# Ultimate-II Virtual Printer

## 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-1230 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.

MPS-1230 was a mid-range black 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
- 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.

- **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, ASCII or RAW (default is PNG)
  PNG are images created by the printer emulator each time a page is ejected from the printer. Caution, if a file with the same name already exists, it will not be overwritten and the page is lost. 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.

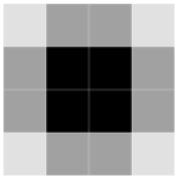
- **Printer ink density**: Low, Medium or High (default is Medium)
  You can consider this as "how strong is the pin impact on the paper". *Low* will only print very small dots and *High* larger dots. As a consequence, this will change the resulting contrast. *High* gives the best result for DRAFT character 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, 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 19.

- **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 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 |
|---|---|---|---|
| **Elementary Dot (x1)** | | | |
| **Elementary Dot (x300)** |  |  |  |
| **Draft text** | 1541 ULTIMATE II | 1541 ULTIMATE II | 1541 ULTIMATE II |
| **NLQ text** | 1541 ULTIMATE II | 1541 ULTIMATE II | 1541 ULTIMATE II |
| **Draft graphic chars** | ♠ ♥ ♦ ♣ | ♠ ♥ ♦ ♣ | ♠ ♥ ♦ ♣ |
| **NLQ graphic chars** | ♠ ♥ ♦ ♣ | ♠ ♥ ♦ ♣ | ♠ ♥ ♦ ♣ |

# 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-1230 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 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-1230 printer (1 min in DRAFT mode, 4 min in NLQ mode) !

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 3.2, 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.

## 4. Capabilities

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

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

* Only in Ultimate-II Virtual Printer, not available on a real MPS-1230 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. 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
```

D O U B L E  W I D T H

**EN OFF**
**15**
**0Fh**

Disable the **Double Width** print mode (Enhanced OFF)

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

**RVS ON**
**18**
**12h**

Select the **Reverse** print mode. Each character is printed in negative.

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

REVERSE

**RVS OFF**
**146**
**92h**

Disable the **reverse** print mode

```
10 OPEN1,4
20 PRINT#1,CHR$(146);
30 CLOSE1
```

**ESC - 1**
**27 45 49**
**1Bh 2Dh 31h**

Select the **Underline** print mode for all characters and spaces that follow.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(49);"UNDERLINE"
30 CLOSE1
```

UNDERLINE

**ESC - 0**
**27 45 48**
**1Bh 2Dh 30h**

Disable the Underline print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(48);
30 CLOSE1
```

**ESC e**
**27 69**
**1Bh 45h**

Select the **Bold** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(69);"BOLD"
30 CLOSE1
```

**BOLD**

**ESC f**
**27 70**
**1Bh 46h**

Disable the Bold print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(70);
30 CLOSE1
```

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

Select the **Italic** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(52);"ITALIC"
```

```
30 CLOSE1
```

*ITALIC*

**ESC 5**
**27 53**
**1Bh 35h**

Disable the **Italic** print mode.

```
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);"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
```

**NLQ ON**
**31**
**1Fh**

Select the Near Letter Quality print mode (NLQ)

```
10 OPEN1,4
20 PRINT#1,CHR$(31);
30 CLOSE1
```

```
DRAFT QUALITY
NEAR LETTER QUALITY
```

**NLQ OFF**
**159**
**9Fh**

Disable the Near Letter Quality print mode (NLQ)

```
10 OPEN1,4
20 PRINT#1,CHR$(159);
30 CLOSE1
```

**CRSR DWN**
**17**
**11h**

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
```

**CRSR UP**
**145**
**91h**

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
```

### 5.3.2. Paper feeding

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

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

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

**CR**
**13**
**0Dh**

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

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

**FF**
**12**
**0Ch**

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

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

**CS**
**141**
**8Dh**

Returns the print head to le left margin but stays in the same line (behavior is CR).

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

### 5.3.3. Format control

**ESC c n**
**27 67 n**
**1Bh 43h n**

Defines the page length in number of text lines (range 1-127).

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

**ESC c NUL n**
**27 67 0 n**
**1Bh 43h 00h n**

Defines the page length in inches (range 1-22).

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

**ESC n m**
**27 78 m**
**1Bh 4Eh 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.
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**
**27 79**
**1Bh 4Fh**

Disable the **Bottom of Form** (BOF).
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 $n_1$ $n_2$**
**16 $n_1$ $n_2$**
**10h $n_1$ $n_2$**

On the current line, jump to the horizontal position corresponding to the $n_1n_2$ 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. $n_1n_2$ can range from 00 to 79. Does nothing is current position is already over the $n_1n_2$ position.

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

**ESC POS $n_1$ $n_2$**
**27 16 $n_1$ $n_2$**
**1Bh 10h $n_1$ $n_2$**

On the current line, jump to the horizontal position corresponding to the dot position given by parameters $n_1$ and $n_2$ from the beginning of the line. Parameter is calculated using the formula $n_1$x256+$n_2$. Value range is 0 to 480

Examples:

| $n_1$ | $n_2$ | 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
```

### 5.3.4. 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 $2^7$ is <u>always</u> set, this adds 128 to each value.

First byte with $2^7$ 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 $2^7$ 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**
**8**
**08h**

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.

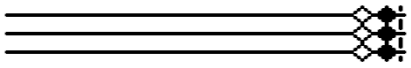
```
10 OPEN1,4,7
20 A$=""
30 FOR I=1 TO 16
40 READ A:A$=A$+CHR$(A)
50 NEXT I
60 FOR J=1 TO 3
70 PRINT#1,CHR$(8);A$
80 NEXT J
90 CLOSE1
100 END
110 DATA 136,148,162,193,162,148,136,136
120 DATA 156,186,255,186,156,136,235,136
```

**BIT IMG SUB n**
**8 26 n**
**08h 1Ah 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.

```
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
```



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

On a MPS-1230 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-1230 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 =**
**27 61**
**1Bh 3Dh**

This code has to be followed by parameters **m n c s a** $\mathbf{p_1}$ $\mathbf{p_2}$…$\mathbf{p_{11}}$ which represents decimal byte codes to describe characters to load.

**m** and **n** are the number of bytes to load. Use the formula
t = (number of chars x 13) +2
then calculate m and n in order to have m + (n x 256) = t using formulas
n = t / 256 (keep entire part only)
m = t – (n x 256)

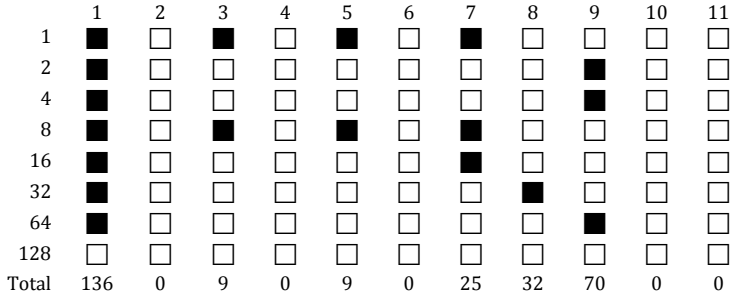
E.g.: for 94 characters,
t = (94 x 13) +2 = 1224
n = 1224 / 256 = 4
m = 1224 – (4 x 256) = 200

**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

$\mathbf{p_1}$ $\mathbf{p_2}$…$\mathbf{p_{11}}$ 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-1230 because explanations given by Commodore seems to be false. I can't make it work, example in the MPS-1230 manual prints nothing. Where are the 13 bytes by character? I only count 12 (**a** $p_1$ $p_2$...$p_{11}$)*

**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 commands

This chapter describes the commands the printer can understand when using the Epson 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 FX-80 emulation.

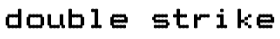
## 6.2. Commands

### 6.2.1. 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
```




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

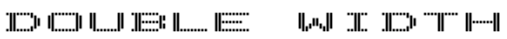
Disable **Double Strike** print mode

```
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
```




**DC4**
**20**
**14h**

Disable the **Double Width** print mode

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

**ESC SO**
**27 14**
**1Bh 0Eh**

Same as **SO** (Double Width print mode ON).

**ESC W 1**
**27 87 1**
**1Bh 57h 01h**

Same as **SO** (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)

**ESC W 0**
**27 87 0**
**1Bh 57h 00h**

Same as **DC4** (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)

**ESC – 1**
**27 45 49**
**1Bh 2Dh 31h**

Select the **Underline** print mode for all characters and spaces that follow.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(49);"UNDERLINE"
30 CLOSE1
```

UNDERLINE

**ESC - 0**
**27 45 48**
**1Bh 2Dh 30h**

Disable the Underline print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(48);
30 CLOSE1
```

**ESC E**
**27 69**
**1Bh 45h**

Select the **Bold** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(69);"BOLD"
30 CLOSE1
```

**BOLD**

**ESC F**
**27 70**
**1Bh 46h**

Disable the Bold print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(70);
30 CLOSE1
```

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

Select the **Italic** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(52);"ITALIC"
30 CLOSE1
```

*ITALIC*

**ESC 5**
**27 53**
**1Bh 35h**

Disable the **Italic** print mode.

