Commodore®

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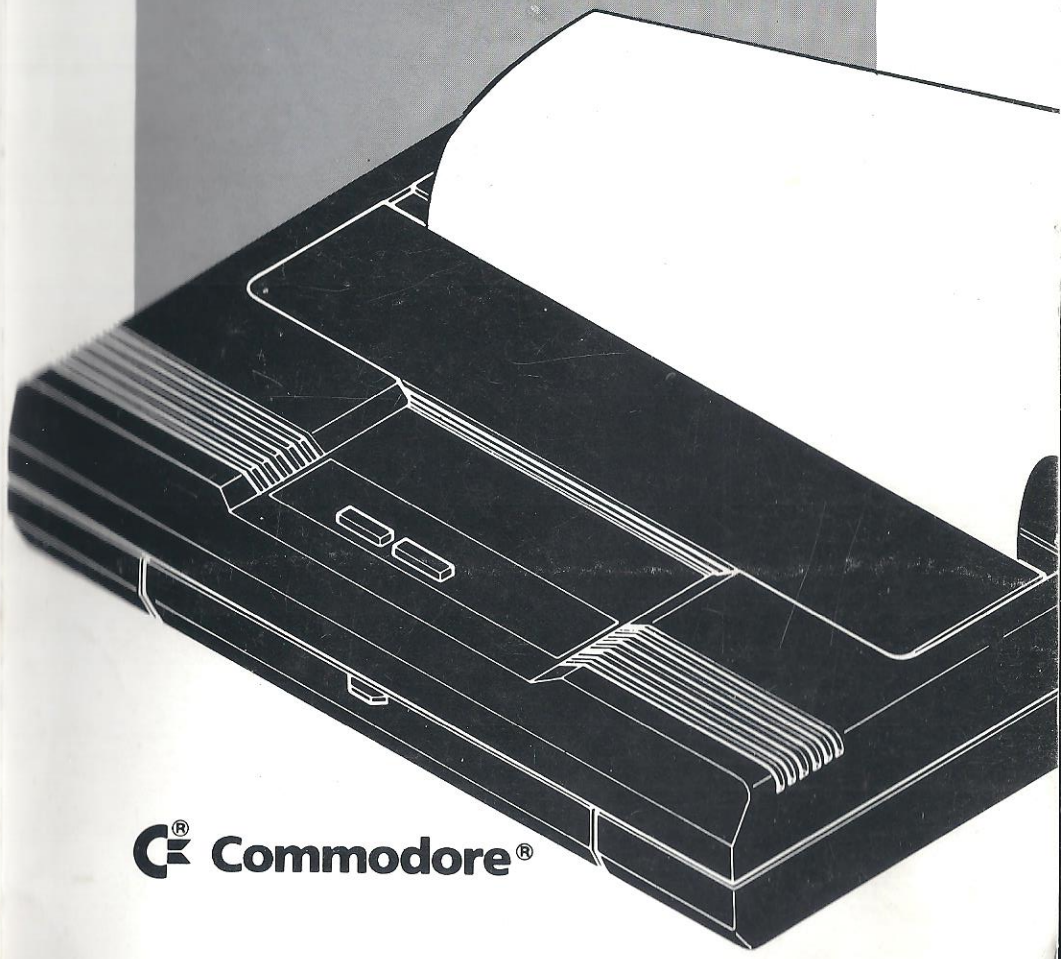
Part No.368047-02

INSTALLATION AND USER'S GUIDE

MPS 1270A PRINTER



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About This Guide

This guide explains how to install and operate the MPS 1270 ink jet printer. In addition to this section, the guide contains the following chapters and appendices:

Chapter 1—Introduction—describes the features of the MPS 1270.

Chapter 2—Installing the MPS 1270—explains how to select a location for your printer, unpack it, install the print head and paper, and connect the printer to your computer.

Chapter 3—Using the MPS 1270—describes the switches and indicators on the printer and explains how to test the printer, select print modes, and set DIP switches.

Chapter 4—Maintaining the MPS 1270—provides tips on maintaining the MPS 1270 and troubleshooting problems.

Chapter 5—Using Printer Control Commands—defines commands that can be used to take advantage of print features.

Appendix A—Technical Specifications—provides details about printer size, power and environmental requirements, and paper and print specifications.

Appendix B—Interface Pin Configuration—lists pin signals for the serial and parallel connectors to the printer.

Appendix C—MPS 1270 Character Sets—provides tables of the character sets the MPS 1270 can produce.

Appendix D—Block and Dot Mode Graphics—provides information concerning the programming of character sets.

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Chapter 1: Introduction

Overview

The Commodore MPS 1270, illustrated in Figure 1-1, is a non-impact printer that allows you to generate printed copies of documents, programs, or illustrations that you create with your computer. Using a series of microscopic jets, the printer sprays ink onto the paper in the shape of the character you designate.

The MPS 1270 is compatible with the Commodore Amiga®, the Commodore PC family of computers and with any other computer that uses either a Commodore serial or a Centronics® parallel port for connection. It is also compatible with most application software, as long as you make the right printer selection for that software (see Chapter 3).

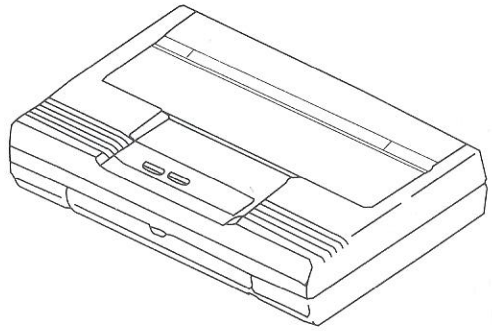


Figure 1-1. The MPS 1270 Printer

Printer Features

The MPS 1270 provides several other important features. You can print in either draft or near letter quality (NLQ) mode, and you can select printer features either by setting a series of switches or typing in commands at the keyboard.

Print Modes

Characters can be printed in draft or NLQ mode. In draft mode, the MPS 1270 prints fewer dots per character at a speed of 160 characters per second. This mode is appropriate for quick printing for your own review. In NLQ mode, the printer prints more dots per character at a slower speed. Because the characters are sharper and more clearly defined, this mode is suitable for final form text and graphics. Figure 1-2 illustrates both print modes, from the Epson set.

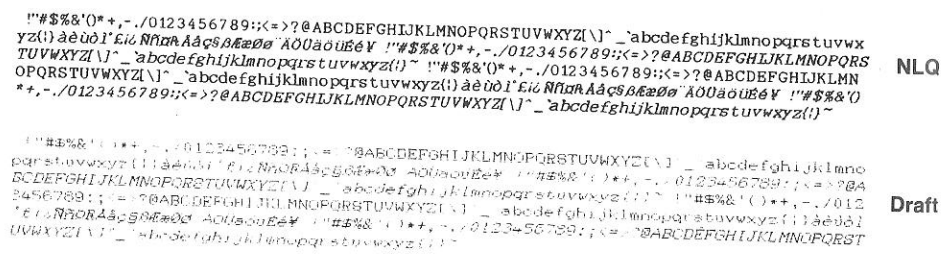


Figure 1-2. MPS 1270 Print Modes

These print modes can be selected by using the Linefeed/Formfeed switch on the operator panel, by changing the DIP switch settings, or by typing in specific control codes.

Detailed information on selecting a print mode appears in Chapter 3 of this guide.

Character Sets and Commands

The MPS 1270 provides three industry-standard character sets for you to choose from: Commodore, Epson FX™ and IBM Proprinter™. Chapter 3 explains how to use the DIP switches to select the character set you want to use. The character sets are illustrated in Appendix C.

In addition to setting features by DIP switch, the MPS 1270 allows you to set features by typing commands into programs that you write or into application programs that may lack a specific feature that you want to use (e.g., subscripts). These commands are discussed in detail in Chapter 5.

Chapter 2: Installing the MPS 1270

This chapter explains how to:

- select a location for the MPS 1270 printer
- unpack the printer
- install the print head and paper
- connect the printer to your computer

Selecting the Proper Location

Observe the following precautions when you select a location for the printer.

1. Place the printer on a level surface, near an AC outlet, and away from direct sunlight and hot appliances (copiers, heaters, etc.)
2. Place the printer where it will not be subject to sudden changes in temperature (which may cause condensation).
3. Place the printer in an area that will not receive strong vibrations or shocks.
4. Use the AC adapter supplied with this printer.

Unpacking the Printer

After you open the box, check that you received the items illustrated in Figure 2-1.

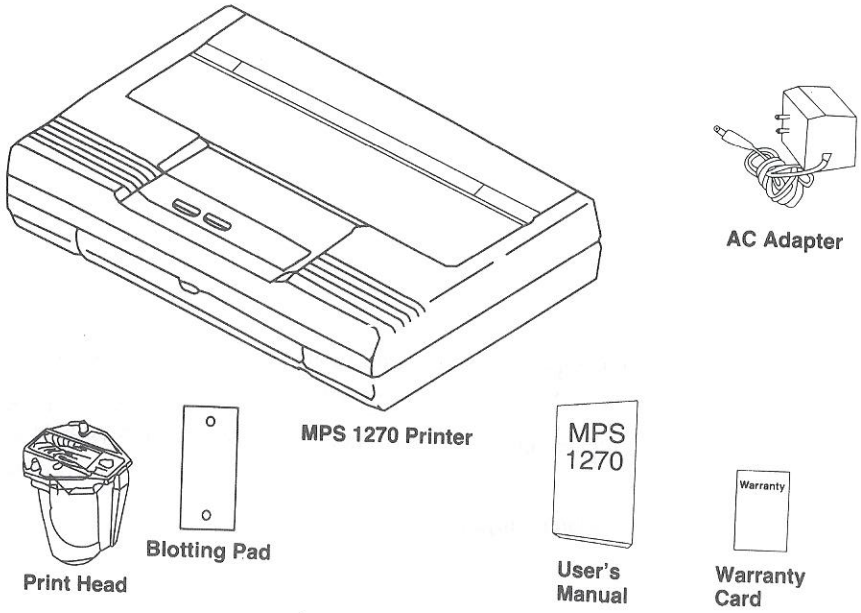


Figure 2-1. Contents of Packing Box

Enter the necessary items on your portion of the warranty card and keep it, along with your receipt for purchase, in a safe place. Mail the prepaid, preaddressed portion of the card back to Commodore.

Keep the packing box in case you need to return the printer to your dealer or transport it to another location.

Before you install the printer, review Figure 2-2 to become familiar with the locations and names of printer parts.

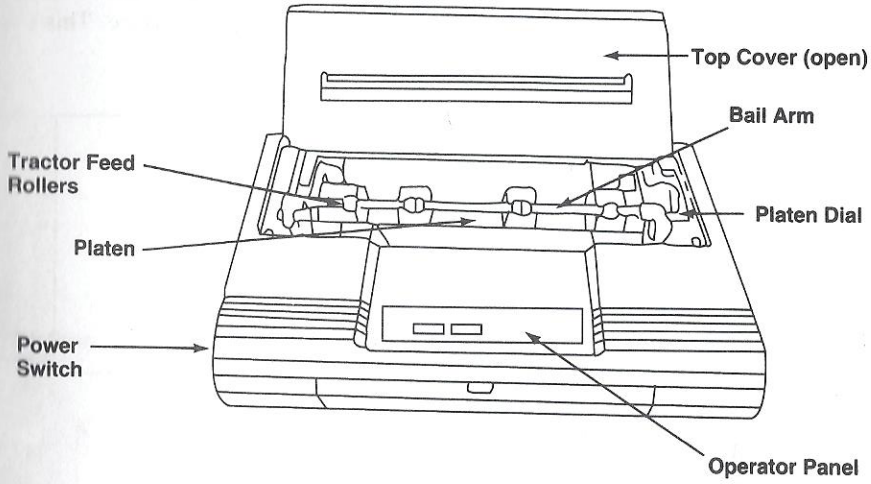


Figure 2-2. Parts of the MPS 1270

Installing the Print Head and Paper

> **Warning:** Do not plug the printer into an outlet until these instructions tell you to do so.

Before you can operate the MPS 1270, you must install the print head and either single- or tractor-feed sheets of paper. These tasks are illustrated and described in the following paragraphs.

Installing the Print Head

The print head is the mechanism that holds the ink cartridge and sprays ink onto the paper.

To mount the new print head:

1. Remove the print head and the blotting pad from the box.
2. Insert a paper clip into the bottom of the ink cartridge as shown in Figure 2-3 and press gently until the ink flows to the surface. This process is called ''priming'' the printhead.

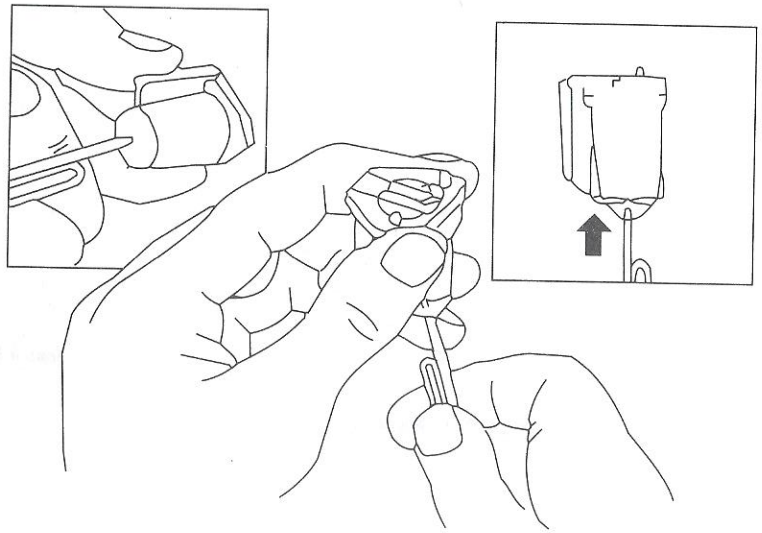


Figure 2-3. Priming the Print Head

3. Gently wipe the excess ink from the nozzle surface with clean tissue paper, cloth, or a cotton swab. Wipe away from the electrical contacts. Be careful not to touch the electrical contacts.

4. Open the top cover of the printer.
5. Gently pull the bail roller forward as far as it will go (the lock position).
6. With the absorbent (paper) side of the blotting pad facing forward, insert the paper into the holder at the left side of the printer. If the carriage interferes, gently move it to the right with your hand. Then insert the blotting pad.

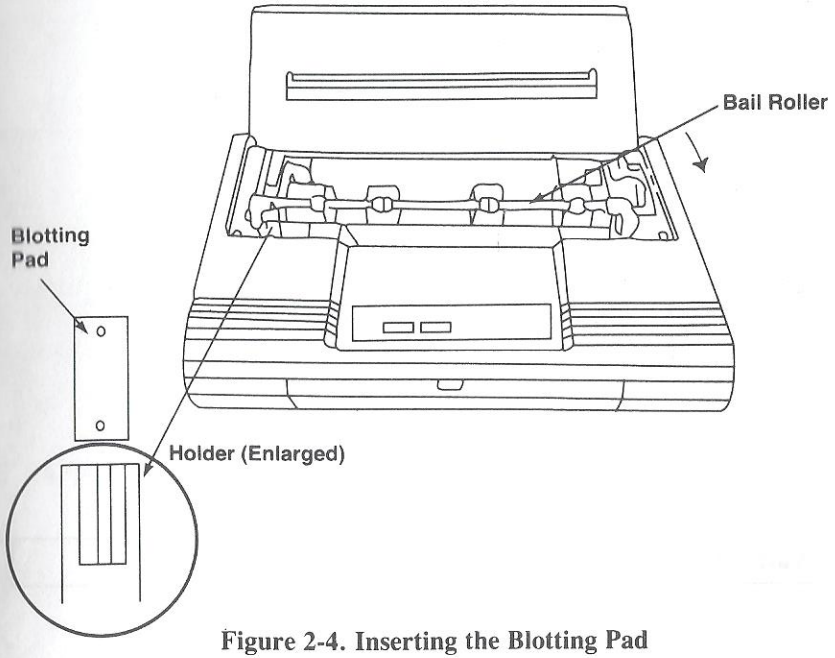


Figure 2-4. Inserting the Blotting Pad

7. Gently push the bail roller back to its original position.
8. Gently move the carriage to the home position (in the left corner).

   You can also move the carriage by plugging the AC adapter into the printer and into the wall outlet and switching on the power to the printer. The printer automatically moves the carriage to the home (left) position. Once the carriage has stopped, switch off the power and unplug the AC adapter from the wall outlet.

9. Lower the print head holder as shown in Figure 2-5.
10. Insert the print head (so that the nozzle is facing toward the platen). Be careful not to scratch the carriage or the electrical contacts.
11. To anchor the print head, lift up on the print head holder until it locks into place. Do not touch the electrical contacts on the print head.

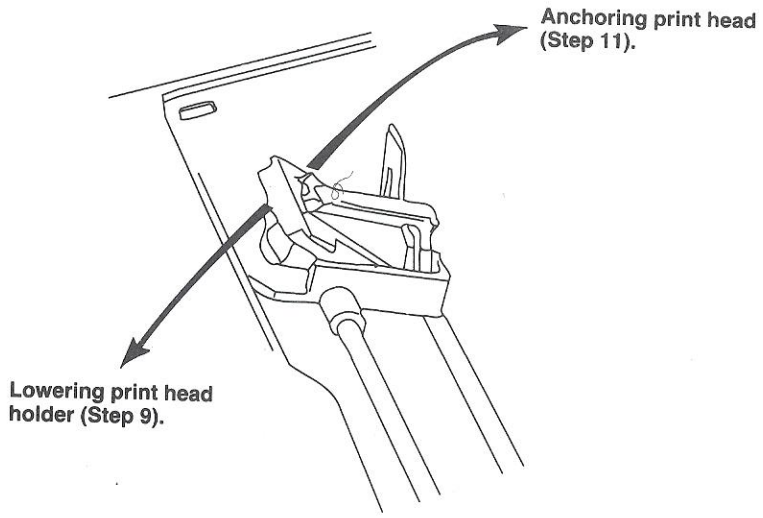


Figure 2-5. Inserting the Print Head

Warning: Keep the ink out of the reach of children. It is toxic.

Inserting Printer Paper

The MPS 1270 can accept both single sheets and tractor-feed paper as described in the following paragraphs.

Single Sheet Paper

Single sheets of paper can be inserted at the front and at the top rear of the printer. Paper inserted in the front can be 7½-8½ inches wide. Paper inserted at the top rear can be 7½-9 inches wide.

To insert paper from the front:

1. Open the top cover.
2. Gently pull the bail roller forward to the lock position.
3. Depress the tab on the front cover, and pull it down.

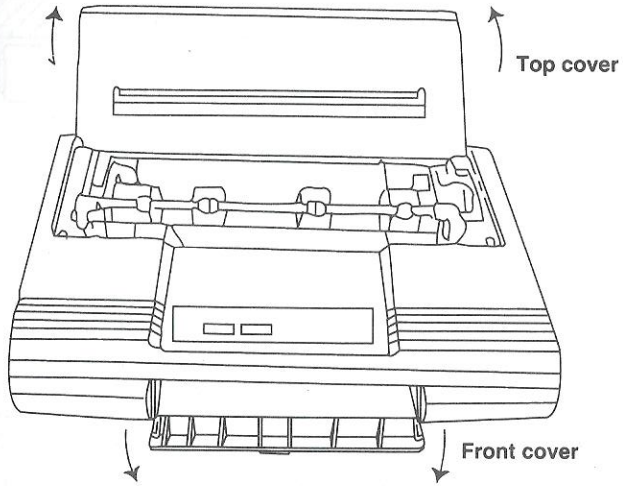


Figure 2-6. Opening Top and Front Covers

4. Align the side of the paper with the left side wall of the opening. Insert the paper into the front slot. With your hand, push the paper toward the back of the printer.

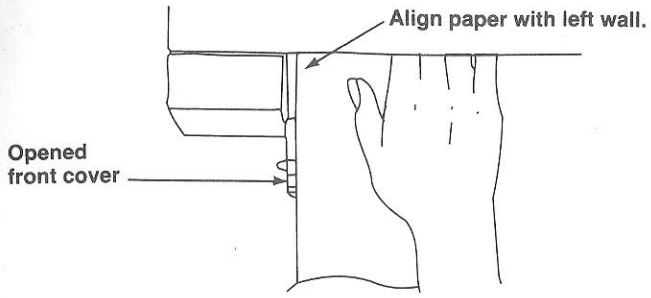


Figure 2-7. Inserting Paper in Front Cover

5. Continue pushing the paper until the leading edge is above the bail roller; then push the bail roller back to its original position.

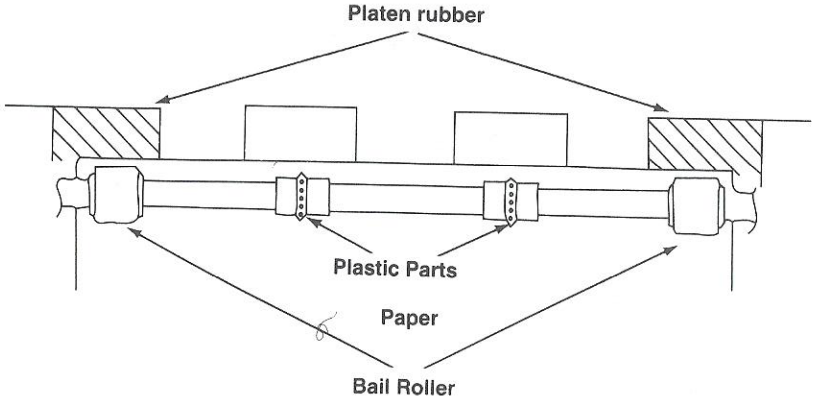


Figure 2-8. Paper in Print Position

6. Now, position the left and right bail rollers so that they are over the platen rubber and within the width of the paper. Position the plastic parts as shown in Figure 2-8. These parts help to hold the paper in position.
7. Turn the platen dial toward you to retract any excess paper extending beyond the bail rollers. When the paper is positioned correctly, a small portion of the edge should extend from behind the rollers.

To insert paper from the top rear:

1. Open the top cover.
2. Gently pull the bail roller forward to the lock position.
3. Insert the paper in the direction marked by the star shown in Figure 2-9. Then, move the tractor so that the width of the paper falls within the left and right tractor guides. (Refer to the section on the tractor feed for information on how to move the tractor.)

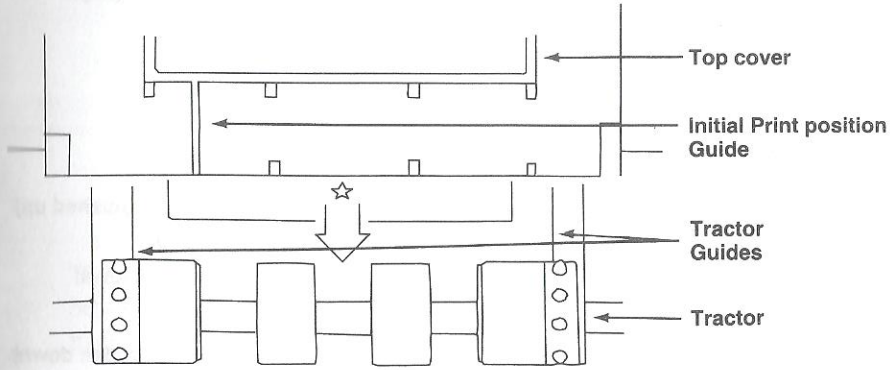


Figure 2-9. Inserting Paper in Top Rear

As shown in Figure 2-9, there is a line on the top cover which indicates the initial printing position. Position the paper using this line as a guide.

4. Now, position the left and right bail rollers so that they are over the platen rubber and within the width of the paper. Position the plastic parts as shown in Figure 2-8. These parts help to hold the paper in position.
5. Turn the platen dial toward you to retract any excess paper extending beyond the bail rollers. When the paper is positioned correctly, a small portion of the edge should extend from behind the rollers.

Tractor Feed Paper

The tractor feed can accept paper 8½ or 9½ inches wide (the distance between the left and right tractor pins).

