub> ... 0****1Bh 42h n<sub>1</sub> ... 0**

Define the **vertical tabulation stop program**. Each value **n** represents a line number where to set a vertical tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created. Current line spacing is used to calculate tab position in the page.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(66);CHR$(5);CHR$(10);CHR$(15);CHR$(0)
30 CLOSE1
```

**ESC D n<sub>1</sub> ... 0****27 68 n<sub>1</sub> ... 0****1Bh 44h n<sub>1</sub> ... 0**

Define the **horizontal tabulation stop program**. Each value **n** represents a character position where to set a tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created. Current char pitch is used to calculate tab position in the line.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(68);CHR$(10);CHR$(20);CHR$(30);CHR$(0)
30 CLOSE1
```

**ESC b m n<sub>1</sub> ... 0** Define a **vertical tabulation stop program**. You can define up to 8 programs (**m=0-7**). Each value **n** represents a line number where to set a vertical tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created per program. Current line spacing is used to calculate tab position in the page. Use **ESC /** to activate the program. Previous command **ESC B** modifies only the current program. Default current program is 0.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(98);CHR$(7);CHR$(5);CHR$(25);CHR$(0)
30 CLOSE1
```

**ESC / n** Activate one of the 8 possible vertical tabulation stop programs. Value **n** is program number from 0 to 7.

**27 47 n**  
**1Bh 2Fh n**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(47);CHR$(n);
30 CLOSE1
```

### 6.2.5. Graphic Bitmap

Epson emulation can print bitmap data. An image is defined by a bit array of 8 rows. Each column is encoded in a byte, MSB is up. Horizontal definition can be one of 60, 120 or 240 dpi. Vertical definition is 72 dpi.

Example for a 16 columns array:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
128	□	□	■	■	■	□	□	□	□	□	■	□	□	□	□	■	□
64	□	■	□	□	□	■	□	□	□	■	■	■	□	□	□	■	□
32	■	□	□	□	□	□	■	□	■	■	■	■	□	□	□	□	□
16	■	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■
8	■	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■
4	■	□	□	□	□	□	■	□	■	■	■	■	■	□	□	□	□
2	□	■	□	□	□	■	□	□	□	■	■	■	□	□	□	■	□
1	□	□	■	■	■	□	□	□	□	□	■	□	□	□	□	■	□
Total	60	66	129	129	129	66	60	24	60	126	255	126	60	24	235	24	

Prior to BIM printing you need to change the line spacing to match the graphic height. Standard line height in graphic mode is 1/9" (8/72") if you use 8 dots or 7/27" if you use 7 dots.

**ESC K ...** Select the **Bit Image Mode** in simple density. You have to provide parameters **n m**  
**27 75 ...** **d<sub>1</sub> d<sub>2</sub> ...**  
**1Bh 4Bh ...** Values **n** and **m** are the 16 bit encoded amount of data (**n** is LSB) total = **n + m x 256**  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print. Default resolution using **ESC K** is 60 dpi but it can be changed using command **ESC ?**

```
10 OPEN1,4
20 A$=CHR$(27)+CHR$(75)+CHR$(16)+CHR$(0);
30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 PRINT#1,CHR$(27);CHR$(65);CHR$(8);CHR$(10);CHR$(13)
70 FOR J=1 TO 3
80 PRINT#1,A$;A$;A$;A$;CHR$(10);CHR$(13)
90 NEXT J
```

```

100 CLOSE1
110 END
120 DATA 60,66,129,129,129,66,60,24
130 DATA 60,126,255,126,60,24,235,24

```



**ESC L ...** Select the **Bit Image Mode** in double density, half speed. You have to provide parameters **n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 76 ...**  
**1Bh 4Ch ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print. Default resolution using **ESC L** is 120 dpi but it can be changed using command **ESC ?**

```

10 OPEN1,4
20 A$=CHR$(27)+CHR$(76)+CHR$(16)+CHR$(0);
30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 PRINT#1,CHR$(27);CHR$(65);CHR$(8);CHR$(10);CHR$(13)
70 FOR J=1 TO 3
80 PRINT#1,A$;A$;A$;A$;CHR$(10);CHR$(13)
90 NEXT J
100 CLOSE1
110 END
120 DATA 60,66,129,129,129,66,60,24
130 DATA 60,126,255,126,60,24,235,24

```



**ESC Y ...** Select the **Bit Image Mode** in double density, normal speed.  
**27 89 ...** On Ultimate-II Virtual Printer, **ESC Y** behaves the same as **ESC L**  
**1Bh 59h ...**

**ESC Z ...** Select the **Bit Image Mode** in quadruple density, half speed. You have to provide parameters **n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 90 ...**  
**1Bh 5Ah ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print. Default resolution using **ESC Z** is 240 dpi but it can be changed using command **ESC ?**

```

10 OPEN1,4
20 A$=CHR$(27)+CHR$(90)+CHR$(16)+CHR$(0);
30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 PRINT#1,CHR$(27);CHR$(65);CHR$(8);CHR$(10);CHR$(13)
70 FOR J=1 TO 3
80 PRINT#1,A$;A$;A$;A$;CHR$(10);CHR$(13)
90 NEXT J
100 CLOSE1
110 END

```

120 DATA 60,66,129,129,129,66,60,24  
 130 DATA 60,126,255,126,60,24,235,24



**ESC \* ...** Select the **Bit Image Mode** with provided density. You have to provide parameters **d n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 42 ...**  
**1Bh 2Ah ...** Value **d** is horizontal density as shown in this table :

d	DENSITY	DESCRIPTION	MAX DOTS/LINE
0	60 dpi	Single	480
1	120 dpi	Double	960
2	120 dpi	Hi-speed double (same as 1 in Ultimate)	960
3	240 dpi	Quadruple	1920
4	80 dpi	CRT screen	640
5	72 dpi	Plotter	576
6	90 dpi	Hi-res CRT	720

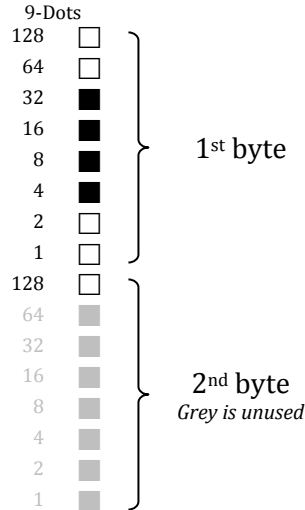
Values **n** and **m** are the 16 bit encoded amount of bitmap data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print.

**ESC ? n m** Change density for bitmap commands. Value **n** is one from **K, L, Y** or **Z**. Value **m** is the  
**27 63 n m** new density for the command (see table in **ESC \*** description).  
**1Bh 3Fh n m**

Example, to change density of ESC L to 80dpi :

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(63);"L";CHR$(4)
30 CLOSE1
```

**ESC ^ ...** Select the **Bit Image Mode** using all the 9 pin of the head. You have to provide parameters **d n m h<sub>1</sub> l<sub>1</sub> h<sub>2</sub> l<sub>2</sub> ...**  
**27 94 ...**  
**1Bh 5Eh ...** Value **d** is density. Only 0 and 1 are allowed for single (60dpi) or double density (120 dpi).  
 Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**h<sub>1</sub> l<sub>1</sub> h<sub>2</sub> l<sub>2</sub> ...** are the bitmap data to print. Values **h<sub>n</sub>** encode the upper 8 dots and values **l<sub>n</sub>** encode the lower dot in the MSB bit (2<sup>7</sup>=128). This needs double of data for just one more dot.



**6.2.6. Charset selection**

FX-80/JX-80 emulation uses ASCII7 to encode characters. This allows only 128 combinations to address characters. When MSB is set to 1 the character is printed using Italic (MSB is 2<sup>7</sup>=128).

**ESC 7** Select Basic character table. This is the default charset for FX-80/JX-80 printer.  
**27 55**  
**1Bh 37h** 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(55);  
 30 CLOSE1

**ESC R n** Select National character table. Value **n** selects the character table :

n	NATIONAL CHARACTER TABLE
0	USA
1	France
2	Germany
3	UK
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II

See national charset changes compared to basic charset in chapter 10.3  
 10 OPEN1,4  
 20 PRINT#1,CHR\$(27);CHR\$(82);CHR\$(1);"FRENCH CHARSET"  
 30 CLOSE1



<b>ESC I 1</b> <b>27 73 1</b> <b>1Bh 49h 01h</b>	Enable the extension of the character table. Parameter 1 can be passed using the '1' character (33, 31h). See table in chapter 10.2 for details about extended charset.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(73);CHR\$(1);"EXTENDED CHARSET ENABLED" 30 CLOSE1
<b>ESC I 0</b> <b>27 73 0</b> <b>1Bh 49h 00h</b>	Disable the extension of the character table. Parameter 0 can be passed using the '0' character (32, 30h).  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(73);CHR\$(0);"EXTENDED CHARSET DISABLED" 30 CLOSE1
<b>ESC 6</b> <b>27 54</b> <b>1Bh 36h</b>	Extend only the italic part of the printable charset <b>This command is ignored by Ultimate-II Virtual Printer.</b>  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(54); 30 CLOSE1

### 6.2.7. Character creation, Down Line Loading (DLL)

All the commands related to character creation are ignored in the Ultimate-II Virtual Printer. The commands are understood and correctly interpreted but ignored to skip them gently.

<b>ESC : 000</b> <b>27 58 0 0 0</b> <b>1Bh 3Ah 0 0 0</b>	Copy standard character generator from ROM to RAM. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC &amp; 0</b> <b>27 38 0</b> <b>1Bh 26h 00h</b>	This code has to be followed by parameters <b>n m a p<sub>1</sub> p<sub>2</sub>...p<sub>11</sub></b> which represents decimal byte codes to describe characters to load.  <b>0</b> is code 0, always present. <b>n</b> ASCII code of first redefined char <b>m</b> ASCII code of last redefined char (n=m if only one char to define)  next parameters are repeated for each defined char. <b>a</b> This parameter tells which needles have to be used to print that character. Head has 9 needles of which 8 can be used here. a = 0 : use the 8 upper needles a = 1 : use the 8 lower needles  <b>p<sub>1</sub> p<sub>2</sub>...p<sub>11</sub></b> Represents the 11 columns defining the dots printed for the character.  In the 8x11 matrix you have to remind that a dot active in a column cannot be active in the next column to let the head recycle. <b>Ultimate-II Virtual Printer does not suffer from this limitation.</b>

**ESC % n** If n=1 select RAM (special characters) and if n=0 select ROM (standard characters)  
**27 37 n** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 25h n**

#### 6.2.8. Other commands

**DC1** **Select the printer.** Wake up the printer if the printer has been disabled with DC3.  
**17** This command is ignored by Ultimate-II Virtual Printer.  
**11h**

**DC3** **Suspend the printer.** The printer will ignore the input data until DC1 is sent.  
**19** This command is ignored by Ultimate-II Virtual Printer.  
**13h**

**CAN** **Cancel** the current job and clear printer buffer.  
**24** This command is ignored by Ultimate-II Virtual Printer.  
**18h**

**ESC =** Force **bit 7** (MSB) to 0. All data received will have its bit 7 cleared except commands.  
**27 61** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 3Dh**

**ESC >** Force **bit 7** (MSB) to 1. All data received will have its bit 7 set except commands.  
**27 62** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 3Eh**

**ESC #** Clear **bit 7** (MSB) forcing.  
**27 35** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 23h**

**ESC <** Set **left to right** printing for one line.  
**27 60** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 3Ch**

**ESC @** **Initialize** the printer. Set all parameters to default values. Paper and head are not moved.  
**27 64**  
**1Bh 40h**

**ESC U n** Select **Mono/Bidirectional** printing.  
**27 85 n** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 30h n** n=0 : bidirectional  
n=1 : mono-directional (left to right) for better alignment.

**ESC i n** Immediate character printing ON/OFF like a typewriter.  
**27 105 n** This command is ignored by Ultimate-II Virtual Printer.  
**1Bh 69h n** n=1 : immediate printing ON (incompatible with continuous paper feeding)  
n=0 : immediate printing OFF

**ESC s n** Half speed printing ON/OFF to make less noise.  
This command is ignored by Ultimate-II Virtual Printer.  
n=1 : half speed  
n=0 : full speed

**DEL** Delete the last printable character from buffer.  
**127** This command is ignored by Ultimate-II Virtual Printer.

**7Fh**

## 7. IBM Graphics Printer commands

This chapter describes the commands the printer can understand when using the IBM Graphics Printer emulation. The power of IBM printers resides in its charsets using ASCII8.

### 7.1. Secondary address

Secondary address on OPEN command is not used by IBM Graphics Printer emulation.

### 7.2. Commands

#### 7.2.1. Color printing

**ESC b** Select the **Black** ribbon color.

**27 98**

**1Bh 62h**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(98);"black"
30 CLOSE1
BLACK
```

