

COMMODORE[®] 1250[™]

mPS

DOT MATRIX PRINTER

user's guide




COMMODORE  [™]

Commodore Business Machines, Inc.
1200 Wilson Drive • West Chester, PA 19380

Commodore Business Machines, Limited
3470 Pharmacy Avenue • Agincourt, Ontario M1W 3G3

PRINTED IN JAPAN





Commodore[®]
MPS 1250[™]
User's Manual

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

“How to Identify and Resolve Radio-TV Interference Problems.”

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

The use of a non-shielded interface cable with this device is prohibited.

Copyright 1987 by Commodore Electronics Limited
Copyright 1986 by Commodore Electronics Limited
Copyright 1985 by Citizen America Corporation
All rights reserved.

This manual contains copyrighted and proprietary information. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Commodore Electronics Limited.

DISCLAIMER

COMMODORE ELECTRONICS LIMITED, MAKES NO WARRANTIES, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO ANY OF THE PROGRAMS HEREIN, THEIR QUALITY, PERFORMANCE, MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE.

THE ENTIRE RISK AS TO THEIR QUALITY AND PERFORMANCE IS WITH THE BUYER. SHOULD THE PROGRAMS PROVE DEFECTIVE FOLLOWING THEIR PURCHASE, THE BUYER (AND NOT THE CREATORS OF THE PROGRAMS, COMMODORE ELECTRONICS LIMITED, THEIR DISTRIBUTORS, OR THEIR RETAILERS) ASSUMES THE ENTIRE COST OF ALL NECESSARY DAMAGES.

IN NO EVENT WILL COMMODORE ELECTRONICS LIMITED, BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE PROGRAMS EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME LAWS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES OR LIABILITIES FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY.

Commodore BASIC

Copyright 1985 by Commodore Electronics Limited

All rights reserved.

Copyright 1977 by Microsoft Corp.

All rights reserved.

Trademark Acknowledgements

Apple is a registered trademark of Apple Computer, Inc. **Apple II** and **Applesoft BASIC** are trademarks of Apple Computer, Inc.

Atari is a registered trademark of Atari, Inc. **Atari BASIC** is a trademark of Atari, Inc.

Centronics is a registered trademark of Data Computer Corporation.

CP/M is a registered trademark of Digital Research, Inc.

Diablo is a registered trademark of Xerox Corporation.

Epson is a registered trademark of Epson America, Inc. **Epson FX** is a trademark of Epson American, Inc.

IBM is a registered trademark of International Business Machines Corporation.

Jane is a trademark of Arktronics Corporation.

Kaypro is a registered trademark of Kaypro Computer Corporation.

Microsoft is a registered trademark of Microsoft Corporation.

Morrow is a registered trademark of Morrow Designs, Inc.

Osborne is a registered trademark of Osborne Computer Corporation.

Print Shop is a trademark of Broderbund Software, Inc.

Sanyo is a registered trademark of Sanyo Corporation.

Spinwriter is a registered trademark of NEC Information Systems, Inc.

TRS-80 is a registered trademark of Radio Shack, a division of TANDY Corporation.

TRS-80 Model II is a trademark of Radio Shack, a division of TANDY Corporation.

Wordstar is a registered trademark of MicroPro International Corporation.

Commodore MPS 1250™ and MPS 1250™ are trademarks of Commodore Electronics Limited

Table of Contents

Introduction	Overview of the Commodore MPS 1250 Printer	i-1
	Operating Modes	i-1
	Character Styles	i-2
	Using the MPS 1250	i-3
	About this Manual	i-4
	Before you Unpack your Printer	i-4
Chapter 1	SETUP	1-1
	Printer Location	1-1
	Unpacking and Assembly	1-2
	Installing the Ribbon	1-3
	Installing the Paper Guide	1-4
	Installing the Printer Cover	1-5
	Getting Acquainted	1-6
	Printer Components	1-6
	The Control Panel	1-7
	Control Panel Procedure	1-8
	Selecting and Loading Paper	1-9
	The Paper Select Lever	1-10
	Loading Single Sheets	1-10
	Installing the Tractor-Feed	1-12
	Loading Continuous Paper	1-14
	Bottom-Feeding Continuous Paper	1-16
	Paper Thickness	1-17
	The Printer Self-Test	1-18
	The Maintenance Self-Test	1-19
	Connecting Your Computer	1-20
	The Connecting Cable	1-20
	The Serial Port	1-21
	The Parallel Port	1-22
	Internal (DIP) Switches	1-24
Chapter 2	PRINTER BASICS (Using Commercial Software)	2-1
	Dot Matrix Printing	2-1
	ASCII Codes	2-3
	Hexadecimal Numbers	2-3
	PET ASCII Codes	2-4
	Which BASIC?	2-5

Commodore BASIC	2-5
Listing a Program	2-6
Secondary Addresses	2-7
Choosing a Character Set with the Secondary Address	2-8
Microsoft BASIC	2-9
IBM and Compatible Computing	2-9
Apple II Computers	2-10
TRS-80 Computers	2-12
CP/M Computers	2-12
Atari Computers	2-13
Listing A Program	2-13
Control Codes and Escape Sequences	2-14
Printer Installation	2-16
Choosing the Right Configuration	2-16
Software Printer Choices	2-17
Word Processors	2-19
Literal Characters	2-20
Spreadsheets, Databases, and Other Programs	2-20
Initializing the Printer	2-21
Chapter 3	
PRINTING TEXT	3-1
Near Letter Quality	3-2
Character Print Width	3-6
Pitch	3-6
Pica Pitch	3-6
Elite Pitch	3-7
Expanded Print	3-8
One-line Expanded Print	3-10
Compressed Print	3-11
Compressed Expanded Print	3-12
Proportional Print	3-14
Proportional Spacing	3-15
Justified Printing	3-17
Print Density	3-18
Emphasized Print	3-18
Doublestrike Print	3-19
Special Effects	3-20
Italics	3-21
Underlining	3-22
Overscoring	3-23
Reverse Print	3-24
Superscript	3-26
Subscript	3-26
Character Height	3-27
Vertically Enlarged Print	3-27

Chapter 4

The Master Commands	3-28
Master Reset	3-29
Master Pitch	3-30
Master Print Mode	3-31
Special Characters and Symbols	3-35
International Character Sets	3-35
Switching Configurations	3-38
Characters From All Characters Chart (IBM Mode)	3-40
PAGE FORMATTING	4-1
The End of the Line	4-1
Carriage Return	4-1
Line Feed	4-2
A Note About BASIC	4-4
Line Spacing	4-4
Fixed Line Spacing	4-4
1/6 Inch Line Spacing	4-5
1/8 Inch Line Spacing	4-5
7/72 Inch Line Spacing	4-6
Variable Line Spacing	4-7
Line Spacing of n/72 Inch	4-7
Line Spacing of n/144 Inch	4-9
Line Spacing of n/216 Inch	4-9
A Variable Line Spacing Example	4-11
Variable Line Feeds	4-14
Line Feed of n/216 Inch	4-14
Page Design	4-15
New Page (Form Feed)	4-15
Page Length	4-16
Set Page Length By Lines	4-16
Set Page Length By Inches	4-18
Margins	4-19
Top and Bottom Margins	4-19
Left Margin	4-22
Right Margin	4-23

Chapter 5

USING TABS	5-1
Horizontal Tabs (Htabs)	5-1
Move to Next Htab	5-1
Set Fixed Htabs	5-3
Variable Htabs	5-4
Relative Htab	5-5
Dot Tabs	5-7
Absolute Dot Tabs	5-7
Relative Dot Tabs	5-9

	Vertical Tabs (Vtabs)	5-10
	Move to Next Vtab	5-10
	Fixed Vtabs	5-11
	Variable Vtabs	5-12
	Relative Vtab	5-14
	Vtab Channels	5-15
	Define Vtab Channel	5-15
	Select Vtab Channel	5-16
Chapter 6	BLOCK AND DOT MODE GRAPHICS	6-1
	Block and Line Graphics	6-1
	Dot Graphics	6-4
	Graphic Commands	6-5
	Pin Numbers	6-5
	Graphics Density	6-7
	Sending Graphics Data	6-10
	Line Length: Number of Columns	6-10
	Putting It All Together	6-11
	Graphics for Special Applications	6-12
	Master Graphics Command	6-13
	Changing Graphic Density	6-14
	Nine-pin Graphics	6-16
	Designing Graphics	6-17
	Defining Shapes	6-17
	Calculated Shapes (Plotting)	6-19
Chapter 7	COMMODORE DOT GRAPHICS	7-1
	Bit Image Coding (Commodore Mode)	7-1
	Combining Bit Images to Form a Larger Image	7-3
	All Bit Pattern Printing	7-4
	Repeat Bit Image Printing	7-5
	Dot Address Determination	7-6
Chapter 8	CREATING CHARACTERS	8-1
	How the MPS 1200 Prints Characters	8-1
	Designing Your Own Characters	8-2
	Copying Standard Characters	8-4
	Saving Character Designs in the MPS 1200's Memory	8-4
	Attribute Byte	8-5
	Data Bytes	8-7
	Printing Defined Characters	8-11
	Special Effects	8-13
Chapter 9	ODDS AND ENDS	9-1
	Local Character Set Selection	9-1

	Quote Mode	9-2
	Buffer Commands	9-3
	Delete	9-3
	Cancel	9-4
	Master Reset	9-5
	Backspace	9-5
	Unidirectional Print	9-6
	Continuous Unidirectional Print	9-7
	One-Line Unidirectional Print	9-8
	Slashed Zero	9-9
	Paper Out Sensor	9-10
	The Eighth Bit	9-10
	Eighth Bit On	9-11
	Eighth Bit Off	9-11
	Cancel Eighth Bit Control	9-12
	Hex Dump	9-12
Appendix A	Maintenance	A-1
	Cleaning	A-1
	Ribbon Cartridge	A-3
	Print Head	A-3
Appendix B	MPS 1250 Character Sets	B-1
	Choosing an MPS 1250 Serial Character Set	B-2
	Choosing an MPS 1250 Parallel Character Set	B-3
	PETASCII Uppercase/Graphics Characters	B-4
	PETASCII Upper/Lowercase Characters	B-6
	ASCII Character Set	B-8
	Epson Standard Characters	B-10
	Epson Graphics Characters	B-12
	IBM Graphics—Character Set 1	B-14
	IBM Graphics—Character Set 2	B-16
	IBM Graphics—All Characters	B-18
	International Character Sets	B-20
	Hex Dump Control Code Abbreviations	B-21
Appendix C	Command Reference	C-1
	Printer Control Codes	C-2
	Escape Sequence Commands	C-4
Appendix D	The Internal (DIP) Switches And How To Set Them ..	D-1
	Serial Mode	D-1
	Parallel Mode	D-4
	Changing the Switch Settings	D-10

Appendix E	Technical Specifications	E-1
	Printing	E-1
	Characters	E-1
	Paper	E-2
	Printer	E-2
	Serial Interface	E-2
	Parallel Interface	E-2

Index

Quick Reference Card

Introduction

OVERVIEW OF THE COMMODORE MPS 1250 PRINTER

The Commodore MPS 1250 is a full-function dot-matrix printer that allows you to create printed copies of documents, programs, or illustrations you design with your computer. The documents you print can appear in several character styles, and the ability to use several bold and enhanced features adds variety to the printed material.

The MPS 1250 can function with other Commodore, or Epson®-compatible equipment connected with the serial port, or with any other equipment that can use a Centronics® parallel port for connection, such as the Commodore PC 10, other IBM®-compatible machines, and Amiga computers.

Operating Modes

The MPS 1250 is a very versatile printer. It can be connected to a variety of different computers either by its serial port or by its parallel port.

Figure i-1 Serial Connector

If your computer connects to a printer with a port that looks like this, then you must connect the MPS 1250 using the serial port.

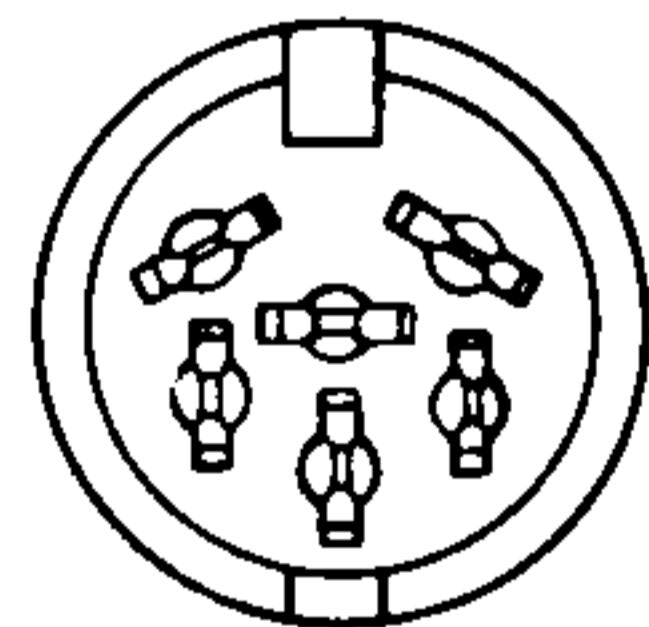
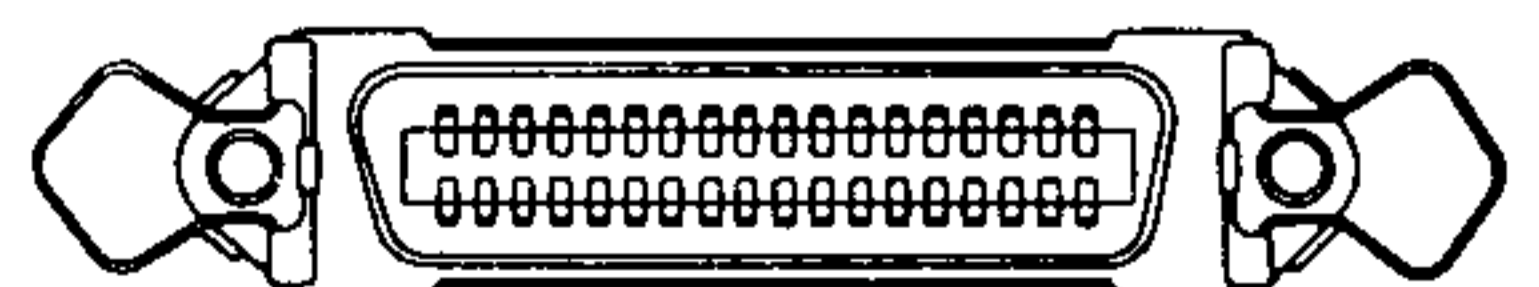


Figure i-2 Parallel Connector

If your computer connects to a printer with a port that looks like this, then you must connect the MPS 1250 using the parallel port.