```
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 SI**
**27 15**
**1Bh 0Fh**

Same as **SI** (Condensed 17.1 chars/inch)

**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 P**
**27 80**
**1Bh 50h**

Same as **DC2** (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);"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 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 |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| 1 | | | | | | | • |
| 2 | | | | | | | |
| 3 | | | | | | | • |
| 4 | | | | | | • | |
| 5 | | | | | | | • |
| 6 | | | | | | • | |
| 7 | | | | | | | • |
| 8 | | | | | • | | |
| 9 | | | | | • | | • |
| 10 | | | | | • | | |
| 11 | | | | | • | | • |
| 12 | | | | | • | • | |
| 13 | | | | | • | | • |
| 14 | | | | | • | • | |
| 15 | | | | | • | | • |
| 16 | | | | • | | | |
| 17 | | | | • | | | • |
| 18 | | | | • | | | |
| 19 | | | | • | | | • |
| 20 | | | | • | | • | |
| 21 | | | | • | | | • |
| 22 | | | | • | | • | |
| 23 | | | | • | | | • |
| 24 | | | | • | • | | |
| 25 | | | | • | • | | • |
| 26 | | | | • | • | | |
| 27 | | | | • | • | | • |
| 28 | | | | • | • | • | |
| 29 | | | | • | • | | • |
| 30 | | | | • | • | • | |
| 31 | | | | • | • | | • |
| 32 | | | • | | | | |
| 33 | | | • | | | | • |
| 34 | | | • | | | | |
| 35 | | | • | | | | • |
| 36 | | | • | | | • | |
| 37 | | | • | | | | • |
| 38 | | | • | | | • | |
| 39 | | | • | | | | • |
| 40 | | | • | | • | | |
| 41 | | | • | | • | | • |
| 42 | | | • | | • | | |
| 43 | | | • | | • | | • |
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| 55 | | | • | • | | | • |
| 56 | | | • | • | • | | |
| 57 | | | • | • | • | | • |
| 58 | | | • | • | • | | |
| 59 | | | • | • | • | | • |
| 60 | | | • | • | • | • | |
| 61 | | | • | • | • | | • |
| 62 | | | • | • | • | • | |
| 63 | | | • | • | • | | • |
| 64 | | • | | | | | |
| 65 | | • | | | | | • |
| 66 | | • | | | | | |
| 67 | | • | | | | | • |
| 68 | | • | | | | • | |
| 69 | | • | | | | | • |
| 70 | | • | | | | • | |
| 71 | | • | | | | | • |
| 72 | | • | | | • | | |
| 73 | | • | | | • | | • |

| n | U | I | W | S | B | C | E |
|---|---|---|---|---|---|---|---|
| 86 | | • | | • | | • | |
| 87 | | • | | • | | | • |
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| 89 | | • | | • | • | | • |
| 90 | | • | | • | • | | |
| 91 | | • | | • | • | | • |
| 92 | | • | | • | • | • | |
| 93 | | • | | • | • | | • |
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| 117 | | • | • | • | | | • |
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| 124 | | • | • | • | • | • | |
| 125 | | • | • | • | • | | • |
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| 131 | • | | | | | | • |
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| 133 | • | | | | | | • |
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| 135 | • | | | | | | • |
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| 137 | • | | | | • | | • |
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| 147 | • | | | • | | | • |
| 148 | • | | | • | | • | |
| 149 | • | | | • | | | • |
| 150 | • | | | • | | • | |
| 151 | • | | | • | | | • |
| 152 | • | | | • | • | | |
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| 154 | • | | | • | • | | |
| 155 | • | | | • | • | | • |
| 156 | • | | | • | • | • | |
| 157 | • | | | • | • | | • |
| 158 | • | | | • | • | • | |
| 159 | • | | | • | • | | • |

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| 175 | • | | • | | • | | • |
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| 177 | • | | • | • | | | • |
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| 213 | • | • | | • | | | • |
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| 234 | • | • | • | | • | | |
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| 237 | • | • | • | | • | | • |
| 238 | • | • | • | | • | • | |
| 239 | • | • | • | | • | | • |
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| 242 | • | • | • | • | | | |
| 243 | • | • | • | • | | | • |
| 244 | • | • | • | • | | • | |
| 245 | • | • | • | • | | | • |

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|---|---|---|---|---|---|---|---|
| 74 | | • | | | • | | |
| 75 | | • | | | • | | • |
| 76 | | • | | | • | • | |
| 77 | | • | | | • | | • |
| 78 | | • | | | • | • | |
| 79 | | • | | | • | | • |
| 80 | | • | | • | | | |
| 81 | | • | | • | | | • |
| 82 | | • | | • | | | |
| 83 | | • | | • | | | • |
| 84 | | • | | • | | • | |
| 85 | | • | | • | | | • |

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|---|---|---|---|---|---|---|---|
| 160 | • | | • | | | | |
| 161 | • | | • | | | | • |
| 162 | • | | • | | | | |
| 163 | • | | • | | | | • |
| 164 | • | | • | | | • | |
| 165 | • | | • | | | | • |
| 166 | • | | • | | | • | |
| 167 | • | | • | | | | • |
| 168 | • | | • | | • | | |
| 169 | • | | • | | • | | • |
| 170 | • | | • | | • | | |
| 171 | • | | • | | • | | • |

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|---|---|---|---|---|---|---|---|
| 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

### 6.2.2. Paper feeding

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

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

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

**CR**
**13**
**0Dh**

A **Carriage Return** returns the print head to le left margin but stays on the same line (behavior is CR only, no LF).

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

**FF**
**12**
**0Ch**

A **Form Feed** 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
```

**ESC 0**
**27 48**
**1Bh 30h**

Select vertical spacing **1/8"** between each printed line.

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

**ESC 1**
**27 49**
**1Bh 31h**

Select vertical spacing **7/72"** between each printed line.

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

**ESC 2**
**27 50**
**1Bh 32h**

Select vertical spacing **1/6"** between each printed line.

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

**ESC 3 n**
**27 51 n**
**1Bh 32h n**

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

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(51);CHR$(37)"37/216 inch"
```

```
30 CLOSE1
```

**ESC A n**
**27 65 n**
**1Bh 41h n**

Select vertical spacing **n/72"** 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
```

**ESC J n**
**27 74 n**
**1Bh 4Ah n**

Skip down **n/216"** of paper.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(74);CHR$(70)"70/216 inch skipped"
30 CLOSE1
```

**ESC j n**
**27 106 n**
**1Bh 6Ah n**

Reverse paper feed **n/216"** up.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(106);CHR$(70)"70/216 inch up"
30 CLOSE1
```

### 6.2.3. Format control

**BS**
**8**
**08h**

**Backspace**, 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
```

**ESC C n**
**27 67 n**
**1Bh 43h n**

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
```

**ESC C NUL n**
**27 67 0 n**
**1Bh 43h 00h n**

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
```

**ESC l n**
**27 108 n**
**1Bh 6Ch n**

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

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(108);CHR$(10)
30 PRINT#1,"MARGIN LEFT AT 10"
40 CLOSE1
```

**ESC Q n**
**27 81 n**
**1Bh 51h n**

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

```
10 OPEN1,4
```

```
20 PRINT#1,CHR$(27);CHR$(81);CHR$(70)
30 PRINT#1,"RIGHT MARGIN AT 70"
40 CLOSE1
```

**ESC N m**
**27 78 m**
**1Bh 4Eh 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.
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**
**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 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 $n_1$ … 0**
**27 66 $n_1$ … 0**
**1Bh 42h $n_1$ … 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 $n_1$ … 0**
**27 68 $n_1$ … 0**
**1Bh 44h $n_1$ … 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 $n_1$ … 0**
**27 98 m $n_1$ … 0**
**1Bh 62h m $n_1$ … 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**
**27 47 n**
**1Bh 2Fh n**

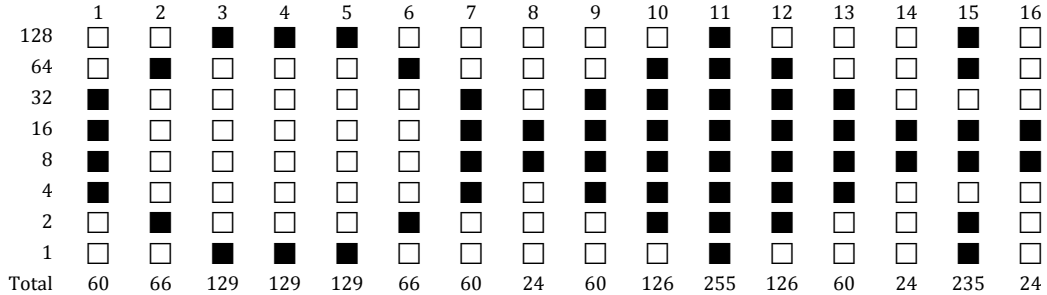
Activate one of the 8 possible vertical tabulation stop programs. Value **n** is program number from 0 to 7.

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

### 6.2.4. 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:




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 …**
**27 75 …**

Select the **Bit Image Mode** in simple density. You have to provide parameters **n m $d_1$ $d_2$ …**

**1Bh 4Bh …** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 **$d_1$ $d_2$ …** 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 …**
**27 76 …**
**1Bh 4Ch …** Select the **Bit Image Mode** in double density, half speed. You have to provide parameters **n m $d_1$ $d_2$ …** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 **$d_1$ $d_2$ …** 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 …**
**27 89 …**
**1Bh 59h …** Select the **Bit Image Mode** in double density, normal speed.
On Ultimate-II Virtual Printer, **ESC Y** behaves the same as **ESC L**

**ESC Z …**
**27 90 …**
**1Bh 5Ah …** Select the **Bit Image Mode** in quadruple density, half speed. You have to provide parameters **n m $d_1$ $d_2$ …** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256 **$d_1$ $d_2$ …** 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 * ...**
**27 42 ...**
**1Bh 2Ah ...**

Select the **Bit Image Mode** with provided density. You have to provide parameters **d n m $d_1$ $d_2$ ...**
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
**$d_1$ $d_2$ ...** are the bitmap data to print.

**ESC ? n m**
**27 63 n m**
**1Bh 3Fh n m**

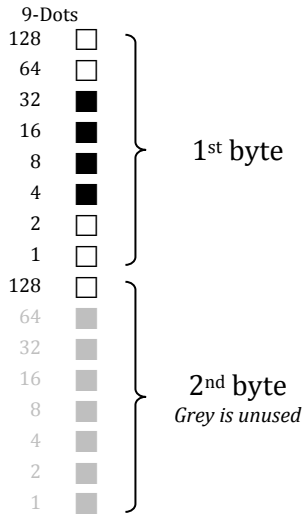
Change density for bitmap commands. Value **n** is one from **K**, **L**, **Y** or **Z**. Value m is the new density for the command (see table in **ESC *** description).

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 ^ ...**
**27 94 ...**
**1Bh 5Eh ...**

Select the **Bit Image Mode** using all the 9 pin of the head. You have to provide parameters **d n m $h_1$ $l_1$ $h_2$ $l_2$ ...**
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
**$h_1$ $l_1$ $h_2$ $l_2$ ...** are the bitmap data to print. Values $\mathbf{h_n}$ encode the upper 8 dots and values $\mathbf{l_n}$ encode the lower dot in the MSB bit ($2^7$=128). This needs double of data for just one more dot.




### 6.2.5. Charset selection

FX-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 $2^7$=128).

**ESC 7**
**27 55**
**1Bh 37h**

Select Basic character table. This is the default charset for FX-80 printer.

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

**ESC R n**
**27 82 n**
**1Bh 52h 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
```