**ESC m** Select the **Magenta** ribbon color.

**27 109**

**1Bh 6Dh**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(109);"magenta"
30 CLOSE1
MAGENTA
```

**ESC c** Select the **Cyan** ribbon color.

**27 99**

**1Bh 63h**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(99);"cyan"
30 CLOSE1
CYAN
```

**ESC y** Select the **Yellow** ribbon color.

**27 121**

**1Bh 79h**

```
10 OPEN1,4,7
20 PRINT#1,CHR$(27);chr$(121);"yellow"
30 CLOSE1
YELLOW
```

ESC r n  
27 114 n  
1Bh 72h n

Select the ribbon color depending on parameter "n" as described on this table:

n	COLOR	
0	BLACK	1 pass
1	MAGENTA	1 pass
2	CYAN	1 pass
3	VIOLET	1 pass MAGENTA + 1 pass CYAN
4	YELLOW	1 pass
5	ORANGE	1 pass MAGENTA + 1 pass YELLOW
6	GREEN	1 pass CYAN + 1 pass YELLOW

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(114);CHR$(n);
30 CLOSE1
```

```
BLACK
MAGENTA
CYAN
VIOLET
YELLOW
ORANGE
GREEN
```

### 7.2.2. Graphical operations

ESC G  
27 71  
1Bh 47h

Select the **Double Strike** print mode. Characters are printed twice and paper is lifted 1/216" between the two passes.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);chr$(71);"DOUBLE STRIKE"
30 CLOSE1
```

```
double strike
```

ESC H  
27 72  
1Bh 48h

Disable **Double Strike** print mode

```
10 OPEN1,4
20 PRINT#1,CHR$(27);chr$(72);
30 CLOSE1
```

SO  
14  
0Eh

Select the **Double Width** print mode

```
10 OPEN1,4
20 PRINT#1,CHR$(14);"DOUBLE WIDTH"
30 CLOSE1
```

```
DOUBLE WIDTH
```

DC4  
20  
14h

Disable the **Double Width** print mode

```
10 OPEN1,4
20 PRINT#1,CHR$(20);
30 CLOSE1
```

<b>ESC SO</b> <b>27 14</b> <b>1Bh 0Eh</b>	Same as <b>SO</b> (Double Width print mode ON).
<b>ESC W 1</b> <b>27 87 1</b> <b>1Bh 57h 01h</b>	Same as <b>SO</b> (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)
<b>ESC W 0</b> <b>27 87 0</b> <b>1Bh 57h 00h</b>	Same as <b>DC4</b> (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)
<b>ESC - 1</b> <b>27 45 49</b> <b>1Bh 2Dh 31h</b>	Select the <b>Underline</b> print mode for all characters and spaces that follow.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(49);"UNDERLINE" 30 CLOSE1  <u>UNDERLINE</u>
<b>ESC - 0</b> <b>27 45 48</b> <b>1Bh 2Dh 30h</b>	Disable the Underline print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(48); 30 CLOSE1
<b>ESC E</b> <b>27 69</b> <b>1Bh 45h</b>	Select the <b>Bold</b> print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(69);"BOLD" 30 CLOSE1  <b>BOLD</b>
<b>ESC F</b> <b>27 70</b> <b>1Bh 46h</b>	Disable the Bold print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(70); 30 CLOSE1
<b>ESC 4</b> <b>27 52</b> <b>1Bh 34h</b>	Select the <b>Italic</b> print mode. <i>This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1550C printer. Italic was not supported in IBM Graphics Printer.</i>  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(52);"ITALIC" 30 CLOSE1  <i>ITALIC</i>

**ESC 5  
27 53  
1Bh 35h** Disable the **Italic** print mode.  
 This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1550C printer. Italic was not supported in IBM Graphics Printer.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(53);
30 CLOSE1
```

**SI  
15  
0Fh** Select the **CONDENSED** spacing mode (17.1 chars/inch)

```
10 OPEN1,4
20 PRINT#1,CHR$(15);"CONDENSED"
30 CLOSE1
```

**ESC M  
27 77  
1Bh 4Dh** Select the **ELITE** spacing mode (12 chars/inch).

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(77);"PICA"
30 CLOSE1
```

**DC2  
18  
12h** Select the **PICA** spacing mode (10 chars/inch). This is the default spacing.

```
10 OPEN1,4
20 PRINT#1,CHR$(18);"PICA"
30 CLOSE1
```

**ESC [ n  
27 91 n  
1Bh 5Bh n** Select the spacing mode depending on parameter "n" as described on this table:

n	SPACING	
0	PICA	10 chars/inch
1	ELITE	12 chars/inch
2	MICRO	15 chars/inch
3	CONDENSED	17.1 chars/inch
4	PICA COMPRESSED	20 chars/inch
5	ELITE COMPRESSED	24 chars/inch
6	MICRO COMPRESSED	30 chars/inch

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(91);CHR$(n);
30 CLOSE1
```

PICA	Draft Regular
ELITE	Draft Regular
MICRO	Draft Regular
CONDENSED	Draft Regular
PICA COMPRESSED	Draft Regular
ELITE COMPRESSED	Draft Regular
MICRO COMPRESSED	Draft Regular

**ESC S 0**  
**27 83 48**  
**1Bh 53h 30h**

Select the **Superscript** print mode. Characters are half high than the normal height and are printer on the upper half interline.

```
10 OPEN1,4
20 PRINT#1,"NORMAL";CHR$(27);CHR$(83);CHR$(48);"SUPERSCRIPT"
30 CLOSE1
```

NORMAL~~SUPERSCRIPT~~

**ESC S 1**  
**27 83 49**  
**1Bh 53h 31h**

Select the **Subscript** print mode. Characters are half high than the normal height and are printer on the lower half interline.

```
10 OPEN1,4
20 PRINT#1,"NORMAL";CHR$(27);CHR$(83);CHR$(49);"SUBSCRIPT"
30 CLOSE1
```

NORMAL~~SUBSCRIPT~~

**ESC T**  
**27 84**  
**1Bh 54h**

Disable Superscript and Subscript print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(84);
30 CLOSE1
```

**ESC x n**  
**27 120 n**  
**1Bh 78h n**

If n=0, select standard quality mode (Draft)  
 If n=1, select near letter quality mode (NLQ)

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(120);CHR$(n);
30 CLOSE1
```

DRAFT QUALITY  
 NEAR LETTER QUALITY

**ESC ! n**  
**27 33 n**  
**1Bh 21h n**

Select graphical layout for text.

*This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1550C printer. See EPSON-FX80 command description page 24 for details.*

### 7.2.3. Paper feeding

**LF**  
**10**  
**0Ah**

A **Line Feed** advances the paper to the next line (behavior is LF only, no CR).