Once you have connected your computer appropriately, you may then choose between several different modes of how you would

like your printer to operate. For instance, if you have a Commodore PC-10, you must hook up your computer to the printer using the parallel port. You can then choose between having the MPS 1250 behave like a Commodore printer, an IBM graphics printer or an Epson printer. See table i-1 for your choices.

Serial Connector	Parallel Connector
<ul style="list-style-type: none"> Commodore mode (ASCII or PETASCII) Epson mode (ASCII or PETASCII) 	<ul style="list-style-type: none"> IBM graphics mode Epson mode (3 possible configurations)

Table i-1. The MPS 1250 modes.
All modes include international characters

The printer is shipped from the factory ready to be used in Commodore mode, but any mode can be chosen before the printer is turned on by setting a DIP switch on the back of the printer. See Section 1, Setting Up Your MPS 1250, for details about changing the DIP switch setting if you want to use IBM or Epson modes.

Character Styles

Each character the MPS 1250 prints is made up of dots, arranged in a specific pattern stored in the printer's permanent memory. The MPS 1250 has four styles of characters, called fonts, which allow you flexibility in the appearance of the printout. The four fonts are:

- PETASCII — Uppercase/Graphics
Upper/Lowercase
- ASCII
- Epson FX — Standard
Graphics
- IBM Graphics — Set 1
Set 2
All Characters

Each font can be either NLQ or draft qualities.

Draft characters are legible, but are often considered inappropriate for final drafts because they are less dense and therefore more difficult to read than NLQ characters. NLQ characters are made up of many more dots than draft characters, so the characters appear more fully formed.

The full character sets are displayed in Appendix B.

Using the MPS 1250

Many applications programs, including word processors and spreadsheets, contain all the built-in printer instructions needed in order to print successfully. Certain programs, however, may not contain all of the print functions you require. For example, you may wish to use a raised numeral superscript to signify a footnote, but the program you have chosen doesn't support this function. Your MPS 1250, however, has the ability to print superscripts and many other enhancements, and a short BASIC program can tell the printer to use these special features.

For a preview of what your MPS 1250 can do, look at the following samples of a few of its typesyles and graphics.

NEAR LETTER QUALITY

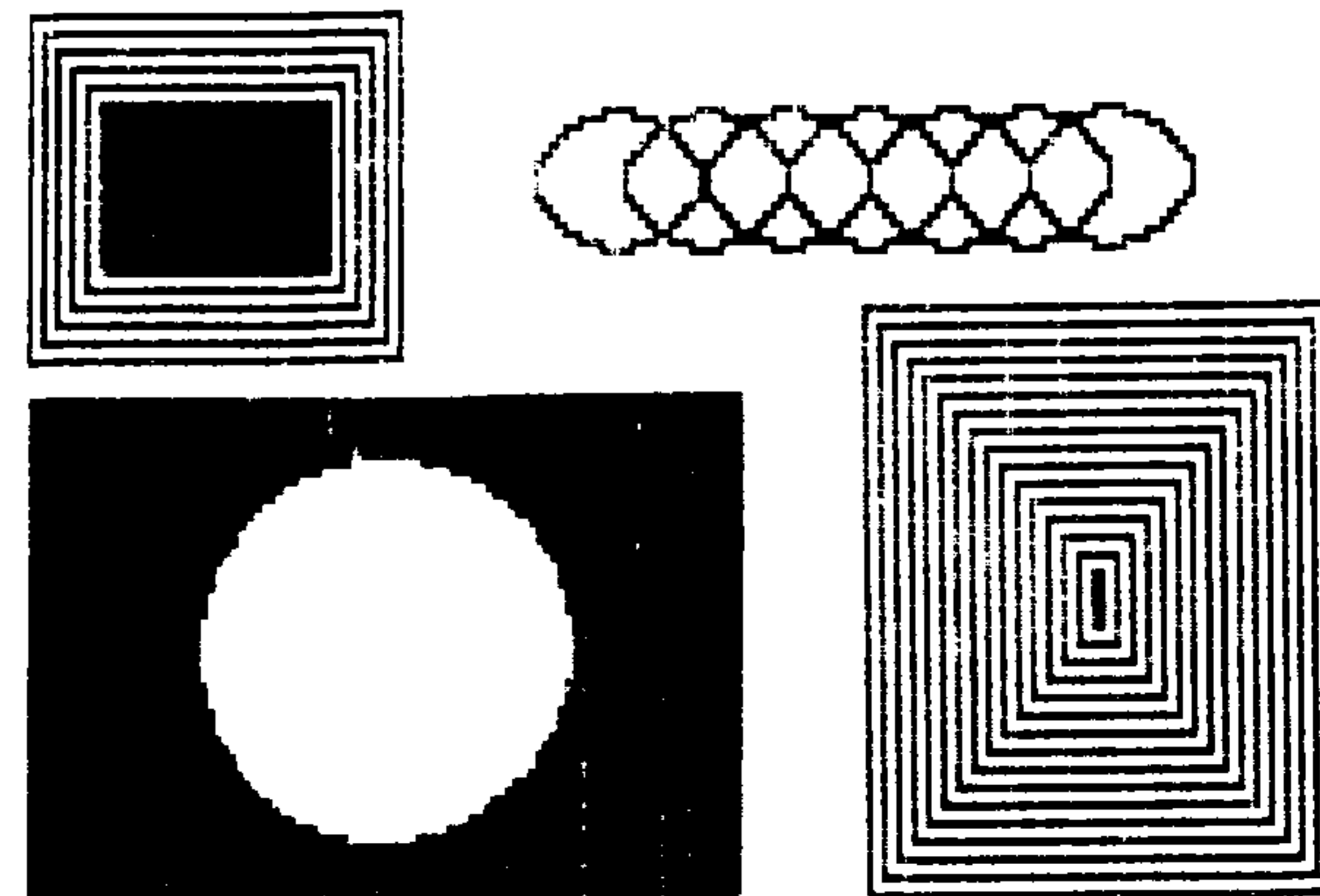
NLQ standard ABCDEFGHIJKLMnopqrstuvwxyz
 NLQ emphasized ABCDEFGHIJKLMnopqrstuvwxyz

DRAFT MODE

Pica ABCDEFGHIJKLMnopqrstuvwxyz
 Elite ABCDEFGHIJKLMnopqrstuvwxyz
 Condensed ABCDEFGHIJKLMnopqrstuvwxyz
 Underline ABDCDEFGHIJKLMnopqrstuvwxyz

Emphasized enlarged

~~REVERSE PRINTING~~
 REVERSE PRINTING OFF
 REVERSE AND STANDARD PRINTING



ABOUT THIS MANUAL

You can read as much or as little of this manual as you need. If you have used printers before and have a specific program that you want to use with the MPS 1250, a quick reading of the first two chapters may be all you need. If, on the other hand, you are new to computers and printers, you will find this manual easy to follow and the MPS 1250 easy to use.

The MPS 1250 User's Manual is written not just for the programmer, but also for the non-programmer who wants professional printing results.

In this manual, you'll find out all about the MPS 1250's many printing functions: how you can print in regular draft letters or in near letter quality characters, as well as expanded, compressed, emphasized and doublestrike print, italics, superscripts and subscripts. Additional features like reverse printing, double-height and international characters are also explained. Sample programs in both Commodore BASIC and Microsoft BASIC demonstrate most of these features.

You'll learn about designing your own characters and creating graphics on your MPS 1250, using your printer in either the Commodore-compatible mode, Epson FX mode, or IBM Graphics mode.

Before you unpack your printer

(No matter which type of user you are), you should begin by reading Chapter 1. It tells you how to unpack and set up your printer correctly.

When you have the MPS 1250 set up and connected to your computer, read Chapter 2. It explains important things you'll need to know to get the most out of your MPS 1250, such as how dot matrix printing works, how Commodore BASIC and/or Microsoft BASIC is used with your printer, and how your printer interacts with software.

- If you plan to use your printer just with store-bought software and have no interest in programming, you only need to read the parts relevant to software in Chapter 2, then you can skip ahead to Appendix A to learn about printer maintenance.

- If you plan to do your own programming or custom design graphics, you should read the entire book.

Chapters 3 through 9 explain about all the MPS 1250's features, with examples of control codes and escape sequences in programs you can type in and use right away. These programs demonstrate what each effect looks like and the proper syntax for the commands.

No matter what the level of your computer skills, you'll find the MPS 1250 printer to be a versatile high-quality printer that will suit your needs exactly.

Chapter 1

Setup

This chapter will explain how to set up your MPS 1250 printer. You'll see how to pick a suitable location for your printer and unpack its components. You'll also learn how to install the ribbon, load paper and connect the printer to your computer.

PRINTER LOCATION

Before you set up your printer, you should think about the best location for it. Near your computer is a pretty good start, but there are a few other considerations you should take into account:

- Choose a flat, sturdy surface with enough room for the paper to be fed freely into and flow out of the printer. If you use continuous fanfold paper, you'll need enough room behind the printer (or underneath with bottom-feeding) for a stack of paper.
- Position the printer so its power cord and connection to the computer won't interfere with the paper flow.
- If you're putting the printer on a wood surface, place a protective mat between the printer and the surface to prevent possible damage to the surface.
- Avoid areas subject to excessive heat (such as direct sunlight), humidity, dust or grease.
- Connect the printer to a steady source of electricity. Motors and many appliances (like copiers, heaters, refrigerators and air conditioners) cause fluctuations in the power line. You may want to use a surge protector which guards against power fluctuations. There are many good ones available.

UNPACKING AND ASSEMBLY

When you unpack your MPS 1250, save the packing materials. They are specially designed to protect the printer, and will be useful in the event you need to ship it.

In the box, you should find the items shown below (in addition to this manual). If anything is missing or appears damaged, contact your dealer immediately.

Make sure you take the time to fill out and send the warranty card now, since it registers you as an MPS 1250 owner and validates your warranty.

Make sure that the power switch on the left hand side of the printer is set to OFF.

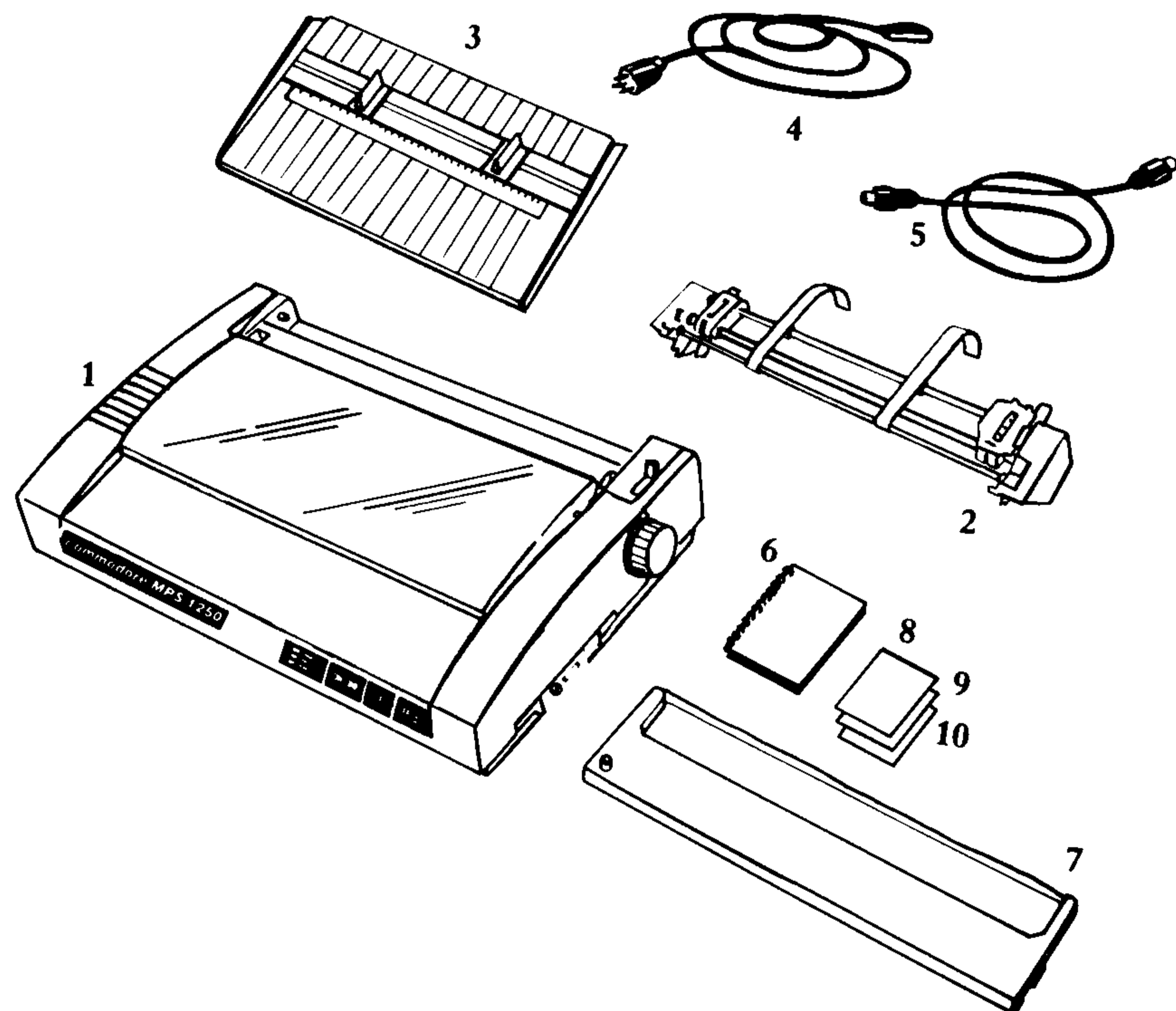


Figure 1-1. Inside the carton, you should find: 1) Printer, 2) tractor-feed unit, 3) paper guide, 4) power cord, 5) serial cable, 6) User's Manual, 7) ribbon cartridge, 8) warranty card, 9) service center list, 10) Read This First.