**ESC I 1**
**27 73 1**
**1Bh 49h 01h**

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
```

**ESC I 0**
**27 73 0**
**1Bh 49h 00h**

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
```

**ESC 6**
**27 54**
**1Bh 36h**

Extend only the italic part of the printable charset
This command is ignored by Ultimate-II Virtual Printer.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(54);
30 CLOSE1
```

### 6.2.6. 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.

**ESC : 000**
**27 58 0 0 0**
**1Bh 3Ah 0 0 0**

Copy standard character generator from ROM to RAM.
This command is ignored by Ultimate-II Virtual Printer.

**ESC & 0**
**27 38 0**
**1Bh 26h 00h**

This code has to be followed by parameters **n m a** $\mathbf{p_1}$ $\mathbf{p_2}$...$\mathbf{p_{11}}$ which represents decimal byte codes to describe characters to load.

**0** is code 0, always present.
**n** ASCII code of first redefined char
**m** ASCII code of last redefined char (n=m if only one char to define)

next parameters are repeated for each defined char.

**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

$\mathbf{p_1}$ $\mathbf{p_2}$...$\mathbf{p_{11}}$ 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. Ultimate-II Virtual Printer does not suffer from this limitation.

**ESC % n**
**27 37 n**
**1Bh 25h n**

If n=1 select RAM (special characters) and if n=0 select ROM (standard characters)
This command is ignored by Ultimate-II Virtual Printer.

### 6.2.7. Other commands

**DC1**
**17**
**11h**

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

| | |
|---|---|
| **DC3**<br>**19**<br>**13h** | **Suspend the printer**. The printer will ignore the input data until DC1 is sent.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **CAN**<br>**24**<br>**18h** | **Cancel** the current job and clear printer buffer.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **ESC =**<br>**27 61**<br>**1Bh 3Dh** | Force **bit 7** (MSB) to 0. All data received will have its bit 7 cleared except commands.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **ESC >**<br>**27 62**<br>**1Bh 3Eh** | Force **bit 7** (MSB) to 1. All data received will have its bit 7 set except commands.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **ESC #**<br>**27 35**<br>**1Bh 23h** | Clear **bit 7** (MSB) forcing.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **ESC <**<br>**27 60**<br>**1Bh 3Ch** | Set **left to right** printing for one line.<br>This command is ignored by Ultimate-II Virtual Printer. |
| **ESC @**<br>**27 64**<br>**1Bh 40h** | **Initialize** the printer. Set all parameters to default values. Paper and head are not moved. |
| **ESC U n**<br>**27 85 n**<br>**1Bh 30h n** | Select **Mono/Bidirectional** printing.<br>This command is ignored by Ultimate-II Virtual Printer.<br>n=0 : bidirectional<br>n=1 : mono-directional (left to right) for better alignment. |
| **ESC i n**<br>**27 105 n**<br>**1Bh 69h n** | Immediate character printing ON/OFF like a typewriter.<br>This command is ignored by Ultimate-II Virtual Printer.<br>n=1 : immediate printing ON (incompatible with continuous paper feeding)<br>n=0 : immediate printing OFF |
| **ESC s n** | Half speed printing ON/OFF to make less noise.<br>This command is ignored by Ultimate-II Virtual Printer.<br>n=1 : half speed<br>n=0 : full speed |
| **DEL**<br>**127**<br>**7Fh** | Delete the last printable character from buffer.<br>This command is ignored by Ultimate-II Virtual Printer. |

# 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.

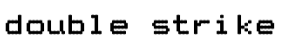
## 7.2. Commands

### 7.2.1. 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
```




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

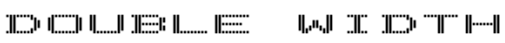
Disable **Double Strike** print mode

```
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
```




**DC4**
**20**
**14h**

Disable the **Double Width** print mode

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

**ESC SO**
**27 14**
**1Bh 0Eh**

Same as **SO** (Double Width print mode ON).

**ESC W 1**
**27 87 1**
**1Bh 57h 01h**

Same as **SO** (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)

**ESC W 0**
**27 87 0**
**1Bh 57h 00h**

Same as **DC4** (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)

**ESC – 1**
**27 45 49**
**1Bh 2Dh 31h**

Select the **Underline** print mode for all characters and spaces that follow.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(49);"UNDERLINE"
30 CLOSE1
```

UNDERLINE

**ESC - 0**
**27 45 48**
**1Bh 2Dh 30h**

Disable the Underline print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(48);
30 CLOSE1
```

**ESC E**
**27 69**
**1Bh 45h**

Select the **Bold** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(69);"BOLD"
30 CLOSE1
```

**BOLD**

**ESC F**
**27 70**
**1Bh 46h**

Disable the Bold print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(70);
30 CLOSE1
```

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

Select the **Italic** print mode.
This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1230 printer. Italic was not supported in IBM Graphics Printer.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(52);"ITALIC"
30 CLOSE1
```

*ITALIC*

**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-1230 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**

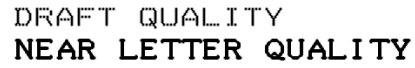
Disable Superscript and Subscript print mode.

```
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
```




**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-1230 printer. See EPSON-FX80 command description page 22 for details.

### 7.2.2. 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
```

**CR**
**13**
**0Dh**

A **Carriage Return** returns the print head to le left margin but stays on the same line (behavior is CR only, no LF).

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

**FF**
**12**
**0Ch**

A **Form Feed** 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
```

**ESC 0**
**27 48**
**1Bh 30h**

Select vertical spacing **1/8"** between each printed line.

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

**ESC 1**
**27 49**
**1Bh 31h**

Select vertical spacing **7/72"** between each printed line.

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

**ESC 2**
**27 50**
**1Bh 32h**

Select vertical spacing **1/6"** between each printed line.

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

**ESC 3 n**
**27 51 n**
**1Bh 32h n**

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

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(51);CHR$(37)"37/216 inch"
30 CLOSE1
```

**ESC A n**
**27 65 n**
**1Bh 41h n**

Select vertical spacing **n/72"** 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
```

**ESC J n**
**27 74 n**
**1Bh 4Ah n**

Skip down **n/216"** of paper.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(74);CHR$(70)"70/216 inch skipped"
30 CLOSE1
```

### 7.2.3. Format control

**BS**
**8**
**08h**

**Backspace**, 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
```

**ESC C n**
**27 67 n**
**1Bh 43h n**

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
```

**ESC C NUL n**
**27 67 0 n**
**1Bh 43h 00h n**

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
```

**ESC N m**
**27 78 m**
**1Bh 4Eh 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.
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**
**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 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**

The same behavior as **LF**. Advances the paper to the next line (no CR).

```
10 OPEN1,4
20 PRINT#1,CHR$(11);"JUMPED ONE LINE"
30 CLOSE1
```

**ESC D $n_1$ … 0**
**27 68 $n_1$ … 0**
**1Bh 44h $n_1$ … 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
```

### 7.2.4. Graphic Bitmap

IBM Graphics Printer emulation prints bitmap data the same way as EPSON FX-80. 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 26 for details.

**ESC K …**
**27 75 …**

Select the **Bit Image Mode** in simple density (60 dpi). You have to provide parameters **n m $d_1$ $d_2$ …**

**1Bh 4Bh ...** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ ...** are the bitmap data to print.

*See EPSON command description page 26 for an example.*

**ESC L ...**
**27 76 ...**
**1Bh 4Ch ...**
Select the **Bit Image Mode** in double density (120 dpi), half speed. You have to provide parameters **n m $d_1$ $d_2$ ...**
Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ ...** are the bitmap data to print.

*See EPSON command description page 27 for an example.*

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

**ESC Z ...**
**27 90 ...**
**1Bh 5Ah ...**
Select the **Bit Image Mode** in quadruple density (240 dpi), half speed. You have to provide parameters **n m $d_1$ $d_2$ ...**
Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ ...** are the bitmap data to print.

*See EPSON command description page 27 for an example.*

### 7.2.5. 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 56. 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**
**27 55**
**1Bh 37h**
Select **Table 1** character set. This is the default charset for IBM printers.

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

**ESC 6**
**27 54**
**1Bh 36h**
Select **Table 2** character set. This is the international charset user configured.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(54);
30 CLOSE1
```

### 7.2.6. 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.

**ESC =**
**27 61**
**1Bh 3Dh**
This code has to be followed by parameters **m n** and data.
This command is ignored by Ultimate-II Virtual Printer.

**m** and **n** are the number of bytes to load in order to have n + (m x 256) = size

**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
```

### 7.2.7. Other commands

**BELL**
**7**
**07h**

Make a short beep.
This command is ignored by Ultimate-II Virtual Printer.