```
10 OPEN1,4
20 PRINT#1,CHR$(10);
30 CLOSE1
```



<b>CR</b> <b>13</b> <b>0Dh</b>	A <b>Carriage Return</b> returns the print head to the left margin but stays on the same line (behavior is CR only, no LF).  10 OPEN1,4 20 PRINT#1,CHR\$(13); 30 CLOSE1
<b>FF</b> <b>12</b> <b>0Ch</b>	A <b>Form Feed</b> prints the current page to a PNG file and then continues printing on the first line of a new blank page.  10 OPEN1,4 20 PRINT#1,CHR\$(12); 30 CLOSE1
<b>ESC 0</b> <b>27 48</b> <b>1Bh 30h</b>	Select vertical spacing <b>1/8"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(48); 30 CLOSE1
<b>ESC 1</b> <b>27 49</b> <b>1Bh 31h</b>	Select vertical spacing <b>7/72"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(49); 30 CLOSE1
<b>ESC 2</b> <b>27 50</b> <b>1Bh 32h</b>	Select vertical spacing <b>1/6"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(50); 30 CLOSE1
<b>ESC 3 n</b> <b>27 51 n</b> <b>1Bh 32h n</b>	Select vertical spacing <b>n/216"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(51);CHR\$(37)"37/216 inch" 30 CLOSE1
<b>ESC A n</b> <b>27 65 n</b> <b>1Bh 41h n</b>	Select vertical spacing <b>n/72"</b> between each printed line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(65);CHR\$(8)"8/72 inch for one pass BIM" 30 CLOSE1
<b>ESC J n</b> <b>27 74 n</b> <b>1Bh 4Ah n</b>	Skip down <b>n/216"</b> of paper.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(74);CHR\$(70)"70/216 inch skipped" 30 CLOSE1

#### 7.2.4. Format control

**BS**                    **Backspace**, go back one character. Left character is not erased and next character

<b>8</b> <b>08h</b>	will be printed over it. You can combine characters this way.
	10 OPEN1,4 20 PRINT#1,"a";CHR\$(8)"^ to print a with a circumflex"; 30 CLOSE1
<b>ESC C n</b> <b>27 67 n</b> <b>1Bh 43h n</b>	Defines the page length in number of lines (range 1-127). Current line spacing is used to calculate form length.
	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(1-127); 30 CLOSE1
<b>ESC C NUL n</b> <b>27 67 0 n</b> <b>1Bh 43h 00h n</b>	Defines the page length in inches (range 1-22).
	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(0);CHR\$(1-22); 30 CLOSE1
<b>ESC N m</b> <b>27 78 m</b> <b>1Bh 4Eh m</b>	Define the <b>Bottom of Form</b> (BOF) in number "m" of lines at the end of the page that are skipped to jump over perforations when using continuous paper. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
	10 OPEN1,4,7 20 PRINT#1,CHR\$(27);CHR\$(78);CHR\$(m); 30 CLOSE1
<b>ESC O</b> <b>27 79</b> <b>1Bh 4Fh</b>	Disable the <b>Bottom of Form</b> (BOF). <b>This command is ignored by Ultimate-II Virtual Printer.</b>
	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(79); 30 CLOSE1
<b>ESC 8</b> <b>27 56</b> <b>1Bh 38h</b>	Disable the end of paper detector to be able to print until the end of the paper. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(56); 30 CLOSE1
<b>ESC 9</b> <b>27 57</b> <b>1Bh 39h</b>	Enable the end of paper detector. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(57); 30 CLOSE1

<b>TAB</b> <b>9</b> <b>09h</b>	This is the traditional <b>horizontal tabulation</b> . Head jumps to the next tabulation stop. Default stops are located every 8 PICA character position since the beginning of a line.  10 OPEN1,4 20 PRINT#1,CHR\$(9);"THIS IS THE PRINT POSITION 8" 30 CLOSE1
<b>VT</b> <b>11</b> <b>0Bh</b>	The same behavior as <b>LF</b> . Advances the paper to the next line (no CR).  10 OPEN1,4 20 PRINT#1,CHR\$(11);"JUMPED ONE LINE" 30 CLOSE1
<b>ESC D n<sub>1</sub> ... 0</b> <b>27 68 n<sub>1</sub> ... 0</b> <b>1Bh 44h n<sub>1</sub> ... 0</b>	Define the <b>horizontal tabulation stop program</b> . Each value <b>n</b> represents a character position where to set a tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created. Current char pitch is used to calculate tab position in the line.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(68);CHR\$(10);CHR\$(20);CHR\$(30);CHR\$(0) 30 CLOSE1

### 7.2.5. Graphic Bitmap

IBM Graphics Printer emulation prints bitmap data the same way as EPSON. An image is defined by a bit array of 8 rows. Each column is encoded in a byte, MSB is up. Horizontal definition can be one of 60, 120 or 240 dpi. Vertical definition is 72 dpi. See Graphic Bitmap for EPSON page 29 for details.

<b>ESC K ...</b> <b>27 75 ...</b> <b>1Bh 4Bh ...</b>	Select the <b>Bit Image Mode</b> in simple density (60 dpi). You have to provide parameters <b>n m d<sub>1</sub> d<sub>2</sub> ...</b> Values <b>n</b> and <b>m</b> are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 <b>d<sub>1</sub> d<sub>2</sub> ...</b> are the bitmap data to print.
--	---

*See EPSON command description page 29 for an example.*

<b>ESC L ...</b> <b>27 76 ...</b> <b>1Bh 4Ch ...</b>	Select the <b>Bit Image Mode</b> in double density (120 dpi), half speed. You have to provide parameters <b>n m d<sub>1</sub> d<sub>2</sub> ...</b> Values <b>n</b> and <b>m</b> are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 <b>d<sub>1</sub> d<sub>2</sub> ...</b> are the bitmap data to print.
--	--

*See EPSON command description page 30 for an example.*

<b>ESC Y ...</b> <b>27 89 ...</b> <b>1Bh 59h ...</b>	Select the <b>Bit Image Mode</b> in double density (120 dpi), normal speed. <b>On Ultimate-II Virtual Printer, ESC Y behaves the same as ESC L</b>
--	---

<b>ESC Z ...</b> <b>27 90 ...</b> <b>1Bh 5Ah ...</b>	Select the <b>Bit Image Mode</b> in quadruple density (240 dpi), half speed. You have to provide parameters <b>n m d<sub>1</sub> d<sub>2</sub> ...</b> Values <b>n</b> and <b>m</b> are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 <b>d<sub>1</sub> d<sub>2</sub> ...</b> are the bitmap data to print.
--	---

*See EPSON command description page 30 for an example.*



<b>CAN</b> <b>24</b> <b>18h</b>	<b>Cancel</b> the current job and clear printer buffer. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC &lt;</b> <b>27 60</b> <b>1Bh 3Ch</b>	Set <b>left to right</b> printing for one line. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC @</b> <b>27 64</b> <b>1Bh 40h</b>	<b>Initialize</b> the printer. Set all parameters to default values. Paper and head are not moved. <b>This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1550C printer.</b>
<b>ESC U n</b> <b>27 85 n</b> <b>1Bh 30h n</b>	Select <b>Mono/Bidirectional</b> printing. <b>This command is ignored by Ultimate-II Virtual Printer.</b> n=0 : bidirectional n=1 : mono-directional (left to right) for better alignment.

## 8. IBM Proprinter commands

This chapter describes the commands the printer can understand when using the IBM Proprinter emulation. This is the less powerful emulation that the MPS-1550C can do. IBM Proprinter was a widely spread printer in the office and business world.

### 8.1. Secondary address

Secondary address on OPEN command is not used by IBM Proprinter emulation.

### 8.2. Commands

#### 8.2.1. Color printing

**ESC b** Select the **Black** ribbon color.

**27 98**

```
1Bh 62h      10 OPEN1,4,7
              20 PRINT#1,CHR$(27);chr$(98);"black"
              30 CLOSE1
              BLACK
```

**ESC m** Select the **Magenta** ribbon color.

**27 109**

```
1Bh 6Dh      10 OPEN1,4,7
              20 PRINT#1,CHR$(27);chr$(109);"magenta"
              30 CLOSE1
              MAGENTA
```

**ESC c** Select the **Cyan** ribbon color.

**27 99**

```
1Bh 63h      10 OPEN1,4,7
              20 PRINT#1,CHR$(27);chr$(99);"cyan"
              30 CLOSE1
              CYAN
```

**ESC y** Select the **Yellow** ribbon color.

**27 121**

```
1Bh 79h      10 OPEN1,4,7
              20 PRINT#1,CHR$(27);chr$(121);"yellow"
              30 CLOSE1
              YELLOW
```

#### 8.2.2. Graphical operations

**ESC G** Select the **Double Strike** print mode. Characters are printed twice and paper is lifted 1/216" between the two passes.

**27 71**

```
1Bh 47h      10 OPEN1,4
              20 PRINT#1,CHR$(27);chr$(71);"DOUBLE STRIKE"
              30 CLOSE1
```

**double strike**

<b>ESC H</b> <b>27 72</b> <b>1Bh 48h</b>	Disable <b>Double Strike</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(27);chr\$(72); 30 CLOSE1
<b>SO</b> <b>14</b> <b>0Eh</b>	Select the <b>Double Width</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(14);"DOUBLE WIDTH" 30 CLOSE1
	<b>DOUBLE WIDTH</b>
<b>DC4</b> <b>20</b> <b>14h</b>	Disable the <b>Double Width</b> print mode  10 OPEN1,4 20 PRINT#1,CHR\$(20); 30 CLOSE1
<b>ESC W 1</b> <b>27 87 1</b> <b>1Bh 57h 01h</b>	Same as <b>SO</b> (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)
<b>ESC W 0</b> <b>27 87 0</b> <b>1Bh 57h 00h</b>	Same as <b>DC4</b> (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)
<b>ESC - 1</b> <b>27 45 49</b> <b>1Bh 2Dh 31h</b>	Select the <b>Underline</b> print mode for all characters and spaces that follow.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(49);"UNDERLINE" 30 CLOSE1
	<b>UNDERLINE</b>
<b>ESC - 0</b> <b>27 45 48</b> <b>1Bh 2Dh 30h</b>	Disable the Underline print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(45);CHR\$(48); 30 CLOSE1
<b>ESC E</b> <b>27 69</b> <b>1Bh 45h</b>	Select the <b>Bold</b> print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(69);"BOLD" 30 CLOSE1

**BOLD**

<b>ESC F</b> <b>27 70</b> <b>1Bh 46h</b>	Disable the Bold print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(70); 30 CLOSE1
<b>SI</b> <b>15</b> <b>0Fh</b>	Select the <b>CONDENSED</b> spacing mode (17.1 chars/inch)  10 OPEN1,4 20 PRINT#1,CHR\$(15);"CONDENSED" 30 CLOSE1
<b>DC2</b> <b>18</b> <b>12h</b>	Select the <b>PICA</b> spacing mode (10 chars/inch). This is the default spacing.  10 OPEN1,4 20 PRINT#1,CHR\$(18);"PICA" 30 CLOSE1
<b>ESC :</b> <b>27 58</b> <b>1Bh 3Ah</b>	Select the <b>ELITE</b> spacing mode (12 chars/inch).  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(58);"ELITE" 30 CLOSE1
<b>ESC S 0</b> <b>27 83 48</b> <b>1Bh 53h 30h</b>	Select the <b>Superscript</b> print mode. Characters are half high than the normal height and are printer on the upper half interline.  10 OPEN1,4 20 PRINT#1,"NORMAL";CHR\$(27);CHR\$(83);CHR\$(48);"SUPERSCRIP" <sup>T</sup> 30 CLOSE1  NORMAL <sup>SUPERSCRIP</sup> T
<b>ESC S 1</b> <b>27 83 49</b> <b>1Bh 53h 31h</b>	Select the <b>Subscript</b> print mode. Characters are half high than the normal height and are printer on the lower half interline.  10 OPEN1,4 20 PRINT#1,"NORMAL";CHR\$(27);CHR\$(83);CHR\$(49);"SUBSCRIPT" <sub>T</sub> 30 CLOSE1  NORMAL <sub>SUBSCRIPT</sub> T
<b>ESC T</b> <b>27 84</b> <b>1Bh 54h</b>	Disable Superscript and Subscript print mode.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(84); 30 CLOSE1



**ESC \_n**            **Overline** ON/OFF. Will print a line over the text.  
**27 95 n**            n=1: enable overline  
**1Bh 5Fh n**        n=0: disable overline

```

10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(95);CHR$(1);"Overline"
30 CLOSE1

```

`Overline`

### 8.2.3. Paper feeding

**LF**                A **Line Feed** advances the paper to the next line (behavior is LF only, no CR).  
**10**  
**0Ah**                10 OPEN1,4  
                       20 PRINT#1,CHR\$(10);  
                       30 CLOSE1

**CR**                A **Carriage Return** returns the print head to the left margin but stays on the same  
**13**                line (behavior is CR only, no LF). You can change the LF behavior with **ESC 5**  
**0Dh**                command.