Installing the Ribbon

The printer ribbon is a black plastic cartridge, that will be easy to install. Take the printer ribbon out of its packing materials, and open the printer cover. Holding the cartridge so the round knob is facing up and on the left side, place the cartridge in the printer as shown in Figure 1-2. Gently push the cartridge down until it snaps into place.

Slide the ribbon into place between the print head and the metal ribbon guide. (To make this easier, the print head should be positioned near the center of the printer.) Remove any slack in the ribbon by turning the small plastic knob counterclockwise, then close the printer cover.

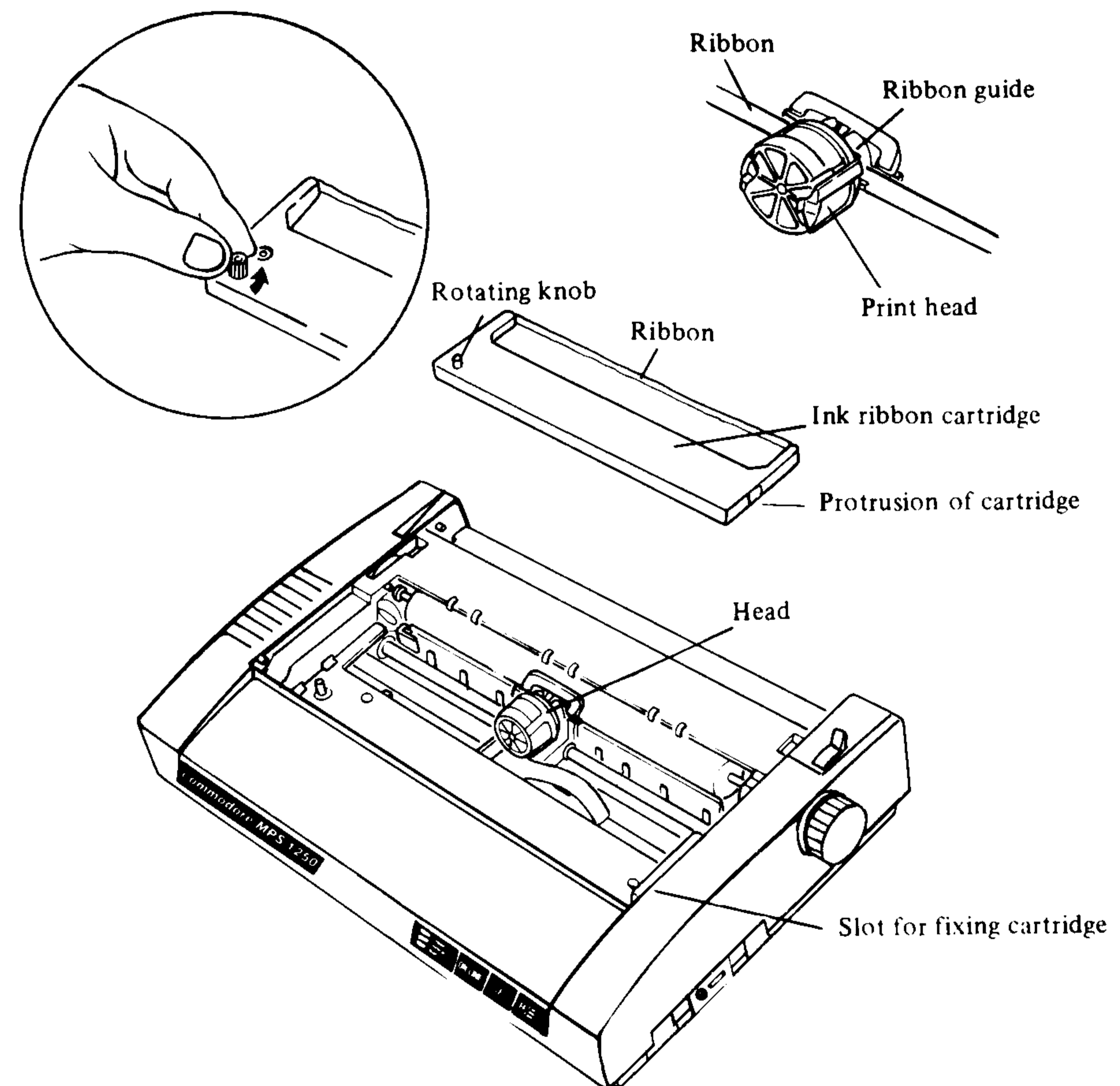


Figure 1-2. Installing the ribbon cartridge.

CAUTION: When replacing a ribbon cartridge, turn the power off and slide the print head to the right edge before removing the old ribbon, to avoid damaging the print head.

Installing the Paper Guide

The paper guide is a plastic incline with two sliding pieces on the front. The guide fits into a groove toward the back of the printer and is used to feed sheets of paper into the printer. The sliding pieces guide the paper into the platen and keep it from becoming crooked as it advances.

To install the paper guide, slide it into the lip at the rear of the printer at a 45 degree angle (see Figure 1-3). Once it fits securely into the lip, let it rest on the knobs on the back of the printer.

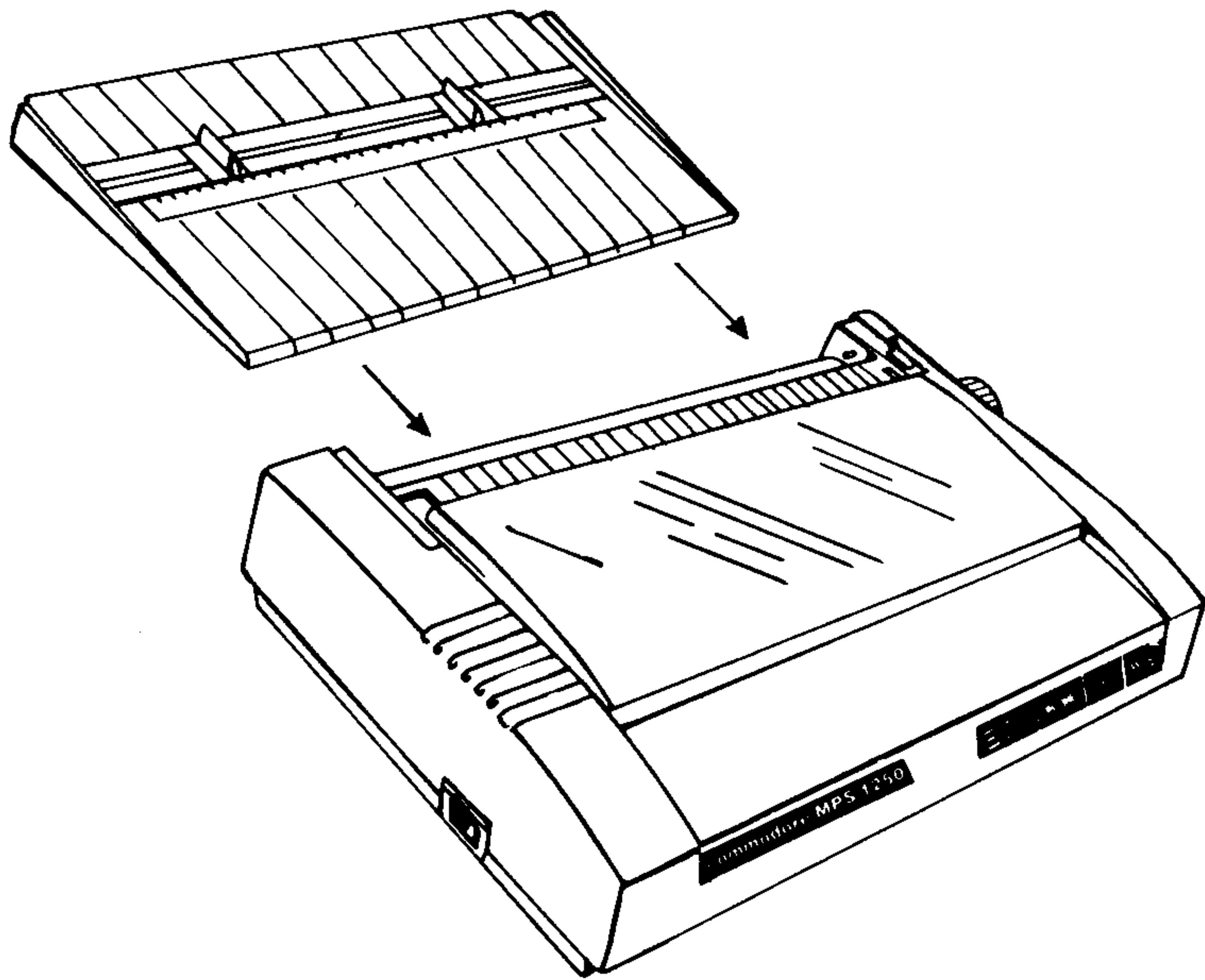


Figure 1-3. Installing the paper guide.

Installing the Printer Cover

With the ribbon installed, you can replace the plastic cover on the printer. Hold the cover at a 45 degree angle (see Figure 1-4) and insert the two slots onto the tabs in the printer case. Now press down on the back edge of the cover until it snaps into place.

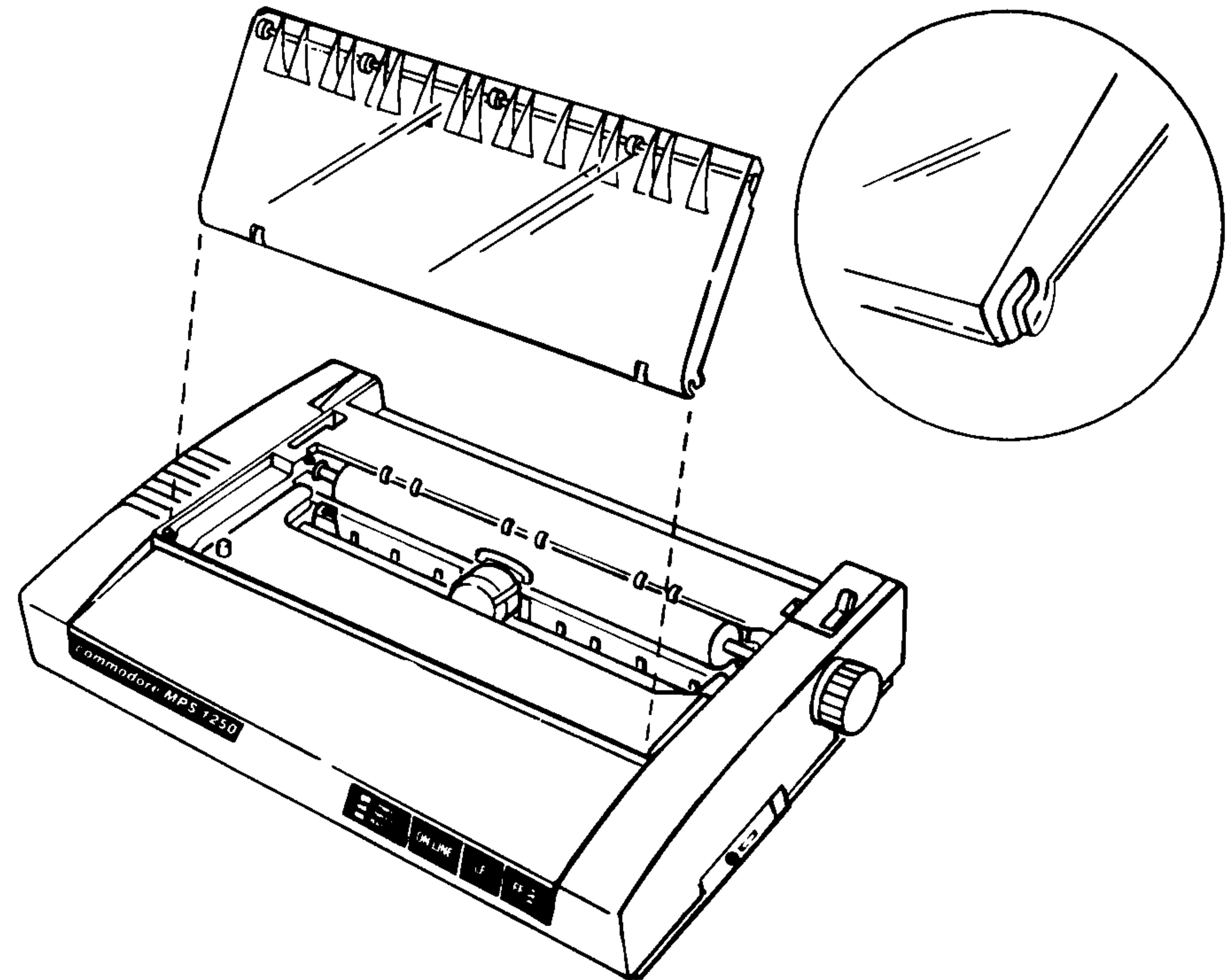


Figure 1-4. Installing the printer cover.