**CAN**
**24**
**18h**

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

**ESC <**
**27 60**
**1Bh 3Ch**

Set **left to right** printing for one line.
This command is ignored by Ultimate-II Virtual Printer.

**ESC @**
**27 64**
**1Bh 40h**

**Initialize** the printer. Set all parameters to default values. Paper and head are not moved.
This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1230 printer.

**ESC U n**
**27 85 n**
**1Bh 30h n**

Select **Mono/Bidirectional** printing.
This command is ignored by Ultimate-II Virtual Printer.
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-1230 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.

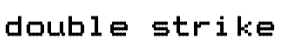
## 8.2. Commands

### 8.2.1. 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
```




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

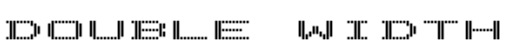
Disable **Double Strike** print mode

```
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
```




**DC4**
**20**
**14h**

Disable the **Double Width** print mode

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

**ESC W 1**
**27 87 1**
**1Bh 57h 01h**

Same as **SO** (Double Width ON). 1 can be sent with ASCII code of '1' (49 - 31h)

**ESC W 0**
**27 87 0**
**1Bh 57h 00h**

Same as **DC4** (Double Width OFF). 0 can be sent with ASCII code of '0' (48 - 30h)

**ESC – 1**
**27 45 49**
**1Bh 2Dh 31h**

Select the **Underline** print mode for all characters and spaces that follow.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(49);"UNDERLINE"
30 CLOSE1
```

UNDERLINE

**ESC - 0**
**27 45 48**
**1Bh 2Dh 30h**

Disable the Underline print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(45);CHR$(48);
30 CLOSE1
```

**ESC E**
**27 69**
**1Bh 45h**

Select the **Bold** print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(69);"BOLD"
30 CLOSE1
```

**BOLD**

**ESC F**
**27 70**
**1Bh 46h**

Disable the Bold print mode.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(70);
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
```

**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 :**
**27 58**
**1Bh 3Ah**

Select the **ELITE** spacing mode (12 chars/inch).

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(58);"ELITE"
30 CLOSE1
```

**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 _ n**
**27 95 n**
**1Bh 5Fh n**

**Overline** ON/OFF. Will print a line over the text.
n=1: enable overline
n=0: disable overline

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

$\overline{\text{Overline}}$

### 8.2.2. 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
```

**CR**
**13**
**0Dh**

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

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

**FF**
**12**
**0Ch**

A **Form Feed** 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
```

**ESC 0**
**27 48**
**1Bh 30h**

Select vertical spacing **1/8"** between each printed line.

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

**ESC 1**
**27 49**
**1Bh 31h**

Select vertical spacing **7/72"** between each printed line.

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

**ESC 2**
**27 50**
**1Bh 32h**

Select vertical spacing **1/6"** between each printed line or activate **ESC A** previously prepared line spacing.

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

**ESC 3 n**
**27 51 n**
**1Bh 32h n**

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

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(51);CHR$(37)"37/216 inch"
30 CLOSE1
```

**ESC 5 n**
**27 53 n**
**1Bh 35h n**

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
```

**ESC A n**
**27 65 n**
**1Bh 41h n**

Prepare vertical spacing **n/72"** 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
```

**ESC J n**
**27 74 n**
**1Bh 4Ah n**

Skip down **n/216"** of paper.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(74);CHR$(70)"70/216 inch skipped"
30 CLOSE1
```

### 8.2.3. Format control

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

**8**
**08h**

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
```

**ESC C n**
**27 67 n**
**1Bh 43h n**

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
```

**ESC C NUL n**
**27 67 0 n**
**1Bh 43h 00h n**

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
```

**ESC N m**
**27 78 m**
**1Bh 4Eh 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.
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**
**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 $n_1$ … 0**
**27 66 $n_1$ … 0**
**1Bh 42h $n_1$ … 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 $n_1$ … 0**
**27 68 $n_1$ … 0**
**1Bh 44h $n_1$ … 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**
**27 82**
**1Bh 52h**

Clear tab stops. Horizontal stop are set to default (every 8 characters) and vertical stops are deleted.

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

### 8.2.4. Graphic Bitmap

IBM Proprinter emulation prints bitmap data the same way as EPSON FX-80. 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 26 for details.

**ESC K …**
**27 75 …**
**1Bh 4Bh …**

Select the **Bit Image Mode** in simple density (60 dpi). You have to provide parameters **n m $d_1$ $d_2$ …**
Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ …** are the bitmap data to print.

*See EPSON command description page 26 for an example.*

**ESC L …**
**27 76 …**
**1Bh 4Ch …**

Select the **Bit Image Mode** in double density (120 dpi), half speed. You have to provide parameters **n m $d_1$ $d_2$ …**
Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ …** are the bitmap data to print.

*See EPSON command description page 27 for an example.*

**ESC Y …**
**27 89 …**
**1Bh 59h …**

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

**ESC Z …**

Select the **Bit Image Mode** in quadruple density (240 dpi), half speed. You have to

**27 90 …** provide parameters **n m $d_1$ $d_2$ …**
**1Bh 5Ah …** Values **n** and **m** are the 16 bit encoded amount of data (n is LSB) total = n + m x 256
**$d_1$ $d_2$ …** are the bitmap data to print.

*See EPSON command description page 27 for an example.*

### 8.2.5. 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 56. 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**
**27 55**
**1Bh 37h**
Select **Table 1** character set. This is the default charset for IBM printers.

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

**ESC 6**
**27 54**
**1Bh 36h**
Select **Table 2** character set. This is the international charset user configured.

```
10 OPEN1,4
20 PRINT#1,CHR$(27);CHR$(54);
30 CLOSE1
```

**ESC \ n**
**27 92 n**
**1Bh 5Ch n**
Print **n** characters from extended table. In the next **n** 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
```

**ESC ^**
**27 94**
**1Bh 5Eh**
Print **one** 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
```

### 8.2.6. 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.

**ESC =**
**27 61**
**1Bh 3Dh**
This code has to be followed by parameters **m n** and data.
**m** and **n** are the number of bytes to load in order to have n + (m x 256) = size
This command is ignored by Ultimate-II Virtual Printer.

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

Select the print quality depending on parameter "n"

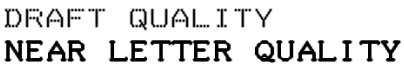
n=0 standard quality (draft) and normal characters

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
```




### 8.2.7. Other commands

**BELL**
**7**
**07h**

Make a short beep.
This command is ignored by Ultimate-II Virtual Printer.

**DC1**
**17**
**11h**

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

**DC3**
**19**
**13h**

No operation.

**CAN**
**24**
**18h**

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

**ESC <**
**27 60**
**1Bh 3Ch**

Set **left to right** printing for one line.
This command is ignored by Ultimate-II Virtual Printer.

**ESC @**
**27 64**
**1Bh 40h**

**Initialize** the printer. Set all parameters to default values. Paper and head are not moved.
This feature has been added in Ultimate-II Virtual Printer and does not exist in a real MPS-1230 printer.

**ESC Q**
**27 81**
**1Bh 51h**

De-select printer.
This command is ignored by Ultimate-II Virtual Printer.

**ESC U n**
**27 85 n**
**1Bh 30h n**

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

# 9. PETASCII character table

## 9.1. USA/UK

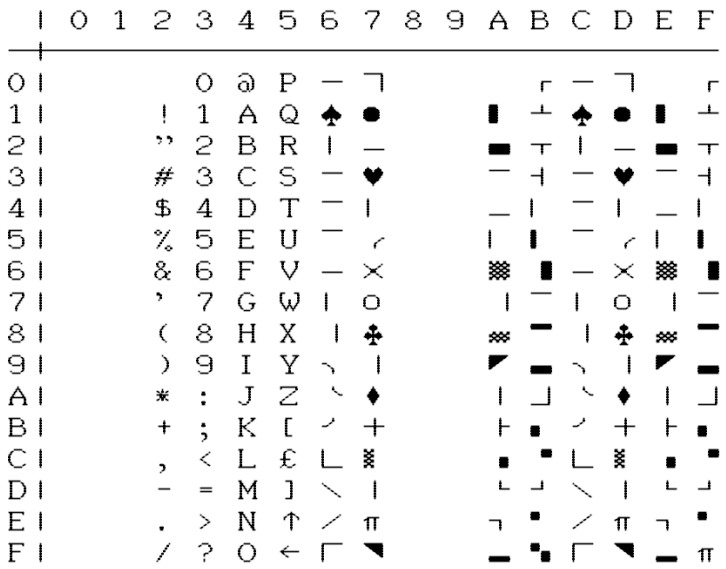


Table 1 : USA/UK Charset in Uppercase/Graphic Mode (Secondary address = 0)