To insert tractor feed paper:

1. Open the top cover.
2. Gently pull the bail roller forward to the lock position.
3. Pull down on the left and right tractor lock levers and adjust the left and right tractor pins to the width of the paper. Move the pins all the way to the inside for a pin-to-pin distance of approximately 8½ inches, all the way to the outside for a pin-to-pin distance of approximately 9½ inches.
4. Turn the platen dial to adjust the tractor pins and the tractor guide groove as shown in Figure 2-10.

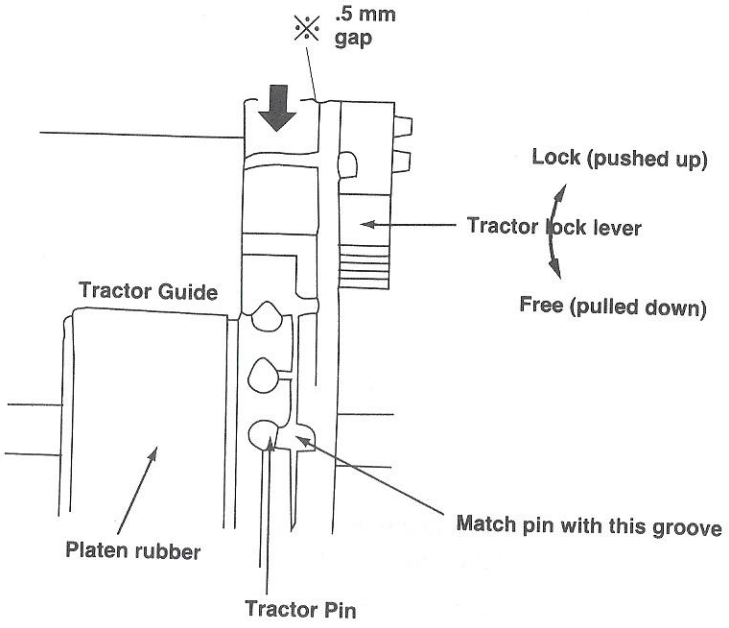


Figure 2-10. Tractor Feed Mechanism

5. Insert the tractor feed paper into the opening at the rear of the printer, passing the paper through the tractor guides.

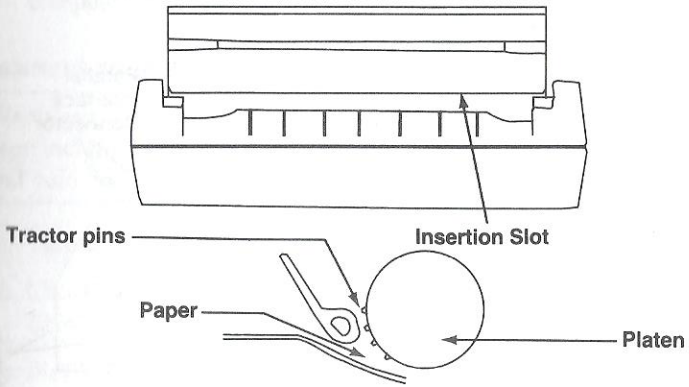


Figure 2-11. Inserting Tractor Feed Paper

The paper is in the proper position when there is a gap of about 0.5mm between the edge of the paper and the ·※· portion of the left and right tractor guides.

When there is too much of a gap or the setting is narrower than the paper width, adjust it by changing the left and right tractor pin positions.

6. When the paper has been inserted until it stops, hold the paper with your left hand so that it does not shift. Feed the paper by turning the platen dial toward the rear of the printer with your right hand. Note that the paper will not feed unless the left and right tractor pins have been set correctly.
7. Check the initial printing position line on the top cover, the tractor guide, and the paper position, and then push up on the left and right tractor lock levers to lock securely (see Figure 2-10).
8. Now, position the left and right bail rollers so that they are over the platen rubber and within the width of the paper. Position the plastic parts as shown in Figure 2-8. These parts help to hold the paper in position.
9. Turn the platen dial toward you to retract any excess paper extending beyond the bail rollers. When the paper is positioned correctly, a small portion of the edge should extend from behind the rollers.

Connecting the Printer

The MPS 1270 is connected to an AC power source via an AC adapter and to a computer via a serial or parallel cable attached to the appropriate interface connector as shown in Figure 2-12.

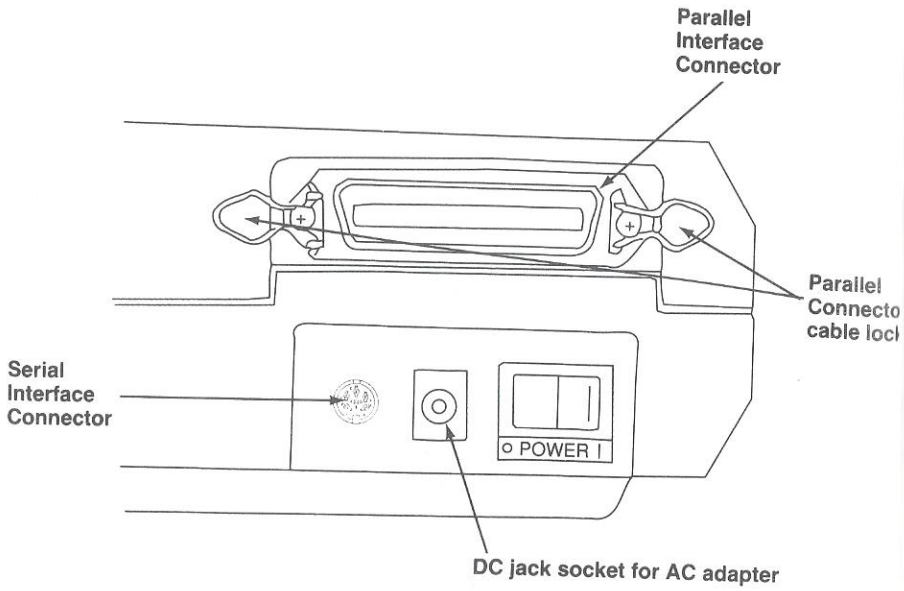


Figure 2-12. MPS 1270 Printer Connectors

To connect your printer to a computer:

1. Check that the power is switched off to the printer and to the computer.
2. Remove the cover, if necessary, from the interface connector.
3. Insert either the serial or parallel interface cable connector into the appropriate printer connector. The connector can be inserted only in the proper direction.

> **Note:** Be sure to use an interface cable that conforms to the specifications of this printer. See Appendix B. Do not attempt to connect both types of cables simultaneously.

4. If you are using a parallel cable, attach the connector and lock it into place with the locks on the left and right sides (Figure 2-12).
5. Attach the other end of the cable to the corresponding connector on the computer (i.e., serial to serial, parallel to parallel).

To connect your printer to the power supply:

> **Warning:** This printer must be powered by the AC adapter that has been included with it. Use of another adapter may damage the printer and void your warranty.

1. Turn the power on/off switch on the printer to off.
2. Check that AC voltage indicated on the AC adapter (120VAC or 220-240 VAC) is the same as that of the outlet voltage.
3. Plug the AC adapter into the AC outlet.
4. Insert the DC jack of the AC adapter into the DC socket of the printer.
5. Turn on the printer and the computer.

Chapter 3:
Using The MPS 1270

This chapter explains how to:

- operate the printer in serial and parallel modes
- test the printer
- select a print mode
- use application software
- set the DIP (dual in line package) switches
- perform a HEX dump

Operating the Printer

Before you use the printer, you should locate and understand the functions of the switches and indicator lights on the printer and the operator's panel. The switches include power, on-line, and line feed/form feed (L.F./F.F.). The indicator lights include power and on-line.

Power Switch

The power switch is located on the left side of the printer. Pressing in on the O side of the switch turns power **off.** Pressing in on the | side turns power **on.**

Operator's Panel

The operator's panel is at the top front of the MPS 1270. As shown in Figure 3-1, it contains the ON LINE and L.F./F.F. switches and the power and on-line indicators.

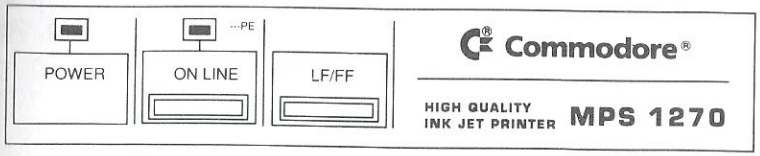


Figure 3-1. MPS 1270 Operator's Panel

On-Line Switch

This switch controls the link with the computer. Pressing the switch has these effects:

When the printer is on-line . . . . The printer goes off-line (even when printing) but completes the line currently being printed.

When the printer is off-line . . . . The printer immediately goes on-line, except when it is out of paper.

L.F./F.F. (linefeed/formfeed) Switch

This switch feeds and ejects the paper. Each time you press the switch, the paper is fed in 1 line increments (1/6″). If you hold the switch down for longer than one second, the paper is fed to the next T.O.F. (Top Of Form) or is ejected. The L.F./F.F. switch only functions when the printer is off-line.

Other special functions have been added to the ON LINE switch and the L.F./F.F. switch as discussed later in this chapter.

Indicator Lights

The indicators on the operator's panel include power and on-line. When power is on, the power indicator is green. When the printer is on-line to the computer, the on-line indicator is orange. When you press the ON LINE switch (taking the printer off-line), the indicator turns off. When the printer is out of paper and is off-line, the on-line indicator flashes.

Testing the Printer

The MPS 1270 contains a built-in self test, a program that prints all the available printer characters. This test lets you see what the print will look like and also assures you that everything is working properly. The self-test is easy to run. You can even run it before the printer is connected to the computer.

To run the test, keep the L.F./F.F. switch pressed down and turn on the power. Every time you press the ON LINE switch, you stop or start the printing. Test mode remains in effect until you turn the power off.

Selecting a Print Mode

The MPS 1270 prints in draft or near letter quality (NLQ) mode. Draft printing is legible and fast so it is used for most daily work. Near letter quality mode, while slower, prints more dots per character, making them more fully formed and easier to read. The MPS 1270 printer defaults to NLQ mode when powered on.

But, you can select the mode you want via your applications software, commands you enter at the keyboard, or by using the L.F./F.F. switch.

To select draft mode using the L.F./F.F. switch:

1. Turn the printer on.
2. Press the L.F./F.F. switch.

To return to NLQ mode using the L.F./F.F. switch:

1. Be sure the printer is on-line. (The on-line indicator will be orange.)
2. Press the ON LINE switch and the L.F./F.F. switch simultaneously.

Note that you can switch between modes while printing is in progress.

Using Application Software

Many application programs, including word processors and spreadsheets, contain special programs, called printer drivers, which let you use a wide variety of printers with them. Generally, you must tell the application program which type of printer you're using by selecting from a list displayed by the print or installation process. If you do not see the MPS 1270 on the list, you can select the Commodore Serial, FX-80™ or the IBM Proprinter™ and then change your printer's DIP switches as described in the following section.

Setting the DIP Switches

The MPS 1270 is equipped with a set of eight DIP switches that let you select printer settings. The switches, illustrated in Figure 3-2, are positioned at the left side, in front of home position. (To locate the switches, open the top cover and look inside the front corner, just behind the Commodore logo. You can view the switches more clearly from the back of the printer.)

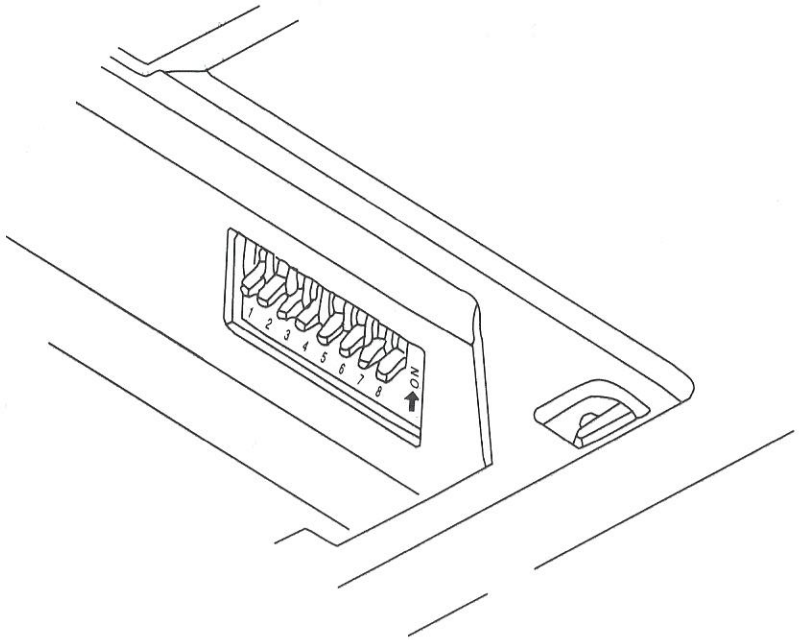


Figure 3-2. MPS 1270 DIP Switches

The switches can be set to ON (pushed up) or OFF (pushed down) with the tip of a bent paper clip or the point of a ball point pen.

> **Note:** Make changes to the DIP switches with power **off.** Otherwise, you will need to reset the printer each time you change the switch settings.

Default Switch Settings (Serial Mode)

At the time of shipping, the switches are set as follows:

Switch	Function	OFF	ON	At time of shipping
1 2 3	International Character Set	See Figure 3-3	See Figure 3-3	OFF OFF OFF
4	Automatic Linefeed	CR	CR&LF	OFF
5	Device Select	4	5	OFF
6	Control Code Mode	Commodore	Epson	OFF
7	ASCII Translation	PETASCII	ASCII	OFF
8	Select Interface	Serial	Parallel	OFF

Table 3-1. Default Mode Switch Settings

Note that switch 8 is OFF, which means that your printer is factory set to operate in serial mode. Note too that switch 6 is OFF, which means that only Commodore serial mode commands (see Chapter 5) are available to you in this mode. You can also set switches 1-3 to select an international character set as shown in Figure 3-3.

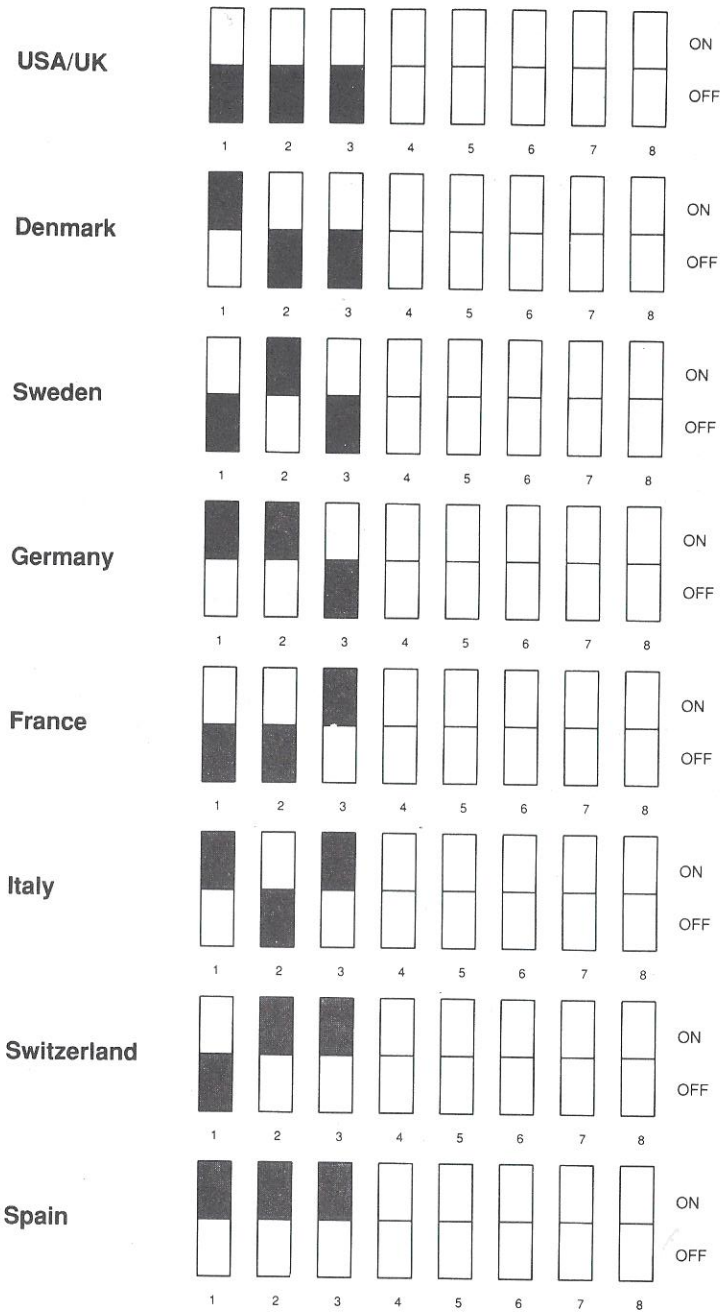


Figure 3-3. Switch Settings for Commodore Serial Mode-International Character Sets

Switch Settings (Parallel Mode)

If you want to operate the MPS 1270 in parallel mode, you must set switch 8 to Off. In this mode, you have the option of functioning as an Epson FX printer or as an IBM proprinter by setting switches 5 and 6 as shown in Figure 3-4. Figures 3-5 through 3-8 provide additional switch setting options for these modes.

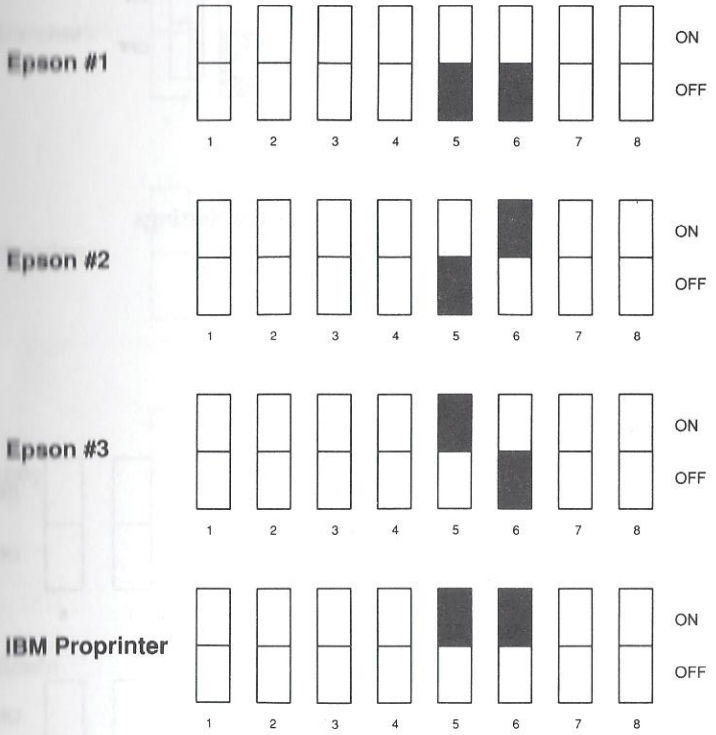


Figure 3-4. Switch Settings for Parallel Printer Configuration Options

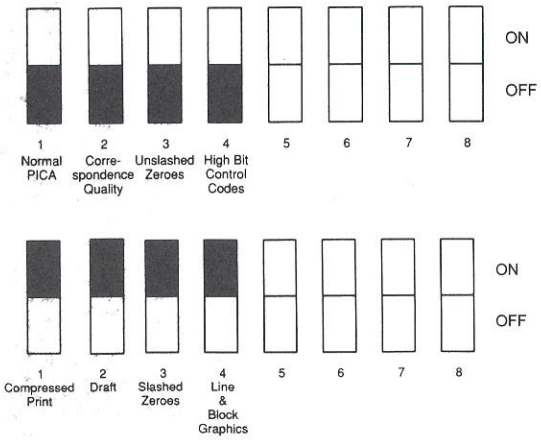


Figure 3-5. Epson FX #1 Switch Settings

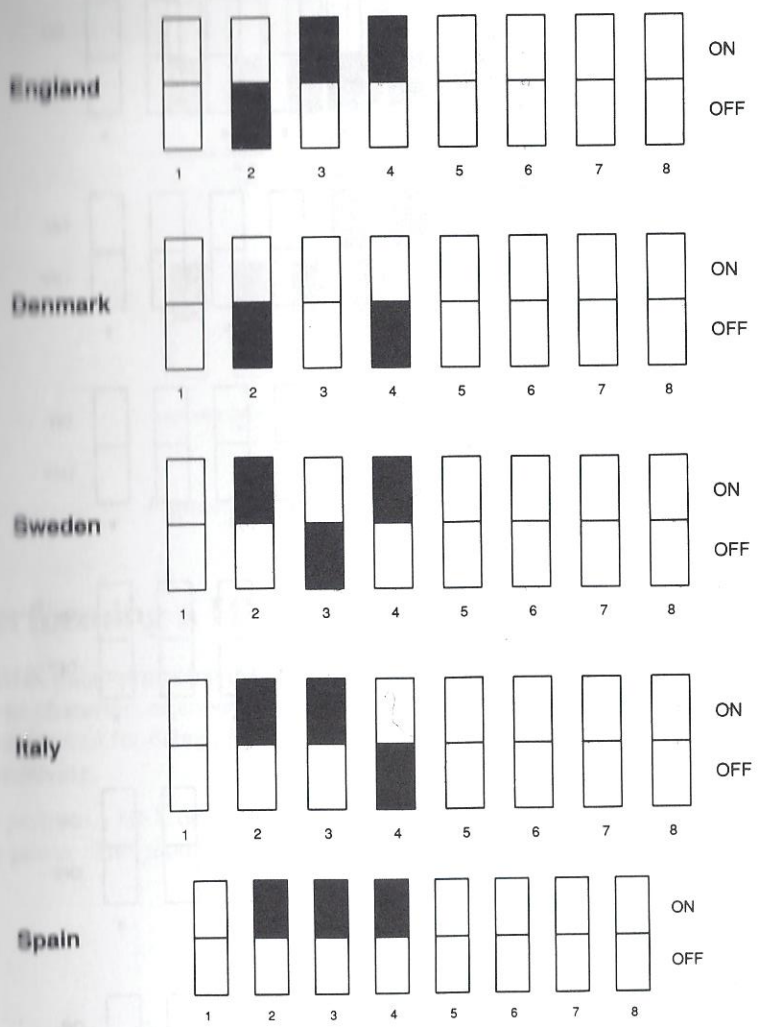
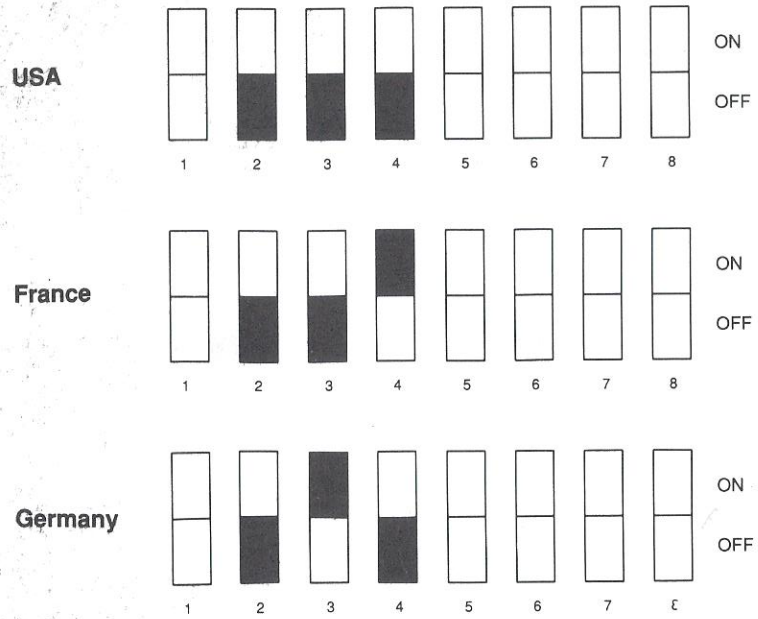


Figure 3-6. Epson FX #2 (International Character Sets)



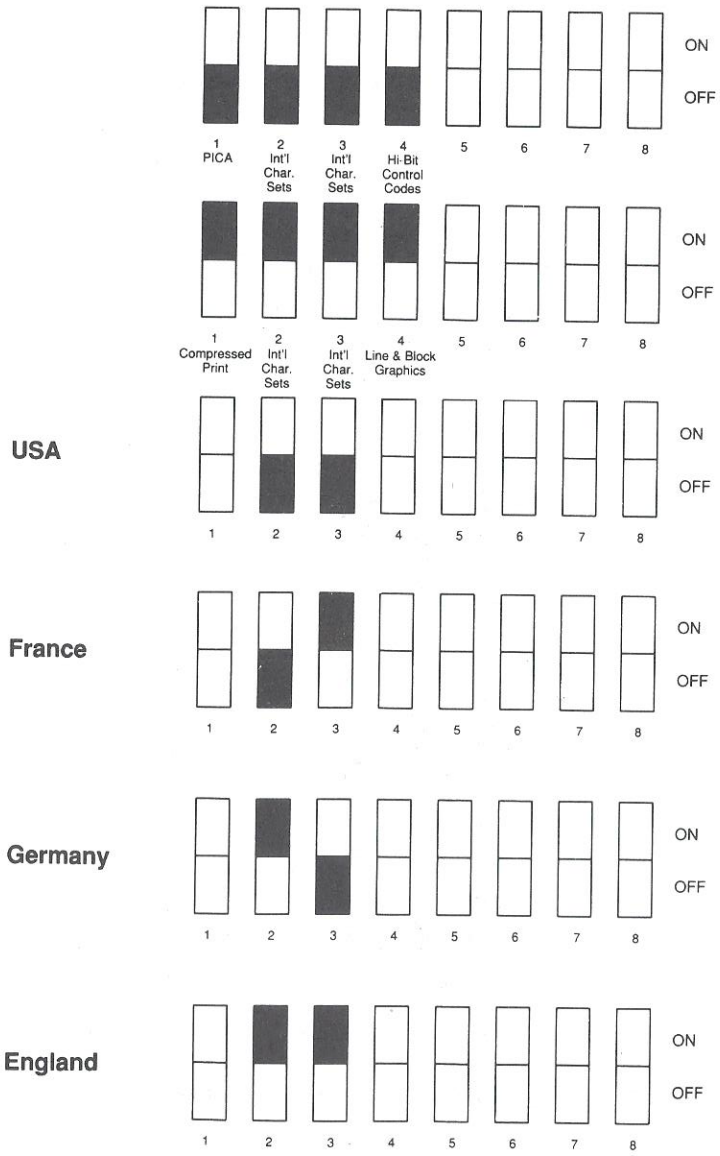


Figure 3-7. Epson FX #3 Switch Settings

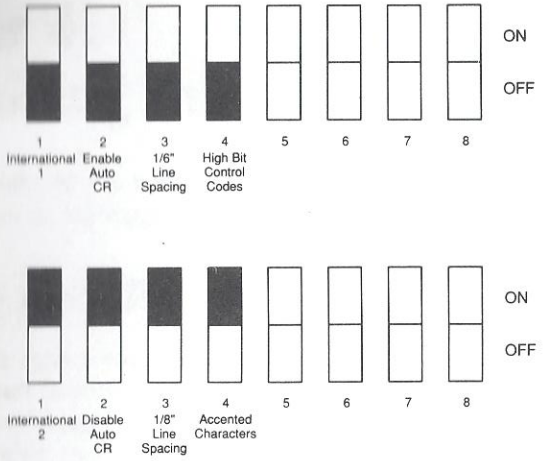


Figure 3-8. IBM Proprinter Switch Settings

Performing a HEX dump

A HEX dump prints out the hexadecimal value of every code it receives, as well as the character, or control code, each value stands for. This printout is a valuable tool for debugging programs because it shows you the codes the printer is receiving.