```

10 OPEN1,4
20 PRINT#1,CHR$(13);
30 CLOSE1

```

**FF**                A **Form Feed** prints the current page to a PNG file and then continues printing on  
**12**                the first line of a new blank page.  
**0Ch**

```

10 OPEN1,4
20 PRINT#1,CHR$(12);
30 CLOSE1

```

**ESC 0**            Select vertical spacing **1/8"** between each printed line.  
**27 48**  
**1Bh 30h**            10 OPEN1,4  
                       20 PRINT#1,CHR\$(27);CHR\$(48);  
                       30 CLOSE1

**ESC 1**            Select vertical spacing **7/72"** between each printed line.  
**27 49**  
**1Bh 31h**            10 OPEN1,4  
                       20 PRINT#1,CHR\$(27);CHR\$(49);  
                       30 CLOSE1

**ESC 2**            Select vertical spacing **1/6"** between each printed line or activate **ESC A** previously  
**27 50**            prepared line spacing.  
**1Bh 32h**

```

10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(50);
30 CLOSE1

```

**ESC 3 n**            Select vertical spacing **n/216"** between each printed line.

<b>27 51 n</b> <b>1Bh 32h n</b>	10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(51);CHR\$(37)"37/216 inch" 30 CLOSE1
<b>ESC 5 n</b> <b>27 53 n</b> <b>1Bh 35h n</b>	Automatic LF ON/OFF. n=1: LF is added on each CR n=0: LF is not added on each CR  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(53);CHR\$(1)"NOW AUTO LF ENABLED" 30 CLOSE1
<b>ESC A n</b> <b>27 65 n</b> <b>1Bh 41h n</b>	Prepare vertical spacing <b>n/72"</b> between each printed line but you will need to activate it with command ESC 2  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(65);CHR\$(8)"8/72 inch for one pass BIM" 30 CLOSE1
<b>ESC J n</b> <b>27 74 n</b> <b>1Bh 4Ah n</b>	Skip down <b>n/216"</b> of paper.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(74);CHR\$(70)"70/216 inch skipped" 30 CLOSE1

#### 8.2.4. Format control

<b>BS</b> <b>8</b> <b>08h</b>	<b>Backspace</b> , go back one character. Left character is not erased and next character will be printed over it. You can combine characters this way.  10 OPEN1,4 20 PRINT#1,"a";CHR\$(8)"^ to print a with a circumflex"; 30 CLOSE1
<b>ESC C n</b> <b>27 67 n</b> <b>1Bh 43h n</b>	Defines the page length in number of lines (range 1-127). Current line spacing is used to calculate form length.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(1-127); 30 CLOSE1
<b>ESC C NUL n</b> <b>27 67 0 n</b> <b>1Bh 43h 00h n</b>	Defines the page length in inches (range 1-22).  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(67);CHR\$(0);CHR\$(1-22); 30 CLOSE1
<b>ESC N m</b> <b>27 78 m</b> <b>1Bh 4Eh m</b>	Define the <b>Bottom of Form (BOF)</b> in number "m" of lines at the end of the page that are skipped to jump over perforations when using continuous paper. <b>This command is ignored by Ultimate-II Virtual Printer.</b>  10 OPEN1,4,7

```
20 PRINT#1,CHR$(27);CHR$(78);CHR$(m);
30 CLOSE1
```

**ESC O**  
**27 79**  
**1Bh 4Fh**

Disable the **Bottom of Form (BOF)**.  
**This command is ignored by Ultimate-II Virtual Printer.**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(79);
30 CLOSE1
```

**ESC 4**  
**27 52**  
**1Bh 34h**

Set Top Of Form (TOF). It uses the current print line as the top margin for next pages. This configuration is kept until power off or Printer Reset in the Ultimate action F5 menu.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(52);"NOW THIS IS TOP MARGIN"
30 CLOSE1
```

**TAB**  
**9**  
**09h**

This is the traditional **horizontal tabulation**. Head jumps to the next tabulation stop. Default stops are located every 8 PICA character position since the beginning of a line.

```
10 OPEN1,4
20 PRINT#1,CHR$(9);"THIS IS THE PRINT POSITION 8"
30 CLOSE1
```

**VT**  
**11**  
**0Bh**

Jump to next **vertical tabulation** stop. There is no Carriage Return. No default stops are defined. If no vertical stops are defined, it will jump one line, same as LF.

```
10 OPEN1,4
20 PRINT#1,CHR$(11);"JUMPED TO NEXT VERTICAL STOP"
30 CLOSE1
```

**ESC B n<sub>1</sub> ... 0**  
**27 66 n<sub>1</sub> ... 0**  
**1Bh 42h n<sub>1</sub> ... 0**

Define the **vertical tabulation stop program**. Each value **n** represents a line number where to set a vertical tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created. Current line spacing is used to calculate tab position in the page.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(66);CHR$(5);CHR$(10);CHR$(15);CHR$(0)
30 CLOSE1
```

**ESC D n<sub>1</sub> ... 0**  
**27 68 n<sub>1</sub> ... 0**  
**1Bh 44h n<sub>1</sub> ... 0**

Define the **horizontal tabulation stop program**. Each value **n** represents a character position where to set a tab stop in ascending order. Last one is 0 to tell that the sequence has ended. Up to 32 stops can be created. Current char pitch is used to calculate tab position in the line.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(68);CHR$(10);CHR$(20);CHR$(30);CHR$(0)
30 CLOSE1
```

**ESC R** Clear tab stops. Horizontal stop are set to default (every 8 characters) and vertical stops are deleted.  
**27 82**  
**1Bh 52h**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(82);
30 CLOSE1
```

### 8.2.5. Graphic Bitmap

IBM Proprinter emulation prints bitmap data the same way as EPSON. An image is defined by a bit array of 8 rows. Each column is encoded in a byte, MSB is up. Horizontal definition can be one of 60, 120 or 240 dpi. Vertical definition is 72 dpi. See Graphic Bitmap for EPSON page 29 for details.

**ESC K ...** Select the **Bit Image Mode** in simple density (60 dpi). You have to provide parameters **n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 75 ...**  
**1Bh 4Bh ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print.

*See EPSON command description page 29 for an example.*

**ESC L ...** Select the **Bit Image Mode** in double density (120 dpi), half speed. You have to provide parameters **n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 76 ...**  
**1Bh 4Ch ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print.

*See EPSON command description page 30 for an example.*

**ESC Y ...** Select the **Bit Image Mode** in double density (120 dpi), normal speed.  
**27 89 ...** **On Ultimate-II Virtual Printer, ESC Y behaves the same as ESC L**  
**1Bh 59h ...**

**ESC Z ...** Select the **Bit Image Mode** in quadruple density (240 dpi), half speed. You have to provide parameters **n m d<sub>1</sub> d<sub>2</sub> ...**  
**27 90 ...**  
**1Bh 5Ah ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256  
**d<sub>1</sub> d<sub>2</sub> ...** are the bitmap data to print.

*See EPSON command description page 30 for an example.*

### 8.2.6. Charset selection

IBM emulation uses ASCII8 to encode characters. This allows 256 combinations to address characters. IBM printers work with 2 character tables. Default is Table 1 described page 63. Table2 is configurable by the user in Ultimate Printer configuration menu from 6 possible international tables. A command can select Table 2 but no command can change the international setting.