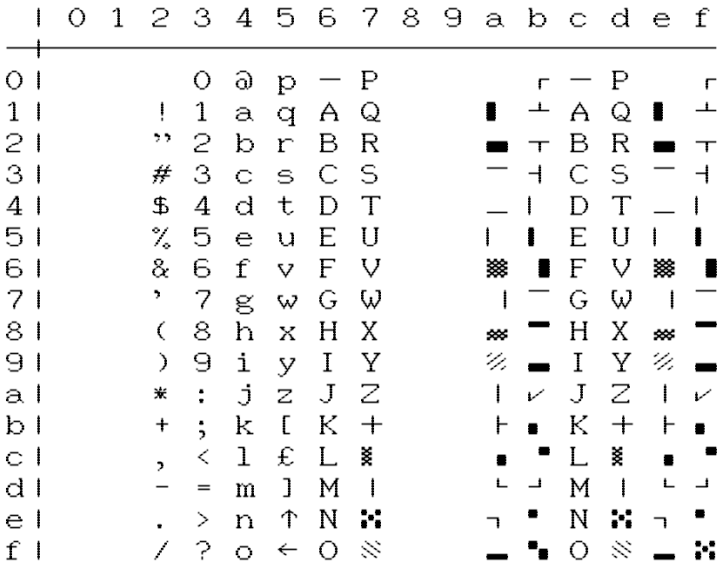


Table 2 USA/UK Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.2. Denmark

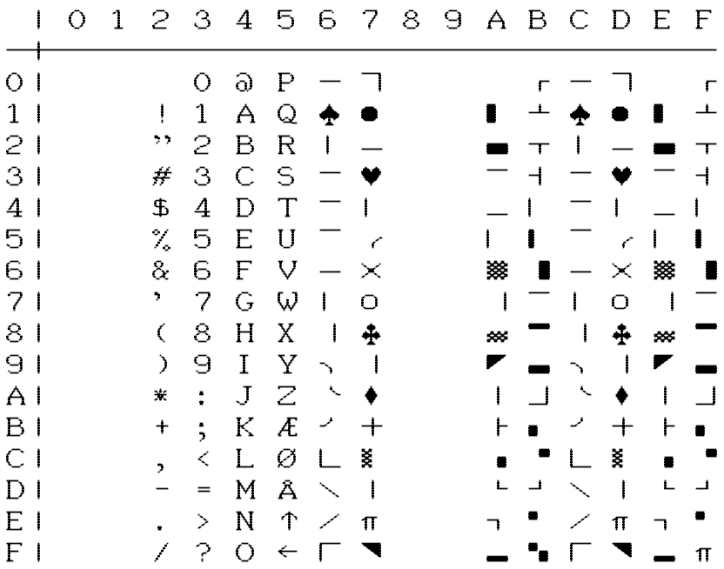


Table 3 : DENMARK Charset in Uppercase/Graphic Mode (Secondary address = 0)

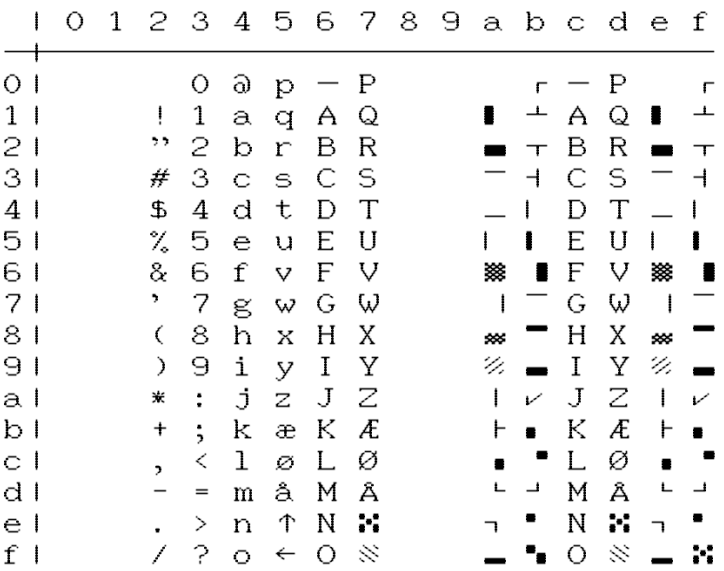


Table 4 DENMARK Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.3. France / Italy

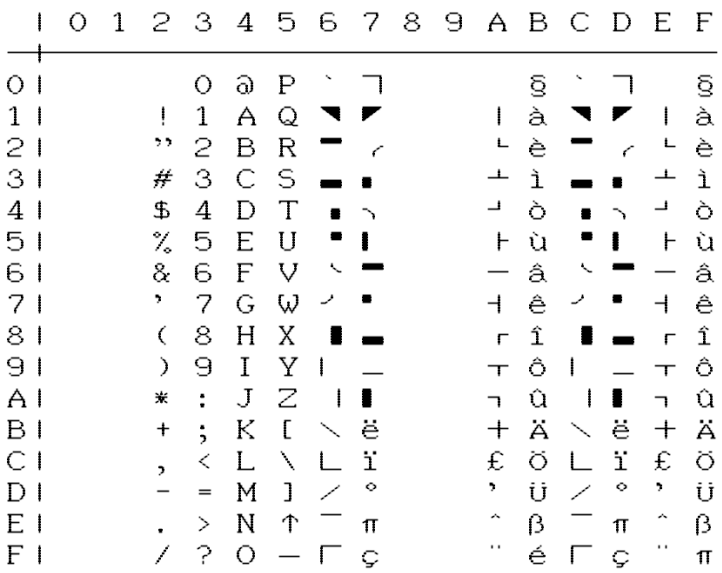


Table 5 : FRANCE/ITALY Charset in Uppercase/Graphic Mode (Secondary address = 0)

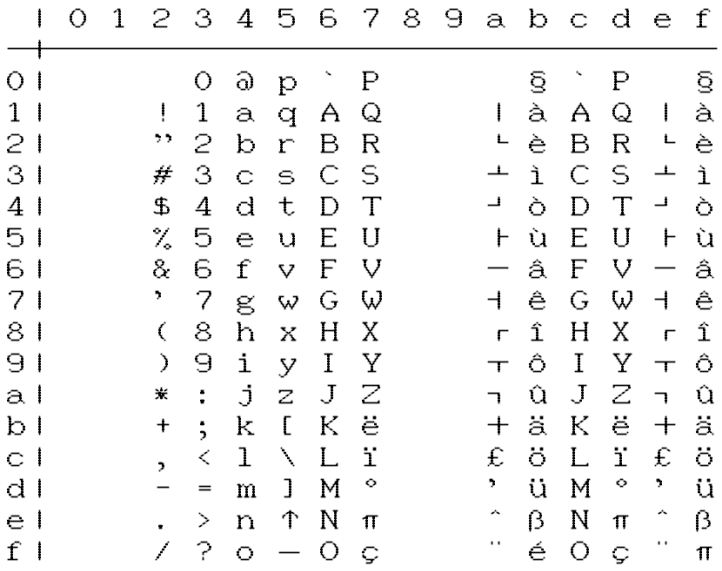


Table 6 FRANCE/ITALY Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.4. Germany

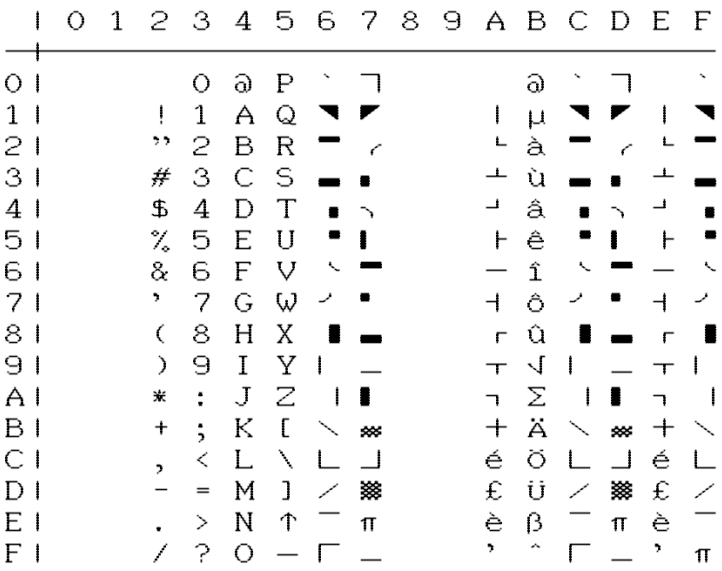


Table 7 : GERMANY Charset in Uppercase/Graphic Mode (Secondary address = 0)

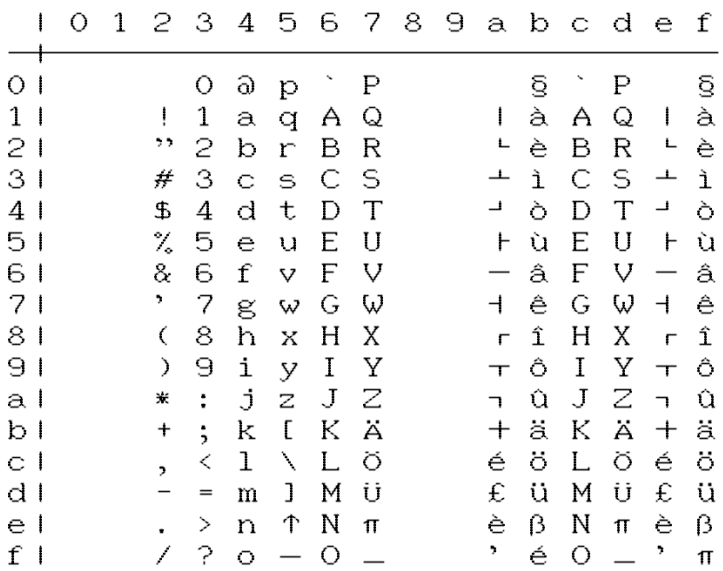


Table 8 GERMANY Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.5. Spain

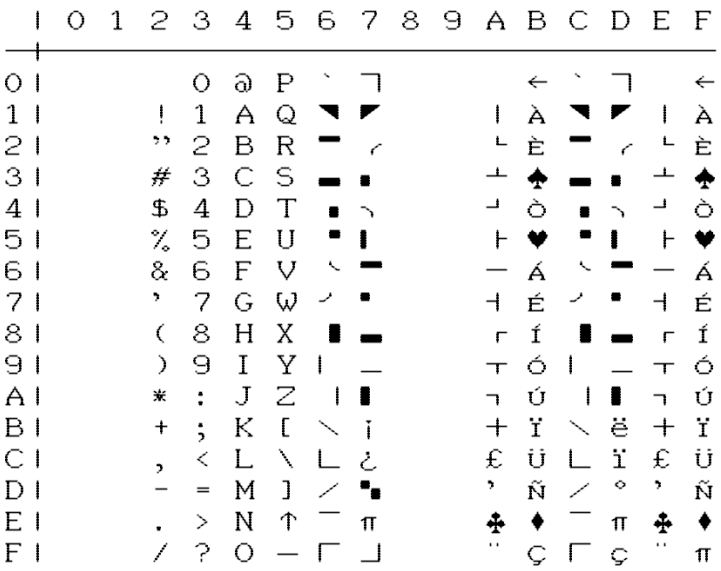


Table 9 : SPAIN Charset in Uppercase/Graphic Mode (Secondary address = 0)