To perform a HEX dump, keep the ON LINE switch pressed down and turn on the power. This mode remains in effect until you turn the power off.

Chapter 4:
Maintaining the MPS 1270

This chapter explains how to keep the MPS 1270 in good working order and also provides some tips on solving printing problems.

Caring for the MPS 1270

If you take proper care of your printer, it should provide you with years of service. Proper care includes keeping the MPS 1270 (including the electrical contacts) clean, replacing the ink cartridge as needed, and unplugging the printer and AC adapter when they are not in use.

Keeping the Printer Clean

If foreign matter is dropped into the printer, immediately switch off the power and remove the foreign matter. If water or other liquid enters the printer, contact your dealer.

When the printer has not been used for a long period of time, ink will have hardened on the nozzle surface. Wipe the surface with a clean, moistened tissue to clean it.

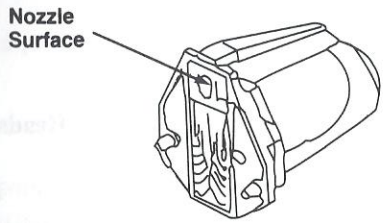


Figure 4-1. Cleaning the Nozzle Surface

One cause of printing trouble is the accumulation of dirt on the electrical contacts, which are located on the print head side and on the printer side. When the printer has not been used for a long period of time, the electrical contacts might make poor contact. They should be wiped gently using a clean cloth moistened with isopropyl alcohol. Be very careful not to damage the contacts.

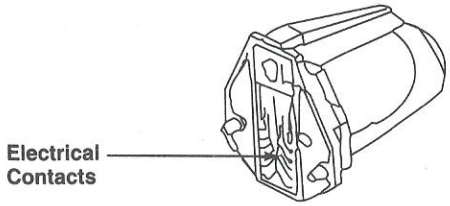


Figure 4-2. Cleaning the Electrical Contacts

Replacing the Print Head

Replace the print head when the ink has been used up. See Chapter 2 for the correct procedure for installing the print head.

The life of the print head can be gauged as shown in Figure 4-3 below.

Figure 4-3. New and Empty Print Heads

Even when the ink cartridge is empty, there will appear to be some ink remaining. Note that the ink cartridge cannot be refilled.

Warning: Keep the ink out of the reach of children. It is toxic.

Troubleshooting

The table below provides a list of common problems and solutions.

Problem	Solution
Printer is on; carriage moves, but no print appears.	Install/Replace ink cartridge. Prime ink cartridge. Clean electrical contacts on carriage. Lock print head holder.
Print quality is poor.	Replace ink cartridge. Prime ink cartridge. Lock print head holder. Clean electrical contacts on carriage.
Blot of ink on left side of paper.	Install blotter pad.
Power is on but printer does not respond to computer.	Check interface cable connections.
Printer does not print in expected format.	Check printer selection in application software. Check DIP Switch settings.
On Line indicator flashes.	Press ON LINE indicator. Turn printer off and on again.
No power to printer.	Check AC adapter connection to printer and to power source.
Paper does not feed properly.	Check paper path. Align tractor feed on roller pins. Check/clean platen and bail arm rollers. Adjust right roller for paper width.
Printer stops; add paper indicator (P.E.) flashes.	Use only supplied AC adapter. Press ON LINE switch. Turn printer off and on again. Check all cable connections. Check paper.
Printer does not advance paper, prints on one line repeatedly.	Enable Automatic Linefeed.

Chapter 5:
Printer Control Commands

Printer control commands allow you to:

- take advantage of built in printer features even if you don't have application software. For example, without a word processing program that allows you to make words bold or underlined, you can still get these styles using printer commands.
- enhance the printing capabilities of your application software. If, for example, your application allows boldface but not underlining, you can still underline text with printer commands.

  Commands include ***control codes*** and ***escape sequences***. Control codes generate a non-printing action (e.g., setting a tab). Escape sequences turn on/off printer features or attributes.

Certain print attributes are set and reset (turned on or off) by using the appropriate ESC code sequence and the numbers 1 or 0. Using 1 turns the particular attribute on; using 0 turns the attribute off. For example, the underline attribute is turned on by sending the ESC code, the character ''-'', and the number 1. The underline attribute is turned off by sending the ESC code, the ''-'' character, and the number 0.

In codes where the attribute is toggled on or off using the ESC sequence and 1 or 0, the 1 or 0 can be numeric (in hexadecimal or decimal code) or ASCII code (number 1 or 0 itself). For example, in BASIC, the following expressions can be used interchangeably to set the underline attribute on:

```
CHR$(27);''-'';CHR$(1);
CHR$(27);''-'';CHR$(49);
CHR$(27);''-'';CHR$(&H31);
CHR$(27);''-'';''1'';
CHR$(27);''-1'';
```

Substituting the numeric or ASCII code for 0 in the above expressions turns the underline attribute off. The following print attributes are set and reset in the same way.

Attribute	ESC Sequence
Underline	ESC -
Unidirectional Print	ESC U
Set Super/Subscript	ESC S
Enlarged Print	ESC W
Proportional Print	ESC p
Automatic Line Feed	ESC 5 (IBM only)
Overscore	ESC _ (IBM only)
Select User-Defined Set	ESC % (Epson only)
Printable Code Area Expansion	ESC I (Epson only)
Select Immediate Print Mode	ESC i (Epson only)

As explained in Chapter 3, your printer can operate in Commodore serial or Epson and IBM parallel modes. Some control codes and escape sequences are available in all modes; others are available only in a specific mode (e.g., Commodore serial).

The following pages list and describe all the control codes and escape sequence available for the MPS 1270.

Commands Available in All Modes (Commodore Serial, Epson, IBM)

ESC x n — Select NLQ or Dra

	ON	OFF
BASIC	CHR$(27) "x1"	CHR$(27) "x0"
PETASCII Hex	1B 58 31	1B 58 30
ASCII Hex	1B 78 31	1B 78 30

If n = 0, selects the Draft print mode
If n = 1, selects the NLQ print mode

SI , DC3 — Select/Cancel Compressed Print

	ON	OFF
BASIC	CHR$(15)	CHR$(18)
PETASCII Hex	0F	12
ASCII Hex	0F	12

Sets the "Condensed" print mode with a 17.0 chars/inch spacing. It is cleared by DC2 after the printer restarts printing with the horizontal spacing selected during the machine setting phase.

DC2: IBM mode. Cancels condensed mode and 12 cpi and sets the printer to 10 cpi.

ESC SI

	ON	OFF
BASIC	CHR$(27) CHR$(15)	CHR$(27) CHR$(18)
PETASCII Hex	1B 0F	1B 12
ASCII Hex	1B 0F	1B 12

Duplicates the SI command.

SO, DC4 — Set the One-line Expanded print

	ON	OFF
BASIC	CHR$(14)	CHR$(20)
PETASCII Hex	0E	14
ASCII Hex	0E	14

Sets the "Double Width" print mode for a whole line. The character is printed at a spacing double of the current, so that the number of characters per inch is halved. Each character occupies two tab stops. It is cleared by CR, CAN, LF or DC4.

ESC SO

	ON	OFF
BASIC	CHR$(27) CHR$(14)	CHR$(27) ''W0''
PETASCII Hex	1B 0E	1B D7 30
ASCII Hex	1B 0E	1B 57 30

Duplicates the SO command.

ESC W n Select/Cancel Expanded M

	ON	OFF
BASIC	CHR$(27) ''W1''	CHR$(27) ''W0''
PETASCII Hex	1B D7 31	1B D7 30
ASCII Hex	1B 57 31	1B 57 30

ESC W 1 Sets the ''Double Width'' print mode. The setting stays valid up the reception of code ESC W 0.

ESC W 0 Clears the ''Double Width'' print mode.

ESC M Select Elite P

	ON	OFF
BASIC	CHR$(27) ''M''	CHR$(27) ''P''
PETASCII Hex	1B CD	1B D0
ASCII Hex	1B 4D	1B 50

Sets the ''Elite'' print pitch (12 chars/inch). Cleared ESC P.

ESC P Select Pica P

	ON	OFF
BASIC	CHR$(27) ''P''	CHR$(27) ''M''
PETASCII Hex	1B D0	1B CD
ASCII Hex	1B 50	1B 4D

Clears the ''Elite'' print pitch (12 chars/inch), restoring ''Pica'' print pitch (10 chars/inch). ESC P does not clear Double Width, Condensed, etc., print modes.

ESC E , ESC F Select/Cancel Emphasized Mode

	ON	OFF
BASIC	CHR$(27) ''E''	CHR$(27) ''F''
PETASCII Hex	1B C5	1B C6
ASCII Hex	1B 45	1B 46

ESC E Sets the ''Emphasized'' print mode. Emphasized printing creates double strike character images witih the smallest possible horizontal spacing.

ESC F Clears the ''Emphasized'' print mode.

ESC G , ESC H Select/Cancel Double-Strike Mode

	ON	OFF
BASIC	CHR$(27) ''G''	CHR$(27) ''H''
PETASCII Hex	1B C7	1B C8
ASCII Hex	1B 47	1B 48

ESC G Sets the ''Double Strike'' print mode. Double Strike printing creates double strike character images with the smallest possible vertical spacing.

ESC H Clears the ''Double Strike'' print mode, started by ESC G.

ESC S 1 — Select Superscr

	ON	OFF
BASIC	CHR$(27) ''S1''	CHR$(27) ''T''
PETASCII Hex	1B D3 31	1B 54
ASCII Hex	1B 53 31	1B 54

ESC S 0 Sets the ''Superscript'' print mode. Characters are half height wit respect to normal printing and are printed in the upper half line.

ESC S 1 Sets the ''Subscript'' print mode. Characters are half height with respect to normal printing and are printed in the lower half line.

ESC T Clears the ''Subscript'' and ''Superscript'' print modes. If the print had not been preset for these print modes, the command is ignored.

ESC S 0 — Select Subscr

	ON	OFF
BASIC	CHR$(27) ''S0''	CHR$(27) ''T''
PETASCII Hex	1B D3 30	1B D4
ASCII Hex	1B 53 30	1B 54

ESC - n — Select/Cancel Underli

	ON	OFF
BASIC	CHR$(27) ''-1''	CHR$(27) ''-0''
PETASCII Hex	1B 2D 31	1B 2D 30
ASCII Hex	1B 2D 31	1B 2D 30

n = 1 Sets the ''Underline'' print mode for all characters and blanks.
n = 0 Clears the ''Underline'' print mode.

ESC ! n — Master Select

	ON	OFF
BASIC	CHR$(27)''!''CHR$(n)	CHR$(27)''!''CHR$(0)
PETASCII Hex	1B 21 nh	1B 21 00
ASCII Hex	1B 21 nh	1B 21 00

Bit	Feature	Value
0	Pica	0
0	Elite	1
1	Proportional	2
2	Compressed	4
3	Emphasized	8
4	Doublestrike	16
5	Expanded	32
6	Italics	64
7	Underlining	128

The print mode number for any combination of features is the sum of the values of the features, for example:

Elite	=	1
Emphasized	=	8
Expanded	=	32
Compressed	=	4
Italic	=	64
Underlined	=	128
Print Mode Number	=	237

ESC 4 , ESC 5 Select/Cancel Italic Mode (Epson only)

	ON	OFF
BASIC	CHR$(27)"4"	CHR$(27)"5"
PETASCII Hex	1B 34	1B 35
ASCII Hex	1B 34	1B 35

ESC 4 Sets the Italic characters print mode.

ESC 5 Clears the Italic characters print mode.

Note: In the IBM configuration, ESC 4 sets the top-of-form; ESC 5 controls the automatic line feed feature.

ESC R n Select International Character Set (excluding IBM)

	ON	OFF
BASIC	CHR$(27)"R" CHR$(n)	CHR$(27)"R" CHR$(0)
PETASCII Hex	1B D2 nh	1B D2 0B
ASCII Hex	1B 52 nh	1B 52 00

n	Country
0	U.S.A.
1	France
2	Germany
3	England
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II

Selects the national characters table according to the value of parameter n:

Table 5-1 International ASCII Codes

Country	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	$	@	[	\	]	^	'	{	|	}	~
France	#	$	à	°	ç	§	^	'	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	'	ä	ö	ü	β
England	£	$	@	[	\	]	^	'	{	|	}	~
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	#	$	@	[	ψ	]	^	'	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	ü	é	æ	ø	å	ü
Denmark II	*	$	É	Æ	Ø	Å	ü	é	æ	ø	å	ü

Notes: In the IBM configuration, ESC R clears all horizontal and vertical tabs (htabs and vtabs).

ASCII 95 (the underline character) is redefined as a left arrow (←) when the Commodore standard character set (n = 11) is selected.

ESC Q n — Select Right Margin (excluding IBM)

BASIC	CHR$(27)''Q'' CHR$(n) (n = 1 to 255)	
PETASCII Hex	1B D1 nh	(nh = 01h to FFh)
ASCII Hex	1B 51 nh	

The sequence ESC Q sets the right margin at column n. To use it send ESC Q followed by the ASCII code for the column number you want. The actual width of the margin is determined by the character width in effect when the margin is set. Later changes in the character width do not affect the width of the margin.

The minimum value of n is 1 as expanded character width.

The right margin must be set at least 2 columns greater than the left margin or the setting is ignored. The setting is also ignored if the right margin exceeds the maximum number of columns allowable for the character width in effect at the time.

ESC l n — Set Left Margin

BASIC	CHR$(27)''l'' CHR$(n) (n = 0 to 255)	
PETASCII Hex	1B 4C nh	(nh = 00h to FFh)
ASCII Hex	1B 6C nh	

The ESC l (lower case ''l'') command sets the left margin at column n. Printing starts at column (n + 1). To use it, send ESC l followed by the ASCII code for the column number you want. The actual width of the margin is determined by the character width in effect when the margin is set. Later changes in the character width do not affect the width of the margin.

If the margin setting exceeds the maximum number of columns in a line for the character width in effect, the setting is ignored.

ESC N n , ESC O — Set Top and Bottom Margin

	ON	OFF
BASIC	CHR$(27)''N'' CHR$(n) (n = 1 to 127)	CHR$(27) ''O''
PETASCII Hex	1B CE nh	1B CF
ASCII Hex	1B 4E nh (nh = 01h to 7Fh)	1B 4F

The top/bottom margin command, ESC N, is sometimes called the skip-over-perforation command. It sets the number of lines to skip at the bottom of every page (above the perforation on continuous paper). To use the top/bottom margin command, send ESC N followed by the ASCII code for the number of lines you want to skip.

The ESC O (letter O) command cancels the top/bottom margin or skip-over-perforation. When set with ESC N, the skip-over-perforation feature can also be canceled by changing the page length or by the master reset command.

ESC 0 — 1/8″ Line Spacing

BASIC	CHR$(27)''0''
PETASCII Hex	1B 30
ASCII Hex	1B 30

This command sets the line spacing to 1/8 inch, printing eight lines per inch. In the IBM configuration (internal switches 5 and 6 on), 1/8 inch line spacing can be selected by setting switch 3 on.

ESC 1 — Line Spacing of 7/72″

BASIC	CHR$(27)''1''
PETASCII Hex	1B 31
ASCII Hex	1B 31

This command changes the line spacing to 7/72 inch, printing approximately 10.3 lines per inch. It is used mainly with graphics so that the tops and bottoms of the graphic characters connect, but can be used in other applications as well.

ESC 2 — 1/6″ Line Spacing

BASIC CHR$(27)"2"
PETASCII Hex 1B 32
ASCII Hex 1B 32

This command sets the line spacing to 1/6 inch, printing six lines per inch.

IBM mode: ESC 2 is the executive command of ESC A and starts the new vertical spacing.

ESC 3 n — Line Spacing of n/216″

BASIC CHR$(27)"3" CHR$(n) (n = 0 to 255)
PETASCII Hex 1B 33 nh (nh = 00h to FF h)
ASCII Hex 1B 33 nh (nh = 00h to FF h)

This command sets the line spacing to n/216 of an inch, adjusting the line spacing to ⅓-dot increments. To use it, send the printer CHR$(27) "3" followed by the ASCII code for the number of 216ths you want, from 0 to 255.

To achieve n/216 line spacing in Commodore serial mode only, use the secondary address of the OPEN command. A secondary address value of 6 controls the number of n/216 steps between successive lines of print. The number you give is divided into 216 to determine the number of lines per inch. Thus, 27 = 8 lines per inch, 72 = 3 lines per inch, etc. The default value is 36, which = 6 lines per inch.

ESC J n — Line Feed of n/216″

BASIC CHR$(27)"J" CHR$(n) (n = 0 to 255)
PETASCII Hex 1B CA nh (nh = 00h to FFh)
ASCII Hex 1B 4A nh

The one-time line feed command immediately advances the paper whatever distance you specify without changing the print head position. To use it, send CHR$(27)"J" followed by the ASCII code for the number of 216ths you want, from 0 to 255.

ESC A n — Line Spacing of n/72″

BASIC CHR$(27) "A" CHR$(n) (n = 0 to 85)
ASCII Hex 1B 41 nh (nh = 00h to 55h)

This command sets the line spacing to n/72 of an inch, adjusting the line spacing to 1-dot increments. To use it, send CHR$(27) "A" followed by the ASCII code for the number of 72nds you want, from 0 to 85.

Note: The CHR$(27)"A" CHR$(n) command works differently in the IBM graphics configuration. You will need to follow ESC A with ESC 2 to activate the newly defined line spacing.

ESC J — Reverse Line Feed (Epson only)

BASIC CHR$(27)"j" CHR$(n)
PETASCII Hex 1B 6A nh
ASCII Hex 1B 6A nh

Executes reverse line feed. Line spacing on n/216ths of an inch is executed in the reverse direction after the data in the print buffer has been printed.

n = line spacing in 1/216th of an inch.

The accuracy of paper feed is guaranteed up to n = 18.

ESC C n — Set Page Length by Lines

BASIC CHR$(27)"C" CHR$(n) (n = 1 to 255)
PETASCII Hex 1B C3 nh (nh = 01h to FFh)
ASCII Hex 1B 43 nh (nh = 01h to FFh)

This command sets the page length to n lines. To use this command, send the printer ESC C followed by the ASCII code for the number of lines you want, from 1 to 255.

ESC C0 n — Set page length by inches

BASIC CHR$(27) "C" CHR$(0) CHR$(n) (n = 1 to 150)
PETASCII Hex 1B C3 00 nh (nh = 01h to 96h)
ASCII Hex 1B 43 00 nh (nh = 01h to 96h)

This command sets the page length to n inches. To use this command, send ESC C followed by CHR$(0) and then the ASCII code for the number of inches you want, from 0 to 150.

ESC D n1 n2 — Set Variable Horizontal Tab

BASIC CHR$(27)"D" CHR$(n1) CHR$(n2) . . . . . CHR$(0)
PETASCII Hex 1B C4 n1h n2h . . . . . 00 (nh = 01h to 89h)
ASCII Hex 1B 44 n1h n2h 00

If you don't want your tabs spaced evenly across the page, then you can use the MPS 1270's variable htab command, ESC D. With the variable htab command you can set up to 32 tabs at any column you like, from column 1 to 137. To use the command, send ESC D followed by the ASCII code for each tab position you want, from 1 to 137. After the last tab position, send CHR$(0) to end the sequence.

The column numbers for variable htabs must be given in ascending numerical order.

Using the variable htab command cancels any fixed or variable htabs that were previously set. If you want to return to fixed htabs, you must either set them again with a fixed htab command or reinitialize the printer to reset the default htabs.

ESC B n1 n2 — Set Variable Vertical Tabs

BASIC CHR$(27)"B" CHR$(n1) CHR$(n2). . . . . CHR$(0)
(n = 1 to 255)
PETASCII Hex 1B C2 n1h n2h 00
ASCII Hex 1B 42 n1h n2h 00
(nh = 01h to FFh)

If you don't want fixed vertical tabs, you can set up to 16 vtabs at any line number from 1 to 255 that you like using the variable vtab command, ESC B. To use the command, send ESC B followed by the ASCII code for the line number of each vtab position you want, from 1 to 255. After the last tab position, send CHR$(0) to end the sequence.

The line numbers for variable vtabs must be given in ascending numerical order.

Using the variable vtab command cancels any fixed or variable vtabs that were previously set. If you want to return to fixed vtabs, you must set them again with a fixed vtab command.

ESC b — Set Vertical Tabs in channel N.

BASIC CHR$(27)"b"CHR$(N)CHR$(n1)CHR$(n2) . . . .
CHR$(0) (N = 0 to 7; n = 7 to 25)
PETASCII Hex 1B 42 Nh n1h n2h 00
ASCII Hex 1B 62 Nh n1h n2h 00
(Nh = 00h to 07h; nh = 01h to FFh)

To use vtab channels, you must first define the vtabs for each channel you want to use. To do this, send the MPS 1270 ESC b followed by the ASCII code for the channel number, from 0 to 7, followed by the ASCII code for the line number of each vtab position you want, from 1 to 255. After the last position, send CHR$(0) to end the sequence.