**ESC 7** Select **Table 1** character set. This is the default charset for IBM printers.  
**27 55**  
**1Bh 37h**

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(55);
30 CLOSE1
```

<b>ESC 6</b> <b>27 54</b> <b>1Bh 36h</b>	Select <b>Table 2</b> character set. This is the international charset user configured.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(54); 30 CLOSE1
<b>ESC \ n</b> <b>27 92 n</b> <b>1Bh 5Ch n</b>	Print <b>n</b> characters from extended table. In the next <b>n</b> data, commands will not be interpreted. If a code is not printable it will be replace with a space.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(92);CHR\$(3);CHR\$(27);CHR\$(92);CHR\$(54); 30 CLOSE1
<b>ESC ^</b> <b>27 94</b> <b>1Bh 5Eh</b>	Print <b>one</b> character from extended table. The next data byte will not be interpreted as a command. If the code is not printable it will be replace with a space.  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(94);CHR\$(13); 30 CLOSE1

### 8.2.7. Character creation, Down Line Loading (DLL)

All the commands related to character creation are ignored in the Ultimate-II Virtual Printer. The commands are understood and correctly interpreted but ignored to skip them gently.

<b>ESC =</b> <b>27 61</b> <b>1Bh 3Dh</b>	This code has to be followed by parameters <b>m n</b> and data. <b>m</b> and <b>n</b> are the number of bytes to load in order to have $n + (m \times 256) = \text{size}$ <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC I n</b> <b>27 73 n</b> <b>1Bh 49h n</b>	Select the print quality depending on parameter "n" n=0 standard quality (draft) and normal characters n=2 near letter quality (NLQ) and normal characters n=4 standard quality (draft) and special characters created with Down Line Loading (DLL). <b>Not supported on Ultimate-II Virtual Printer, same behavior as n=0.</b> n=6 near letter quality (NLQ) and special characters created with Down Line Loading (DLL). <b>Not supported on Ultimate-II Virtual Printer, same behavior as n=2.</b>  10 OPEN1,4 20 PRINT#1,CHR\$(27);CHR\$(73);CHR\$(n); 30 CLOSE1  DRAFT QUALITY NEAR LETTER QUALITY

### 8.2.8. Other commands

<b>BELL</b> <b>7</b> <b>07h</b>	Make a short beep. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
---------------------------------------	--

<b>DC1</b> <b>17</b> <b>11h</b>	Printer selection. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>DC3</b> <b>19</b> <b>13h</b>	No operation.
<b>CAN</b> <b>24</b> <b>18h</b>	<b>Cancel</b> the current job and clear printer buffer. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC &lt;</b> <b>27 60</b> <b>1Bh 3Ch</b>	Set <b>left to right</b> printing for one line. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC @</b> <b>27 64</b> <b>1Bh 40h</b>	<b>Initialize</b> the printer. Set all parameters to default values. Paper and head are not moved. <b>This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1550C printer.</b>
<b>ESC Q</b> <b>27 81</b> <b>1Bh 51h</b>	De-select printer. <b>This command is ignored by Ultimate-II Virtual Printer.</b>
<b>ESC U n</b> <b>27 85 n</b> <b>1Bh 30h n</b>	Select <b>Mono/Bidirectional</b> printing. <b>This command is ignored by Ultimate-II Virtual Printer.</b> n=0 : bidirectional n=1 : mono-directional (left to right) for better alignment.

### 9. PETASCII character table

#### 9.1. USA/UK

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	-	┘					┘	-	┘		┘
1		!	1	A	Q	♠	●				█	┘	♠	●	█	┘
2		”	2	B	R		-				█	┘		-	█	┘
3		#	3	C	S	-	♥				-	┘	-	♥	-	┘
4		\$	4	D	T	-					-		-		-	
5		%	5	E	U	-	✓						-	✓		
6		&	6	F	V	-	×				▒	█	-	×	▒	█
7		'	7	G	W		o					-		o		-
8		(	8	H	X		♣				▒	-		♣	▒	-
9		)	9	I	Y	✓					▒	█	✓		▒	█
A		*	:	J	Z	✓	♦					┘	✓	♦		┘
B		+	;	K	[	✓	+				┘	█	✓	+	┘	█
C		,	<	L	£	L	▒				█	█	L	▒	█	█
D		-	=	M	]	✓					┘	┘	✓		┘	┘
E		.	>	N	↑	✓	≠				┘	█	✓	≠	┘	█
F		/	?	O	←	┘	▒				-	█	┘	▒	-	▒

Table 1 : USA/UK Charset in Uppercase/Graphic Mode (Secondary address = 0)

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

Table 2 USA/UK Charset in Lowercase/Uppercase Mode (Secondary address = 7)

9.2. Denmark

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	-	┘					┘	-	┘		┘
1		!	1	A	Q	♠	●				┘	┘	♠	●	┘	┘
2		”	2	B	R		-				┘	T		-	┘	T
3		#	3	C	S	-	♥				-	┘	-	♥	-	┘
4		\$	4	D	T	-					-		-		-	
5		%	5	E	U	-	┘						-	┘		
6		&	6	F	V	-	×				▒	▒	-	×	▒	▒
7		'	7	G	W		o					-		o		-
8		(	8	H	X		♣				▒	-		♣	▒	-
9		)	9	I	Y	┘					▒	-	┘		▒	-
A		*	:	J	Z	┘	♦					┘	┘	♦		┘
B		+	;	K	Æ	┘	+				┘	▒	┘	+	┘	▒
C		,	<	L	Ø	L	▒				┘	▒	L	▒	┘	▒
D		-	=	M	Å	┘					┘	┘	┘		┘	┘
E		.	>	N	↑	┘	π				┘	▒	┘	π	┘	▒
F		/	?	O	←	┘	▒				-	▒	┘	▒	-	π

Table 3 : DENMARK Charset in Uppercase/Graphic Mode (Secondary address = 0)

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

Table 4 DENMARK Charset in Lowercase/Uppercase Mode (Secondary address = 7)



### 9.3. France / Italy

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	7				8	`	7		8	
1		!	1	A	Q	◀	▶				l	à	◀	▶	l	à
2		”	2	B	R	—	◊				l	è	—	◊	l	è
3		#	3	C	S	■	■				±	ì	■	■	±	ì
4		\$	4	D	T	◊	◊				l	ò	◊	◊	l	ò
5		%	5	E	U	■	■				±	ù	■	■	±	ù
6		&	6	F	V	◊	◊				—	â	◊	◊	—	â
7		'	7	G	W	◊	◊				±	ê	◊	◊	±	ê
8		(	8	H	X	■	■				r	î	■	■	r	î
9		)	9	I	Y	l	l				±	ô	l	l	±	ô
A		*	:	J	Z	l	l				±	ù	l	l	±	ù
B		+	;	K	[	\	ë				±	ä	\	ë	±	ä
C		,	<	L	\	L	ï				£	ö	L	ï	£	ö
D		-	=	M	]	/	°				'	ü	/	°	'	ü
E		.	>	N	↑	—	π				^	β	—	π	^	β
F		/	?	O	—	Γ	ç				"	é	Γ	ç	"	π

Table 5 : FRANCE/ITALY Charset in Uppercase/Graphic Mode (Secondary address = 0)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0			0	@	p	`	P				8	`	P		8	
1		!	1	a	q	A	Q				l	à	A	Q	l	à
2		”	2	b	r	B	R				l	è	B	R	l	è
3		#	3	c	s	C	S				±	ì	C	S	±	ì
4		\$	4	d	t	D	T				l	ò	D	T	l	ò
5		%	5	e	u	E	U				±	ù	E	U	±	ù
6		&	6	f	v	F	V				—	â	F	V	—	â
7		'	7	g	w	G	W				±	ê	G	W	±	ê
8		(	8	h	x	H	X				r	î	H	X	r	î
9		)	9	i	y	I	Y				±	ô	I	Y	±	ô
a		*	:	j	z	J	Z				±	ù	J	Z	±	ù
b		+	;	k	[	K	ë				±	ä	K	ë	±	ä
c		,	<	l	\	L	ï				£	ö	L	ï	£	ö
d		-	=	m	]	M	°				'	ü	M	°	'	ü
e		.	>	n	↑	N	π				^	β	N	π	^	β
f		/	?	o	—	O	ç				"	é	O	ç	"	π

Table 6 FRANCE/ITALY Charset in Lowercase/Uppercase Mode (Secondary address = 7)

9.4. Germany

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	7				@	`	7			
1		!	1	A	Q	◀	▶				l	µ	◀	▶	l	◀
2		”	2	B	R	-	∕				l	à	-	∕	l	-
3		#	3	C	S	■	■				±	ù	■	■	±	■
4		\$	4	D	T	■	∕				±	â	■	∕	±	■
5		%	5	E	U	■	∕				±	ê	■	∕	±	■
6		&	6	F	V	∕	-				-	î	∕	-	∕	
7		'	7	G	W	∕	■				±	ô	∕	±	∕	
8		(	8	H	X	■	■				r	û	■	■	r	■
9		)	9	I	Y	∕	-				±	√	∕	±	∕	
A		*	:	J	Z	∕	■				±	Σ	∕	±	∕	
B		+	;	K	[	∕	■				±	Ä	∕	±	∕	
C		,	<	L	\	L	∕				é	Ö	L	∕	é	L
D		-	=	M	]	∕	■				£	Ü	∕	■	£	∕
E		.	>	N	↑	-	π				è	β	-	π	è	-
F		/	?	O	-	∕	-				'	^	∕	-	'	π

Table 7 : GERMANY Charset in Uppercase/Graphic Mode (Secondary address = 0)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0			0	@	p	`	P				g	`	P			g
1		!	1	a	q	A	Q				l	à	A	Q	l	à
2		”	2	b	r	B	R				l	è	B	R	l	è
3		#	3	c	s	C	S				±	ì	C	S	±	ì
4		\$	4	d	t	D	T				±	ò	D	T	±	ò
5		%	5	e	u	E	U				±	ù	E	U	±	ù
6		&	6	f	v	F	V				-	â	F	V	-	â
7		'	7	g	w	G	W				±	ê	G	W	±	ê
8		(	8	h	x	H	X				r	î	H	X	r	î
9		)	9	i	y	I	Y				±	ô	I	Y	±	ô
a		*	:	j	z	J	Z				±	û	J	Z	±	û
b		+	;	k	[	K	Ä				±	ä	K	Ä	±	ä
c		,	<	l	\	L	Ö				é	ö	L	Ö	é	ö
d		-	=	m	]	M	Ü				£	ü	M	Ü	£	ü
e		.	>	n	↑	N	π				è	β	N	π	è	β
f		/	?	o	-	O	-				'	é	O	-	'	π

Table 8 GERMANY Charset in Lowercase/Uppercase Mode (Secondary address = 7)

9.5. Spain

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	┘				←	`	┘			←
1	!	1	A	Q	▾	▾						À	▾	▾		À
2	”	2	B	R	▬	↙					└	È	▬	↙	└	È
3	#	3	C	S	■	■					├	♠	■	■	├	♠
4	\$	4	D	T	▬	▬					└	Ò	▬	▬	└	Ò
5	%	5	E	U	▬	▬					└	♥	▬	▬	└	♥
6	&	6	F	V	`	▬					—	Á	`	▬	—	Á
7	'	7	G	W	↘	■					├	É	↘	■	├	É
8	(	8	H	X	■	▬					└	Í	■	▬	└	Í
9	)	9	I	Y		▬					├	Ó		▬	├	Ó
A	*	:	J	Z		■					├	Ú		■	├	Ú
B	+	;	K	[	\	ı					├	ÿ	\	ë	├	ÿ
C	,	<	L	\	L	¿					£	Ü	L	ı	£	Ü
D	-	=	M	]	/	■					'	Ñ	/	°	'	Ñ
E	.	>	N	↑	▬	π					♣	♦	▬	π	♣	♦
F	/	?	O	—	┘	┘					”	Ç	┘	Ç	”	π

Table 9 : SPAIN Charset in Uppercase/Graphic Mode (Secondary address = 0)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0			0	@	p	`	P				←	`	P			←