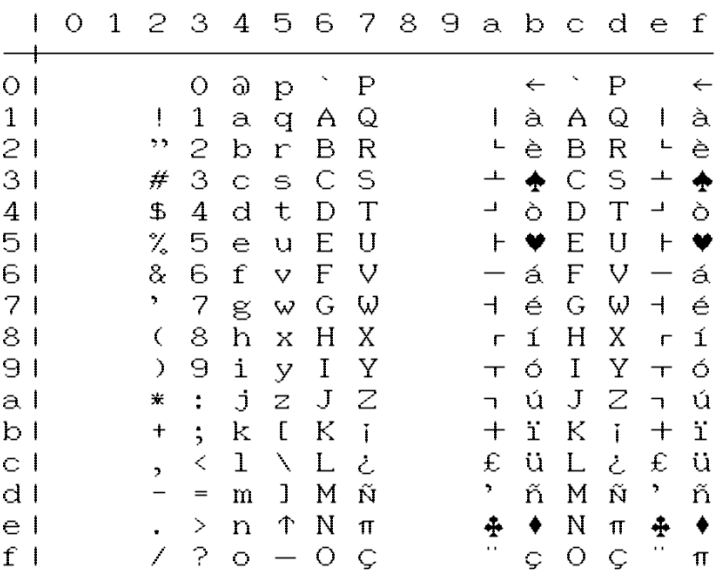


Table 10 SPAIN Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.6. Sweden

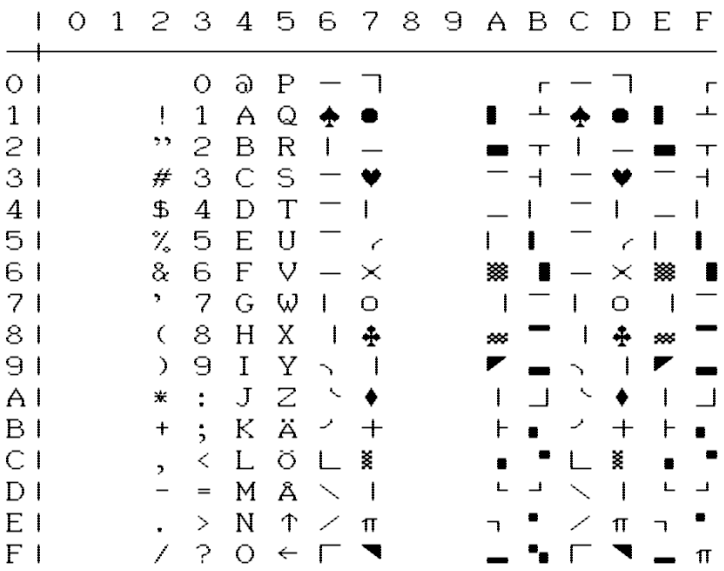


Table 11 : SWEDEN Charset in Uppercase/Graphic Mode (Secondary address = 0)

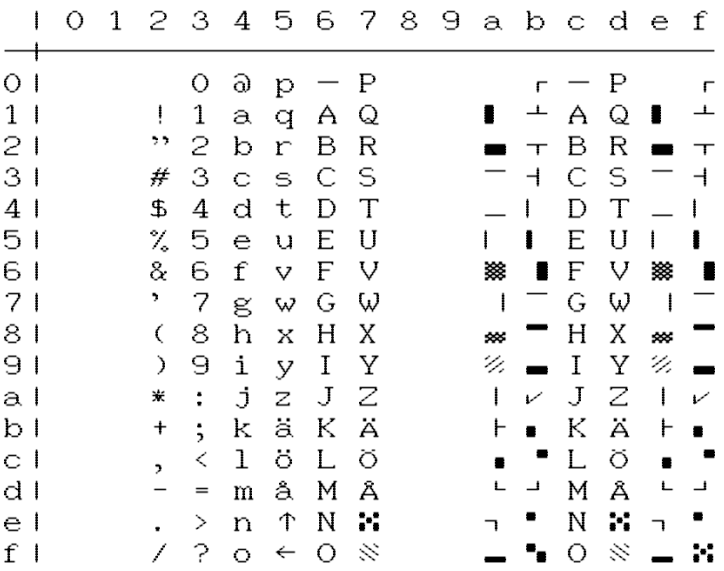


Table 12 SWEDEN Charset in Lowercase/Uppercase Mode (Secondary address = 7)

## 9.7. Switzerland

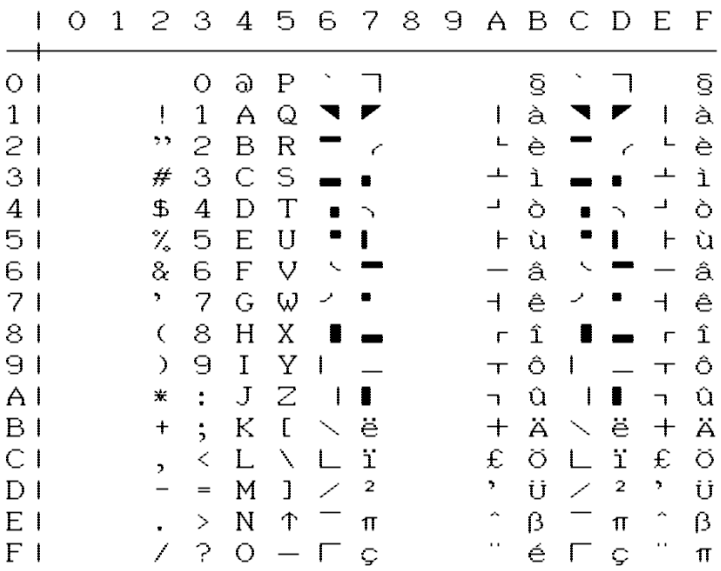


Table 13 : SWITZERLAND Charset in Uppercase/Graphic Mode (Secondary address = 0)

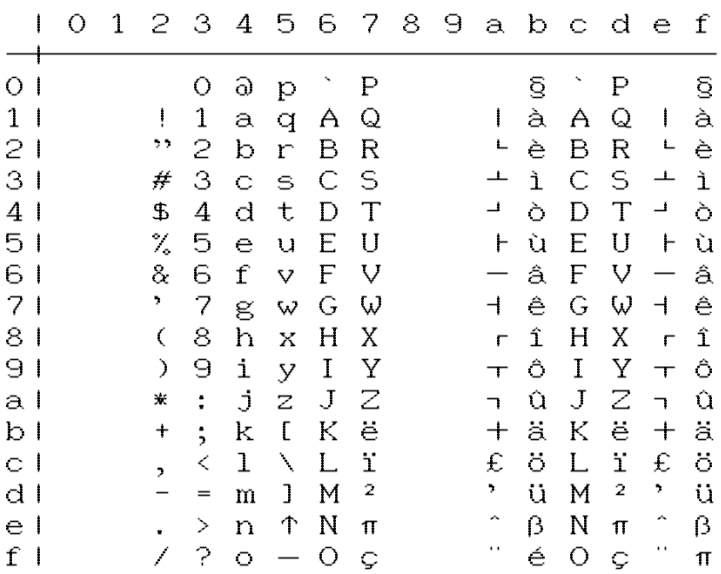


Table 14 SWITZERLAND Charset in Lowercase/Uppercase Mode (Secondary address = 7)

# 10. EPSON FX-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

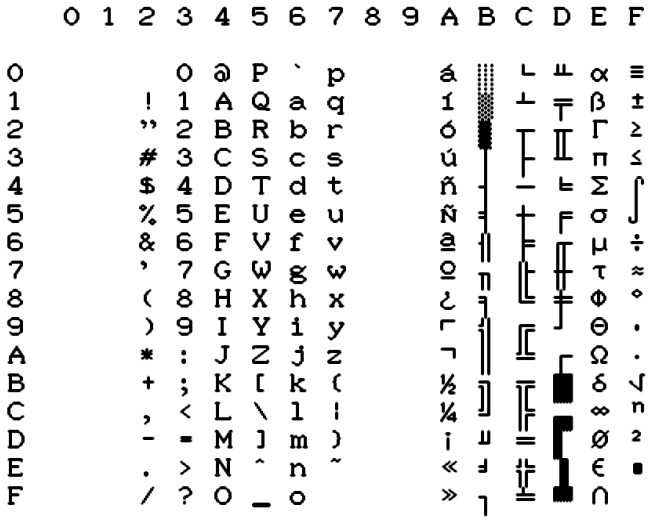
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | à | § | | 0 | @ | P | ` | p | à | § | | 0 | @ | P | ` | p |
| 1 | è | ß | ! | 1 | A | Q | a | q | è | ß | ¡ | 1 | A | Q | a | q |
| 2 | ù | | " | 2 | B | R |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