Channel 0 is the default channel. Unless you tell it otherwise, the MPS 1270 will use the vtabs that are defined in that channel. (Vtabs set with the command ESC B are automatically placed in channel 0). Vtab channels are selected with the ESC / command, described and illustrated below.

ESC / n — Select Vertical tab channel

BASIC	CHR$(27)"/" CHR$(n) (n = 0 to 7)
PETASCII Hex	1B 2F nh
ASCII Hex	1B 2F nh

The vtab channel is defined with the ESC b command (described above). A vtab channel is a set of up to 16 previously defined vtabs. Up to eight channels, numbered 0 to 7, can be defined. To select a vtab channel, use the command ESC / followed by the ASCII code for the number of the channel you want, from 0 to 7.

Note: In the IBM mode, ESC / is used to print control codes as characters when using your own download characters.

ESC p n — Select/Cancel Proportional Mode

	ON	OFF
BASIC	CHR$(27) "p1"	CHR$(27) "p0"
PETASCII Hex	1B 50 31	1B 50 30
ASCII Hex	1B 70 31	1B 70 30

ESC p 1 Sets the character proportional print pitch. It is cleared by ESC p 0.

ESC p 0 Clears the character proportional print pitch, restoring the normal spacing.

ESC (sp) n — Select Character Space

	ON	OFF
BASIC	CHR$(27)"(sp)";CHR$(n)	CHR$(27)"(sp)"; CHR$(0)
PETASCII Hex	1B 20 nh	1B 20 00
ASCII Hex	1B 20 nh	1B 20 00

Determines the amount of space added to the right of each character, specified in dots (1/72 of an inch).

ESC $ n1 n2 — Set Absolute dot tab

BASIC	CHR$(27) "$" CHR$(n1) CHR$(n2) (n1 and n2 specify the tab position in dots)
PETASCII Hex	1B 24 n1h n2h
ASCII Hex	1B 24 n1h n2h (n1h and n2h specify the tab position in dots)

Absolute dot tabs move the print head to the location on the page that is the specified number of dot columns from the left end of the line. They will do this regardless of where the print head is currently located on the line.

The format of the command is ESC $ CHR$(n1) CHR$(n2) where n1 and n2 are used to define the dot column to tab to. To determine the values to use for n1 and n2, divide the desired dot column by 256. The integer portion of the quotient becomes n2; the remainder is n1. You can use these mathematical formulas to calculate n1 and n2, where n is the desired dot column:

n2 = INT (n/256)
n1 = n-(n2*256)

**ESC ** — Select Relative Dot Position (Epson only)

BASIC	CHR$(27)"\" CHR$(n1) CHR$(n2)
ASCII Hex	1B 5C n1h n2h

The relative dot command spaces in one-half dot columns, or 1/120 inch (compared to one dot columns, or 1/60 inch, with the absolute dot command). At 120 dot columns per inch, the printer has up to 960 columns. If you specify a dot column beyond the right margin, the results are unpredictable. The maximum value for n1 is 192; the maximum value for n2 is 3 (if n2 is less than 3, however, then the maximum value for n1 is 255).

Positive values of n1 move the print position to the right, and negative values move it to the left.

See **ESC $ n1 n2** above for further information.

ESC a n — Justification (excluding IBM)

	ON	OFF
BASIC	CHR$(27)"a"CHR$(n)	CHR$(27)"a"CHR$(0)
PETASCII Hex	1B 41 nh	1B 41 00
ASCII Hex	1B 61 nh	1B 61 00

n — Justification Style

0	Flush against the left margin (default)
1	Centered (between left and right margins)
2	Flush against the right margin
3	Fully justified (flush against both margins)

With fully justified printing, the printer adjusts the spaces between every word on a line from 1 to 4 characters width. If it fails, the word on the margin is recorrected almost to the original position.

ESC K — Single Density Graphics

BASIC CHR$(27)"K"CHR$(n1) CHR$(n2) data
PETASCII Hex 1B CB n1h n2h
ASCII Hex 1B 4B n1h n2h

Single density graphics print at 60 dots per inch with a line length of n1 + (256 x n2).

The printer can operate in graphics mode acccording to the Bit Image Mode (BIM). In this mode, the printing is performed with dots in horizontal strips 8 dots high.

The maximum number of BIM data printable on one line is 480. If n1 and n2 define a number of data that exceed the limit, the exceeding part is ignored.

See Appendix D for more information.

A dot is printed if the corresponding bit in the received byte is at logic 1. If the corresponding bit is at logic 0, the dot is not printed.

Correspondence between Bits and Print Head pins

8-Pin

2^7 =	128	Top
2^6 =	64	
2^5 =	32	
2^4 =	16	
2^3 =	8	
2^2 =	4	
2^1 =	2	
2^0 =	1	
Not used		Bottom

ESC L — Double-Density Graphics

BASIC CHR$(27)"L"CHR$(n1) CHR$(n2) data
PETASCII Hex 1B CC n1h n2h
ASCII Hex 1B 4C n1h n2h

Double density graphics print at 120 dots per inch with a line length of n1 + (256 x n2).

The maximum number of BIM data per row is 960. For the other features, the same rules as ESC K apply.

See Appendix D for more information.

ESC Y — High-Speed Double Density

BASIC CHR$(27)"Y" CHR$(n1) CHR$(n2) data
PETASCII Hex 1B D9 n1h n2h
ASCII Hex 1B 59 n1h n2h

High-speed double density graphics print at 120 dots per inch with a line length of n1 + (256 x n2).

The maximum number of BIM data per row is 960, but adjacent horizontal dots are not printed. For the other features, the same rules as ESC K apply.

See Appendix D for more information.

ESC Z — Quadruple Density Graphics

BASIC CHR$(27)"Z"CHR$(n1) CHR$(n2) data
PETASCII Hex 1B DA n1h n2h
ASCII Hex 1B 5A n1h n2h

High-speed double density graphics print at 240 dots per inch with a line length of n1 + (256 x n2).

The maximum number of BIM data per row is 1920 bytes, but adjacent horizontal dots are not printed. For the other features, the same rules as ESC K apply.

See Appendix D for more information.

ESC * m n1 n2 — Master Graphics Command

BASIC CHR$(27)"*"CHR$(m)CHR$(n1)CHR$(n2) data
(m = 0 to 7)
PETASCII Hex 1B 2A mh n1h n2h
ASCII Hex 1B 2A mh n1h n2h

The master graphics command provides an easy way to select any of the printer's eight densities. Each density is assigned a graphics mode number, from 0 to 7, as shown in the table below. To use the master graphics command send ESC * followed by the ASCII code for the mode you want, followed by the ASCII codes for the line length.

Mode	Description	Density	Max. Columns/Line
0	Single	60 dots/inch	480
1	Double	120 dots/inch	960
2	Hi-speed double	120 dots/inch	960
3	Quadruple	240 dots/inch	1920
4	CRT Screen	80 dots/inch	640
5	One-to-one	72 dots/inch	576
6	Hi-res CRT	90 dots/inch	720
7	Two-to-one	144 dots/inch	1152

For the other features, the same rules as ESC K apply.

ESC ? n m — Changing Graphic Density

BASIC CHR$(27)"?n"CHR$(m) (n = K,L,Y or Z) (m = 0 to 7)
PETASCII Hex 1B 3F nh mh (nh = CBh, CCh, D9h, DAh)
ASCII Hex 1B 3F nh mh (mh = 00h to 07h)

This command changes one graphics mode to another. Any of the four graphics commands, ESC K, ESC L, ESC Y, or ESC Z can be changed to any of the densities available with the ESC * command. Put the letter of the command that you want to change (K, L, Y, or Z) in place of the variable n, and the value of the graphics density that you want in m. For example, to change the ESC K command to double density, the command would be: CHR$(27) "?K" CHR$(1). Each density value you can select for m is shown in the table above.

See Appendix D for more information.

ESC ^ m n1 n2 — Nine-pin Graphics (Epson only)

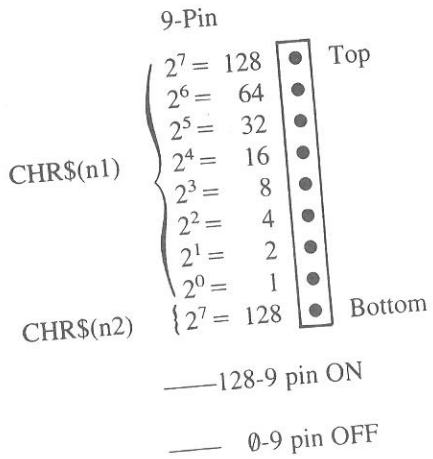
BASIC CHR$(27)" ^ "CHR$(m)CHR$(n1)CHR$(n2) data
(m = 0 to 1)
PETASCII Hex 1B DE mh n1h n2h
ASCII Hex 1B 5E mh n1h n2h

In nine-pin graphics, the first data code determines the pattern of the top eight pins in the usual way. The second code determines whether the bottom pin is printed: a code of 128 or greater prints the bottom pin; a code less than 128 does not print the bottom pin.

m = 0 for 60 dots/inch density
m = 1 for 120 dots/inch density

See Appendix D for more information.

n1 n2 Refer to ESC K to define the strip length.
Data: The first, third and fifth byte determine the printing of the dots that correspond to the first 8 pins of the print head. The second, fourth and sixth byte (and so on), determine the printing of the dot corresponding to the ninth print head pin, as in the following figure.



ESC & Define download characters (Epson only)

BASIC CHR$(27)"&"CHR$(0)CHR$(n1)CHR$(n2)
CHR$(a) CHR$(d0) . . . CHR$(d10)

PETASCII Hex 1B 26 00 n1h n2h ah d0h d10h
ASCII Hex 1B 26 00 n1h n2h ah d0h d10h

This code must be followed by the parameters n a d0 . . . d10. The code defines personalized characters and stores them in RAM. The parameter meaning is specified as follows.

Parameters d0 . . . d10 determine the dot map of the character to be defined, as shown below. The d0 . . . d10 sequence must be repeated for each character to be personalized.

n1,n2 These parameters specify the start code and the end of field for the character range to be personalized, respectively. The value can vary in the range 0 / 255. In case "n1" = "n2", only one character is personalized. (The one specified by the two parameters n2 and n1).

This attribute precedes the 11 bytes d0 . . . d10 defining the character to be personalized. Its meaning varies according to the defined character spacing (fixed or proportional).

— Fixed spacing: only the value of bit 2 to the 7th (MSB) is considered significant. This value is "0" if the ninth needle is used (and the first is not used) and is "1" if the first pin is used (and the ninth is not used).

— Proportional spacing: bit 2 to the 7th has the same meaning described in the previous paragraph; the other 7 bits are also considered to define the (variable) length for the characters, as follows:

2 to the 7th 0 = ninth pin used
1 = ninth pin not used

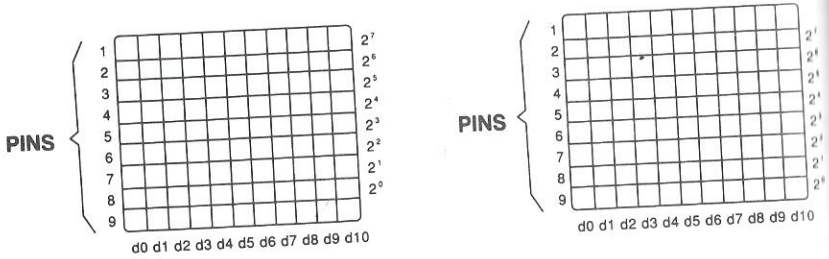
2 to the 6th
2 to the 5th
2 to the 4th
] start of character

2 to the 3rd
2 to the 2nd end of character
2 to the 1st
2 to the 0

For the characters in proportional spacing, a print area for the matrix is therefore defined, starting from the beginning to the end of character, ignoring the bytes that come before the start of characters and the bytes that follow the end of character.

d0 . . . d10 The values for these parameters define the character shape according to the correspondance between the character design and the binary value of parameter di. To draw each character, the user is provided the following effective 8 x 11 matrix:

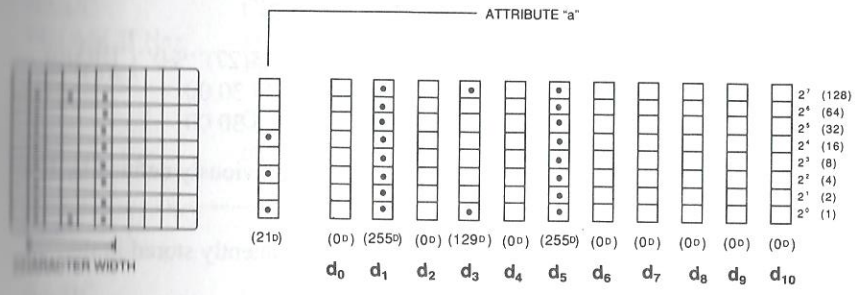
Print Matrix



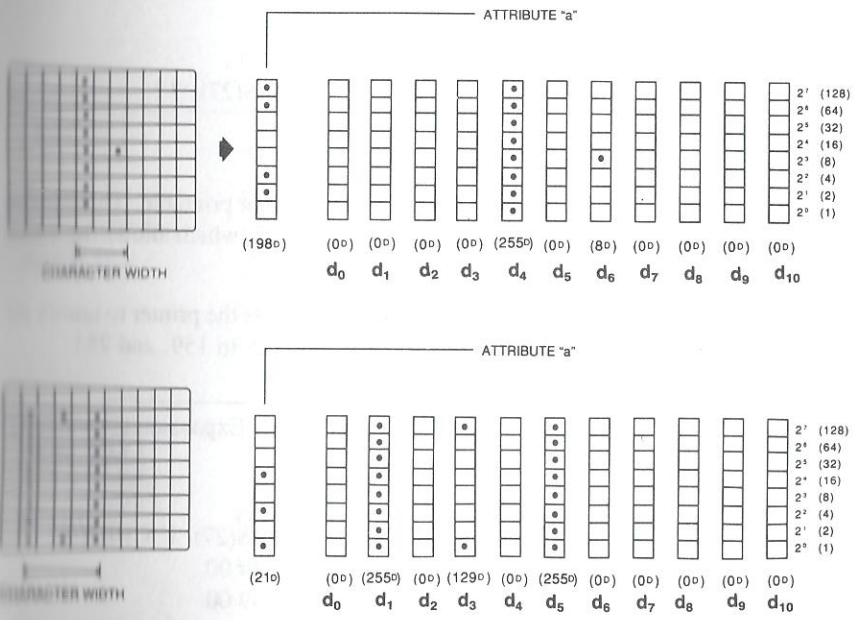
The dot is printed if the corresponding bit in the received Byte "d" is 1.

On the 8 x 11 matrix, the user can mark the print dots required to draw the character, keeping in mind that to guarantee the recycle of the print head, a needle activated in column "n" cannot be re-activated in column "n + 1". If the configuration sent to the printer does not comply with this rule, the printer automatically makes the configuration acceptable. In this case, however, the issued character will differ from the printed character for all the dots that would inhibit needle recycle, had they been printed.

Example of Personalized Character Definition in Fixed Spacing



Example of Personalized Character Definition in Proportional Spacing



ESC : 000 Copying Standard Characters (excluding IBM)

BASIC CHR$(27)":"CHR$(0)CHR$(0)
PETASCII Hex 1B 3A 00 00 00
ASCII Hex 1B 3A 00 00 00

Copies the ROM character generator contents (normal characters), operational when the code is received, into the user RAM.

ESC %

Select/Cancel user-defined character set (Epson only)

	ON	OFF
BASIC	CHR$(27)''%1''CHR$(0)	CHR$(27)''%0''CHR$(0)
PETASCII Hex	1B 25 31 00	1B 25 30 00
ASCII Hex	1B 25 31 00	1B 25 30 00

ESC % 1 RAM selection (personalized characters previously defined by ESC &).

ESC % 0 ROM selection (standard characters permanently stored in the printer).

ESC 6, ESC 7

Printable Code Area Exapnsion (Epson only)

	ON	OFF
BASIC	CHR$(27)''6''	CHR$(27)''7''
PETASCII Hex	1B 36	1B 37
ASCII Hex	1B 36	1B 37

ESC 6 ASCII codes 128 to 159 and 255 are usually not printable. These codes become printable upon input of the ESC 6 code, which allows the use of these codes for printable characters.

ESC 7 Cancels ESC 6 setting. Input of this code causes the printer to ignore all codes except control codes in ASCII codes 128 to 159, and 255.

ESC I

Printable Code Area Expansion (Epson only)

	ON	OFF
BASIC	CHR$(27)''I''CHR$(1)	CHR$(27)''I''CHR$(0)
PETASCII Hex	1B 49 01	1B 49 00
ASCII Hex	1B 49 01	1B 49 00

ASCII codes 0 to 31 and 128 to 159 are usually not printable. These codes become printable upon input of the ESC I code if n = 1, which allows the use of these codes for printable characters. If n = 0, 0 to 31 and 128 to 159 return to non-printable codes.

ESC

Cancel MSB Bit Control

BASIC	CHR$(27)''#''
PETASCII Hex	1B 23
ASCII Hex	1B 23

Clears the forcing the ''0'' (by ESC =) or to 1 (by ESC >) of the most significant bit (MSB) of the 8 bit code.

ESC =

Set Low-bit (excluding IBM)

BASIC	CHR$(27)''=''
PETASCII Hex	1B 3D
ASCII Hex	1B 3D

Sets to ''0'' the most significant bit (2 to the 7th) limiting the code range to 0 / 127D. (See also ESC # and ESC >).

ESC >

Set High-bit

BASIC	CHR$(27)''>''
PETASCII Hex	1B 3E
ASCII Hex	1B 3E

Sets to ''1'' the most significant bit (2 to the 7th) limiting the code range to 128 / 255D. (See also ESC # and ESC =).

ESC EM

Cut Sheet Feeder Control

BASIC CHR$(27) CHR4(25) CHR$(n)

Ignores this command.

ESC 9, ESC 8

Paper Out Sensor

	ON	OFF
BASIC	CHR$(27)''9''	CHR$(27)''8''
PETASCII Hex	1B 39	1B 38
ASCII Hex	1B 39	1B 38

Ignores this command.

ESC < — One-Line Unidirectional Print

BASIC	CHR$(27)"<"
PETASCII Hex	1B 3C
ASCII Hex	1B 3C

Enables monodirectional printing of one print line (from left to right).

ESC @ — Initialize Printer

RESET

BASIC	CHR$(27)"@"
PETASCII Hex	1B 40
ASCII Hex	1B 40

Initializes the printer, setting the power on conditions (see the chapter "Printer Initialization"). All data stored in the print buffer are lost (text and settings).

ESC U — Set/Cancel unidirectional print

	ON	OFF
BASIC	CHR$(27)"U1"	CHR$(27)"U0"
PETASCII Hex	1B D5 31	1B D5 30
ASCII Hex	1B 55 31	1B 55 30

ESC U 1 Enables monodirectional printing (from left to right) to ensure better text alignment.

ESC U 0 Enables bidirectional printing (faster).

ESC i — Select Immediate Print Mode (Epson only)

BASIC	CHR$(27)"i" CHR$(n)
PETASCII Hex	1B 6A nh
ASCII Hex	1B 6A nh

ESC i 1 Sets the printer to print the just received character not waiting for the appropriate print command (just like a typewriter).

ESC i 0 Clears the print mode set by ESC i 1, restoring the normal print mode.

ESC s — Select Half-Speed Mode

BASIC	CHR$(27) "s" CHR$(n)
ASCII	1B 73 n h

Ignore this command.

BEL

BASIC	CHR$(7)
ASCII Hex	07

This code is ignored by the printer.

ESC e Nul n — Set Fixed Horizontal Tab

BASIC	CHR$(27) "e" CHR$(0) CHR$(n)	
PETASCII Hex	1B 45 00 nh	(nh = 02h to line length)
ASCII Hex	1B 65 00 nh	(nh = 02h to line length)
		(n = 2 to line length)

When you first turn on the printer, there are horizontal tabs set at every eight columns—at column 9, 17, 25, and so on. If you want htabs to be set to other columns, you can change them with the command ESC e CHR$(0) followed by the ASCII code for the tab interval you want, from 2 to the current line length.

ESC e 1 n — Set Vertical tabs n lines

BASIC	CHR$(27) "e" CHR$(1) CHR$(n)
	(n = 1 to page length)
PETASCII Hex	1B 45 01 nh
ASCII Hex	1B 65 01 nh
	(nh = 01h to page length)

This command sets fixed vtabs at intervals of whatever number of lines you like. Send the ESC e CHR$(1) followed by the ASCII code for the vtab interval you want in lines, from 1 to the page length in lines.

ESC f 0 n — Set Relative Horizontal Tab

BASIC	CHR$(27) ''f'' CHR$(0) CHR$ (n)	(n = 0 to 127)
PETASCII Hex	1B 46 00 nh	(nh = 00h to 7Fh)
ASCII Hex	1B 66 00 nh	

If you only need to move across the page one time, ESC f CHR$(0) moves the print position any number of columns to the right from the current position. This is why it's called *relative:* It moves a number of spaces in relation to the print current position on the page.

To use the relative htab command, send the printer ESC f CHR$(0) followed by the ASCII code for the number of columns you want to move, from 0 to 127.

ESC f 1 n — Advances The Paper n lines

BASIC	CHR$(27) ''f'' CHR$(1) CHR$(n)	(n = 0 to 127)
ASCII Hex	1B 66 01 nh	(nh = 00h to 7Fh)

If you only need to move down the page one time, ESC f CHR$(1) advances the paper any number of lines. This is why it's called *relative;* it moves a number of lines in relation to current paper position. It is the equivalent of printing a number of line feeds.

To use the relative vtab command send the ESC f CHR$(1) followed by the ASCII code for the number of lines you want to move, from 0 to 127.

This command is also an easy way to leave a fixed space without having to figure out where you are on the page.

ESC h, ESC ˜ 1 n — Set/Cancel vertically enlarged print

	ON	OFF
BASIC	CHR$(27) ''h''	CHR$(27) ''u''
PETASCII Hex	1B 48	1B 55
ASCII Hex	1B 68	1B 75
OR		
BASIC	CHR$(27) CHR$(126) ''11''	CHR$(27) CHR$(126) ''10''
PETASCII Hex	1B 7E 31 31	1B 7E 31 30
ASCII Hex	1B 7E 31 31	1B 7E 31 30

ESC h
ESC ˜ 11 Sets the ''Vertically Enlarged'' print mode

ESC u
ESC ˜ 10 Returns to normal height printing.

ESC m n — Select Character Set

BASIC	CHR$(27) ''m'' CHR$(n)	(n = 0 or 4)
ASCII Hex	1B 6D nh	

EPSON mode: Sets/cancels line and block graphics characters

IBM mode: Sets/cancels accented characters

ESC r, ESC t, ESC ~ 2 n

Set/Cancel reverse print

	ON	OFF
BASIC	CHR$(27) ''r''	CHR$(27) ''t''
ASCII Hex	1B 72	1B 74
OR		
BASIC	CHR$(27) CHR$(126) ''21''	CHR$(27) CHR$(126) ''20''
ASCII Hex	1B 7E 32 31	1B 7E 32 30

There are two escape sequences you can use to access reverse print. One is ESC r (make sure it's a lower case ''r'') and the other is ESC~21. The character before the 21 is called a ''tilde.'' This symbol probably isn't on your keyboard, so you must use its ASCII code form: CHR$(126). This version of the reverse print command uses 1 and 0 as its on and off switches. Sending ESC~21 turns on reverse print; sending ESC~20 turns off reverse print.

ESC ~ 3 n

Select master pitch

	ON	OFF
BASIC	CHR$(27)CHR$(126) ''3''CHR$(n)	CHR$(27)CHR$(126) ''3''CHR$(0)
PETASCII Hex	1B 7E 33 nh	1B 7E 33 00
ASCII Hex	1B 7E 33 nh	1B 7E 33 00
n	Pitch	
0	Pica	(10 CPI)
1	Elite	(12 CPI)
2	Pica compressed	(17 CPI)
6	15 CPI	
7	Elite Compressed	(20.4 CPI)

The master pitch command allows you to change between compressed and normal print in pica or elite with one command. The master pitch command is ESC~3. To select the particular pitch combination you want, send its ASCII code number, CHR$(n) (with n being 0, 1, 2, 6 or 7) after the master pitch command.