1	!	1	a	q	A	Q						à	A	Q		à
2	”	2	b	r	B	R					└	è	B	R	└	è
3	#	3	c	s	C	S					├	♠	C	S	├	♠
4	\$	4	d	t	D	T					└	ò	D	T	└	ò
5	%	5	e	u	E	U					└	♥	E	U	└	♥
6	&	6	f	v	F	V					—	á	F	V	—	á
7	'	7	g	w	G	W					├	é	G	W	├	é
8	(	8	h	x	H	X					└	í	H	X	└	í
9	)	9	i	y	I	Y					├	ó	I	Y	├	ó
a	*	:	j	z	J	Z					├	ú	J	Z	├	ú
b	+	;	k	[	K	ı					├	ÿ	K	ı	├	ÿ
c	,	<	l	\	L	¿					£	ü	L	ı	£	ü
d	-	=	m	]	M	Ñ					'	ñ	]	M	Ñ	'
e	.	>	n	↑	N	π					♣	♦	N	π	♣	♦
f	/	?	o	—	O	Ç					”	ç	O	Ç	”	π

Table 10 SPAIN Charset in Lowercase/Uppercase Mode (Secondary address = 7)

9.6. Sweden

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	-	┘					┘	-	┘		┘
1		!	1	A	Q	♠	●				■	┘	♠	●	■	┘
2		”	2	B	R		-				■	┘		-	■	┘
3		#	3	C	S	-	♥				-	┘	-	♥	-	┘
4		\$	4	D	T	-					-		-		-	
5		%	5	E	U	-	✓						-	✓		
6		&	6	F	V	-	×				■	■	-	×	■	■
7		'	7	G	W		o					-		o		-
8		(	8	H	X		♣				■	-		♣	■	-
9		)	9	I	Y	✓					■	■	✓		■	■
A		*	:	J	Z	✓	♦					┘	✓	♦		┘
B		+	;	K	Ä	✓	+				┘	■	✓	+	┘	■
C		,	<	L	Ö	L	■				■	■	L	■	■	■
D		-	=	M	Å	✓					┘	┘	✓		┘	┘
E		.	>	N	↑	✓	π				┘	■	✓	π	┘	■
F		/	?	O	←	┘	■				-	■	┘	■	-	π

Table 11 : SWEDEN Charset in Uppercase/Graphic Mode (Secondary address = 0)

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

Table 12 SWEDEN Charset in Lowercase/Uppercase Mode (Secondary address = 7)

9.7. Switzerland

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	7				8	`	7		8	
1		!	1	A	Q	▾	▾					à	▾	▾		à
2		”	2	B	R	—	/				ˆ	è	—	/	ˆ	è
3		#	3	C	S	■	■				±	ì	■	■	±	ì
4		\$	4	D	T	■	\				ˆ	ò	■	\	ˆ	ò
5		%	5	E	U	■					†	ù	■		†	ù
6		&	6	F	V	\	—				—	â	\	—	â	
7		'	7	G	W	/	■				†	ê	/	■	†	ê
8		(	8	H	X	■	—				ˆ	î	■	—	ˆ	î
9		)	9	I	Y		—				ˆ	ô		—	ˆ	ô
A		*	:	J	Z		■				ˆ	û		■	ˆ	û
B		+	;	K	[	\	ë				ˆ	Ä	\	ë	ˆ	Ä
C		,	<	L	\	L	ï				£	ö	L	ï	£	ö
D		-	=	M	]	/	²				'	ü	/	²	'	ü
E		.	>	N	↑	—	π				^	β	—	π	^	β
F		/	?	O	—	Γ	ç				"	é	Γ	ç	"	π

Table 13 : SWITZERLAND Charset in Uppercase/Graphic Mode (Secondary address = 0)

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0			0	@	p	`	P				8	`	P		8	
1		!	1	a	q	A	Q					à	A	Q		à
2		”	2	b	r	B	R				ˆ	è	B	R	ˆ	è
3		#	3	c	s	C	S				±	ì	C	S	±	ì
4		\$	4	d	t	D	T				ˆ	ò	D	T	ˆ	ò
5		%	5	e	u	E	U				†	ù	E	U	†	ù
6		&	6	f	v	F	V				—	â	F	V	—	â
7		'	7	g	w	G	W				†	ê	G	W	†	ê
8		(	8	h	x	H	X				ˆ	î	H	X	ˆ	î
9		)	9	i	y	I	Y				ˆ	ô	I	Y	ˆ	ô
a		*	:	j	z	J	Z				ˆ	û	J	Z	ˆ	û
b		+	;	k	[	K	ë				ˆ	ä	K	ë	ˆ	ä
c		,	<	l	\	L	ï				£	ö	L	ï	£	ö
d		-	=	m	]	M	²				'	ü	M	²	'	ü
e		.	>	n	↑	N	π				^	β	N	π	^	β
f		/	?	o	—	O	ç				"	é	O	ç	"	π

Table 14 SWITZERLAND Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 10. EPSON FX-80/JX-80 character table

### 10.1. Basic charset

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

### 10.2. Extended charset

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	à	â	0	@	P	`	p	à	â		0	@	P	`	p	
1	é	ë	!	A	Q	a	q	è	ë	/	1	A	Q	a	q	
2	ù		"	B	R	b	r	ù		"	2	B	R	b	r	
3	ò		#	C	S	c	s	ò		#	3	C	S	c	s	
4	ì		\$	D	T	d	t	ì		\$	4	D	T	d	t	
5	°		%	E	U	e	u	°		%	5	E	U	e	u	
6	£		&	F	V	f	v	£		&	6	F	V	f	v	
7	Ä		'	G	W	g	w	Ä		'	7	G	W	g	w	
8	Ö		(	H	X	h	x	Ö		(	8	H	X	h	x	
9	Û		)	I	Y	i	y	Û		)	9	I	Y	i	y	
A	ä		*	J	Z	j	z	ä		*	A	J	Z	j	z	
B		+	;	K	[	k	[		+	;	B	K	[	k	[	
C	ü		,	L	\	l		ü		,	C	L	\	l		
D	é		-	M	]	m	]	é		-	D	M	]	m	]	
E	é		.	N	^	n	~	é		.	E	N	^	n	~	
F	¥		/	O	_	o		¥		/	F	O	_	o		∅

### 10.3. International charsets changes

CHARSET	23h	24h	40h	5Bh	5ch	5dh	5eh	60h	7Bh	7Ch	7Dh	7Eh
Basic	#	\$	@	[	\	]	^	`	(		)	~
USA	#	\$	@	[	\	]	^	`	(		)	~
France	#	\$	à	°	ç	§	^	`	é	ù	è	°
Germany	#	\$	ä	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	£	\$	@	[	\	]	^	`	(		)	~
Denmark I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Å	Ö	Å	Ü	é	ä	ö	å	Ü
Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₧	\$	@	í	ñ	¿	^	`	ñ	ñ	)	~
Japan	#	\$	@	[	¥	]	^	`	(		)	~
Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	Ü
Denmark II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	Ü

## 11. IBM character tables

### 11.1. Table 1

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

### 11.2. Table 2

#### 11.2.1. International 1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P	`	p	ç	é	á	í	ó	ú	ñ	ñ	ñ
1		!	1	A	Q	a	q	ü	æ	í	ó	ú	ñ	ñ	ñ	ñ
2		”	2	B	R	b	r	é	æ	í	ó	ú	ñ	ñ	ñ	ñ
3	♥	#	3	C	S	c	s	á	ö	ó	ú	ñ	ñ	ñ	ñ	ñ
4	♦	\$	4	D	T	d	t	ä	ö	ó	ú	ñ	ñ	ñ	ñ	ñ
5	♣	%	5	E	U	e	u	à	ö	ó	ú	ñ	ñ	ñ	ñ	ñ
6	♠	&	6	F	V	f	v	â	ö	ó	ú	ñ	ñ	ñ	ñ	ñ
7		'	7	G	W	g	w	ç	ü	ó	ú	ñ	ñ	ñ	ñ	ñ
8		(	8	H	X	h	x	é	y	ö	ú	ñ	ñ	ñ	ñ	ñ
9		)	9	I	Y	i	y	è	ü	ö	ú	ñ	ñ	ñ	ñ	ñ
A		*	:	J	Z	j	z	ë	ü	ö	ú	ñ	ñ	ñ	ñ	ñ
B		+	;	K	[	k	[	ï	é	ö	ú	ñ	ñ	ñ	ñ	ñ
C		,	<	L	\	l	\	ï	é	ö	ú	ñ	ñ	ñ	ñ	ñ
D		-	=	M	]	m	]	ï	é	ö	ú	ñ	ñ	ñ	ñ	ñ
E		.	>	N	^	n	^	ï	é	ö	ú	ñ	ñ	ñ	ñ	ñ
F		/	?	O	_	o	_	ï	é	ö	ú	ñ	ñ	ñ	ñ	ñ

11.2.2. International 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á		L	F	α	≡
1		!	”	1	A	Q	a	q	Û	æ	í		+	F	β	±
2	♥	”	”	2	B	R	b	r	ü	Æ	ó		+	F	Γ	±
3	♦	#	”	3	C	S	c	s	é	ø	ú		+	F	Γ	±
4	♠	\$	”	4	D	T	d	t	ä	ö	ñ		+	F	Γ	±
5	⊗	%	”	5	E	U	e	u	å	ø	ñ		+	F	Γ	±
6	♣	&	”	6	F	V	f	v	ä	ø	ñ		+	F	Γ	±
7		'	”	7	G	W	g	w	ç	ü	ö		+	F	Γ	±
8		(	”	8	H	X	h	x	é	ü	ö		+	F	Γ	±
9		)	”	9	I	Y	i	y	ë	ü	ö		+	F	Γ	±
A		*	”	*	J	Z	j	z	ë	ü	ö		+	F	Γ	±
B		+	”	+	K	[	k	[	ë	ü	ö		+	F	Γ	±
C		,	”	,	L	\	l	\	ë	ü	ö		+	F	Γ	±
D		-	”	-	M	]	m	]	ë	ü	ö		+	F	Γ	±
E		.	”	.	N	^	n	^	ë	ü	ö		+	F	Γ	±
F		/	”	/	O	_	o	_	ë	ü	ö		+	F	Γ	±

11.2.3. Israel

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	ן	י	á		L	F	α	≡
1		!	”	1	A	Q	a	q	ן	י	í		+	F	β	±
2	♥	”	”	2	B	R	b	r	ן	י	ó		+	F	Γ	±
3	♦	#	”	3	C	S	c	s	ן	י	ú		+	F	Γ	±
4	♠	\$	”	4	D	T	d	t	ן	י	ñ		+	F	Γ	±
5	⊗	%	”	5	E	U	e	u	ן	י	ñ		+	F	Γ	±
6	♣	&	”	6	F	V	f	v	ן	י	ñ		+	F	Γ	±
7		'	”	7	G	W	g	w	ן	י	ñ		+	F	Γ	±
8		(	”	8	H	X	h	x	ן	י	ñ		+	F	Γ	±
9		)	”	9	I	Y	i	y	ן	י	ñ		+	F	Γ	±
A		*	”	*	J	Z	j	z	ן	י	ñ		+	F	Γ	±
B		+	”	+	K	[	k	[	ן	י	ñ		+	F	Γ	±
C		,	”	,	L	\	l	\	ן	י	ñ		+	F	Γ	±
D		-	”	-	M	]	m	]	ן	י	ñ		+	F	Γ	±
E		.	”	.	N	^	n	^	ן	י	ñ		+	F	Γ	±
F		/	”	/	O	_	o	_	ן	י	ñ		+	F	Γ	±

11.2.4. Greece

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Α	Ρ	ι		L	F	α	Ω
1		!	”	1	A	Q	a	q	Β	Σ	κ		+	F	ε	±
2	♥	”	”	2	B	R	b	r	Γ	Τ	λ		+	F	ε	±
3	♦	#	”	3	C	S	c	s	Δ	Υ	μ		+	F	ε	±
4	♠	\$	”	4	D	T	d	t	Ε	Φ	ν		+	F	ε	±
5	⊗	%	”	5	E	U	e	u	Ζ	Χ	ξ		+	F	ε	±
6	♣	&	”	6	F	V	f	v	Η	Ψ	ο		+	F	ε	±
7		'	”	7	G	W	g	w	Θ	Ω	π		+	F	ε	±
8		(	”	8	H	X	h	x	Ι	Κ	ρ		+	F	ε	±
9		)	”	9	I	Y	i	y	Κ	β	σ		+	F	ε	±
A		*	”	*	J	Z	j	z	Λ	γ	τ		+	F	ε	±
B		+	”	+	K	[	k	[	Μ	δ	υ		+	F	ε	±
C		,	”	,	L	\	l	\	Ν	ε	φ		+	F	ε	±
D		-	”	-	M	]	m	]	Ξ	ζ	χ		+	F	ε	±
E		.	”	.	N	^	n	^	Ο	η	ψ		+	F	ε	±
F		/	”	/	O	_	o	_	Π	θ	φ		+	F	ε	±



11.2.5. Portugal

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	Á	⋮	⌈	⌋	⌌	≡
1		!	"	1	A	Q	a	q	Ü	Ê	Â	⋮	⌈	⌋	⌌	±
2		”	#	2	B	R	b	r	Û	Ë	Ã	⋮	⌈	⌋	⌌	²
3	♥		\$	3	C	S	c	s	ä	Ö	Ü	⋮	⌈	⌋	⌌	³
4	♦		%	4	D	T	d	t	å	Ø	Ń	⋮	⌈	⌋	⌌	¼
5	♣	®	&	5	E	U	e	u	ä	Ò	Ñ	⋮	⌈	⌋	⌌	½
6			'	6	F	V	f	v	å	Ó	Ń	⋮	⌈	⌋	⌌	¾
7			(	7	G	W	g	w	ç	Ü	Ö	⋮	⌈	⌋	⌌	•
8			)	8	H	X	h	x	ë	Ý	Û	⋮	⌈	⌋	⌌	°
9			*	9	I	Y	i	y	ë	Û	Ä	⋮	⌈	⌋	⌌	•
A			+		J	Z	j	z	ÿ	Ü	Å	⋮	⌈	⌋	⌌	•
B			,		K	[	k	[	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
C			<		L	\	l	\	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
D			=		M	]	m	]	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
E			>		N	^	n	^	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
F			/		O	_	o	_	ÿ	Å	Û	⋮	⌈	⌋	⌌	•

11.2.6. Spain

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	Á	⋮	⌈	⌋	⌌	≡
1		!	"	1	A	Q	a	q	Ü	Ê	Â	⋮	⌈	⌋	⌌	±
2		”	#	2	B	R	b	r	Û	Ë	Ã	⋮	⌈	⌋	⌌	²
3	♥		\$	3	C	S	c	s	ä	Ö	Ü	⋮	⌈	⌋	⌌	³
4	♦		%	4	D	T	d	t	å	Ø	Ń	⋮	⌈	⌋	⌌	¼
5	♣	®	&	5	E	U	e	u	ä	Ò	Ñ	⋮	⌈	⌋	⌌	½
6			'	6	F	V	f	v	å	Ó	Ń	⋮	⌈	⌋	⌌	¾
7			(	7	G	W	g	w	ç	Ü	Ö	⋮	⌈	⌋	⌌	•
8			)	8	H	X	h	x	ë	Ý	Û	⋮	⌈	⌋	⌌	°
9			*	9	I	Y	i	y	ë	Û	Ä	⋮	⌈	⌋	⌌	•
A			+		J	Z	j	z	ÿ	Ü	Å	⋮	⌈	⌋	⌌	•
B			,		K	[	k	[	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
C			<		L	\	l	\	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
D			=		M	]	m	]	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
E			>		N	^	n	^	ÿ	Å	Û	⋮	⌈	⌋	⌌	•
F			/		O	_	o	_	ÿ	Å	Û	⋮	⌈	⌋	⌌	•

## 12. Commodore commands reference

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>BIT IMG</b>	8	08	Select graphic Bit Image Mode	18
<b>BIM IMG SUB</b>	8 26	08 1A	Select repeated graphic Bit Image Mode	18
<b>HTAB</b>	9	09	Horizontal tabulation	17
<b>LF</b>	10	0A	Line Feed	16