The printer cover has three basic positions: completely closed (during printer operation), completely open (to access the inside of the printer) and halfway (for removing the cover from the printer).

GETTING ACQUAINTED

Now that we've gotten this far, it's time to take a look at the features and functions of some of the components of the MPS 1250. These are shown below.

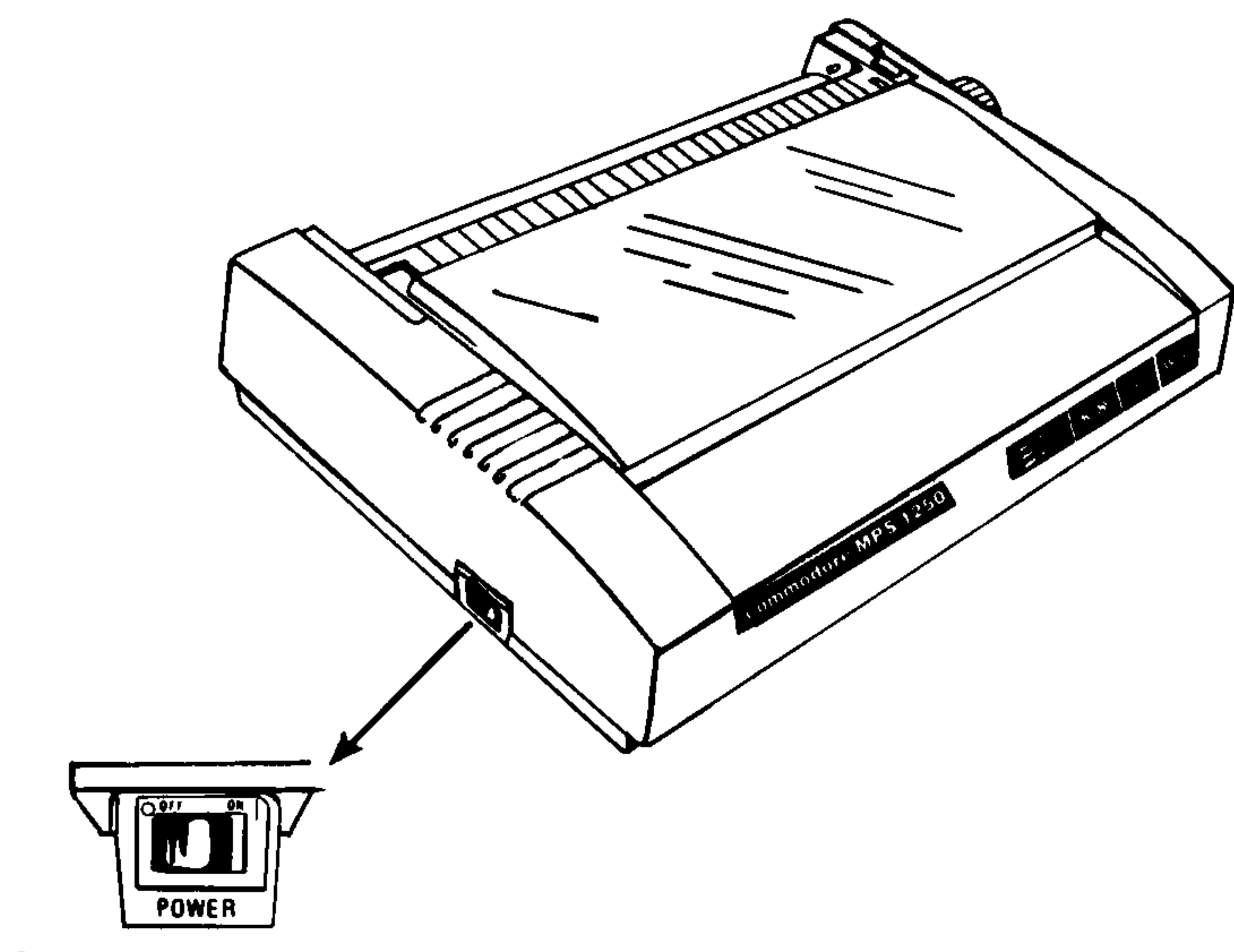


Figure 1-5. MPS 1250 printer components and controls.

Printer Components

Power switch

This switch, located on the lower left side near the front, is used to turn the printer on and off.

Platen

The platen is the hard rubber cylinder that carries the paper to the print head.

Paper feed knob

The paper feed knob, located on the right side of the printer, turns the platen. You can manually advance the paper by turning this knob.

Paper select lever

This lever adjusts the pressure on the platen, according to the type of paper being used. This lever is located on the top right of the printer, near the back.

The paper select lever has two positions, front and back.

The front position is used for single sheets or continuous paper without the tractor-feed. The back position is used when you have installed the tractor-feed.

Paper thickness lever

The paper thickness lever is used to adjust the distance between the print head and the platen to accommodate forms with up to three carbonless copies. This lever is located in front of the platen (under the printer cover) on the right.

Printer cover

The printer cover serves many functions—as a dust cover, noise buffer, paper bail and paper cutter. It protects the MPS 1250 from dust while reducing the sound level during printing. On the inside, the cover has a bar with three rollers, which holds the paper against the platen. And a special beveled edge serves as a paper cutter for tearing off sheets.

Paper guide

The adjustable sliders on the paper guide let you set the width for the paper to be fed into the printer. This will keep the paper flow going smoothly, without allowing the paper to shift or be fed unevenly.

The Control Panel

The control panel is located on the right front of the MPS 1250. It contains four rectangular blocks, one panel with three status lights and three touch switches.



Figure 1-6: The MPS 1250 control panel.

Power light

The power light glows green when the printer is on.

Ready light

The ready light glows green when the printer is ready to accept data from the computer. During normal printing, it flickers as the printer tells the computer to start and stop sending data. This flicker is normal.

Paper out light

The paper out light flashes red when the printer is out of paper.

On-line Switch

The on-line switch determines whether the printer is controlled by the computer and is able to receive data, or is controlled by the other switches on the printer. When the ready light is green, the printer is "on-line" and the computer controls the printer. When this light is off, the printer is "off-line" and the other control panel switches can be used while information from the computer is suspended.

LF (Line Feed) Switch

This switch advances the paper one line each time it is pressed when the computer is off-line. Continuously holding down the switch allows you to advance the paper as far as you like.

FF (Form Feed) Switch

When the printer is off-line, pressing the FF switch advances the paper to the top of the next page.

The control panel switches are also important because they play a key role in turning on some of the MPS 1250's special features like the printer and maintenance self-tests and hex dump, described later in this manual.

CONTROL PANEL PROCEDURE

The control panel can enable you to print in many different type styles (known as fonts).

To enter font select mode, press and hold down the FF switch on the control panel and press the On-line switch (while still holding down the FF switch).

The Ready light starts flashing, and the different fonts may now be selected. To access each of the fonts shown below, press the On-line switch the appropriate number of times. For example, if you want to print in italics, press the On-line switch twice. Each time you press the On-line switch, the Paper Out light flashes in red.

FONT	SELECT (# On-line presses)
PICA	0
NEAR LETTER QUALITY (NLQ)	1
ITALIC	2
EMPHASIZED	3
COMPRESSED	4

When you've selected the desired font, press and release the FF switch. Then press the LF switch, which takes the MPS 1250 out of font select mode and back to normal printer operation, with the Ready light glowing green.

You can select combinations of fonts in this manner. For instance, you can select emphasized italic by entering one font, and then repeat the procedure to enter a second style (or even third or fourth). To return to "normal" printing, either reselect PICA by entering font select mode and exiting without pressing On-line (Ø On-line presses), or turn the printer off then on again.

You can also access the NLQ font without entering font select mode, by pressing and holding the LF switch and then pressing and holding the On-line switch. When you release them, the printer prints in NLQ style. To print draft characters again, just repeat this procedure.

SELECTING AND LOADING PAPER

You can use either single sheets or continuous fan-fold paper with your MPS 1250. Fan-fold paper, also known as pin-feed or continuous paper, is probably when you think of as "computer paper." It comes in sheafs of continuous perforated sheets with holes punched along the side. It is available plain or with lines or stripes in various colors.

Continuous letterheads, pre-printed forms, labels and envelopes can also be used with the MPS 1250. The MPS 1250 can handle any of these, up to ten inches in width.

The Paper Select Lever

The paper select lever (shown in Figure 1-7) sets the type of paper feed the printer uses. In the forward position, it uses **friction feed**. Friction feed increases the pressure on the platen so the paper is automatically fed by friction as the platen turns. This is used with single sheets, and when the tractor-feed is not in place.

The back position (labeled 'PIN') activates the tractor feed. It is used with continuous paper when the tractor-feed is installed. This setting releases the pressure on the platen and allows the paper to be fed by the pins on the sprockets on each side of the paper. The back position can also be used to allow adjustment or alignment of the paper, since it releases the pressure on the platen that's holding down the paper.

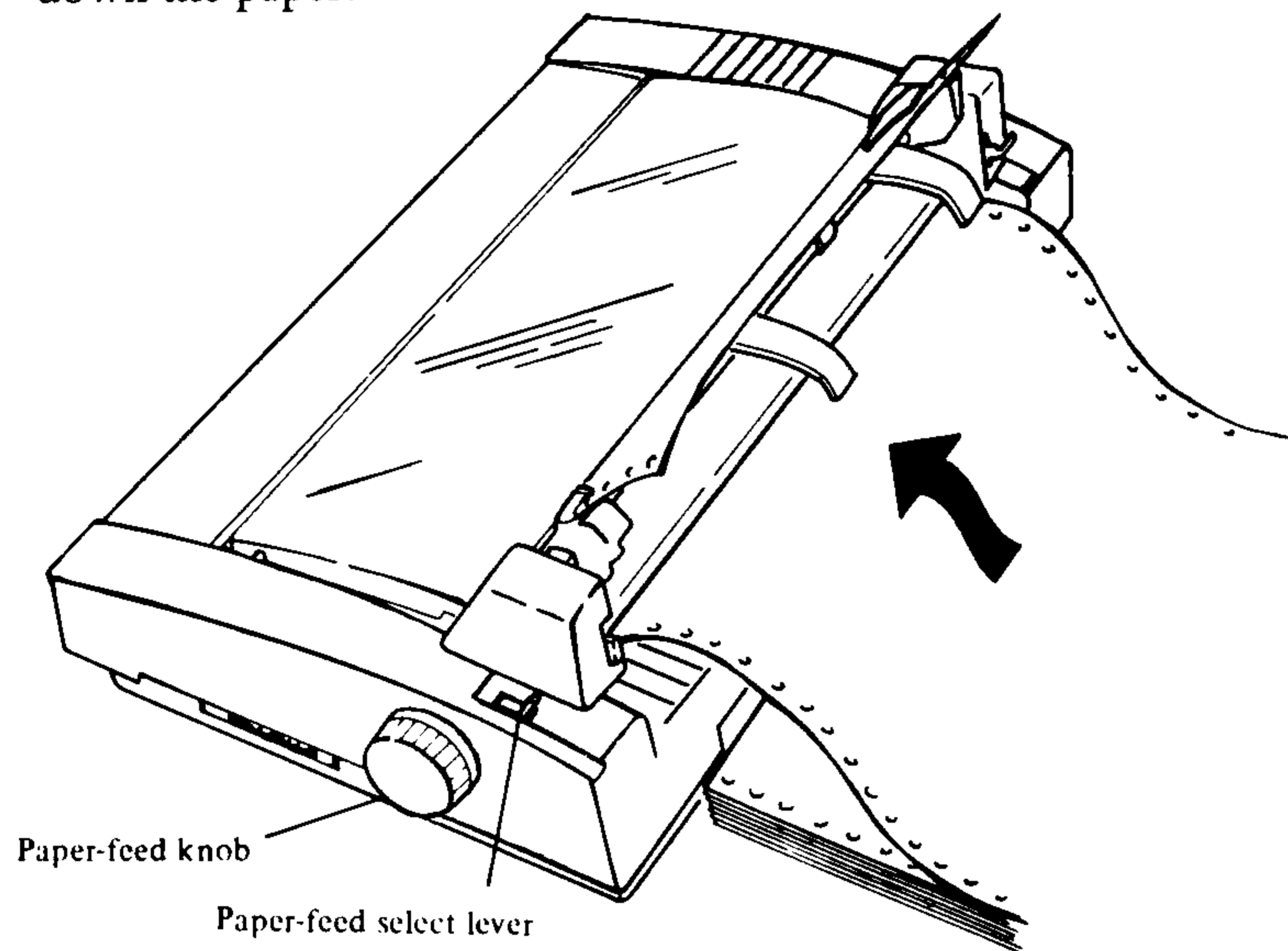


Figure 1-7. The paper select level has two positions for loading different types of paper.

Loading Single Sheets

This is pretty similar to loading paper into a typewriter; maybe it's a little easier due to the paper guide on the back of the printer. Here's how:

1. Move the paper select lever forward.

2. Insert a sheet of paper into the slot behind the platen. The paper should slide in about one inch.

If you have the paper guide installed, set the two sliding guides to where you want to position the paper and the width of the paper; slide the paper in under the platen via the guide.

3. Turn the paper feed knob.
4. If necessary, make any adjustments by setting the paper select switch back, repositioning the paper, and moving the paper select switch forward again.