ESC ~ Øn

Line Spacing of n/144″

BASIC	CHR$(27) CHR$(126) ''0'' CHR$(n)	(n = 0 to 125)
PETASCII Hex	1B 7E 30 nh	(nh = 00h to 7 Dh)
ASCII Hex	1B 7E 30 nh	(nh = 00h to 7 Dh)

This command sets the line spacing to n/144 of an inch, adjusting the line spacing to 1/2-dot increments. To use it, send CHR$(27) ''~0'' followed by the ASCII code for the number of 144ths you want, from 0 to 125.

ESC ~ 4 n

Set/Cancel Slashed Zero

	ON	OFF
BASIC	CHR$(27)CHR$(126)''41''	CHR$(27)CHR$(126)''40''.
PETASCII Hex	1B 7E 34 31	1B 7E 34 30
ASCII Hex	1B 7E 34 31	1B 7E 34 30

The command uses 1 and 0 as its on and off switches. Sending the printer ESC~47 turns on the slashed zero feature; ESC~40 turns off the feature. Since the 1 and the 0 work as on and off switches rather than actual characters, you can substitute CHR$(1) and CHR$(0) for their actual ASCII codes, if you like.

ESC " 5 n — Switching Configurations

	Epson Config.	Commodore Config.	IBM Config.
BASIC	CHR$(27) ""50"	CHR$(27) ""51"	CHR$(27) ""51"
PETASCII Hex	1B 7E 35 30	1B 7E 35 31	1B 7E 35 31
ASCII Hex	1B 7E 35 30		1B 7E 35 31

This command switches the printer between Commodore, Epson FX, and IBM configurations.

Sending the command ESC " 51 switches to IBM mode, and ESC " 50 switches to Epson. Since 0 and 1 work as on and off switches rather than as actual characters, you can substitute CHR$(0) and CHR$(1) for their actual ASCII codes if you like.

Commands Available in Commodore Mode Only

BS — Bit Image Coding

BASIC CHR$(8)
Hex 08

A bit image is a character programmed onto a 7 × 17 grid. When the dots are programmed (placed where you want them on the grid), it is printed out by the print head when the pins at the locations you have programmed strike to create dots to form an image.

By sending the control code CHR$(8) to the printer in Commodore mode, you enter the Bit Image graphic printing mode. This allows you to design and print bit image graphics by inputting bit image data. Each DATA statement is made up of numbers that represent a row of dots which, when READ together, make up your bit graphic image. To design a bit image graphic, follow the steps outlined in the example below.

1. Use a separate piece of paper to design your bit image graphic.

2. Make a dot grid like this, with 7 vertical rows and 16 horizontal columns. The numbering of the vertical rows is extremely important.

```
   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1 o o o o o o o o o o o o o o o o
 2 o o o o o o o o o o o o o o o o
 4 o o o o o o o o o o o o o o o o
 8 o o o o o o o o o o o o o o o o
16 o o o o o o o o o o o o o o o o
32 o o o o o o o o o o o o o o o o
64 o o o o o o o o o o o o o o o o
```

3. Now fill in the dots you want to print to form a bit image, as in the following.

```
   1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 1 o o o o o o ● ● o o o o o o o o
 2 o o ● ● ● ● ● ● ● ● o o o o
 4 o o ● ● o o ● ● o o ● ● o o o o
 8 ● ● ● ● o o ● ● o o ● ● ● o o
16 ● ● ● ● ● ● ● ● ● ● ● ● ● o o
32 o o ● ● o o ● ● o o ● ● o o o o
64 o o ● ● o o ● ● o o ● ● o o o o
```

4. Now add together numbers for each column for the rows in which a dot appears. For instance, there are two dots in the first column, one in the row with a value of 8 and one in the row with 16. The value for that column is then 24. You'll get sixteen column values to use later for your DATA statements for this bit image.

5. Now add 28 to each total for each column from step 4. The first column value would now be 152 (24 + 128). These values are now what you will use for DATA statements to produce the bit image.

The DATA statements in a program for this bit image:

```
data 152, 152, 254, 254, 146, 146, 255, 255
data 146, 146, 254, 154, 152, 152, 128, 128
```

Once you figure out the DATA values for your bit image, you can write a program to print the image. In this example, the image is a 'flying object', which the following program prints five times.

```
10 open 1,4,7
20 a$=""
30 for i=1 to 16
40 read a:a$=a$+chr$(a)
50 next i
60 for j=1 to 5
70 print#1, chr$(8);a$; chr$(27); chr$(50)
80 next j
90 for k=1 to 8:print#1:next k
100 close1
110 end
200 data 152, 152, 254, 254, 146, 146, 255, 255
210 data 146, 146, 254, 254, 152, 152, 128, 128
```

Result:

HT — Move to Next Horizontal Tab

BASIC CHR$(9)
Hex 09

CHR$(9) moves the printing to the next tab setting. Power-on default htab settings are every 8 columns—printing will start with column 9, 17, 25, and so on.

Horizontal tabs are convenient for working with forms and columns of numbers. Their position is determined by the pitch in effect at the time the tabs are set, but once set, they do not change with changes in pitch or character width.

LF — Linefeed

BASIC CHR$(10)
Hex OA

A line feed returns the print position to the left margin and advances the paper to the next line. Many computers automatically add a line feed to each carriage return. If yours does not, you can add a line feed to each carriage return by setting internal switches.

VT — Move to Next Vertical Tab

BASIC CHR$(11)
Hex OB

Vertical tabs move down the page by lines.

Vtabs are unaffected by changes in line spacing. The spacing for vtabs is determined by the line spacing in effect when they are set. If the line spacing is later changed, the vtabs are unaffected.

The vtab command is CHR$(11). Unlike horizontal tabs, vtabs have no default settings. When you first turn a vtab advances the paper one line.

FF — Form Feed

BASIC CHR$(12)
Hex OC

A form feed advances the paper to the top of the next page, the same as the FF switch on the control panel does. The measures the length of the page starting with the position of the paper when you first turn on the printer. Therefore, in order for the form feed command to advance the paper the proper distance, you must line up the top of the page at the print head when you turn on the printer or before you send a master reset (ESC @) command or in Commodore mode secondary address 10.

You can substitute CHR$(1-10) for CHR$(12) in Epson mode to get the same results.

CR

BASIC	CHR$(13)
Hex	OD

A carriage return brings the print position to the left margin, but does not advance the paper to the next line. Therefore, many computers automatically add a line feed (ASCII 10) to each carriage return. In Commodore mode, a line feed is automatically added.

You can add an automatic line feed to each carriage return in IBM, Epson mode by setting internal switch 7 ON if your computer does not add line feeds for you.

In Commodore mode DIP switch 7 is ignored. You can still get a carriage return without automatic line feed in Commodore mode by using CHR$(141) instead of CHR$(13).

SO, SI

Expanded Print

	ON	OFF
BASIC	CHR$(14)	CHR$(15)
Hex	OE	OF

In Commodore mode, you can select expanded print with a control code, CHR$(14). Send CHR$(14) to the printer to turn on expanded print, and CHR$(15) to turn it off.

DLE

Move to Next Horizontal Tab

BASIC	CHR$(16) CHR$(n_1) CHR$($n_2$)
Hex	10 n_1h n_2h

You can also perform a horizontal tab in Commodore mode by sending the code CHR$(16), followed by two numeric characters (nn), where nn is the two-digit number of the column you wish to start printing.

DC1

Local Character Set Selection

	Lower/Uppercase Character Set	Uppercase/Graphics Character Set
BASIC	CHR$(17)	CHR$(145)
Hex	11	91

Secondary addresses 0 and 7 set character sets globally, 0 selecting the Uppercase/Graphics character set and 7 the Upper/Lowercase set. You can set a character set locally in Commodore mode, with CHR$(17) to use the lower and uppercase characters when the secondary address of 7 has been sent to the printer, or switch to uppercase letters and graphics by sending CHR$(145) even though a secondary address of 0 was sent to the printer.

These commands allow the printer to mix both character sets on a single line (although it won't appear that way on your monitor screen. CHR$(17) stays in effect until a carriage return or CHR$(145) is detected. CHR$(145) functions until a carriage return or CHR$(17) is detected.

DC2

Sets/Cancels reverse print

Commodore mode only

	ON	OFF
BASIC	CHR$(18)	CHR$(146)
Hex	12	92

In Commodore mode, you can: turn reverse on and off by sending the control codes CHR$(18) to turn reverse printing on and CHR$(146) to return to normal non-reversed printing.

DC3

Setting Margins with the Secondary Address

	ON	OFF
BASIC	CHR$(147)	CHR$(19)
Hex	93	13

In Commodore mode, CHR$(147) works the same as the escape code CHR$(27)"N"CHR$(6) and CHR$(19) turns off paging as does the sequence CHR$(27)"O".

BS....SUB n data — Repeat Bit Image Printing

BASIC CHR$(8).....CHR$(26);CHR$(n);CHR$(m=bit image data)

Hex 08.....1A nh mh

Often, you'll need to reproduce the same line of bit image DATA for parts of images. The CHR$(26) sequence within CHR$(8) mode enables you to repeat printing a bit image quite easily. The format is shown above.

"n" is a binary number (from 0 to 255) which specifies the number of repetitions to be printed, and the "bit image data" is the pin pattern data for the pattern that is being repeated. If you supply a value of zero for n, it is READ as 256, meaning the bit image will be reprinted 256 times. In order to repeat more than 256 times, you must use this sequence more than once.

US — Selects NLQ prints

	ON	OFF
BASIC	CHR$(31)	CHR$(159)
Hex	1F	9F

With Commodore mode, you can also print in NLQ by issuing the printer control code CHR$(31). CHR$(159) turns it off, as in the following example:

QM — Quote Mode

BASIC CHR$(34)

Hex 22

CHR$(34) in Commodore mode instructs the to print out executable control characters like cursor symbols or delete characters rather than carry out the action. This causes the control characters to be made visible.

CS — Carriage Return

BASIC CHR$(141)

Hex 8D

In Commodore mode sending CHR$(141) causes the printer to perform a carriage return without a line feed to move down to the next line. The following programs show how this can be used for such effects as doubleprinting and underlining in Commodore mode.

Commands Available in IBM Only

The following pages list commands available in IBM mode only.

ESC I n — Select print quality

BASIC	CHR$(27)"I"CHR$(n)	(n = 0,2,4)
ASCII Hex	1B 49 nh	(nh = 00h,02h,04h)

This sequence selects the printing quality.
When n = 0, you have normal quality (standard font).
When n = 2, you have near letter quality (NLQ) (standard font).
When n = 4, you have normal quality (download font).

Each printing quality selection produces a different spacing of the dots that make up a character. Use ESC = to load a download font, before you select the print quality.

ESC : — Select Elite Pitch

BASIC CHR$(27)":"

ASCII Hex 1B 3A

Sets the print pitch at 12 chars/inch. This setting is cleared by the DC2 code that restores the horizontal spacing selected during the machine setting phase.

ESC = — Define download character

BASIC
CHR$(27)''=''CHR$(n1)CHR$(n2)CHR$(20)
CHR$(code)CHR$(a)CHR$(0)CHR$(d0) . . .
CHR$(d10)

ASCII Hex
1B 3D n1h n2h 14 codeh ah 00 d0h . . . d10h

The user can create from 1 to 48 personalized characters; these characters can be printed in the place of the normal characters.

First, n1 and n2 are variables that specify the range of characters that you wish to define with this command. Then, calculate the totoal value with the following formula;

Total value = (number of characters x 13) + 2

If the total value is less than 256, then nl = total value and n2 = 0. If the total value is greater than or equal to 256, then divide the number of bytes by 256. nl = the remainder and n2 = the integer part of the result. For example, for 40 characters,

Total value = (40 x 13) + 2 = 522
522 = (2 x 256) + 10
that is, nl = 6106, n2 = 2

The code in this command is the ASCII code for the first downloaded character. Any ASCII codes from 32 to 126 can be replaced continuously from standard characters starting at that code point.

The attribute byte a shows whether the character is ascending or descending. If a = 0, the character is printed with the top eight pins of the print head (ascending character). If a = 1, the character is printed with the bottom eight pins (descending character). Proportional spacing is not valid in the IBM configuration, so there are no values of the starting column and the ending column.

The variables d(0) through d10 are data bytes. Their value is calculated exactly the way data bytes are calculated for dot graphics.

And at last, you can select the defined character with either of the commands ESC I CHR$(4) or ESC I CHR$(6)

NOTE: Number of characters = 48 max.

ESC 4 — Set Top of Form

BASIC
CHR$(27)''4''

ASCII Hex
1B 34

Sets the current position as first print line within the form length.

NOTE: In the Epson configuration, ESC 4 selects italic printing.

ESC 5 — Set/Cancel Automatic Line Feed

	ON	OFF
BASIC	CHR$(27)''5''CHR$(1)	CHR$(27)''5''CHR$(0)
ASCII Hex	1B 35 01	1B 35 00

n = 1 Automatic LF is preset after CR (CR = CR + LF);
n = 0 This presetting is cleared, therefore CR = CR.

ESC 6 — Select Character Set 2

BASIC
CHR$(27)''6''

ASCII Hex
1B 36

Selects Character Table C-4 (see Appendix C). This table contains characters and symbols in languages different from English.

ESC 7 — Select Character Set 1

BASIC
CHR$(27) ''7''

ASCII Hex
1B 37

Selects Character Table C-3 (see Appendix C). This table contains characters and symbols normally used in the English language.

ESC \ n1 n2 — Print continuously from all character chart

BASIC: CHR$(27)"\"CHR$(n1)CHR$(n2)
ASCII Hex: 1B 5C n1h n2h

This sequence allows the printing of all characters, including characters with an ASCII value below decimal 32. The printer normally recognizes the ASCII values less than decimal value 32 as control codes. ESC \ allows the printer to print the special symbols assigned to the ASCII control codes. You can also use this sequence to print characters between 128 - 159 (for Character Set 1). If the printer receives a code value for an unassigned character, a space character prints. No control code functions operate when this sequence is in effect.

The total number of characters is equal to n1 + (n2 x 256).

ESC ^ — Print single character from all character chart

BASIC: CHR$(27)" ^ "CHR$(n)
ASCII Hex: 1B 5E nh

This sequence prints one character ASCII value n from the All Characters Chart. You can use this sequence to print codes the printer normally recognizes as control coes.

See ESC \ for further information.

ESC R — Return to Default Tabs

BASIC: CHR$(27) "R"
ASCII Hex: 1B 52

Returns the horizontal and vertical tabs to their default settings.

ESC — n — (IBM only)

	ON	OFF
BASIC	CHR$(27)"_1"	CHR$(27)"_0"
ASCII Hex	1B 5F 01	1B 5F 00

n = 1 Sets the "Overline" print mode for all characters and blanks

n = 0 Clears the "Overline" print mode.

ESC Q 3 — Deselect Printer

BASIC: CHR$(27) "Q" CHR$(3)
ASCII Hex: 1B 51 03

If, during the initial printer programming phase, the DC1/DC3 dialogue procedure had been selected, this code deselects the printer that does not receive any more data from the host computer.

Appendix A: Technical Specifications

This appendix provides technical specifications for the MPS 1270 printer.

Print Method: Drop on Demand Thermal Inkjet

Command Set: Commodore MPS 801 IBM ProPrinter™ (Graphics Printer) — Epson FX 80™

Character Set: IBM — All Character Set
Epson — ASCII Character Set
National Character Set
Commodore — ASCII, PETASCII

Downloadable Characters: 48 characters max.

Character Construction, Pitch and Number of Characters per Line

Font	Chr. Construction (V)		(H)		Pitch	Chr./Line
Normal Pitch:						
Draft Pica	9 (S)	X	13 (W)	*	16	80
Draft Elite	9 (S)	X	13 (E)	*	16	96
NQL Pica	18 (M)	X	15 (N)	**	18	80
NQL Elite	18 (M)	X	14 (N)	**	15	96
Condensed:						
Draft Pica	9 (M)	X	7 (X)	**	10	136
Super/Sub-script:						
Draft Pica	9 (M)	X	13 (W)	*	16	80
Draft Elite	9 (M)	X	13 (E)	*	16	96
NQL Pica	9 (M)	X	15 (N)	**	18	80
NQL Elite	9 (M)	X	14 (N)	**	15	96
Condensed	9 (M)	X	7 (X)	**	10	136

* Staggered Firing (zig-zag)
** Full Position Firing

Dot Density:	Vertical . . . . (S) = 1/96″ Vertical . . . . (M) = 1/192″ Horizontal . (W) = 1/160″ Horizontal . (X) = 1/170″ Horizontal . (N) = 1/180″ Horizontal . (E) = 1/192″
Print Speed:	Draft (10 cpi) . . . . 160 cps NLQ (10 cpi) . . . . 28 cps
Character Pitch:	10, 12, 15, 17, and 20.4
Line Feed Pitch:	1/6″, 1/8″, n/72″, and n/216″
Print Width:	8″
Paper Feed:	Friction Feed (built-in front insertion) Tractor Feed — Rear Top (built-in)
Paper Feed Speed:	125 msec. per 1/6″
Print Media:	Plain Paper, coated paper and transparencies
Print Media Width:	Single Sheets 7″ - 8″ (front) Thickness—0.07-0.1 mm 7.5″ - 9.0″ (rear top) Thickness—0.08-0.1 mm Thickness—0.08-0.1 mm

Print Media Width:	Single Sheets	Tractor Feed
	Front	Top Rear
	Width 7½″-8½″	Width 8½″-9½″
	Thickness .07-.1mm	Thickness .08-.1 mm
	Top Rear	
	Width 7½″-9″	
	Thickness .08-.1mm	

Receive Buffer:	0.7 K Bytes Max. (without down loading fonts)
Print Method:	Draft and Condensed—Bi-directional, Logic Seeking NLQ and Super-/subscript—Semi Bi-directional, Logic Seeking Graphics—Unidirectional, L-R Logic Seeking
Interface:	Commodore Serial Centronics® Parallel I/F Connector Hardware - AMP I/O Logic Level- TTL

Ink Cartridge:	Ink Color — Black Ink Capacity — 200 Pages of Standard Text on A4 Size Paper
Power Supply:	AC Adapter Output 8.5VDC 1AMP

Input *	UL,CSA 120VAC	+/- 10%, 60Hz
*	Germany 230VAC	+/- 15%, 50Hz
**	U.K. 230VAC	+/- 15%, 50Hz
**	Australia 240VAC	+/- 10%, 50Hz

(* — plug-in type
** — cord type)

Environmental Conditions:	Operation . . . 10 to 40 degrees C. Storage . . . . . −20 to 60 degrees C. Humidity . . . . 20 to 80% (non-condensing)
Dimensions:	14 in. x 9 in. x 3 in.
Weight:	5.5 lbs
Switches:	Power Switch Operator Switches . . . . . ON LINE . . . . . LF/FF
Indicators:	LEDs . . . . . Power . . . . . ON LINE/PE (paper empty)
Agency Approvals:	(FCC Class-B)
Operating Noise:	50 dBA max
MTBF:	1500H

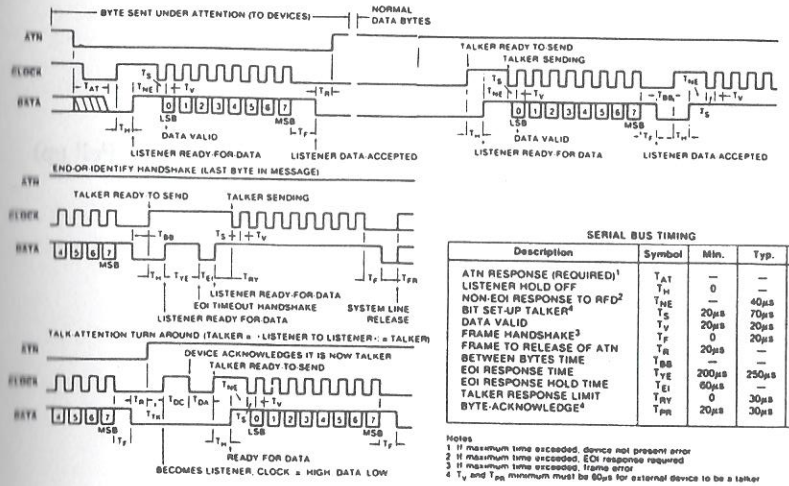
Appendix B:
Interface Pin Configuration

This appendix illustrates the serial and parallel interface connectors and provides signal and timing information.

Connector

Pin No.	Signal
1	SERIAL SRQ (NC)
2	GND
3	SERIAL ATN
4	SERIAL CLK
5	SERIAL DATA
6	RES

Figure B-1. Serial Interface Connector



SERIAL BUS TIMING

Description	Symbol	Min.	Typ.	Max.
ATN RESPONSE (REQUIRED)[1]	T_{AT}	—	—	1000µs
LISTENER HOLD OFF	T_{NE}	0	—	∞
NON-EOI RESPONSE TO RFD[2]	T_{NE}	—	40µs	200µs
BIT SET-UP TALKER[4]	T_S	20µs	70µs	—
DATA VALID	T_V	20µs	20µs	—
FRAME HANDSHAKE[3]	T_F	0	20µs	1000µs
FRAME TO RELEASE OF ATN	T_R	20µs	—	—
BETWEEN BYTES TIME	T_{BB}	—	—	—
EOI RESPONSE TIME	T_{YE}	200µs	250µs	—
EOI RESPONSE HOLD TIME	T_{EI}	60µs	—	—
TALKER RESPONSE LIMIT	T_{RY}	0	30µs	60µs
BYTE-ACKNOWLEDGE[4]	T_{PR}	20µs	30µs	—

Notes
1 If maximum time exceeded, device not present error
2 If maximum time exceeded, EOI response required
3 If maximum time exceeded, frame error
4 T_V and T_{PR} minimum must be 60µs for external device to be a talker

Figure B-2. Serial Timing Diagram

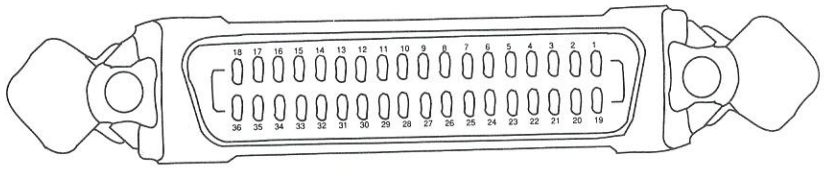


Figure B-3. Parallel Interface Connector

Pin No.	Signal Name	Pin No.	Signal Name
1	$\overline{\text{STROBE}}$	19	GND
2	DATA 1	20	GND
3	DATA 2	21	GND
4	DATA 3	22	GND
5	DATA 4	23	GND
6	DATA 5	24	GND
7	DATA 6	25	GND
8	DATA 7	26	GND
9	DATA 8	27	GND
10	$\overline{\text{ACKNLG}}$	28	GND
11	BUSY	29	GND
12	$\overline{\text{PE}}$	30	GND
13	SLCT	31	$\overline{\text{INIT}}$
14	NC	32	$\overline{\text{FAULT}}$
15	NC	33	GND
16	GND	34	NC
17	GND	35	+5V (3.3K Pull up)
18	+5V (3.3K Pull up)	36	NC

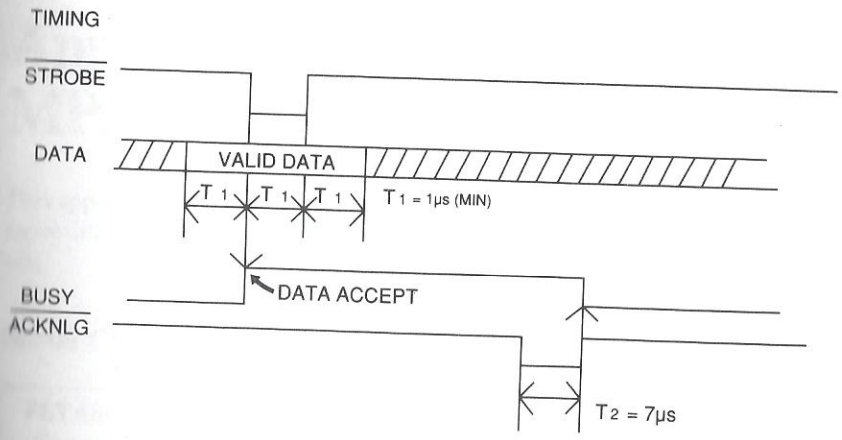


Figure B-4. Parallel Timing Diagram

Appendix C:
MPS 1270 Character Sets

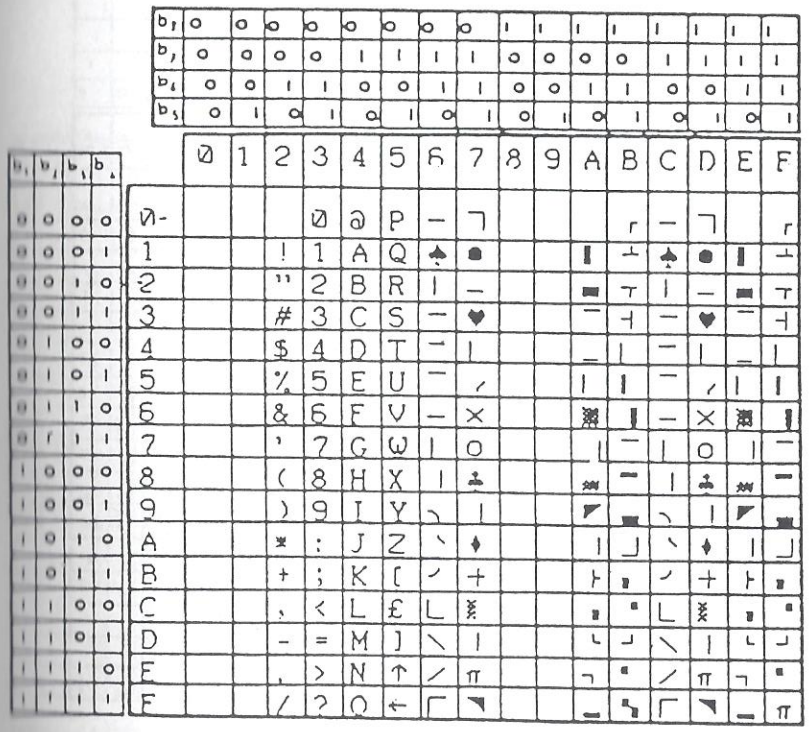
This appendix provides a list of character sets. The table below summarizes the capabilities of the MPS 1270. Figures C-1 through C-15 illustrate the character sets.