<b>FF</b>	12	0C	Form Feed	16
<b>CR</b>	13	0D	Carriage Return	16
<b>EN ON</b>	14	0E	Double width character ON	12
<b>EN OFF</b>	15	0F	Double width character OFF, Bitmap Image Mode OFF	13
<b>POS</b>	16	10	Jump to horizontal position in number of characters	17
<b>CRSR DWN</b>	17	11	Select Commodore charset with lowercases and uppercases	15
<b>RVS ON</b>	18	12	Negative character ON	13
<b>ESC</b>	27	1B	ASCII code for the Escape character	
<b>NLQ ON</b>	31	1F	Near Letter Quality ON	15
<b>ESC POS</b>	16	10	Jump to horizontal position in number of dots	17
<b>ESC -</b>	45	2D	Underline ON/OFF	13
<b>ESC 4</b>	52	34	Italic ON	13
<b>ESC 5</b>	53	35	Italic OFF	14
<b>ESC 8*</b>	56	38	Disable paper end sensor	17
<b>ESC 9*</b>	57	39	Enable paper end sensor	17
<b>ESC =*</b>	61	3D	Custom character definition using Down Line Loading (DLL)	19
<b>ESC c</b>	67	43	Set paper height in number of text lines	11
<b>ESC c NUL</b>	67 0	43 00	Set paper height in inches	16
<b>ESC e</b>	69	45	Bold character ON	13
<b>ESC f</b>	70	46	Bold character OFF	13
<b>ESC g</b>	71	47	Double Strike ON	12
<b>ESC h</b>	72	48	Double Strike OFF	12
<b>ESC i</b>	73	49	Select character print definition	20
<b>ESC n*</b>	78	4E	Define Bottom of Page (BOF)	16
<b>ESC o*</b>	79	4F	Disable Bottom of Page (BOF)	16
<b>ESC s</b>	83	53	Select Superscript or Subscript character mode	14
<b>ESC t</b>	84	54	Disable Superscript and Subscript character mode	15
<b>ESC [</b>	91	5B	Select character spacing (PICA, ELITE, ...)	14
<b>ESC B</b>	98	62	Select black color	11
<b>ESC C</b>	99	63	Select cyan color	11
<b>ESC M</b>	109	6D	Select magenta color	11
<b>ESC R</b>	114	72	Select color	12
<b>ESC X</b>	120	78	Select NLQ or DRAFT	15
<b>ESC Y</b>	121	79	Select yellow color	12
<b>CS</b>	141	8D	Carriage Return with no Line Feed	16
<b>CRSR UP</b>	145	91	Select Commodore charset with uppercases and graphics	15
<b>RVS OFF</b>	146	92	Negative character OFF	13

\* Ignored in the Ultimate-II Virtual Printer

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>NLQ OFF</b>	159	9F	Near Letter Quality OFF	15

### 13. EPSON FX-80/JX-80 commands reference

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>BS</b>	8	08	Backspace	27
<b>TAB</b>	9	09	Horizontal tabulation	28
<b>LF</b>	10	0A	Line Feed	25
<b>VT</b>	11	0B	Vertical tabulation	28
<b>FF</b>	12	0C	Form Feed	26
<b>CR</b>	13	0D	Carriage Return	26
<b>SO</b>	14	0E	Double width character ON	22
<b>SI</b>	15	0F	Condensed pitch 17.1 cpi ON	23
<b>DC1*</b>	17	11	Printer select	34
<b>DC2</b>	18	12	Condensed pitch 17.1 cpi OFF	23
<b>DC3*</b>	19	13	Printer suspend	34
<b>DC4</b>	20	14	Double width character OFF	22
<b>CAN*</b>	24	18	Clean print buffer	34
<b>ESC</b>	27	1B	ASCII code for the Escape character	
<b>ESC SO</b>	14	0E	Double width character ON	22
<b>ESC SI</b>	15	0F	Condensed pitch 17.1 cpi ON	23
<b>ESC !</b>	33	21	Select graphics layout types	24
<b>ESC #*</b>	35	23	Clear bit 7 forcing (MSB)	34
<b>ESC %*</b>	37	25	Select RAM (special chars) and ROM (standard chars)	34
<b>ESC &amp;*</b>	38	26	Define special characters in RAM (DLL)	33
<b>ESC -</b>	45	2D	Underline ON/OFF	22
<b>ESC /</b>	47	2F	Vertical TAB stops program	29
<b>ESC 0</b>	48	30	Line spacing = 1/8"	26
<b>ESC 1</b>	49	31	Line spacing = 7/72"	26
<b>ESC 2</b>	50	32	Line spacing = 1/6"	26
<b>ESC 3</b>	51	33	Line spacing = n/216"	26
<b>ESC 4</b>	52	34	Italic ON	23
<b>ESC 5</b>	53	35	Italic OFF	23
<b>ESC 6*</b>	54	36	Extend printable character set	33
<b>ESC 7</b>	55	37	Select basic national characters table	32
<b>ESC 8*</b>	56	38	Disable paper end sensor	28
<b>ESC 9*</b>	57	39	Enable paper end sensor	28
<b>ESC :*</b>	58	3A	Copy standard character generator (ROM) into RAM	33
<b>ESC &lt;*</b>	60	3C	Set left to right printing for one line	34
<b>ESC =*</b>	61	3D	Force bit 7 (MSB) to "0"	34
<b>ESC &gt;*</b>	62	3E	Force bit 7 (MSB) to "1"	34
<b>ESC ?</b>	63	3F	Change BIM density selected by graphics commands	31
<b>ESC @</b>	64	40	Initialize printer (main reset)	34
<b>ESC A</b>	65	41	Line spacing = n/72"	26
<b>ESC B</b>	66	42	Vertical TAB stops program	28
<b>ESC C</b>	67	43	Set paper height in number of text lines	27
<b>ESC C NUL</b>	67 0	43 00	Set paper height in inches	27
<b>ESC D</b>	68	44	Horizontal TAB stops program	28
<b>ESC E</b>	69	45	Bold character ON	22
<b>ESC F</b>	70	46	Bold character OFF	23
<b>ESC G</b>	71	47	Double Strike ON	21

\* Ignored in the Ultimate-II Virtual Printer

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
ESC H	72	48	Double Strike OFF	22
ESC I	73	49	Extend printable characters set	33
ESC J	74	4A	Skip n/216" of paper	26
ESC K	75	4B	Set normal density graphics	29
ESC L	76	4C	Set double density graphics	30
ESC M	77	4D	Elite pitch 12 cpi ON	23
ESC N*	78	4E	Define Bottom of Page (BOF)	27
ESC O*	79	4F	Disable Bottom of Page (BOF)	27
ESC P	80	50	Elite pitch 12 cpi OFF	23
ESC Q	81	51	Define right margin	27
ESC R	82	52	Select national character set	21
ESC S	83	53	Select Superscript or Subscript character mode	24
ESC T	84	54	Disable Superscript and Subscript character mode	24
ESC U*	85	55	Mono/Bidirectional printing	34
ESC W	87	57	Double width characters ON/OFF	22
ESC Y	89	59	Double density BIM selection, normal speed	30
ESC Z	90	5A	Four times density BIM selection	30
ESC ^	94	5E	9-dot high strips BIM printing	32
ESC b	98	62	Select up to 8 vertical tab stops programs	29
ESC i*	105	69	Immediate character printing ON/OFF	34
ESC j	106	6A	Reverse paper feed n/216"	27
ESC l	108	6C	Define left margin	27
ESC p*	112	70	Proportional spacing ON/OFF	24
ESC r	114	72	Select color	21
ESC s*	115	73	Half speed printing ON/OFF	34
ESC x	120	78	Select NLQ or DRAFT	24
DEL*	127	7F	Clear last printable character	34

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\* Ignored in the Ultimate-II Virtual Printer

## 14. IBM Graphics Printer commands reference

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>BELL*</b>	7	07	Beep	44
<b>BS</b>	8	08	Backspace	41
<b>TAB</b>	9	09	Horizontal tabulation	43
<b>LF</b>	10	0A	Line Feed	40
<b>VT</b>	11	0B	Line Feed	43
<b>FF</b>	12	0C	Form Feed	41
<b>CR</b>	13	0D	Carriage Return	41
<b>SO</b>	14	0E	Double width character ON	37
<b>SI</b>	15	0F	Condensed pitch 17.1 cpi ON	39
<b>DC2</b>	18	12	Condensed pitch 17.1 cpi OFF	39
<b>DC4</b>	20	14	Double width character OFF	37
<b>CAN*</b>	24	18	Clean print buffer	45
<b>ESC</b>	27	1B	ASCII code for the Escape character	
<b>ESC SO</b>	14	0E	Double width character ON	38
<b>ESC ! †</b>	33	21	Select graphics layout types	40
<b>ESC -</b>	45	2D	Underline ON/OFF	38
<b>ESC 0</b>	48	30	Line spacing = 1/8"	41
<b>ESC 1</b>	49	31	Line spacing = 7/72"	41
<b>ESC 2</b>	50	32	Line spacing = 1/6"	41
<b>ESC 3</b>	51	33	Line spacing = n/216"	41
<b>ESC 4 †</b>	52	34	Italic ON	38
<b>ESC 5 †</b>	53	35	Italic OFF	39
<b>ESC 6</b>	54	36	IBM Table 2 charset selection	44
<b>ESC 7</b>	55	37	IBM Table 1 charset selection	44
<b>ESC 8*</b>	56	38	Disable paper end sensor	42
<b>ESC 9*</b>	57	39	Enable paper end sensor	42
<b>ESC &lt;*</b>	60	3C	Set left to right printing for one line	45
<b>ESC =*</b>	61	3D	Down Line Loading of user characters (DLL)	44
<b>ESC @ †</b>	64	40	Initialize printer (main reset)	45
<b>ESC A</b>	65	41	Line spacing = n/72"	41
<b>ESC C</b>	67	43	Set paper height in number of text lines	36
<b>ESC C NUL</b>	67 0	43 00	Set paper height in inches	42
<b>ESC D</b>	68	44	Horizontal TAB stops program	43
<b>ESC E</b>	69	45	Bold character ON	38
<b>ESC F</b>	70	46	Bold character OFF	38
<b>ESC G</b>	71	47	Double Strike ON	37
<b>ESC H</b>	72	48	Double Strike OFF	37
<b>ESC I</b>	73	49	Select print definition	44
<b>ESC J</b>	74	4A	Skip n/216" of paper	41
<b>ESC K</b>	75	4B	Set normal density graphics	43
<b>ESC L</b>	76	4C	Set double density graphics	43
<b>ESC M</b>	77	4D	Elite pitch 12 cpi ON	36
<b>ESC N</b>	78	4E	Define Bottom of Page (BOF)	42
<b>ESC O</b>	79	4F	Disable Bottom of Page (BOF)	42
<b>ESC S</b>	83	53	Select Superscript or Subscript character mode	40