You can also load paper using the LF switch:

1. If you haven't already done so, plug in the power cord.
2. Turn the power switch on. The Power light should come on, and the Paper Out light should flash. The Ready light will be out, meaning the printer is off-line and able to respond to control panel commands.
3. Move the paper select level forward and insert a sheet of paper into the slot, via the paper guide if you've installed it.
4. Press and hold the LF switch until the paper has been fed to the position you want. Or press the FF switch once, which functions as an automatic sheet load, advancing the paper to about one inch above the first print line.
5. If necessary, make any adjustments by setting the paper select switch back, repositioning the paper, and moving the paper select switch forward again.
6. Press the On-line switch; the Paper Out light goes off and the Ready light turns on, signifying that the printer is now on-line and ready to go.

Installing the Tractor-Feed

The tractor-feed unit is used with continuous paper, labels or forms, and is quite easy to install. It uses two **tractors or sprockets**, which can slide back and forth to adjust to paper width. These can be locked into position by flipping the **locking levers** on the back of the tractors. The holes along the edges on each side of the paper fit into pins on these tractors to feed the paper straight and evenly through the printer.

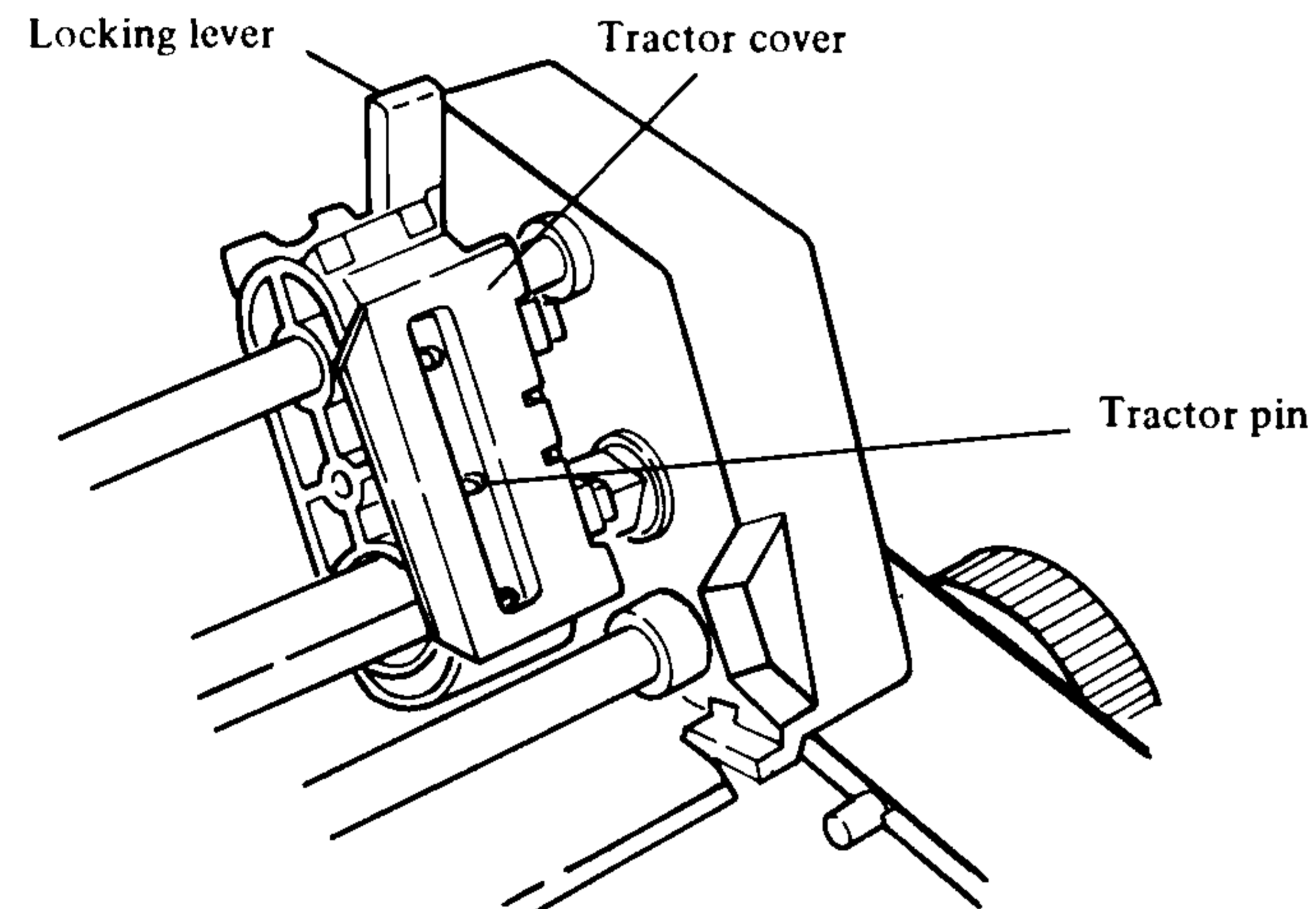


Figure 1-8. Components of the tractor-feed mechanism.

The flip-up covers on the tractor clamp the paper into place on the pins. With each line feed, the pins move and pull the paper around the platen and through the printer. **Paper supports**, which can be moved left or right, guide the paper out of the tractor feed.

Here's how to install the tractor-feed:

1. Remove the printer cover and paper guide. You can just leave the cover in the up position if you like.

2. Push in the two release levers on the back of each end of the tractor-feed, and place the plastic hooks on the bottom of the tractor into the tabs on the printer. The casing of the printer is shaped to accommodate the tractor-feed, which makes it easy to place in the correct position.
3. When you've set the tractor-feed in position on the printer, you can now let go of the release levers to lock the unit into place.
4. Install the paper supports and space them evenly on the tractor unit. If you like you can replace the printer cover.

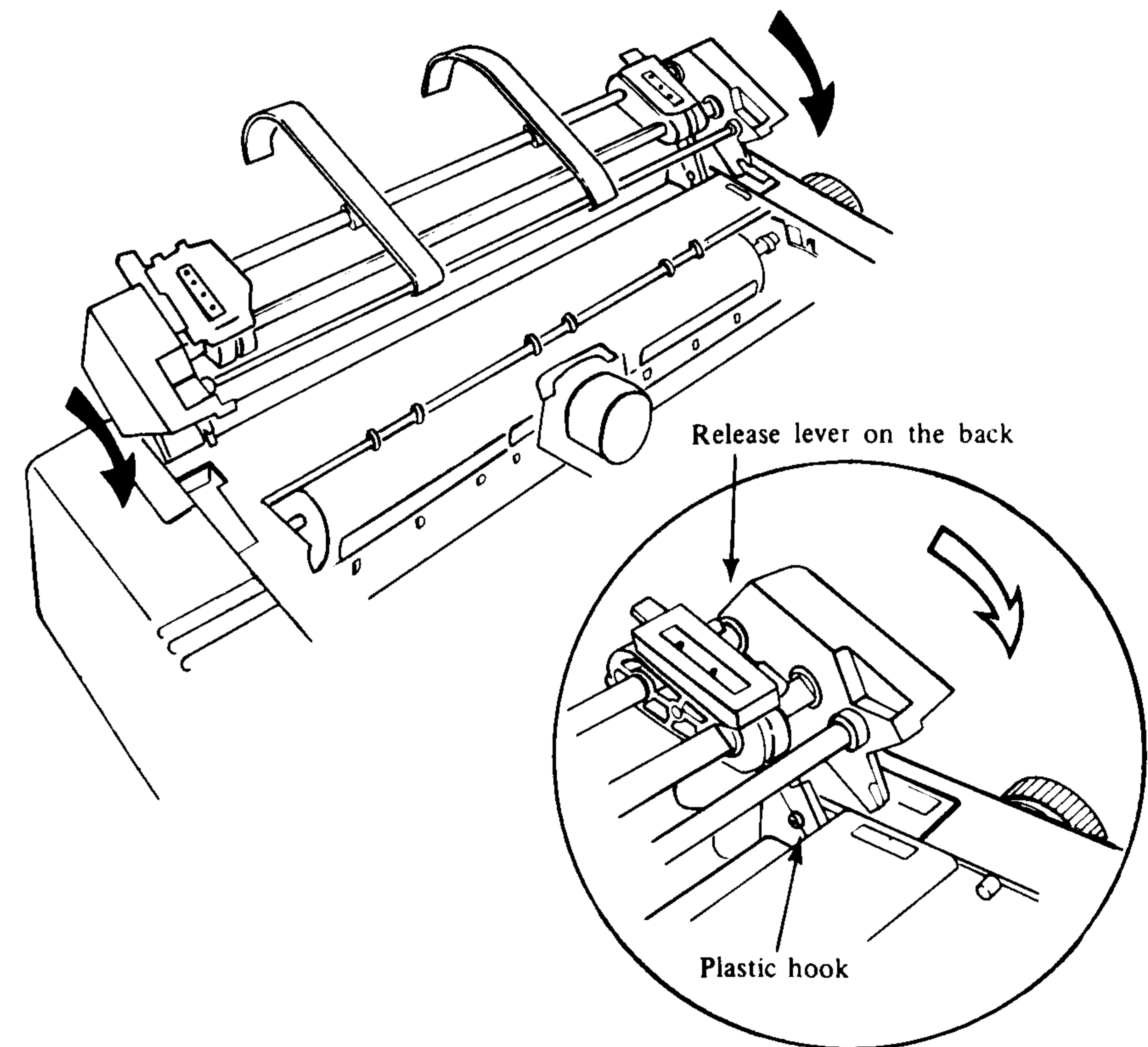


Figure 1-9. Installing the tractor-feed unit.

Loading Continuous Paper

Continuous paper can be loaded through the rear of the printer or through the bottom of the printer.

Here's how to load continuous paper from the rear of the printer just below the platen:

1. Remove or lean the printer cover forward.
2. Turn the power switch off and slide the print head to the left.
3. Move the paper select lever forward and open the tractor covers.
4. Flip the locking levers forward and move the tractors to the approximate positions for the paper width. Adjust the paper supports so they are evenly spaced.
5. Place a stack of paper on a level surface behind the printer. Bring the top sheet of the paper forward and insert it into the platen, as you would insert a single sheet.
6. Turn the paper knob until the paper advances past the metal ribbon guide. Move the paper release lever back to the PIN position (allowing the paper to be moved freely).
7. Fit the punched holes on the paper onto the pins on the tractors, moving the tractors to accommodate the width of the paper. Close the tractor covers to hold the paper in the pins.
8. Turn the paper feed knob until the perforation of the paper is lined up with the top of the ribbon guide. This will assure that you always start printing at the top of the next page.

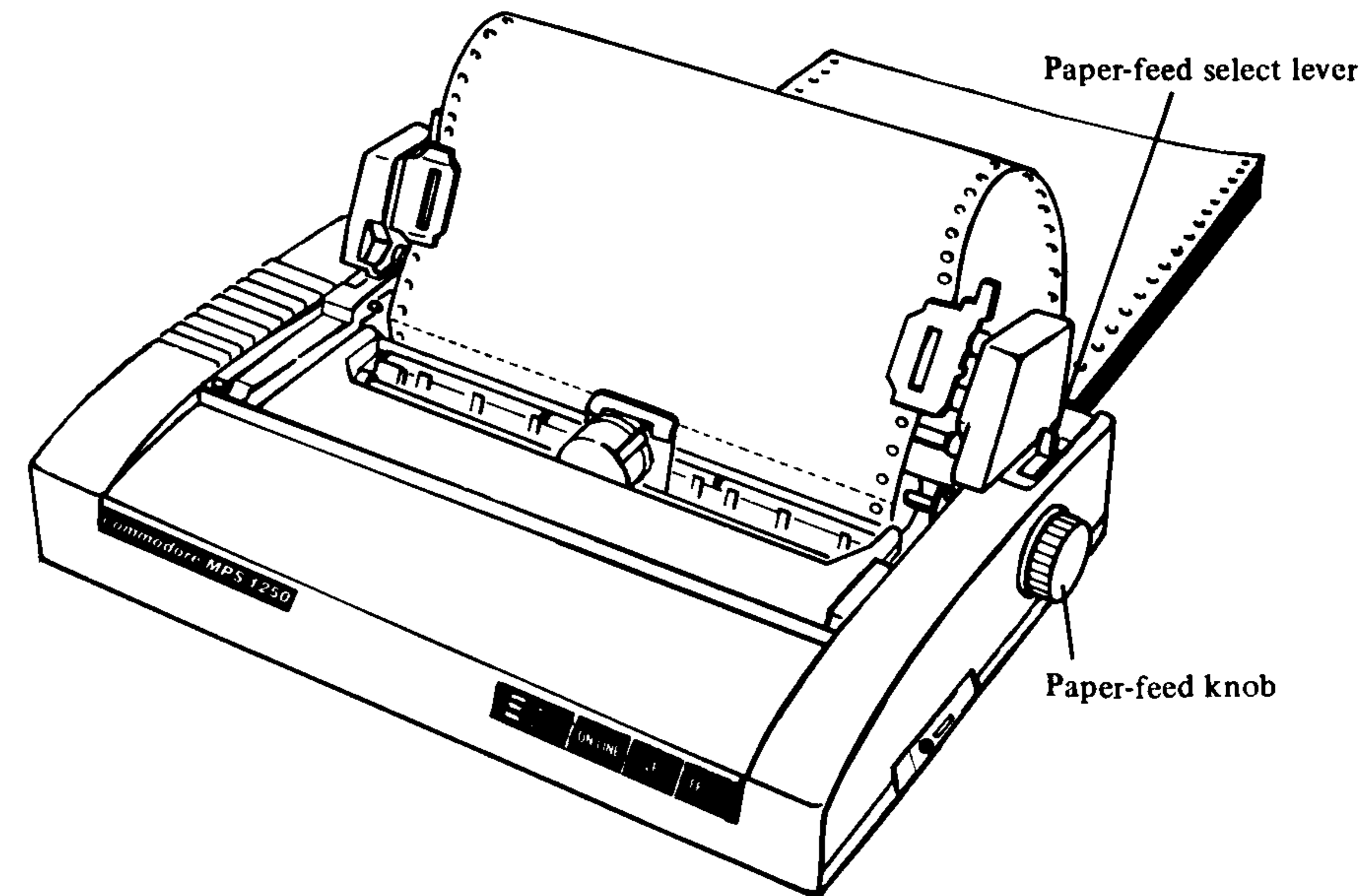


Figure 1-10. Align the top of the paper and the print head.