Serial Character Set

PETASCII (Commodore mode) Uppercase/Graphics	• This is the printer's default character set. • You can also use the master reset command to get back to it. • You can also use secondary address 0. NOTE: You can not use any of the international characters sets in this mode.
Upper/Lower Case	• Use secondary address 7.
ASCII	• Turn DIP switch 7 on.
International Characters*	• Select Upper/Lowercase or ASCII characters, then send ESC R CHR$(n), where n refers to a value in table

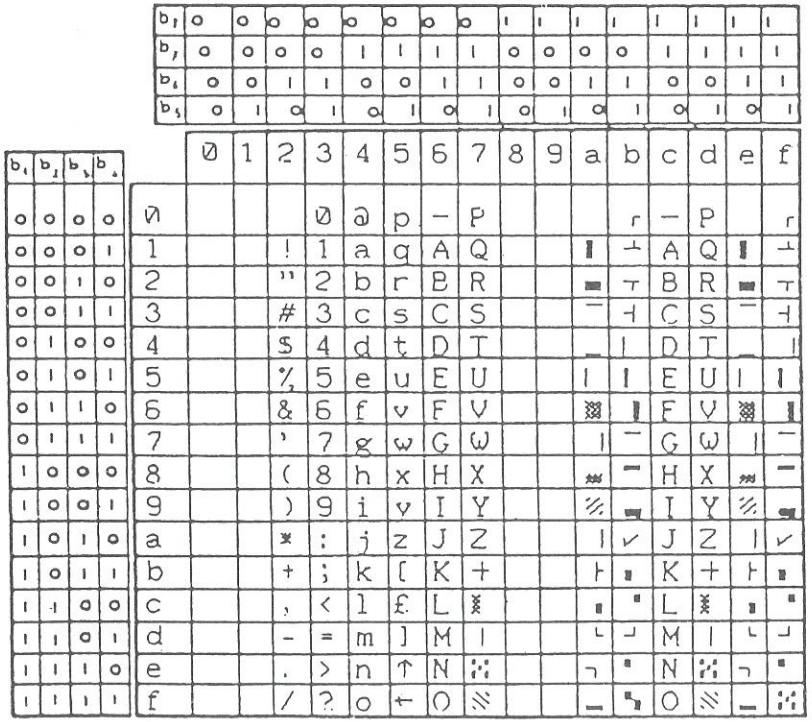
Epson FX™ Standard Graphics	• This is the printer's default character set. • Turn DIP switch 4 ON. (EPSON FX #3)
IBM Set 1 Set 2 International 1, 2 All Characters	• This is the IBM model default character set. • Send ESC m CHR$(4) while in IBM mode. • While in the IBM mode (DIP switches 5 and 6 ON), turn DIP switch 1 ON or OFF. • Send ESC"^" CHR$(n) where n is the ASCII value that you wish to print.
International Characters	• Send ESC R CHR$(n), where n refers to a value in Table (EPSON only).

Table C-1. PETASCII Characters—USA/UK



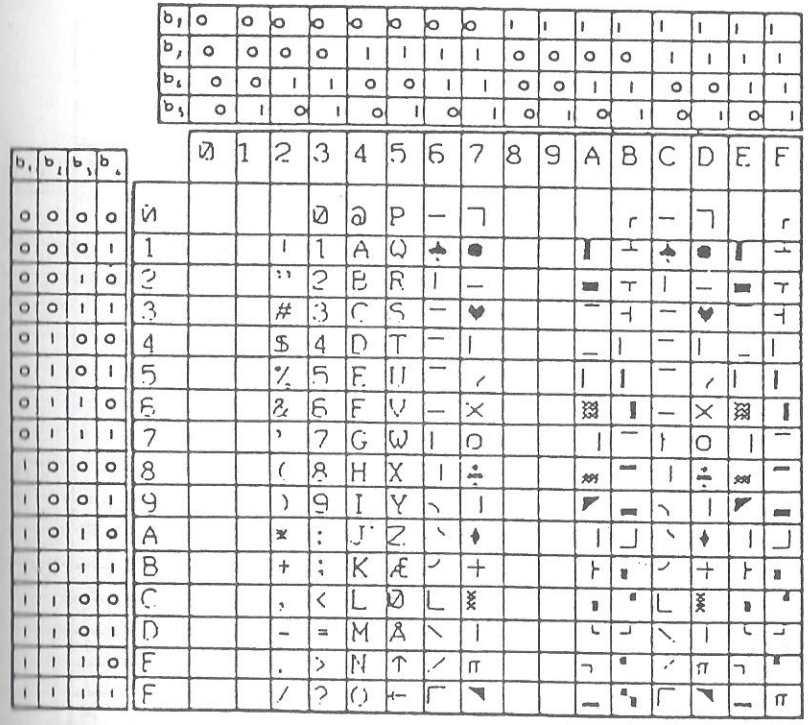
USA/UK (Upper case/Graphics mode, Secondary address = 0)

Table C-1. (cont.)



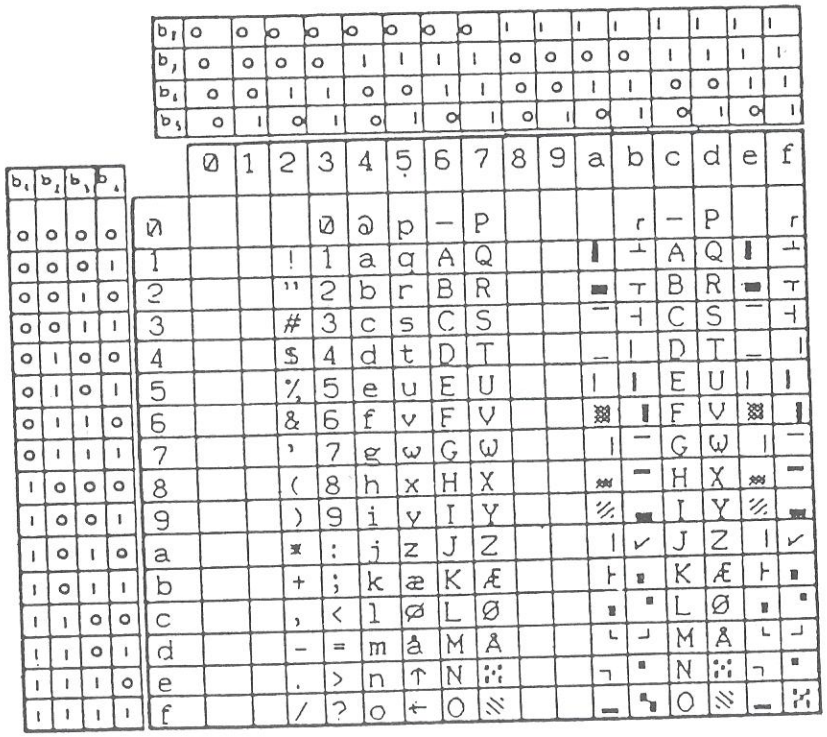
USA/UK (Upper/Lower case mode, Secondary address = 7)

Table C-2. PETASCII Characters—Denmark



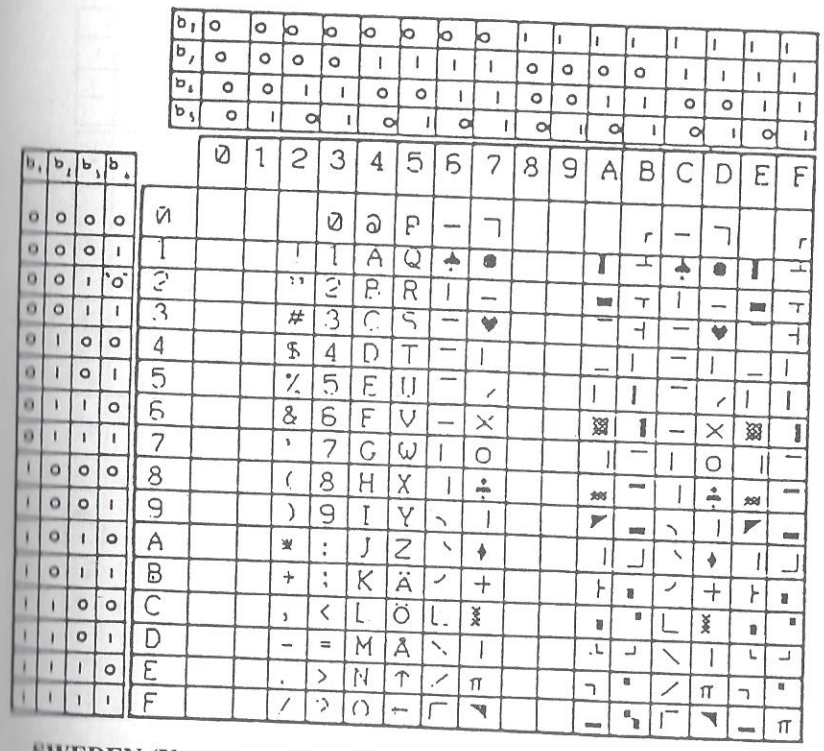
DENMARK (Upper case/Graphics mode, Secondary address = 0)

Table C-2. (cont.)



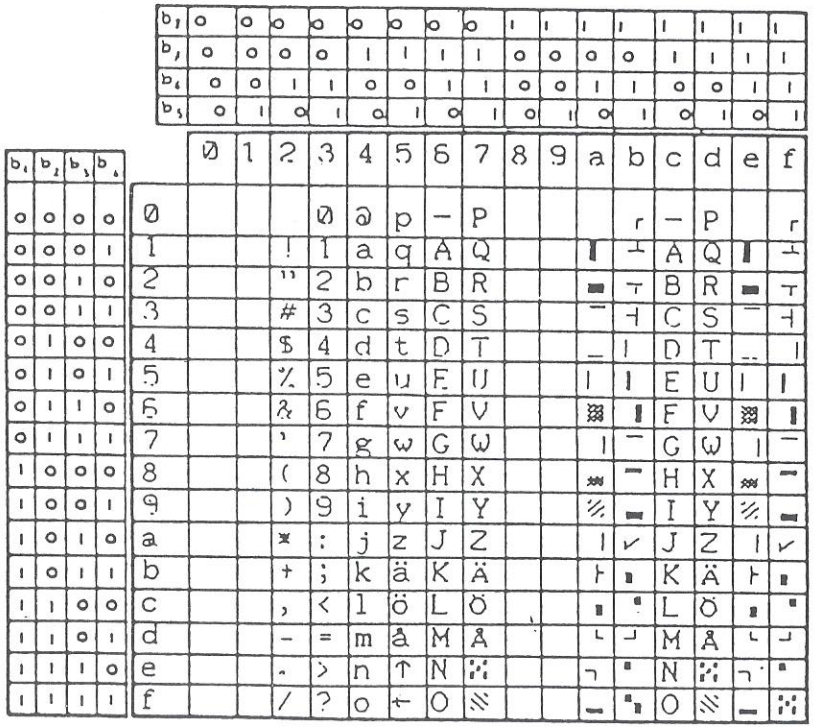
DENMARK (Upper/Lower case mode, Secondary address = 7)

Table C-3. PETASCII Characters—Sweden



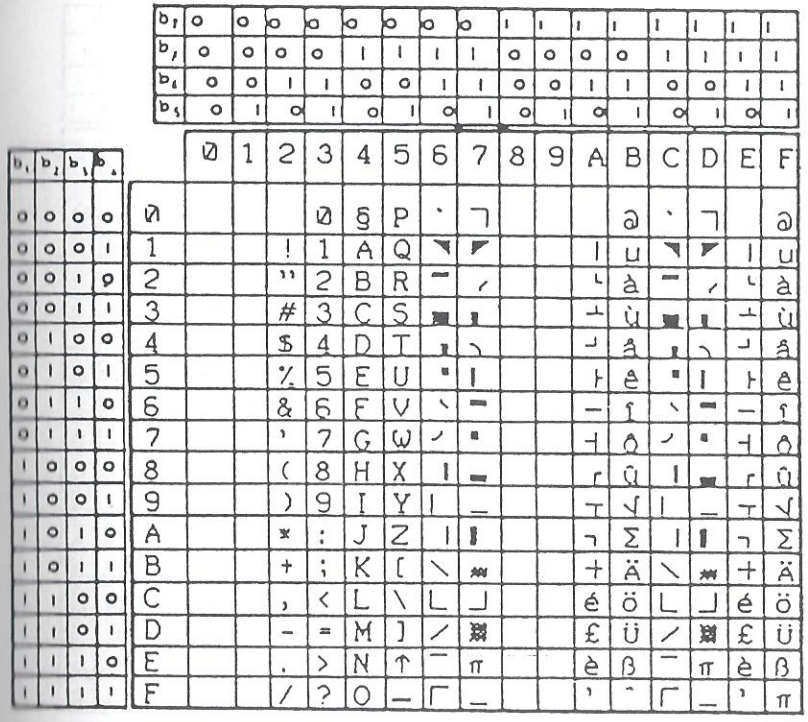
SWEDEN (Upper case/Graphics mode, Secondary address = 0)

Table C-3. (cont.)



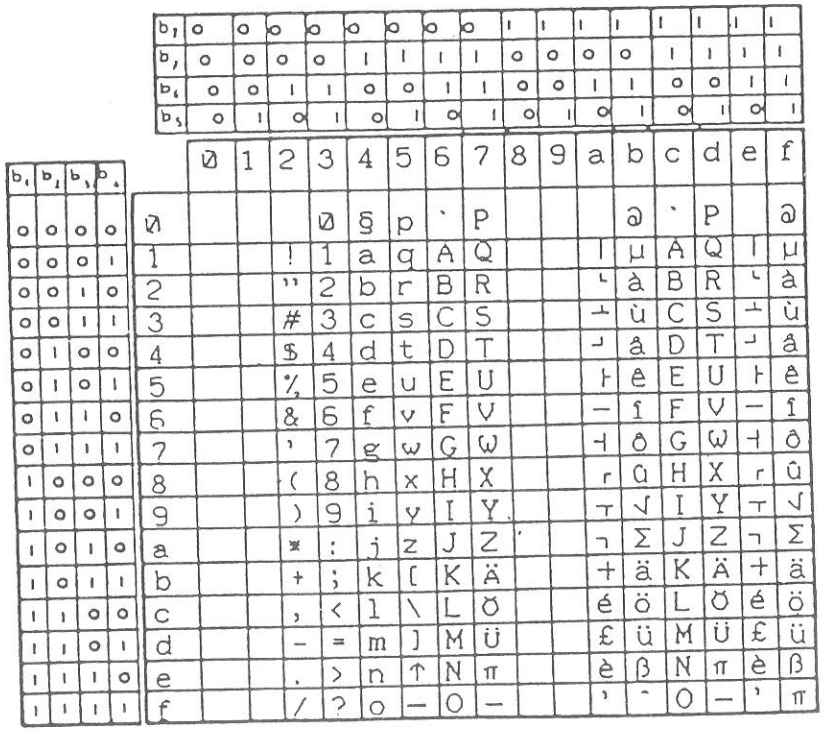
SWEDEN (Upper/Lower case mode, Secondary address = 7)

Table C-4. PETASCII Characters—Germany



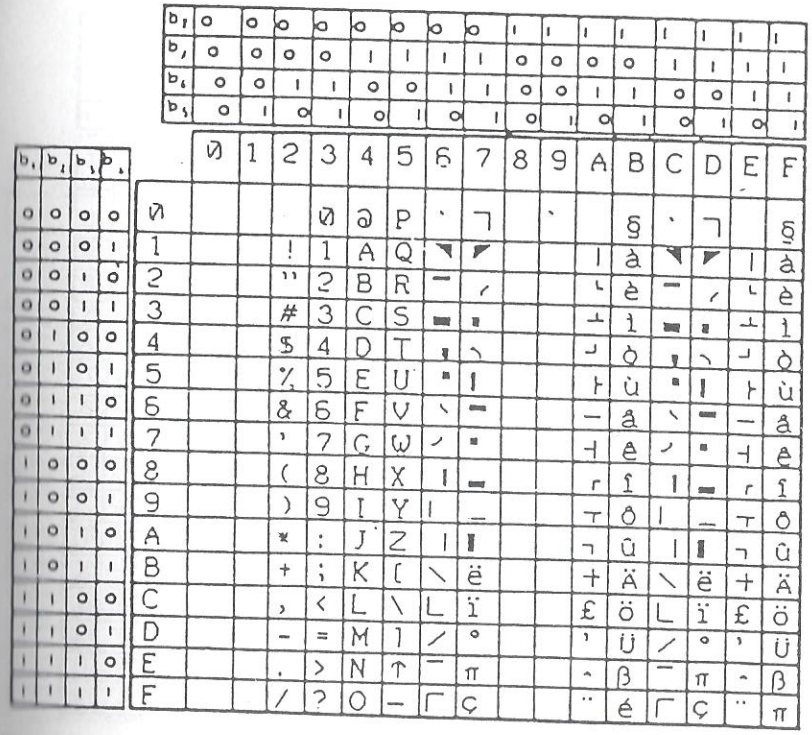
GERMANY (Upper case/Graphics mode, Secondary address = 0)

Table C-4. (cont.)



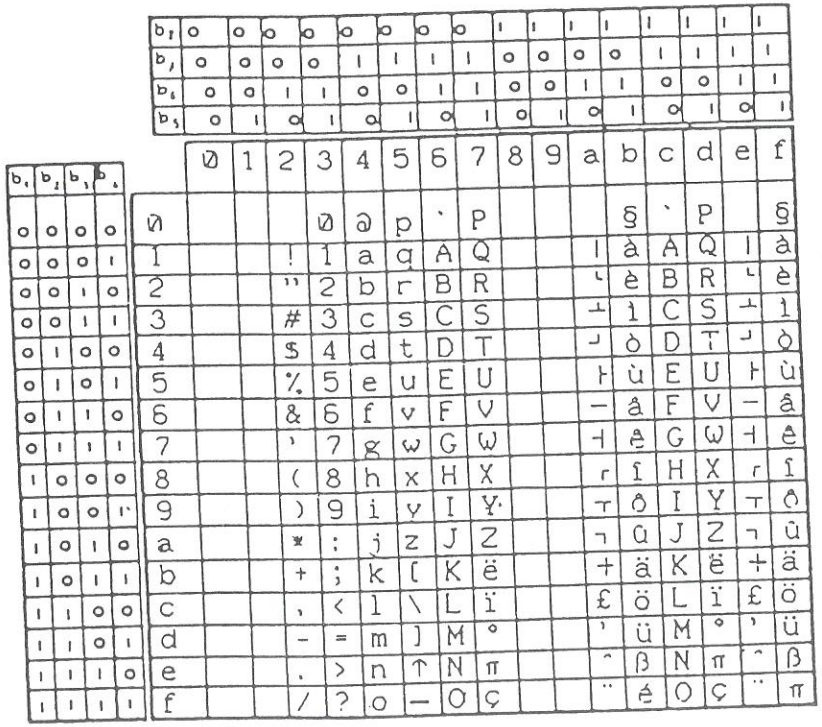
GERMANY (Upper/Lower case mode, Secondary address = 7)

Table C-5. PETASCII Characters—France



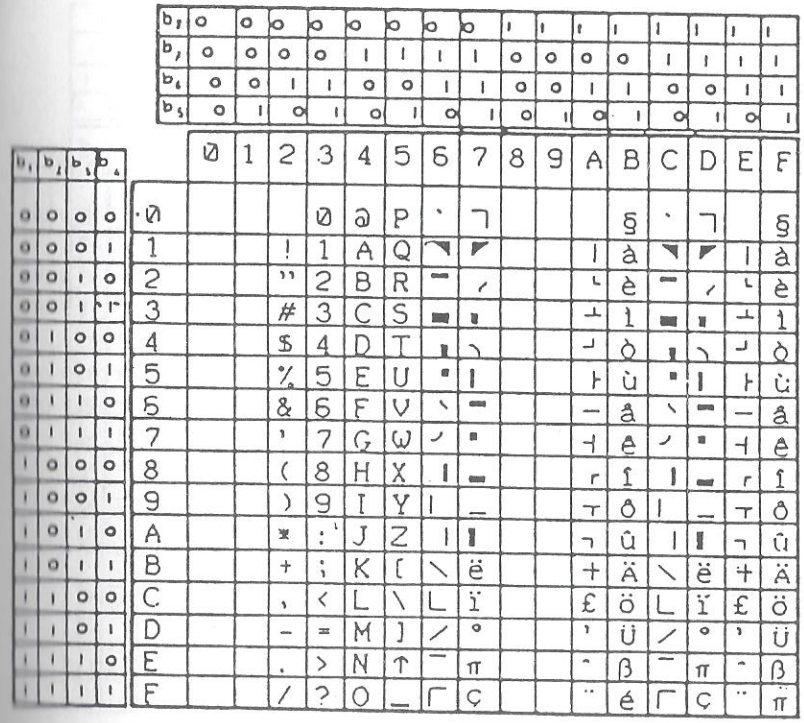
FRANCE (Upper case/Graphics mode, Secondary address = 0)

Table C-5. (cont.)