## 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 | Ö | Ü | ^ | ` | ä | ö | å | ü |
| UK | £ | $ | @ | [ | \ | ] | ^ | ` | { | ¦ | } | ~ |
| Denmark I | # | $ | @ | Æ | Ø | Å | ^ | ` | æ | ø | å | ~ |
| Sweden | # | ¤ | é | Ä | Ö | Å | Ü | é | ä | ö | å | ü |
| Italy | # | $ | @ | ° | \ | é | ^ | ù | à | ò | è | ì |
| Spain | ₧ | $ | @ | ¡ | 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 |

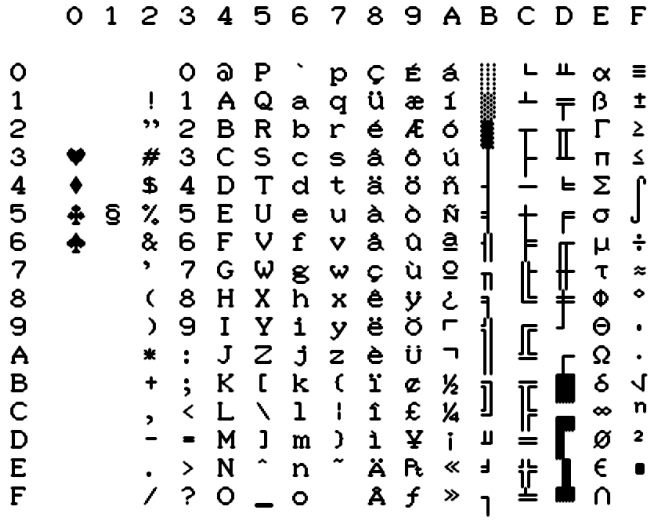
# 11. IBM character tables

## 11.1. Table 1

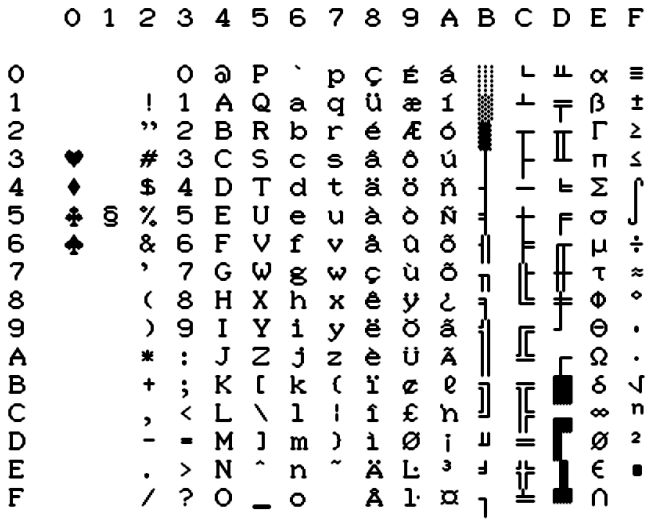


## 11.2. Table 2

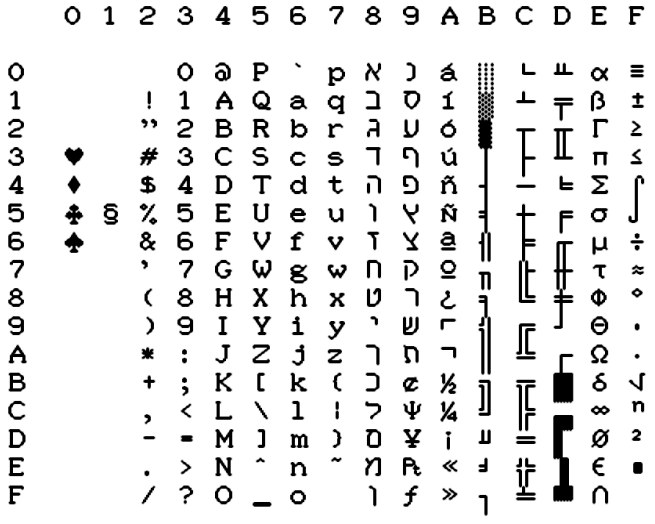
### 11.2.1. International 1



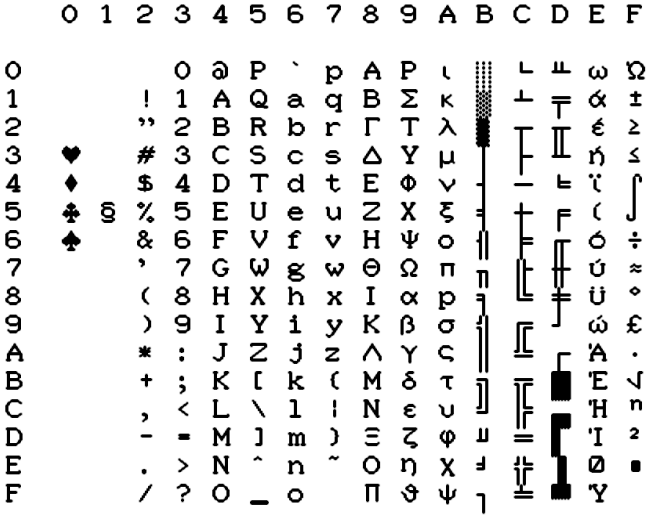
### 11.2.2. International 2



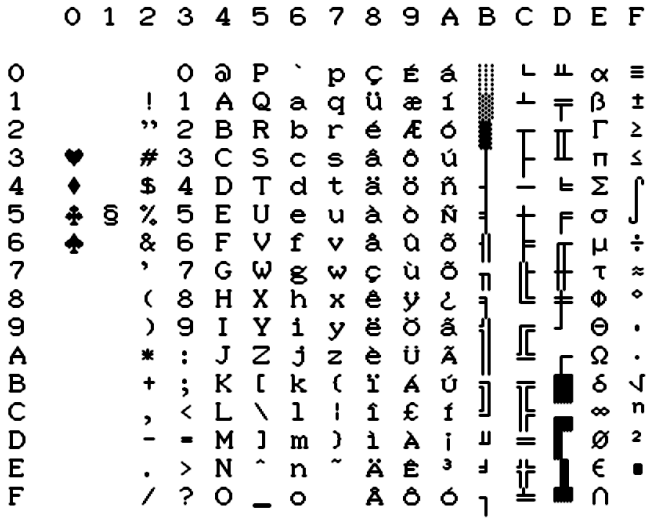
### 11.2.3. Israel



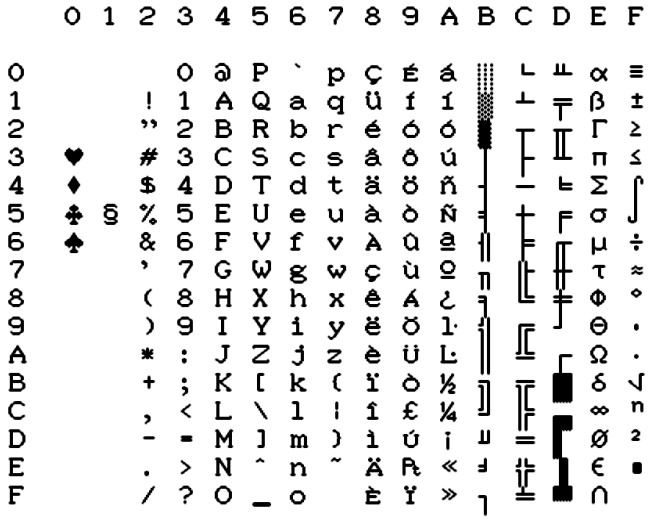
### 11.2.4. Greece



### 11.2.5. Portugal



### 11.2.6. Spain



## 12. Commodore commands reference

| CODE ASCII | DEC | HEX | DESCRIPTION | PAGE |
|---|---|---|---|---|
| **BIT IMG** | 8 | 08 | Select graphic Bit Image Mode | 16 |
| **BIM IMG SUB** | 8 26 | 08 1A | Select repeated graphic Bit Image Mode | 16 |
| **HTAB** | 9 | 09 | Horizontal tabulation | 15 |
| **LF** | 10 | 0A | Line Feed | 14 |
| **FF** | 12 | 0C | Form Feed | 14 |
| **CR** | 13 | 0D | Carriage Return | 14 |
| **EN ON** | 14 | 0E | Double width character ON | 10 |
| **EN OFF** | 15 | 0F | Double width character OFF, Bitmap Image Mode OFF | 11 |
| **POS** | 16 | 10 | Jump to horizontal position in number of characters | 15 |
| **CRSR DWN** | 17 | 11 | Select Commodore charset with lowercases and uppercases | 13 |
| **RVS ON** | 18 | 12 | Negative character ON | 11 |
| **ESC** | 27 | 1B | ASCII code for the Escape character | |
| **NLQ ON** | 31 | 1F | Near Letter Quality ON | 13 |
| **ESC POS** | 16 | 10 | Jump to horizontal position in number of dots | 15 |
| **ESC -** | 45 | 2D | Underline ON/OFF | 11 |
| **ESC 4** | 52 | 34 | Italic ON | 11 |
| **ESC 5** | 53 | 35 | Italic OFF | 12 |
| **ESC 8*** | 56 | 38 | Disable paper end sensor | 15 |
| **ESC 9*** | 57 | 39 | Enable paper end sensor | 15 |
| **ESC =*** | 61 | 3D | Custom character definition using Down Line Loading (DLL) | 17 |
| **ESC c** | 67 | 43 | Set paper height in number of text lines | 14 |
| **ESC c NUL** | 67 0 | 43 00 | Set paper height in inches | 14 |
| **ESC e** | 69 | 45 | Bold character ON | 11 |
| **ESC f** | 70 | 46 | Bold character OFF | 11 |
| **ESC g** | 71 | 47 | Double Strike ON | 10 |
| **ESC h** | 72 | 48 | Double Strike OFF | 10 |
| **ESC i** | 73 | 49 | Select character print definition | 18 |
| **ESC n*** | 78 | 4E | Define Bottom of Page (BOF) | 14 |
| **ESC o*** | 79 | 4F | Disable Bottom of Page (BOF) | 14 |
| **ESC s** | 83 | 53 | Select Superscript or Subscript character mode | 12 |
| **ESC t** | 84 | 54 | Disable Superscript and Subscript character mode | 13 |
| **ESC [** | 91 | 5B | Select character spacing (PICA, ELITE, …) | 12 |
| **ESC X** | 120 | 78 | Select NLQ or DRAFT | 13 |
| **CS** | 141 | 8D | Carriage Return with no Line Feed | 14 |
| **CRSR UP** | 145 | 91 | Select Commodore charset with uppercases and graphics | 13 |
| **RVS OFF** | 146 | 92 | Negative character OFF | 11 |
| **NLQ OFF** | 159 | 9F | Near Letter Quality OFF | 13 |