9. Adjust the paper left or right by sliding the tractor. When the paper is positioned (usually the left edge is aligned with the print head), lock the tractors in place by flipping back the locking levers on the back of the tractor unit.
10. Replace the printer cover and turn on the power switch. You're ready to start printing.

The placement of the feed paper stack and the output pile is important for smooth feeding and printer operation. The feed paper stack must be placed either behind or below the back of the printer so the paper can flow smoothly into the printer without interfering with what comes out.

Wherever you place it, make sure the paper can feed into the printer in a straight line. If the stack is off-center, it may cause the paper to misfeed. A typical setup for paper feeding is shown in Figure 1-11.

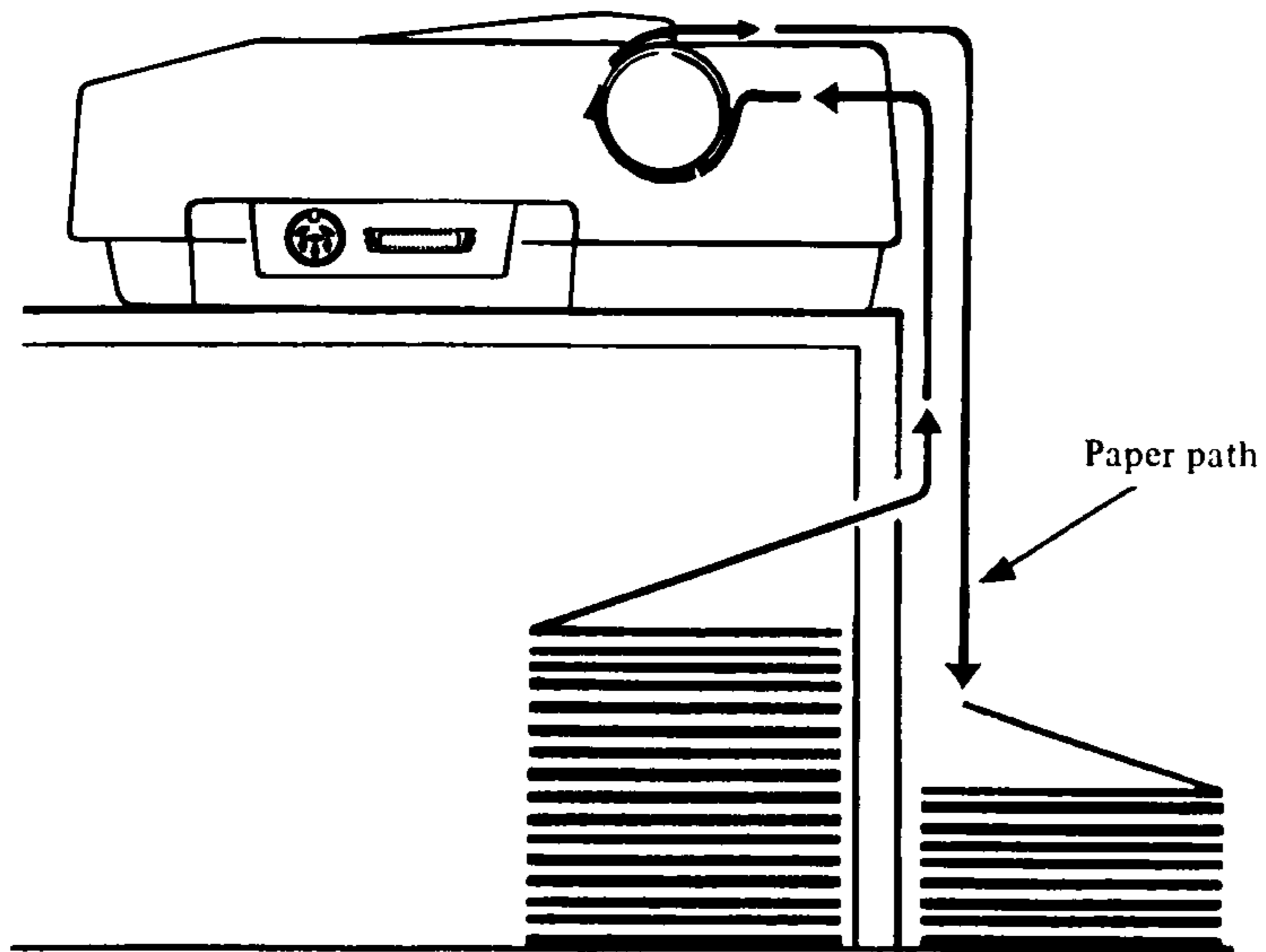


Figure 1-11. A typical setup for printing with continuous paper.

BOTTOM-FEEDING CONTINUOUS PAPER

Bottom-feeding continuous paper is useful when you have a printer stand which allows you to place a stack of paper underneath. However, it's important that the paper flows freely to avoid a misfeed.

Loading bottom-feed paper is very similar to loading paper into the rear of the printer. Follow all the steps described above, but load the paper into the **bottom** slot of the printer instead of the rear. When you turn the paper feed knob, the paper flows from underneath the platen instead of through the back. Then you can place your output pile directly behind the printer.

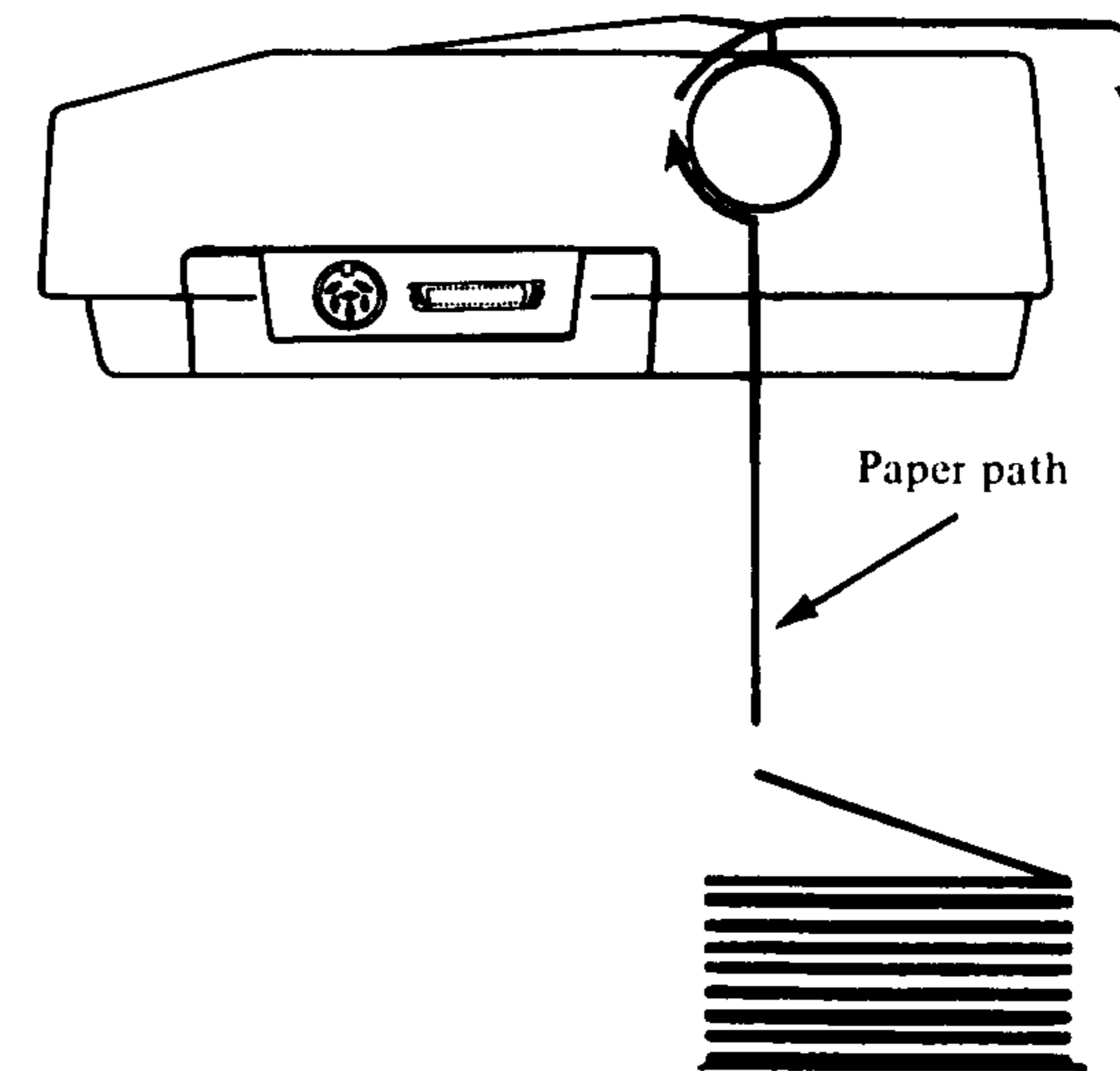


Figure 1-12. Bottom-feed paper can be used with certain printer stands.

Paper Thickness

The MPS 1250 can print up to one original and two duplicate copies using carbonless paper. To print multiple copies, the print head must be adjusted using the **paper thickness lever**, located just in front of the platen on the right side (see Figure 1-13).

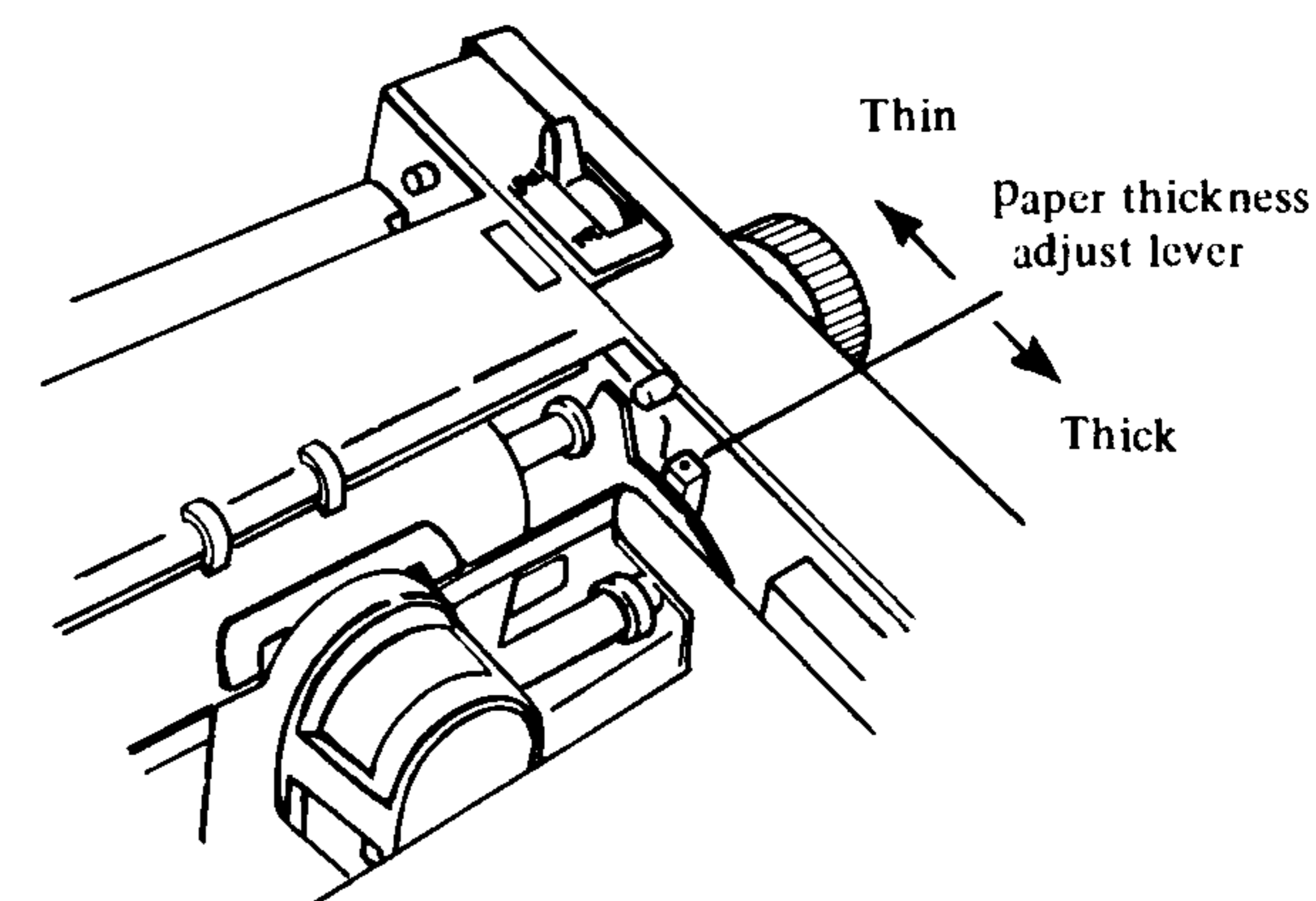


Figure 1-13. The paper thickness lever.