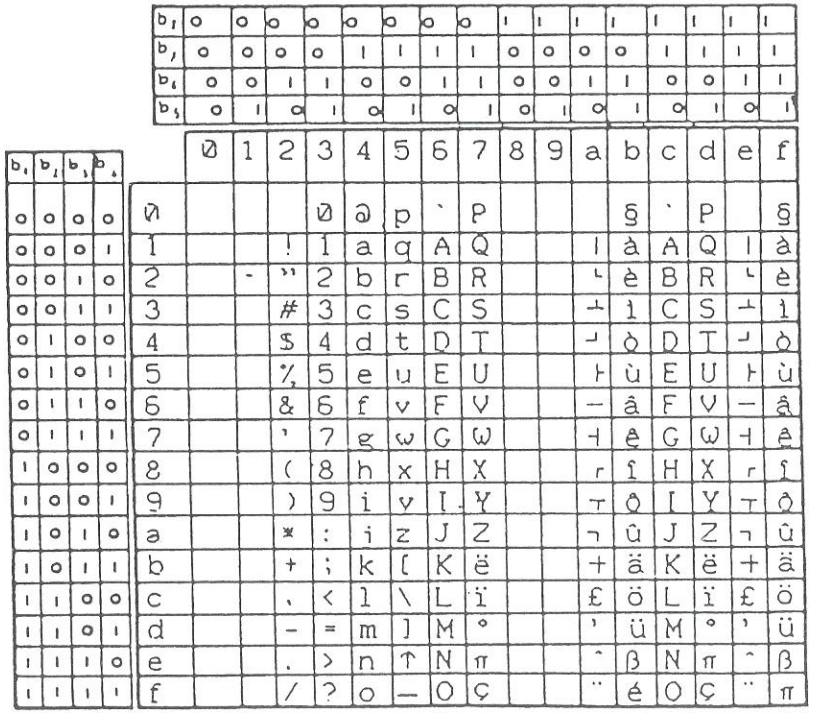
FRANCE (Upper/Lower case mode, Secondary address = 7)

Table C-6. PETASCII Characters—Italy



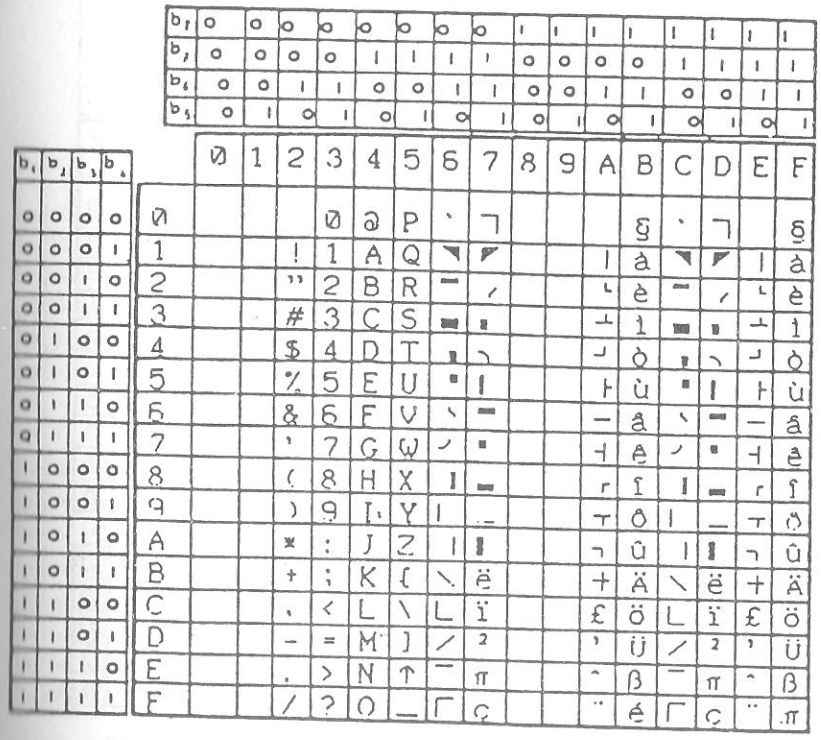
ITALY (Upper case/Graphics mode, Secondary address = 0)

Table C-6. (cont.)



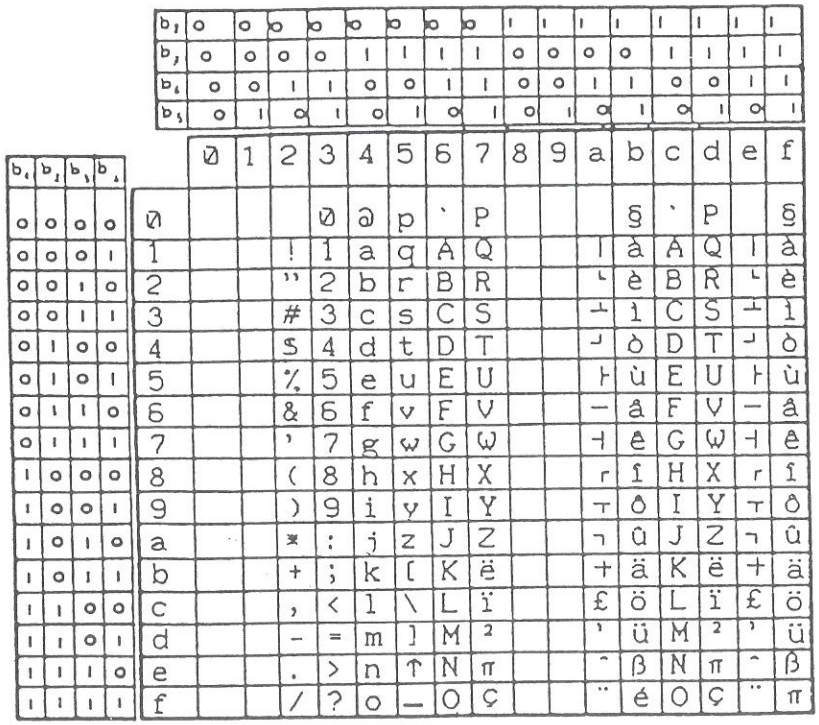
ITALY (Upper/Lower case mode, Secondary address = 7)

Table C-7. PETASCII Characters—Switzerland



SWITZERLAND (Upper case/Graphics mode, Secondary address = 0)

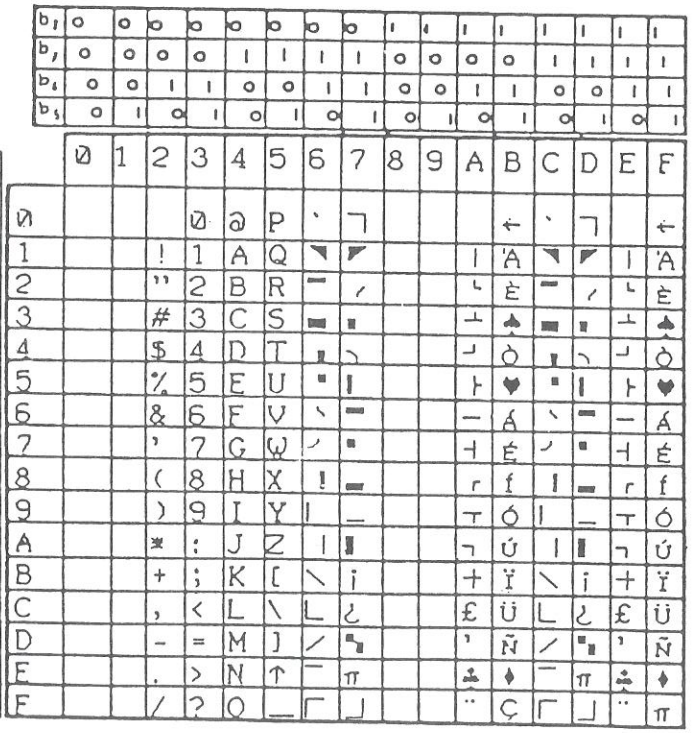
Table C-7. (cont.)



b_4 b_3 b_2 b_1	Ø	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0 0 0 0	Ø				Ø	@	p	`	P				§	`	P		§
0 0 0 1	1			!	1	a	q	A	Q			!	à	A	Q	!	à
0 0 1 0	2			"	2	b	r	B	R			"	è	B	R	"	è
0 0 1 1	3			#	3	c	s	C	S			#	ì	C	S	#	ì
0 1 0 0	4			$	4	d	t	D	T			$	ò	D	T	$	ò
0 1 0 1	5			%	5	e	u	E	U			%	ù	E	U	%	ù
0 1 1 0	6			&	6	f	v	F	V			&	á	F	V	&	á
0 1 1 1	7			'	7	g	w	G	W			'	é	G	W	'	é
1 0 0 0	8			(	8	h	x	H	X			(	í	H	X	(	í
1 0 0 1	9			)	9	i	y	I	Y			)	ó	I	Y	)	ó
1 0 1 0	a			*	:	j	z	J	Z			*	ú	J	Z	*	ú
1 0 1 1	b			+	;	k	[	K	ë			+	ä	K	ë	+	ä
1 1 0 0	c			,	<	l	\	L	ï			,	ö	L	ï	,	ö
1 1 0 1	d			-	=	m	]	M	²			-	ü	M	²	-	ü
1 1 1 0	e			.	>	n	↑	N	π			.	ß	N	π	.	ß
1 1 1 1	f			/	?	o	←	O	ç			/	é	O	ç	/	π

SWITZERLAND (Upper/Lower case mode, Secondary address = 7)

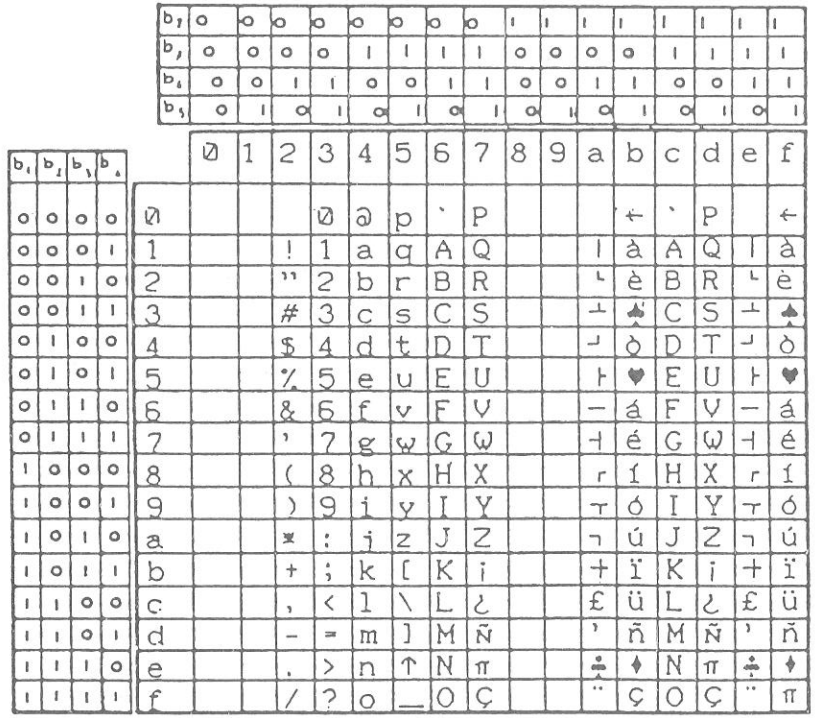
Table C-8. PETASCII Characters—Spain



b_4 b_3 b_2 b_1	Ø	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	Ø			Ø	@	P	`	┐				←	`	┐		←
0 0 0 1	1			!	1	A	Q	◥	◤			!	Á	◥	◤	!	Á
0 0 1 0	2			"	2	B	R	─	⁄			"	É	─	⁄	"	É
0 0 1 1	3			#	3	C	S	▬	▪			#	♣	▬	▪	#	♣
0 1 0 0	4			$	4	D	T	▮	╮			$	Ò	▮	╮	$	Ò
0 1 0 1	5			%	5	E	U	▪	▌			%	♥	▪	▌	%	♥
0 1 1 0	6			&	6	F	V	╲	▬			&	Á	╲	▬	&	Á
0 1 1 1	7			'	7	G	W	⁄	▪			'	É	⁄	▪	'	É
1 0 0 0	8			(	8	H	X	!	▬			(	í	▌	▬	(	í
1 0 0 1	9			)	9	I	Y	▌	_			)	Ó	▌	_	)	Ó
1 0 1 0	A			*	:	J	Z	▌	▌			*	Ú	▌	▌	*	Ú
1 0 1 1	B			+	;	K	[	╲	¡			+	Ï	╲	¡	+	Ï
1 1 0 0	C			,	<	L	\	L	¿			£	Ü	L	¿	£	Ü
1 1 0 1	D			-	=	M	]	⁄	▚			'	Ñ	⁄	▚	'	Ñ
1 1 1 0	E			.	>	N	↑	─	π			♣	♦	─	π	♣	♦
1 1 1 1	F			/	?	O	_	┌	┘			¨	Ç	┌	┘	¨	π

SPAIN (Upper case/Graphics mode, Secondary address = 0)

Table C-8. (cont.)



SPAIN (Upper/Lower case mode, Secondary address = 7)

C-2

Table C-9. Epson Standard Characters

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	none	32	20	space	64	40	@	96	60	`
1	01	none	33	21	!	65	41	A	97	61	a
2	02	none	34	22	"	66	42	B	98	62	b
3	03	none	35	23	#	67	43	C	99	63	c
4	04	none	36	24	$	68	44	D	100	64	d
5	05	none	37	25	%	69	45	E	101	65	e
6	06	none	38	26	&	70	46	F	102	66	f
7	07	none	39	27	'	71	47	G	103	67	g
8	08	BS	40	28	(	72	48	H	104	68	h
9	09	HT	41	29	)	73	49	I	105	69	i
10	0A	LF	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	47	2F	/	79	4F	O	111	6F	o
16	10	none	48	30	0	80	50	P	112	70	p
17	11	DC1	49	31	1	81	51	Q	113	71	q
18	12	DC2	50	32	2	82	52	R	114	72	r
19	13	DC3	51	33	3	83	53	S	115	73	s
20	14	DC4	52	34	4	84	54	T	116	74	t
21	15	none	53	35	5	85	55	U	117	75	u
22	16	none	54	36	6	86	56	V	118	76	v
23	17	none	55	37	7	87	57	W	119	77	w
24	18	CAN	56	38	8	88	58	X	120	78	x
25	19	none	57	39	9	89	59	Y	121	79	y
26	1A	none	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	59	3B	;	91	5B	[	123	7B	{
28	1C	none	60	3C	<	92	5C	\	124	7C	¦
29	1D	none	61	3D	=	93	5D	]	125	7D	}
30	1E	none	62	3E	>	94	5E	^	126	7E	~
31	1F	none	63	3F	?	95	5F	_	127	7F	DEL

Table C-9. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	none	160	A0	space	192	C0	@	224	E0	`
129	81	none	161	A1	!	193	C1	A	225	E1	a
130	82	none	162	A2	"	194	C2	B	226	E2	b
131	83	none	163	A3	#	195	C3	C	227	E3	c
132	84	none	164	A4	$	196	C4	D	228	E4	d
133	85	none	165	A5	%	197	C5	E	229	E5	e
134	86	none	166	A6	&	198	C6	F	230	E6	f
135	87	none	167	A7	'	199	C7	G	231	E7	g
136	88	BS	168	A8	(	200	C8	H	232	E8	h
137	89	HT	169	A9	)	201	C9	I	233	E9	i
138	8A	LF	170	AA	*	202	CA	J	234	EA	j
139	8B	VT	171	AB	+	203	CB	K	235	EB	k
140	8C	FF	172	AC	,	204	CC	L	236	EC	l
141	8D	CR	173	AD	-	205	CD	M	237	ED	m
142	8E	SO	174	AE	.	206	CE	N	238	EE	n
143	8F	SI	175	AF	/	207	CF	O	239	EF	o
144	90	none	176	B0	0	208	D0	P	240	F0	p
145	91	DC1	177	B1	1	209	D1	Q	241	F1	q
146	92	DC2	178	B2	2	210	D2	R	242	F2	r
147	93	DC3	179	B3	3	211	D3	S	243	F3	s
148	94	DC4	180	B4	4	212	D4	T	244	F4	t
149	95	none	181	B5	5	213	D5	U	245	F5	u
150	96	none	182	B6	6	214	D6	V	246	F6	v
151	97	none	183	B7	7	215	D7	W	247	F7	w
152	98	CAN	184	B8	8	216	D8	X	248	F8	x
153	99	none	185	B9	9	217	D9	Y	249	F9	y
154	9A	none	186	BA	:	218	DA	Z	250	FA	z
155	9B	ESC	187	BB	;	219	DB	[	251	FB	{
156	9C	none	188	BC	<	220	DC	\	252	FC	;
157	9D	none	189	BD	=	221	DD	]	253	FD	}
158	9E	none	190	BE	>	222	DE	^	254	FE	~
159	9F	none	191	BF	?	223	DF	_	255	FF	

Table C-10. Epson Graphics Characters

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00		32	20	space	64	40	@	96	60	`
1	01		33	21	!	65	41	A	97	61	a
2	02		34	22	"	66	42	B	98	62	b
3	03		35	23	#	67	43	C	99	63	c
4	04		36	24	$	68	44	D	100	64	d
5	05		37	25	%	69	45	E	101	65	e
6	06		38	26	&	70	46	F	102	66	f
7	07		39	27	'	71	47	G	103	67	g
8	08		40	28	(	72	48	H	104	68	h
9	09		41	29	)	73	49	I	105	69	i
10	0A		42	2A	*	74	4A	J	106	6A	j
11	0B		43	2B	+	75	4B	K	107	6B	k
12	0C		44	2C	,	76	4C	L	108	6C	l
13	0D		45	2D	-	77	4D	M	109	6D	m
14	0E		46	2E	.	78	4E	N	110	6E	n
15	0F		47	2F	/	79	4F	O	111	6F	o
16	10		48	30	0	80	50	P	112	70	p
17	11		49	31	1	81	51	Q	113	71	q
18	12		50	32	2	82	52	R	114	72	r
19	13		51	33	3	83	53	S	115	73	s
20	14		52	34	4	84	54	T	116	74	t
21	15		53	35	5	85	55	U	117	75	u
22	16		54	36	6	86	56	V	118	76	v
23	17		55	37	7	87	57	W	119	77	w
24	18		56	38	8	88	58	X	120	78	x
25	19		57	39	9	89	59	Y	121	79	y
26	1A		58	3A	:	90	5A	Z	122	7A	z
27	1B		59	3B	;	91	5B	[	123	7B	{
28	1C		60	3C	<	92	5C	\	124	7C	;
29	1D		61	3D	=	93	5D	]	125	7D	}
30	1E		62	3E	>	94	5E	^	126	7E	~
31	1F		63	3F	?	95	5F	_	127	7F	

Table C-10. (cont.)

Dec	Hex	Char
128	80	┼
129	81	┴
130	82	┬
131	83	┤
132	84	├
133	85	─
134	86	│
135	87	┌
136	88	┐
137	89	└
138	8A	┘
139	8B	▒
140	8C	▓
141	8D	▬
142	8E	▌
143	8F	●
144	90	○
145	91	♠
146	92	♥
147	93	♦
148	94	♣
149	95	♪
150	96	☎
151	97	♠
152	98	♣
153	99	ㄣ
154	9A	大
155	9B	↑
156	9C	↓
157	9D	×
158	9E	÷
159	9F	±

Dec	Hex	Char
160	A0	
161	A1	!
162	A2	"
163	A3	#
164	A4	$
165	A5	%
166	A6	&
167	A7	'
168	A8	(
169	A9	)
170	AA	*
171	AB	+
172	AC	,
173	AD	-
174	AE	.
175	AF	/
176	B0	0
177	B1	1
178	B2	2
179	B3	3
180	B4	4
181	B5	5
182	B6	6
183	B7	7
184	B8	8
185	B9	9
186	BA	:
187	BB	;
188	BC	<
189	BD	=
190	BE	>
191	BF	?

Dec	Hex	Char
192	C0	@
193	C1	A
194	C2	B
195	C3	C
196	C4	D
197	C5	E
198	C6	F
199	C7	G
200	C8	H
201	C9	I
202	CA	J
203	CB	K
204	CC	L
205	CD	M
206	CE	N
207	CF	O
208	D0	P
209	D1	Q
210	D2	R
211	D3	S
212	D4	T
213	D5	U
214	D6	V
215	D7	W
216	D8	X
217	D9	Y
218	DA	Z
219	DB	[
220	DC	\
221	DD	]
222	DE	^
223	DF	_

Dec	Hex	Char
224	E0	`
225	E1	a
226	E2	b
227	E3	c
228	E4	d
229	E5	e
230	E6	f
231	E7	g
232	E8	h
233	E9	i
234	EA	j
235	EB	k
236	EC	l
237	ED	m
238	EE	n
239	EF	o
240	F0	p
241	F1	q
242	F2	r
243	F3	s
244	F4	t
245	F5	u
246	F6	v
247	F7	w
248	F8	x
249	F9	y
250	FA	z
251	FB	{
252	FC	|
253	FD	}
254	FE	
255	FF	

Table C-11. IBM Characters–Set 1 (ESC7)

Dec	Hex	Char
0	00	none
1	01	none
2	02	none
3	03	none
4	04	none
5	05	none
6	06	none
7	07	none
8	08	BS
9	09	HT
10	0A	LF
11	0B	VT
12	0C	FF
13	0D	CR
14	0E	SO
15	0F	SI
16	10	none
17	11	none
18	12	DC2
19	13	none
20	14	DC4
21	15	none
22	16	none
23	17	none
24	18	CAN
25	19	none
26	1A	none
27	1B	ESC
28	1C	none
29	1D	none
30	1E	none
31	1F	none

Dec	Hex	Char
32	20	space
33	21	!
34	22	"
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Char
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Char
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	none

Table C-11. (cont.)

Dec	Hex	Char
128	80	none
129	81	none
130	82	none
131	83	none
132	84	none
133	85	none
134	86	none
135	87	none
136	88	BS
137	89	HT
138	8A	LF
139	8B	VT
140	8C	FF
141	8D	CR
142	8E	SO
143	8F	SI
144	90	none
145	91	none
146	92	DC2
147	93	none
148	94	DC4
149	95	none
150	96	none
151	97	none
152	98	CAN
153	99	none
154	9A	none
155	9B	ESC
156	9C	none
157	9D	none
158	9E	none
159	9F	none

Dec	Hex	Char
160	A0	á
161	A1	í
162	A2	ó
163	A3	ú
164	A4	ñ
165	A5	Ñ
166	A6	ª
167	A7	º
168	A8	¿
169	A9	⌐
170	AA	¬
171	AB	½
172	AC	¼
173	AD	¡
174	AE	«
175	AF	»
176	B0	▒
177	B1	▒
178	B2	▒
179	B3	▒
180	B4	▒
181	B5	▒
182	B6	▒
183	B7	▒
184	B8	▒
185	B9	▒
186	BA	▒
187	BB	▒
188	BC	▒
189	BD	▒
190	BE	▒
191	BF	▒

Dec	Hex	Char
192	C0	└
193	C1	┴
194	C2	┬
195	C3	├
196	C4	─
197	C5	┼
198	C6	╞
199	C7	╟
200	C8	╚
201	C9	╔
202	CA	╩
203	CB	╦
204	CC	╠
205	CD	═
206	CE	╬
207	CF	╧
208	D0	╨
209	D1	╤
210	D2	╥
211	D3	╙
212	D4	╘
213	D5	╒
214	D6	╓
215	D7	╫
216	D8	╪
217	D9	┘
218	DA	┌
219	DB	▒
220	DC	▒
221	DD	▒
222	DE	▒
223	DF	▒

Dec	Hex	Char
224	E0	α
225	E1	ß
226	E2	Γ
227	E3	π
228	E4	Σ
229	E5	σ
230	E6	µ
231	E7	τ
232	E8	Φ
233	E9	Θ
234	EA	Ω
235	EB	δ
236	EC	∞
237	ED	ø
238	EE	∈
239	EF	∩
240	F0	≡
241	F1	±
242	F2	≥
243	F3	≤
244	F4	⌠
245	F5	⌡
246	F6	÷
247	F7	≈
248	F8	°
249	F9	∙
250	FA	·
251	FB	√
252	FC	ⁿ
253	FD	²
254	FE	■
255	FF	space

Note: These characters may be different if you are using an international character set. See Table C-7 for additional information.

Table C-12. IBM Characters–Set 2 (ESC6)

Dec	Hex	Char
0	00	
1	01	
2	02	
3	03	♥
4	04	♦
5	05	♣
6	06	♠
7	07	
8	08	
9	09	
10	0A	
11	0B	
12	0C	
13	0D	
14	0E	
15	0F	
16	10	
17	11	
18	12	
19	13	
20	14	
21	15	§
22	16	
23	17	
24	18	
25	19	
26	1A	
27	1B	
28	1C	
29	1D	
30	1E	
31	1F	

Dec	Hex	Char
32	20	space
33	21	!
34	22	"
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?