\* Ignored in the Ultimate-II Virtual Printer

† Only in the Ultimate-II Virtual Printer, not in a real MPS-1550C

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>ESC T</b>	84	54	Disable Superscript and Subscript character mode	40
<b>ESC U*</b>	85	55	Mono/Bidirectional printing	45
<b>ESC W</b>	87	57	Double width characters ON/OFF	38
<b>ESC Y</b>	89	59	Double density BIM selection, normal speed	36
<b>ESC Z</b>	90	5A	Four times density BIM selection	43
<b>ESC [</b>	91	5B	Set horizontal spacing	39
<b>ESC b</b>	98	62	Select black color	36
<b>ESC c</b>	99	63	Select cyan color	36
<b>ESC m</b>	109	6D	Select magenta color	36
<b>ESC r</b>	114	72	Select color	37
<b>ESC x</b>	120	78	Select NLQ or DRAFT	40
<b>ESC y</b>	121	79	Select yellow color	36

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\* Ignored in the Ultimate-II Virtual Printer

## 15. IBM Proprinter commands reference

ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>BELL*</b>	7	07	Beep	53
<b>BS</b>	8	08	Backspace	50
<b>TAB</b>	9	09	Horizontal tabulation	51
<b>LF</b>	10	0A	Line Feed	49
<b>VT</b>	11	0B	Vertical tabulation	51
<b>FF</b>	12	0C	Form Feed	49
<b>CR</b>	13	0D	Carriage Return	49
<b>SO</b>	14	0E	Double width character ON	47
<b>SI</b>	15	0F	Condensed pitch 17.1 cpi	48
<b>DC1*</b>	17	11	Printer selection	54
<b>DC2</b>	18	12	Pica pitch 10 cpi	48
<b>DC3</b>	19	13	No operation	54
<b>DC4</b>	20	14	Double width character OFF	47
<b>CAN*</b>	24	18	Clean print buffer	54
<b>ESC</b>	27	1B	ASCII code for the Escape character	
<b>ESC -</b>	45	2D	Underline ON/OFF	47
<b>ESC 0</b>	48	30	Line spacing = 1/8"	49
<b>ESC 1</b>	49	31	Line spacing = 7/72"	49
<b>ESC 2</b>	50	32	Line spacing = 1/6" or <b>ESC A</b> command execution	49
<b>ESC 3</b>	51	33	Line spacing = n/216"	49
<b>ESC 4</b>	52	34	Set Top Of Form (TOF)	51
<b>ESC 5</b>	53	35	Automatic LF: ON/OFF	50
<b>ESC 6</b>	54	36	IBM Table 2 charset selection	53
<b>ESC 7</b>	55	37	IBM Table 1 charset selection	52
<b>ESC :</b>	58	3A	Elite pitch 12 cpi	48
<b>ESC =*</b>	61	3D	Down Line Loading of user characters (DLL)	53
<b>ESC @†</b>	64	40	Initialize printer (main reset)	54
<b>ESC A</b>	65	41	Line spacing = n/72"	50
<b>ESC B</b>	66	42	Vertical tab stops program	46
<b>ESC C</b>	67	43	Set paper height in number of text lines	46
<b>ESC C NUL</b>	67 0	43 00	Set paper height in inches	50
<b>ESC D</b>	68	44	Horizontal TAB stops program	51
<b>ESC E</b>	69	45	Bold character ON	47
<b>ESC F</b>	70	46	Bold character OFF	48
<b>ESC G</b>	71	47	Double Strike ON	46
<b>ESC H</b>	72	48	Double Strike OFF	47
<b>ESC I</b>	73	49	Select print definition	53
<b>ESC J</b>	74	4A	Skip n/216" of paper	50
<b>ESC K</b>	75	4B	Set normal density graphics	52
<b>ESC L</b>	76	4C	Set double density graphics	52
<b>ESC N</b>	78	4E	Define Bottom of Page (BOF)	50
<b>ESC O</b>	79	4F	Disable Bottom of Page (BOF)	51
<b>ESC Q*</b>	81	51	De-select printer	54
<b>ESC R</b>	82	52	Clear tab stops	52
<b>ESC S</b>	83	53	Select Superscript or Subscript character mode	48

\* Ignored in the Ultimate-II Virtual Printer

† Only in the Ultimate-II Virtual Printer, not in a real MPS-1550C



ASCII	CODE		DESCRIPTION	PAGE
	DEC	HEX		
<b>ESC T</b>	84	54	Disable Superscript and Subscript character mode	48
<b>ESC U*</b>	85	55	Mono/Bidirectional printing	54
<b>ESC W</b>	87	57	Double width characters ON/OFF	47
<b>ESC Y</b>	89	59	Double density BIM selection, normal speed	46
<b>ESC Z</b>	90	5A	Four times density BIM selection	52
<b>ESC b</b>	98	62	Select black color	46
<b>ESC c</b>	99	63	Select cyan color	46
<b>ESC m</b>	109	6D	Select magenta color	46
<b>ESC y</b>	121	79	Select yellow color	46
<b>ESC \</b>	92	5C	Print n characters from extended table	53
<b>ESC ^</b>	94	5E	Print one character from extended table	53
<b>ESC _</b>	95	5F	Overline: ON/OFF	49

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\* Ignored in the Ultimate-II Virtual Printer

## 16. Technical Specifications

<b>Output Type</b>	PNG file 2-bit depth (4 grey levels) or 8-bit depth (256 color palette) with lossless compression using LodePNG written by Lode Vandevenne ( <a href="http://lodev.org/lodepng/">http://lodev.org/lodepng/</a> ) typical file size range is 30kB - 140kB
<b>Page size</b>	1984 x 2580
<b>Printable area size</b>	1920 x 2160 (80 PICA characters and 60 lines at 1/6")
<b>Horizontal Resolution</b>	240 dpi
<b>Vertical Resolution</b>	216 dpi
<b>Physical ratio</b>	A4 (21cm x 29,7cm)
<b>Character matrix</b>	8V x 11H in draft mode 16V x 12H in NLQ mode
<b>Print pitches</b>	Pica, 10 char/in, 80 char/line Elite, 12 char/in, 96 char/line Micro, 15 char/in, 120 char/line Condensed, 17.1 char/in, 137 char/line Pica Compressed, 20 char/in, 160 char/line Elite Compressed, 24 char/in, 192 char/line Micro Compressed, 30 char/in, 240 char/line
<b>Printing styles</b>	Color Boldface Double width Superscript Subscript Double strike Underlined Italic Reversed Overlined

### 17. Print Sample

With Printer Ink Density set to Medium. Emulation is Commodore MPS.

**MPS VIRTUAL PRINTER TEST PAGE**

DRAFT Simple Under, Aggp **Bold** *Super* sub **REV**  
 ITALIC Simple Under, Aggp **Bold** *Super* sub **REV**  
 NLQ Simple Under, Aggp **Bold** *Super* sub **REV**

DRAFT Double Under, Aggp **Bold** *Super* sub **REV**  
 ITALIC Double Under, Aggp **Bold** *Super* sub **REV**  
 NLQ Double Under, Aggp **Bold** *Super* sub **REV**  
 DRAFT Large Under, Aggp **Bold** *Super* sub **REV**  
 ITALIC Large Under, Aggp **Bold** *Super* sub **REV**  
 NLQ Large Under, Aggp **Bold** *Super* sub **REV**  
 DRAFT Lg Db Under, Aggp **Bold** *Super* sub **REV**  
 ITALIC Lg Db Under, Aggp **Bold** *Super* sub **REV**  
 NLQ Lg Db Under, Aggp **Bold** *Super* sub **REV**

PICA Draft Regular *Draft Italic* Near Letter Quality  
 ELITE Draft Regular *Draft Italic* Near Letter Quality  
 MICRO Draft Regular *Draft Italic* Near Letter Quality  
 CONDENSED Draft Regular *Draft Italic* Near Letter Quality  
 PICA COMPRESSED Draft Regular *Draft Italic* Near Letter Quality  
 ELITE COMPRESSED Draft Regular *Draft Italic* Near Letter Quality  
 MICRO COMPRESSED Draft Regular *Draft Italic* Near Letter Quality

Yellow Magenta Cyan  
 Orange Violet Green Black

GRAPHIC BITMAP  
 Simple Bitmap

\*\*\*\* COMMODORE 64 BASIC V2 \*\*\*\*  
 64K RAM SYSTEM 38911 BASIC BYTES FREE  
 READY.  
 █

Repeated Bitmap  
 \_\_\_\_\_  
 —○—

PETASCII code tables

UPPER/GRAPHIC																LOWER/UPPER																	
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
01			0	@	P	-	7				r	-	7			r	01			0	@	p	-	P				r	-	P			r
11		!	1	A	Q	♠	●				█	±	♠	●	█	±	11		!	1	a	q	A	Q				█	±	A	Q	█	±
21		"	2	B	R		-				█	±		-	█	±	21		"	2	b	r	B	R				█	±	B	R	█	±
31		#	3	C	S	-	♥				-	+	-	♥	-	+	31		#	3	c	s	C	S				-	+	C	S	-	+
41		\$	4	D	T	-					-		-		-		41		\$	4	d	t	D	T				-		D	T	-	
51		%	5	E	U	-	/						-	/			51		%	5	e	u	E	U						E	U		
61		&	6	F	V	-	x				█	█	-	x	█	█	61		&	6	f	v	F	V				█	█	F	V	█	█
71		'	7	G	W		o					-		o		-	71		'	7	g	w	G	W					-	G	W		-
81		(	8	H	X		♣				█	-		♣	█	-	81		(	8	h	x	H	X				█	-	H	X	█	-
91		)	9	I	Y	\					█	-	\		█	-	91		)	9	i	y	I	Y				█	-	I	Y	█	-
A1		*	:	J	Z	\	♦					┘	\	♦		┘	A1		*	:	j	z	J	Z					┘	J	Z		┘
B1		+	;	K	[	\	+					┘	\	+		┘	B1		+	;	k	[	K	+					┘	K	+		┘
C1		,	<	L	£	L	⊗				█	█	L	⊗	█	█	C1		,	<	l	£	L	⊗				█	█	L	⊗	█	█
D1		-	=	M	]	\						┘	\			┘	D1		-	=	m	]	M						┘	M			┘
E1		.	>	N	↑	\	π					┘	\	π		┘	E1		.	>	n	↑	N	⊗					┘	N	⊗		┘
F1		/	?	O	←	Γ	▀				-	█	Γ	▀	-	█	F1		/	?	o	←	O	⊗				-	█	O	⊗	-	█

## 18. Document Revisions

Revision	Date	Author	Description
<b>1.0.0</b>	May 27, 2016	René Garcia	Initial release
<b>1.0.1</b>	May 30, 2016	René Garcia	Corrected capabilities table and options BIT IMG SUB corrected Ink Density samples
<b>1.1</b>	February 18, 2018	René Garcia	Rename MPS Printer Emulation to Virtual Printer New feature: ASCII output format
<b>1.2</b>	November 23, 2018	René Garcia	Fixed German charset for FX-80 emulation
<b>1.3</b>	May 1, 2019	René Garcia	New feature: Color printer based on MPS-1550C