CONNECTING YOUR COMPUTER

The Connecting Cable

Your MPS 1250 and computer communicate by means of a cable which is usually sold separately. The type of cable, serial or parallel, that is used depends on your computer.

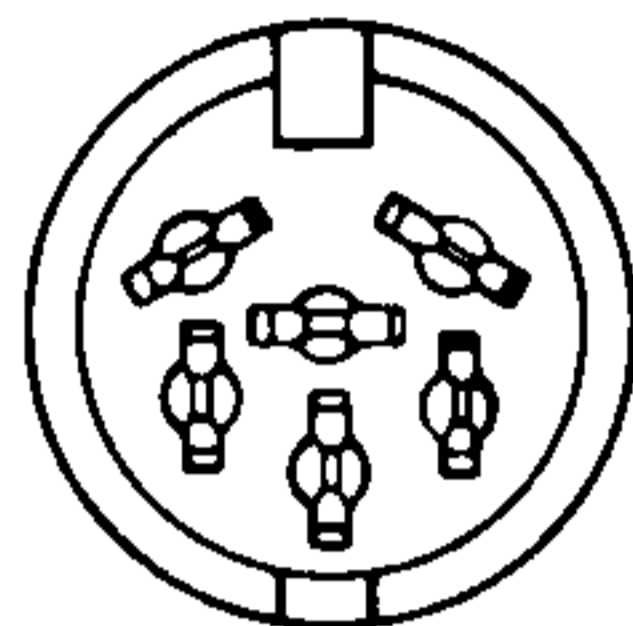


Figure 1-15. A Serial Connector.

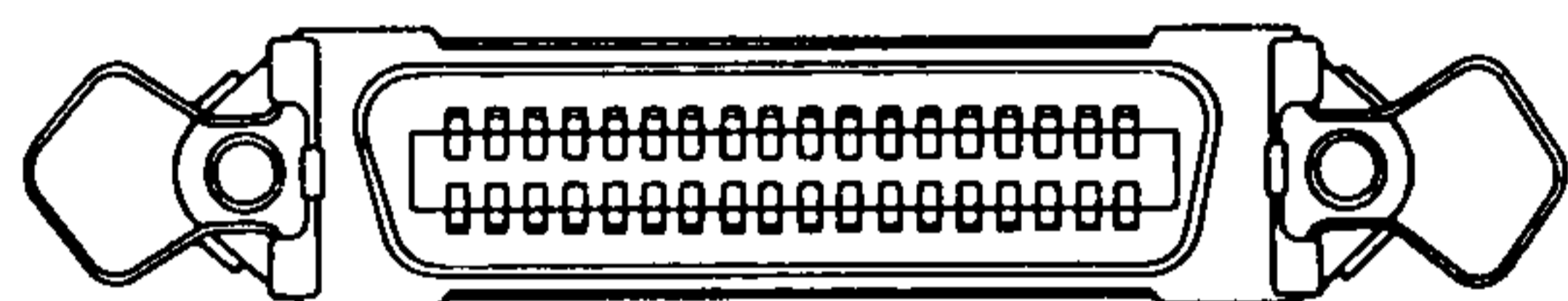


Figure 1-16. A Parallel Connector.

If you are not sure which type to use, check your computer manual. This cable connects from one of the ports on the right side of the printer to the port on your computer (usually on the back of a Commodore computer).

If you need a parallel cable, the cable you need is called a Centronics parallel printer cable or a parallel printer interface cable.

How you connect your computer to the MPS 1250 determines what printer modes are available to you. Table 1-1 shows you what printer modes you may use, depending on your connecting cable.

Table 1.1

Serial Connector	Parallel Connector
• Commodore mode	• IBM graphics mode
• Epson FX mode	• Epson FX mode

This cable connects from one of the two ports on the right side of the printer to the serial or printer port on your computer or disk drive (usually on the back of a Commodore computer drive).

WARNING: Before connecting any cables, make sure the power to both the computer and printer is OFF, to avoid damaging either unit.

The Serial Port

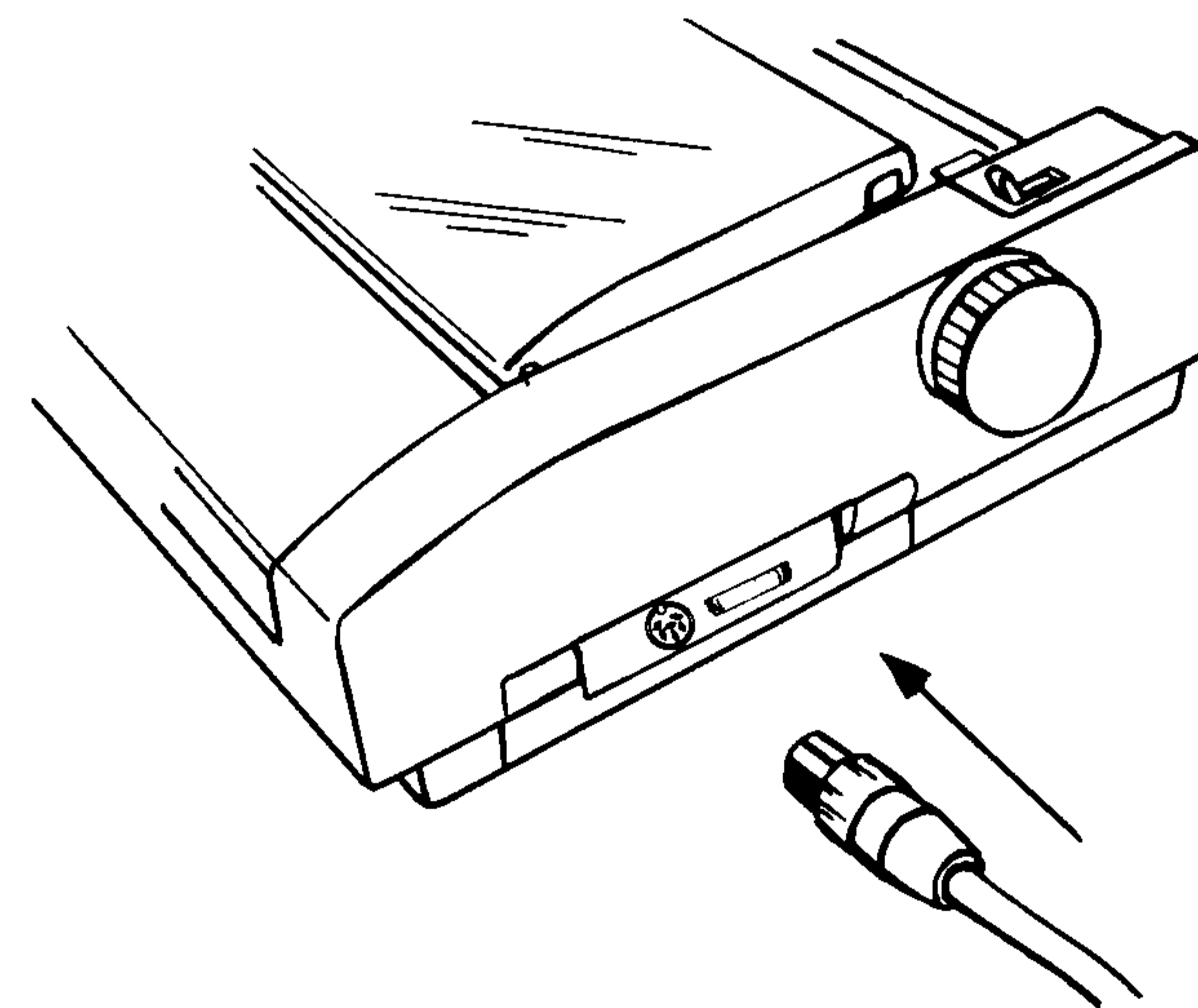


Figure 1-17 shows the serial connection with the cable on the right side of your printer.

When connecting the serial cable to the serial port on the printer, the groove on the silver part of the cable must be at the top, or the pins on the cable will not fit into the holes in the serial port. The cable end should slide in without being forced. Technical details about the serial connector may be found in Appendix E.

The Parallel Port

Connect the MPS 1250 to your computer using the parallel port to take advantage of the printer's IBM graphics and Epson modes.

NOTE: The parallel cable that you will need to connect this printer does not come with the printer. It is sold separately because each computer uses a slightly different cable; you will need one made specifically for your computer. The cable you need is called a **centronics parallel printer cable** or a **parallel printer interface cable**.

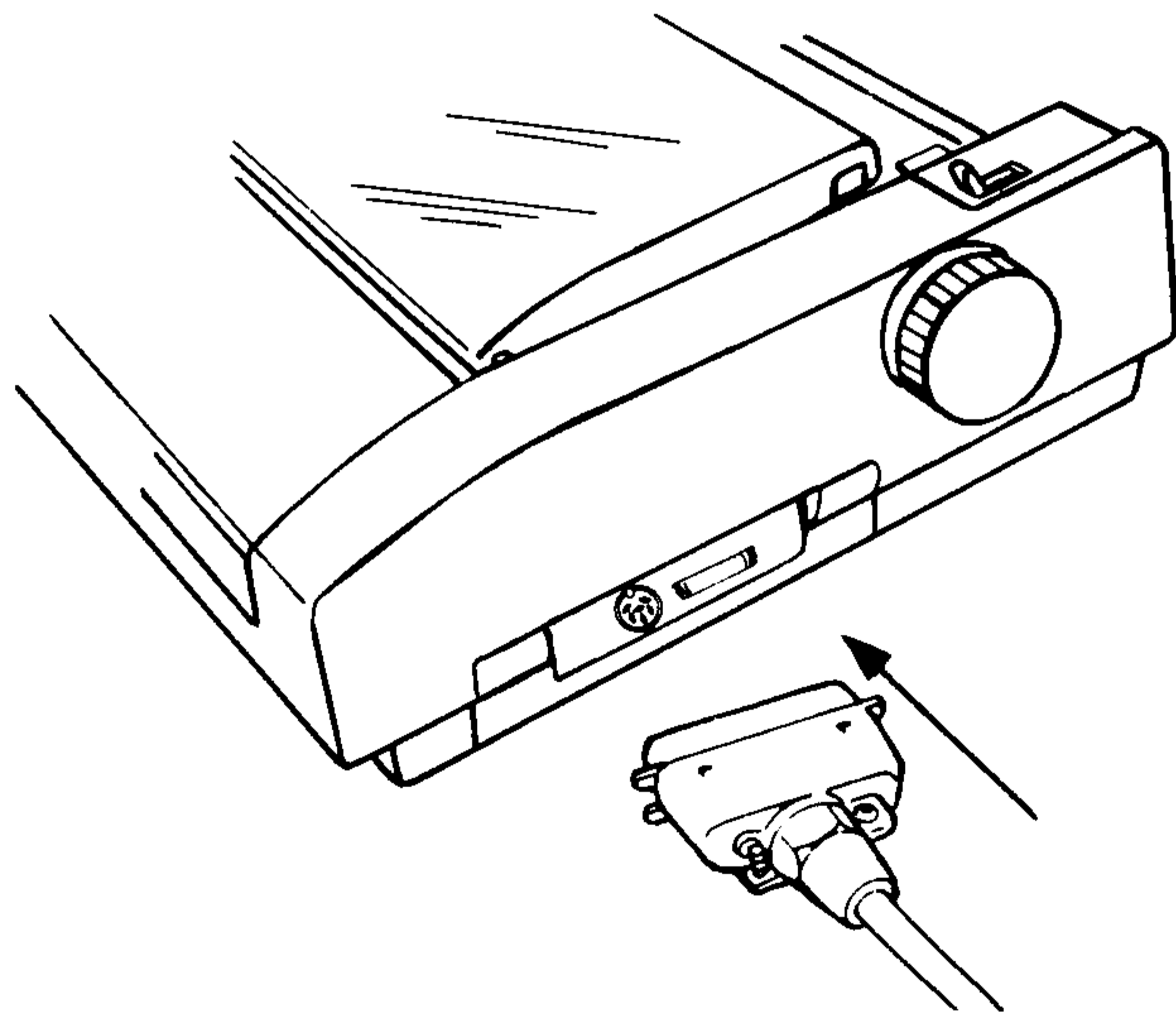


Figure 1-18 shows the parallel connection with the cable on the right side of your printer.

CONNECTING THE PARALLEL CABLE

1) Make sure that the power to both the computer and printer is OFF.

CAUTION:

- When the MPS 1250's serial port is selected, any cable connected to its parallel port **MUST** be disconnected.
- When the MPS 1250's parallel port is selected, any cable connected to its serial port **MUST** be disconnected.

2) As delivered from the factory, the MPS 1250 is in serial mode. To perform in parallel mode DIP switch 1 must be changed from OFF to ON. See Appendix D for further information.

3) Grasp the printer's end of the parallel connector cable. It is tapered so that you can only connect the cable right-side-up.

4) Move the small wire clamps out of the way and fit the cable connector into the port on the MPS 1250. The two should fit together with just a slight push. (If they do not, turn the cable connector over and try again.)

5) With the cable connected, press the wire clamps into the notches. These clips ensure that the cable will not be loosened or unplugged accidentally.

6) Now, connect the other end of the printer cable to your computer. Connecting the cable at the computer is different for each computer. The connection may be similar to the one at the printer, or it may be inside the computer. Follow the instructions for a parallel printer connection supplied with your computer.

For technical details about the parallel connector, see Appendix E.

INTERNAL (DIP) SWITCHES

The MPS 1250 contains several internal switches that you can set to determine how your printer functions. They are set at the factory to the most frequently-used settings, but you may want to change them to “customize” your MPS 1250 to your own needs.