* Ignored in the Ultimate-II Virtual Printer

## 13. EPSON FX-80 commands reference

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

* Ignored in the Ultimate-II Virtual Printer

| CODE ASCII | DEC | HEX | DESCRIPTION | PAGE |
|---|---|---|---|---|
| **ESC H** | 72 | 48 | Double Strike OFF | 19 |
| **ESC I** | 73 | 49 | Extend printable characters set | 29 |
| **ESC J** | 74 | 4A | Skip n/216" of paper | 24 |
| **ESC K** | 75 | 4B | Set normal density graphics | 26 |
| **ESC L** | 76 | 4C | Set double density graphics | 27 |
| **ESC M** | 77 | 4D | Elite pitch 12 cpi ON | 21 |
| **ESC N*** | 78 | 4E | Define Bottom of Page (BOF) | 25 |
| **ESC O*** | 79 | 4F | Disable Bottom of Page (BOF) | 25 |
| **ESC P** | 80 | 50 | Elite pitch 12 cpi OFF | 21 |
| **ESC Q** | 81 | 51 | Define right margin | 24 |
| **ESC R** | 82 | 52 | Select national character set | 29 |
| **ESC S** | 83 | 53 | Select Superscript or Subscript character mode | 21 |
| **ESC T** | 84 | 54 | Disable Superscript and Subscript character mode | 21 |
| **ESC U*** | 85 | 55 | Mono/Bidirectional printing | 31 |
| **ESC W** | 87 | 57 | Double width characters ON/OFF | 19 |
| **ESC Y** | 89 | 59 | Double density BIM selection, normal speed | 27 |
| **ESC Z** | 90 | 5A | Four times density BIM selection | 27 |
| **ESC ^** | 94 | 5E | 9-dot high strips BIM printing | 28 |
| **ESC b** | 98 | 62 | Select up to 8 vertical tab stops programs | 26 |
| **ESC i*** | 105 | 69 | Immediate character printing ON/OFF | 31 |
| **ESC j** | 106 | 6A | Reverse paper feed n/216" | 24 |
| **ESC l** | 108 | 6C | Define left margin | 24 |
| **ESC p*** | 112 | 70 | Proportional spacing ON/OFF | 22 |
| **ESC s*** | 115 | 73 | Half speed printing ON/OFF | 31 |
| **ESC x** | 120 | 78 | Select NLQ or DRAFT | 21 |
| **DEL*** | 127 | 7F | Clear last printable character | 31 |

* Ignored in the Ultimate-II Virtual Printer

## 14. IBM Graphics Printer commands reference

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

* Ignored in the Ultimate-II Virtual Printer
† Only in the Ultimate-II Virtual Printer, not in a real MPS-1230

| CODE ASCII | DEC | HEX | DESCRIPTION | PAGE |
|---|---|---|---|---|
| **ESC T** | 84 | 54 | Disable Superscript and Subscript character mode | 35 |
| **ESC U*** | 85 | 55 | Mono/Bidirectional printing | 39 |
| **ESC W** | 87 | 57 | Double width characters ON/OFF | 32 |
| **ESC Y** | 89 | 59 | Double density BIM selection, normal speed | 38 |
| **ESC Z** | 90 | 5A | Four times density BIM selection | 38 |
| **ESC [** | 91 | 5B | Set horizontal spacing | 34 |
| **ESC x** | 120 | 78 | Select NLQ or DRAFT | 35 |

* Ignored in the Ultimate-II Virtual Printer

## 15. IBM Proprinter commands reference

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

* Ignored in the Ultimate-II Virtual Printer
† Only in the Ultimate-II Virtual Printer, not in a real MPS-1230

| CODE ASCII | DEC | HEX | DESCRIPTION | PAGE |
|---|---|---|---|---|
| **ESC T** | 84 | 54 | Disable Superscript and Subscript character mode | 42 |
| **ESC U*** | 85 | 55 | Mono/Bidirectional printing | 47 |
| **ESC W** | 87 | 57 | Double width characters ON/OFF | 40 |
| **ESC Y** | 89 | 59 | Double density BIM selection, normal speed | 45 |
| **ESC Z** | 90 | 5A | Four times density BIM selection | 45 |
| **ESC ** | 92 | 5C | Print n characters from extended table | 46 |
| **ESC ^** | 94 | 5E | Print one character from extended table | 46 |
| **ESC _** | 95 | 5F | Overline: ON/OFF | 42 |

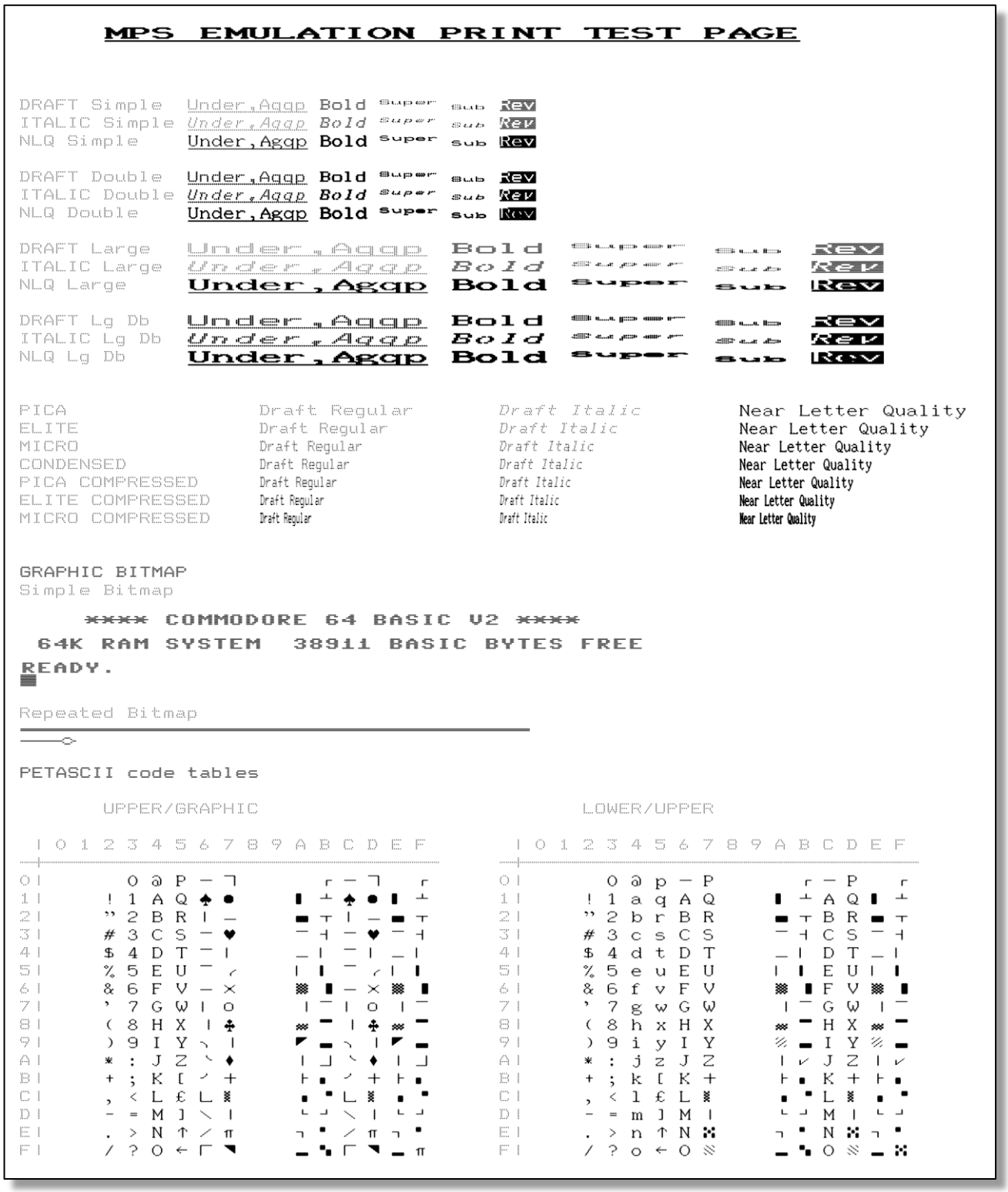
* Ignored in the Ultimate-II Virtual Printer

## 16. Technical Specifications

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

## 17. Print Sample

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



## 18. Document Revisions

| Revision | Date | Author | Description |
|---|---|---|---|
| **1.0.0** | May 27, 2016 | René Garcia | Initial release |
| **1.0.1** | May 30, 2016 | René Garcia | Corrected capabilities table and options<br>BIT IMG SUB corrected<br>Ink Density samples |
| **1.1** | February 18, 2018 | René Garcia | Rename MPS Printer Emulation to Virtual Printer<br>New feature: ASCII output format |