Dec	Hex	Char
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_

Dec	Hex	Char
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	¦
125	7D	}
126	7E	~
127	7F	

Table C-12. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	Ç	160	A0	á	192	C0	└	224	E0	α
129	81	ü	161	A1	í	193	C1	┴	225	E1	ß
130	82	é	162	A2	ó	194	C2	┬	226	E2	Γ
131	83	â	163	A3	ú	195	C3	├	227	E3	π
132	84	ä	164	A4	ñ	196	C4	─	228	E4	Σ
133	85	à	165	A5	Ñ	197	C5	┼	229	E5	σ
134	86	å	166	A6	ª	198	C6	╞	230	E6	µ
135	87	ç	167	A7	º	199	C7	╟	231	E7	τ
136	88	ê	168	A8	¿	200	C8	╚	232	E8	Φ
137	89	ë	169	A9	⌐	201	C9	╔	233	E9	Θ
138	8A	è	170	AA	¬	202	CA	╩	234	EA	Ω
139	8B	ï	171	AB	½	203	CB	╦	235	EB	δ
140	8C	î	172	AC	¼	204	CC	╠	236	EC	∞
141	8D	ì	173	AD	¡	205	CD	═	237	ED	ø
142	8E	Ä	174	AE	«	206	CE	╬	238	EE	∈
143	8F	Å	175	AF	»	207	CF	╧	239	EF	∩
144	90	É	176	B0	▒	208	D0	╨	240	F0	≡
145	91	æ	177	B1	▓	209	D1	╤	241	F1	±
146	92	Æ	178	B2	▓	210	D2	╥	242	F2	≥
147	93	ô	179	B3	▓	211	D3	╙	243	F3	≤
148	94	ö	180	B4	▓	212	D4	╘	244	F4	⌠
149	95	ò	181	B5	▓	213	D5	╒	245	F5	⌡
150	96	û	182	B6	▓	214	D6	╓	246	F6	÷
151	97	ù	183	B7	▓	215	D7	╫	247	F7	≈
152	98	ÿ	184	B8	▓	216	D8	╪	248	F8	°
153	99	Ö	185	B9	▓	217	D9	┘	249	F9	∙
154	9A	Ü	186	BA	▓	218	DA	┌	250	FA	·
155	9B	¢	187	BB	▓	219	DB	▓	251	FB	√
156	9C	£	188	BC	▓	220	DC	▄	252	FC	ⁿ
157	9D	¥	189	BD	▓	221	DD	▌	253	FD	²
158	9E	₧	190	BE	▓	222	DE	▐	254	FE	
159	9F	ƒ	191	BF	▓	223	DF	▀	255	FF	space

Note: These characters may be different if you are using an international character set. See Table C-7 for additional information.

Table C-13. IBM–All Characters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø 0	► 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	⁞ 176	└ 192	╨ 208	α 224	≡ 240
1	☺ 1	◄ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	☻ 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	♥ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	◙ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	▓ 219	δ 235	√ 251
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 238	η 252
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	

Table C-14. IBM–Denmark/Norway–All Characters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø 0	► 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	☺ 1	◄ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	▓ 177	┴ 193	╤ 209	β 225	± 241
2	☻ 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	♥ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ō 166	╢ 182	╞ 198	╓ 214	μ 230	÷ 246
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	Ō 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	◙ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	ø 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▐ 220	∞ 236	η 252
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	Ł 158	« 174	╛ 190	╬ 206	▌ 222	∈ 238	■ 254
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ƒ 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	

Table C-15. Epson International Character Sets

These are the international characters that are substituted for the ASCII code values with the sequence ESC R CHR$(n) for each of the 10 international character sets.

Country	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	$	©	[	\	]	^	`	{	|	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
England	£	$	©	[	\	]	^	`	{	|	}	~
Denmark I	#	$	©	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	*	$	©	°	\	é	^	ù	å	ò	è	ì
Spain	R	$	©	¡	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

Appendix D
Block and Dot Mode Graphics

As applied to computers and printers, "graphics" means anything that is not a letter, number, or symbol generally found on a typewriter or word processor. Graphics includes everything from lines, boxes, border designs, and special logos, to graphs and complete drawings that are limited only by your imagination.

The MPS 1270 can print graphics in two different ways. The first method uses predefined characters called block and line graphic characters. It is handy for designing forms, creating boxes, drawing lines, and so on. The second method, called dot graphics, allows you to specify exactly where each and every dot will be printed. It involves a little more work in planning and programming, but the results are worth it.

The MPS 1270 contains three complete sets of block and line graphics characters. You can see a complete list of these characters in Appendix C.

The block graphics characters in serial mode are 7 dots high; to connect the characters in one line to those in the next line you must set the line spacing to 7/72-inch.

Block and Line Graphics

The MPS 1270 contains three groups of block and line graphics characters—one in its Epson character set at ASCII 128 to 159, one in its Commodore PETASCII set at ASCII 96 to 225, and one in its IBM character set at ASCII 169 to 223. You can see a complete list of the characters in both sets in Appendix C.

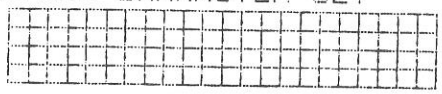
These groups all contain line-drawing characters—but with one big difference. The characters in the Epson and Commodore character set are 7 dots high; to connect the characters in one line to those in the next line you must set the line spacing to 7/72-inch. The characters in the IBM character set, on the other hand, are based on 12-dots; you can connect them using standard 6 lines-per-inch (12/72-inch) line spacing. (The IBM characters also work with 7/72-inch line spacing by overlapping.)

Example

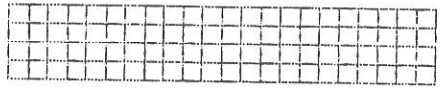
```
10 LPRINT CHR$(27)"m"CHR$(4);
20 LPRINT CHR$(27)"U1";
30 LPRINT "At 7/72-inch line spacing:":LPRINT
40 LPRINT CHR$(27)"1";
50 GOSUB 110
60 LPRINT "At 12/72-inch line spacing:":LPRINT
70 LPRINT CHR$(27)"2";
80 GOSUB 110
90 LPRINT CHR$(27)"@"
100 END
110 LPRINT CHR$(27)"~50";"Epson character set"
120 GOSUB 160:GOSUB 260
130 LPRINT CHR$(27)"~51";"IBM character set"
140 GOSUB 210:GOSUB 260
150 RETURN
160 REM Epson graphic character
170 T(1)=135:T(2)=130:T(3)=136
180 M(1)=132:M(2)=128:M(3)=131
190 B(1)=137:B(2)=129:B(3)=138
200 RETURN
210 REM IBM graphic character
220 T(1)=218:T(2)=194:T(3)=191
230 M(1)=195:M(2)=197:M(3)=180
240 B(1)=192:B(2)=193:B(3)=217
250 RETURN
260 LPRINT CHR$(T(1));
270 FOR N=1 TO 21:LPRINT CHR$(T(2));:NEXT
280 LPRINT CHR$(T(3))
290 FOR K=1 TO 3
300 LPRINT CHR$(M(1));
310 FOR N=1 TO 21:LPRINT CHR$(M(2));:NEXT
320 LPRINT CHR$(M(3))
330 NEXT
340 LPRINT CHR$(B(1));
350 FOR N=1 TO 21:LPRINT CHR$(B(2));:NEXT
360 LPRINT CHR$(B(3))
370 LPRINT
380 RETURN
```



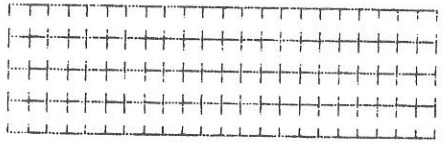
```
AT 7/72-INCH LINE SPACING:
EPSON CHARACTER SET
```



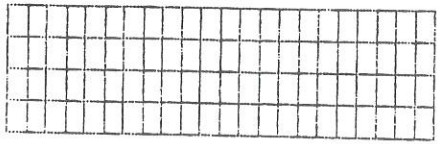
```
IBM CHARACTER SET
```



```
AT 12/72-INCH LINE SPACING:
EPSON CHARACTER SET
```



```
IBM CHARACTER SET
```



In the program above, line 10 points out another difference between line graphics in the Epson and Commodore character sets and those in the IBM character set. The MPS 1270 can interpret ASCII codes 128 to 159 in one of two ways: as control codes or as graphic characters. To use them as graphic characters you must first tell the MPS 1270 with the command ESC "m" CHR$(4) (or by turning on internal switch 5 when Epson #1 configuration).

The IBM character set line graphics, however, use a different ASCII code range (169 to 223). In the IBM character set, these ASCII codes are always line graphics. Once you select the IBM configuration (with the command ESC"~51" or by turning on internal switches 3 and 4), the line graphics characters are ready to use without any other command.

Dot Graphics

When you send the MPS 1270 a code for a character, it prints the character using a pattern of dots stored in its memory. To print a pattern of dots that the MPS 1270 does not have in its memory—a drawing or character you designed yourself for example, you need to control the individual dots that are printed. This technique is called dot graphics.

The print head consists of nine ink jets, referred to here as "pins", one above the other. The print head can therefore print columns of up to nine dots at a time. For most graphics applications however, the botton pin in the print head is not used because most computers send data to their printer in eight-bit "bytes". This is the most commonly used system for dot graphics, known as "eight-pin dot graphics."

Another form of graphics, seven-pin dot graphics, uses only seven of the nine pins on the print head. This is the form of graphics used on older Commodore printers such as the MPS 801 and MPS 803. There are many commercial programs, books and magazine articles which use and explain seven-pin graphics. The MPS 1270 can handle seven-pin as well as eight-pin graphics. Seven-pin graphics is covered in detail in Chapter 5, pages 5-34 and 5-35.

You can also use all nine pins on the MPS 1270 print head for graphics. Nine-pin graphics is quicker than using eight- or seven-pin, but is a bit more difficult to code.

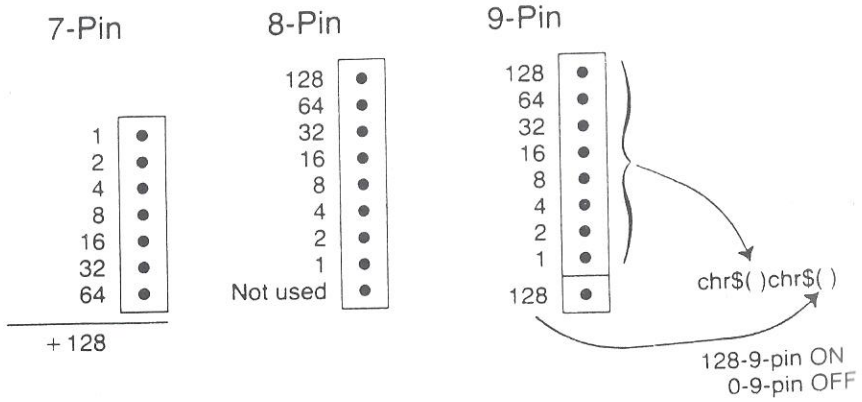


Figure D-1. Dot Graphics Pin Comparison

As you can see in Figure 6-1, the pin numbers are reversed in Commodore seven-pin graphics. To avoid confusion due to this difference and since seven-pin graphics can only be used in Commodore mode, it is covered in a separate chapter.

NOTE: Eight-pin and nine-pin graphics may also be used in Commodore mode. This mode is not limited to seven-pin graphics.

If you are using a commercial software drawing or graphics program such, don't worry about pin numbers with the MPS 1270; just set the DIP switches accordingly, and select "Commodore" or "Epson," or "IBM Graphic" from the printer options listed in the program.

The MPS 1270 prints dot graphics in lines, just as it does predefined characters. The print head moves across the paper using the appropriate pins forming a column of dots on each line. Tall graphics figures are printed by adjusting the line spacing and printing several lines until the figure is complete.

However, with dot graphics the line length and dot spacing are not fixed as they are with predefined characters. To use dot graphics, you must tell the MPS 1270 three things for each line: (1) which pins to print in each column; (2) how closely to space the columns, called the graphic density; and (3) how many columns there will be in the line.

Graphics Commands

The graphics commands perform three functions: they tell the MPS 1270 to interpret the ASCII codes that follow as print head pin number data instead of characters, they set the graphics density, and they set the number of columns per line, which tells the MPS 1270 how many pieces of data to expect. First, let's see how the MPS 1270 prints graphics.

Pin Numbers

To tell the MPS 1270 which pins to print in each column, you need a way to identify the pins in the print head. The MPS 1270 assigns each pin a number as shown in Figure 6.1. Skipping the unused bottom pin, they are numbered as powers of 2: 2^0, 2^1, 2^2 . . . 2^7, or in everyday numbers, 1,2,4,8,16,32,64, and

128. Once you've told the MPS 1270 you are using dot graphics with one of the graphics commands, you tell it which pins to print by sending the ASCII code that corresponds to the pin number—one code for each column.

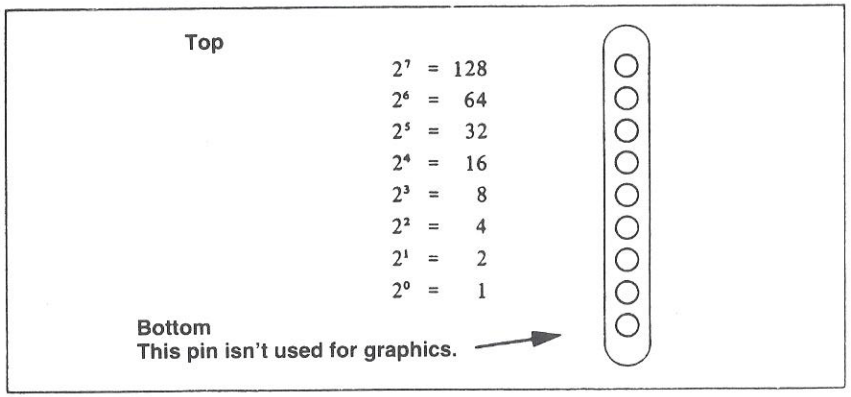


Figure D-2. Print head numbers (Epson mode)

Why aren't the pins just numbered 1 to 8? Because by using powers of two, the sum of any combination of pin numbers is a unique number. In other words, any number from 1 to 255 represents a unique combination of pin numbers. Thus, you can print any combination of pins by sending the ASCII code that corresponds to the sum of the pin numbers. For example to print pins 1,2, and 4, send ASCII 7 (1 + 2 + 4 = 7); to print pins 4, 8, and 64, send ASCII 76; and to print all eight pins, send ASCII 255.

NOTE: Apple users and others whose computers send only seven bits of data cannot send numbers greater than 127 and therefore cannot print the top pin, number 128. This means that when you design your graphics, you can use only seven dots per line. For compatibility with 7-bit computers, all of the graphics in the example programs in this manual are designed this way.

Graphics Density

Changing graphics densities is similar to changing character widths when printing text. The same number of dots are printed, but the density that you select determines how close together the dots are printed. Here are the four graphics commands that select each density:

Single Density Graphics

BASIC	CHR$(27)"K"CHR$(n1) CHR$(n2)
PETASCII Hex	1B CB n1h n2h
ASCII Hex	1B 4B n1h n2h

Single density graphics print at 60 dots per inch with a line length of n1 + (256 × n2).

Double-Density Graphics

BASIC	CHR$(27)"L"CHR$(n1) CHR$(n2)
PETASCII Hex	1B CC n1h n2h
ASCII Hex	1B 4C n1h n2h

Double density graphics print at 120 dots per inch with a line length of n1 + (256 × n2).

High-speed Double-Density

BASIC	CHR$(27)"Y"CHR$(n1) CHR$(n2)
PETASCII Hex	1B D9 n1h n2h
ASCII Hex	1B 59 n1h n2h

High-speed double density graphics print at 120 dots per inch with a line length of n1 + (256 × n2).

Quadruple Density Graphics

BASIC	CHR$(27)"Z"CHR$(n1) CHR$(n2)
PETASCII Hex	1B DA n1h n2h
ASCII Hex	1B 5A n1h n2h

High-speed double density graphics print at 240 dots per inch with a line length of n1 + (256 × n2).

Comparing Graphics Densities

Now that you know what the formats are to select these graphics densities, lets compare them by printing a graphics program. Try the following program:

```
5 open 1,4,7
10 print#1, "Single Density:"
20 print#1, chr$(27)"K"chr$(120); chr$(0); : gosub 200
30 print#1, "Double Density:"
40 print#1, chr$(27)"L"chr$(120); chr$(0); : gosub 200
50 print#1, "High-speed Double Density:"
60 print#1, chr$(27)"Y"chr$(120); chr$(0); : gosub 200
70 print#1, "Quadruple Density:"
80 print#1, chr$(27)"Z"chr$(120); chr$(0); : gosub 200
85 close 1
90 end
200 for n=1 to 40: print#1, chr$(7); chr$(62); chr$(7); : next n
210 print#1: print#1: return
```

```
5 WIDTH "LPT1:",255
10 LPRINT "SINGLE DENSITY:"
20 LPRINT CHR$(27); "K"; CHR$(120); CHR$(0); : GOSUB 200
30 LPRINT "Double Density:"
40 LPRINT CHR$(27); "L"; CHR$(120); CHR$(0); : GOSUB 200
50 LPRINT "High-speed Double Density:"
60 LPRINT CHR$(27); "Y"; CHR$(120); CHR$(0); : GOSUB 200
70 LPRINT "Quadruple Density:"
80 LPRINT CHR$(27); "Z"; CHR$(120); CHR$(0); : GOSUB 200
90 END
200 FOR N=1 TO 40: LPRINT CHR$(7); CHR$(62);
    CHR$(7); : NEXT
210 LPRINT: LPRINT: RETURN
```



```
Single Density:

Double Density:

High-speed Double Density:

Quadruple Density:
```

Each line is set to contain 120 columns of dots by the codes CHR$(120) CHR$(0) in lines 20, 40, 60, and 80. Line 100 defines a three-column pattern of pin numbers—pins 1 + 2 + 4 = 7 in column one, pins 2 + 4 + 8 + 16 + 32 = 62 in column 2, and then pins 1 + 2 + 4 = 7 again in column three—and prints the pattern 40 times to get a total of 120 columns. At single density of 60 dots per inch, the pattern is 2 inches long. At double density of 120 dots per inch, 1 inch. And at quadruple density of 240 dots per inch 1/2 inch.

Notice the difference between the pattern printed in double density and the one printed in high-speed double density. In double density and in quadruple density, columns are spaced only 1/2 and 1/4 dot from each other. The columns actually overlap as shown in Figure 6-3. At this spacing, the print head moves too fast to print the same pins in two adjacent columns. If the graphics figure calls for the same pins in two adjacent columns as the example program does (every third and fourth column call for pins 1,2, and 4), the pins in the adjacent columns are ignored. If you look closely at the high-speed double density pattern in the example program, you can see that columns 4,7, and so on are missing.

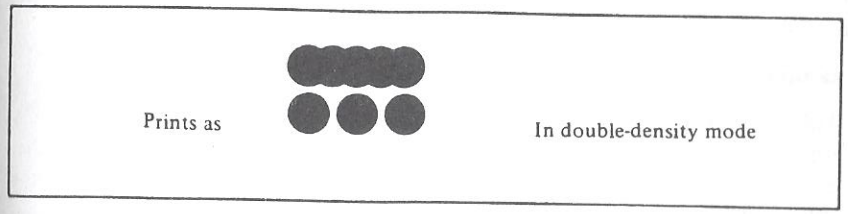


Figure D-3. Double and Quadruple densities

Since the columns are spaced so close together, these missing columns are not normally noticeable. But for those cases where printing the same pins in two adjacent columns is critical, the MPS 1270 provides the normal double density mode. In this mode, the print head moves slowly enough to print the same pins in adjacent columns. The trade-off is the slower speed. When printing larger graphics figures, the difference in the print time at double density and at high-speed density can be considerable. In quadruple density, the columns are too close together to print the same pin numbers in adjacent columns even at a slower speed. Therefore, there is no low-speed quadruple density.

Sending Graphics Data

When you send one of the graphics commands, you tell the 120-D to interpret the codes that follow as pin values instead of characters and commands. The 120-D must know how many codes to interpret this way and when to resume interpreting codes as commands and characters.

Line Length: Number of Columns

To send the correct graphics data, you must follow the graphics command with two ASCII codes that specify the number of columns in the dot graphics line, CHR$8(n1) and CHR$(n2).

Why two numbers? Consider the maximum number of columns that can be printed in a line. At 60 dots per inch, the MPS 1270 can print 480 columns of dots in an 8-inch line. And at 240 dots per inch the MPS 1270 can print 1,920 columns in a line! But the largest number BASIC can send is 255. Obviously, you need a way to send larger numbers.

The MPS 1270 solves this problem by using the two numbers n1 and n2 together to determine the number of columns in a line. The first number, n1, indicates the number of columns from 0 to 255. The second number, n2, indicates the number of times 256 is to be added to the first number. With this scheme you can send any size number you need.

Example:

```
  100 = 100 + 0 × 256 n1 = 100, n2 = 0
  480 = 244 + 1 × 256 n1 = 224, n2 = 1
  816 =  48 + 3 × 256 n1 =  48, n2 = 3
1,920 = 128 + 7 × 256 n1 = 128, n2 = 7
```


NOTE: The largest number that 7-bit computers can send is 127. This means that you can specify only 1 to 127 columns with $n2 = 0$, 256 to 383 columns with $n2 = 1$, and so on. To print figures with widths 128 to 255, 384 to 511, and so on, simply divide the line into two pieces. Print the first half ending the print statement with a semicolon. Then use a second print statement to print the second half on the same line.

You can calculate the values of n1 and n2 for any number of columns you need by dividing the number of columns by 256. The quotient will be n2 and the remainder will be n1. If you like, you can calculate n1 and n2 with two expressions:

```
n2 = INT (x/256)
N2 = X-256*n2
```

where X is the number of columns. Table 6-1 shows another easy way to calculate n1 and n2.

Table D-1. Calculating n1 and n2.

If the number of columns (x) ranges from:

	n1 is:	and n2 is:
1 to 255	x	0
256 to 511	x-256	1
512 to 767	x-512	2
768 to 1023	x-768	3
1024 to 1279	x-1024	4
1280 to 1535	x-1280	5
1536 to 1791	x-1536	6
1792 to 1920	x-1792	7

Putting It All Together

Now that we know how the graphics commands work, how to control the pins, and how to set the number of columns, let's try a sample program to see some actual graphics.

Example:

```
10 open 4,4,7
20 print#4, chr$(27); "K; chr$(44); chr$(1);
30 for i = 1 to 300
40 j = i – 128*(int(I/128))
50 if j = 9 or j = 13 then j = 0
60 print#4, chr$(j);
70 next i
80 close 4
90 end
10 WIDTH "LPT1:",255
20 LPRINT CHR$(27); "K"; CHR$(44); CHR$(1);
30 FOR N = 1 TO 300
40 J = N MOD 128
50 IF J = 9 OR J = 13 THEN J = 0
60 LPRINT CHR$(J);
70 NEXT
```

This program demonstrates several techniques for printing graphics. Line 10 tells BASIC not to add a carriage return every 80 characters as many versions of BASIC do. Line 20 sends the graphics command for single density and sets the graphics line length to 300 columns (44 + 1 × 256). Notice that line 20 ends with a semi-colon. If it did not, the carriage return and line feed sent at the end of the line would be interpreted as the first two graphic codes. Lines 30 through 70 form a loop that prints the value for J, which is incremented in line 40, three hundred times. Line 50 eliminates J = 9 and J = 13, thus avoiding printing CHR$(9) and CHR$(13), which are problems for many computers. You can use a similar statement if your computer has trouble with other codes.

Try the previous program again in double density and quadruple density by changing the graphics command in line 20. If yours is an eight-bit computer, you can also change the value in line 40 from 128 to 256, which will allow the top pin, number 128, to print. Experiment by changing the line length in line 20. Be sure to change line 30 to correspond to the new line length.

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