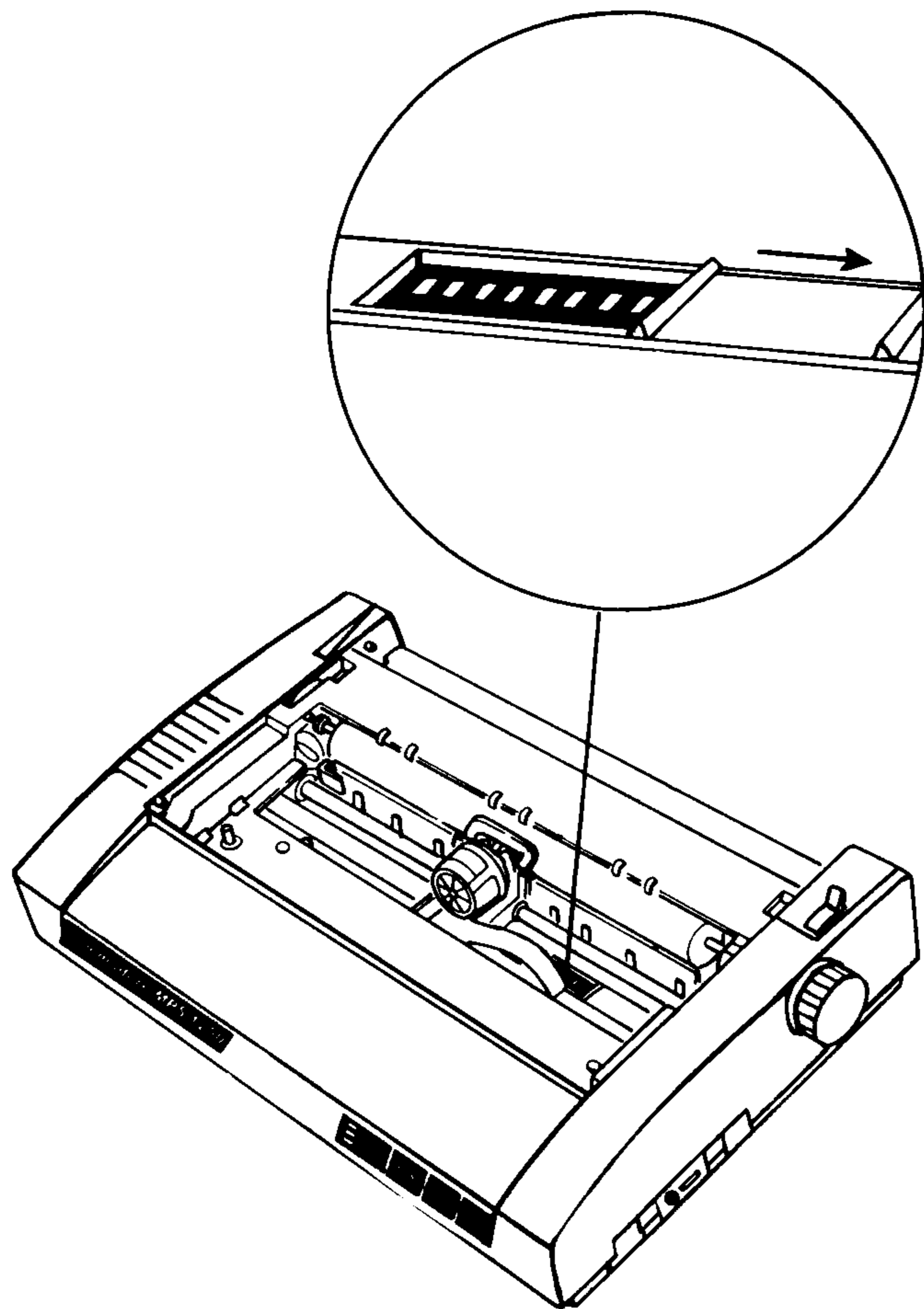


Figure 1-19. The DIP switch cover.

The eight switches determine how your printer will function in such aspects as:

- Interface with computer (serial or parallel)
- ASCII translation (PETASCII or standard ASCII)
- Control code (Commodore, IBM, or Epson mode)
- Print style (draft or near letter quality)
- Device number (4 or 5)
- Paper end detector (on or off)
- Automatic line feed (on or off)
- Print pitch (pica or compressed)

As you'll see later, most of these functions can also be set using software commands; the switches merely control the way the MPS 1250 operates when you first turn it on.

For now, a few words about the printer/computer interface control code modes, according to DIP switches 1, 3 and 4.

The MPS 1250 has three basic “modes” which determine how it reacts to different printer control codes, Commodore mode, IBM graphics mode, and Epson FX mode. When all the switches are set to the OFF position, the MPS 1250 behaves like a Commodore 1525 or MPS 803 printer. This is how the printer is set at the factory. By changing the values of dip switches 1, 3 and 4 you may change to the IBM graphics mode or 3 different Epson mode configurations. Most characters, commands and escape sequences are common to the three modes, so how you set these switches will depend on your exact needs. As you read further into this manual, you'll see more of what the differences between these modes are. If you plan to use your printer in any mode other than Commodore, or you want to find out more about these switches, see Appendix D.

Appendix D shows you what printer functions these switches control and how to change them.

Chapter 2

Printer Basics (Using Commercial Software)

In this chapter, we'll cover how to use the MPS 1250 printer with commercial programs. We start with a discussion of how dot matrix printers work and how they use PETASCII/ASCII codes to communicate with computers. We then cover how to use the MPS 1250 with word processors, spreadsheets, and database programs.

DOT MATRIX PRINTING

The MPS 1250 is called a "dot matrix" printer because each character is printed as a group, or matrix, of dots. If you look very closely at the printed characters you can see the dots. Figure 2-1 shows how the letter H is formed from 17 dots.

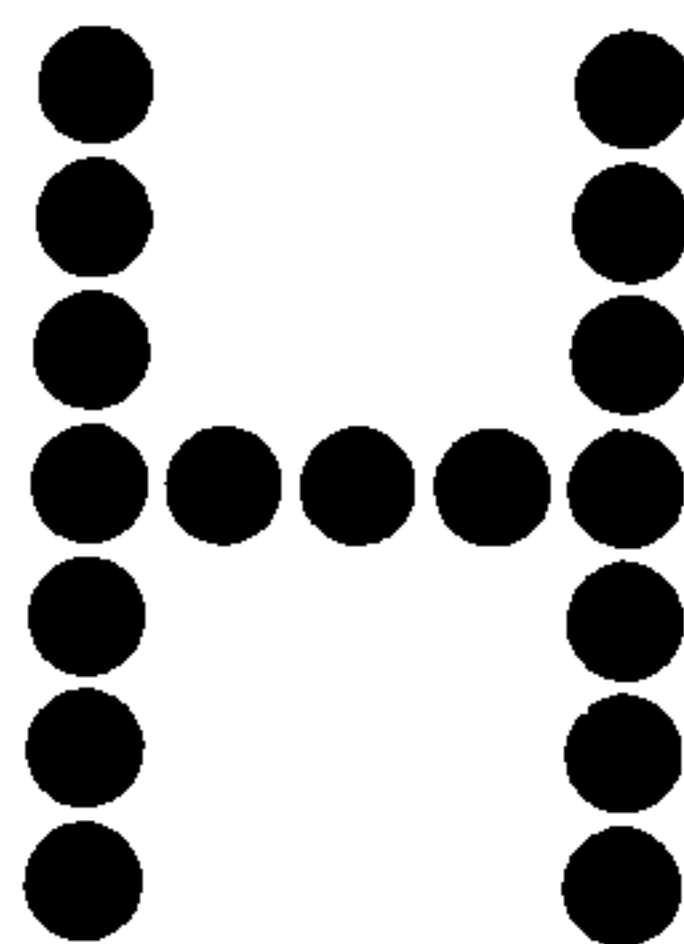


Figure 2-1. The letter H is formed by 17 dots

To understand why a dot matrix printer prints as it does, we need to look at the print head. The print head in the MPS 1250 consists of 9 pins arranged one above the other as shown in Figure 2-2.

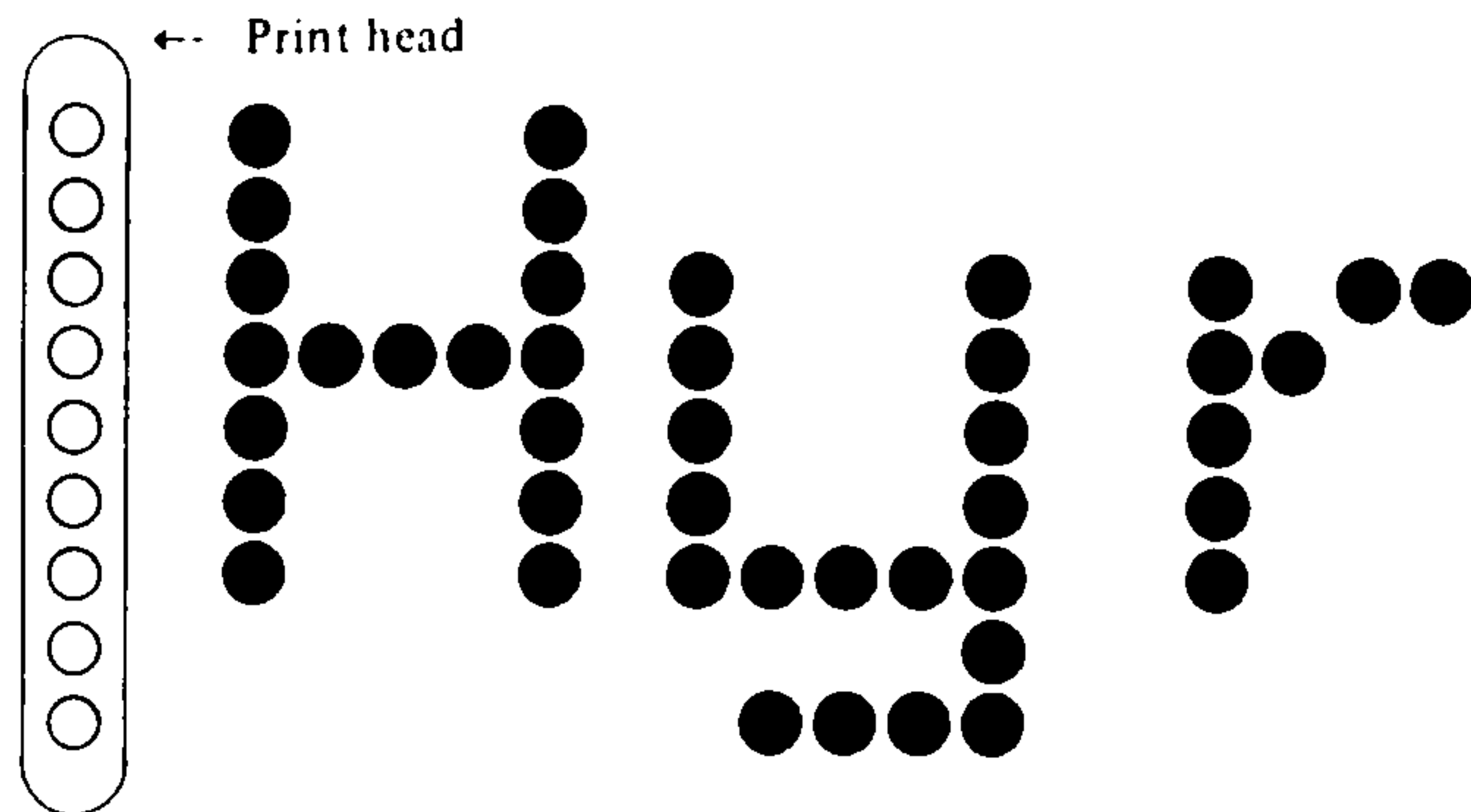


Figure 2-2. The print head has nine pins

When the MPS 1250 receives a signal from the computer, the electronics inside the printer cause certain pins in the print head to strike the ribbon, creating a vertical pattern of dots on the paper. The print head then shifts slightly, prints another column of dots, shifts again, and so on, until the letter is formed. As the print head moves across the page, a line of characters is printed. Then it reverses direction and prints another line of characters as it returns. This process is called *bidirectional* printing.

The correct sequence of strikes and movement of the print head for each character is stored in the printer's memory. The printer selects the character pattern you want based on a numerical code it receives from your computer. These codes are part of a set that is used throughout the computer industry. It is known as the *American Standard Code for Information Interchange*, or ASCII (pronounced as ask-key).

ASCII CODES

Most of the time you don't need to be concerned about ASCII codes. When you type a letter A on your keyboard, the computer knows which ASCII code to send to the printer. But if you want to send a nonprinting code to your printer, to change to italics or compressed print for example, you need to know the ASCII code and how to get your computer to send it.

There are 256 ASCII codes, numbered 0 to 255. The first 128 include the codes for the letters of the alphabet (both lower and upper case), the digits 0 to 9, and punctuation marks. For example, the letter A is ASCII 65; the digit 6 is ASCII 54. The first 128 ASCII codes also contain a number of nonprinting codes, called control codes. These codes, ASCII 0 through 31, are the ones that control the MPS 1250 functions. We will have more to say about them later in this manual.

The second 128 codes, ASCII 128 to 255, are sometimes called the "high-bit" or "8-bit" ASCII characters. They are less standardized than the first 128 and their meaning depends somewhat on the particular equipment and application involved. The MPS 1250 interprets the high-bit ASCII in several different ways, as shown later in this chapter, and in Appendix B.

One of the most confusing things about ASCII codes is that there are two numbering systems for the codes. Some books and programs refer to them by their decimal value (0 to 255) and others use their hexadecimal value.

Hexadecimal Numbers

The numbers we usually use are called *decimal* numbers because they are based on ten—the ten digits 0 through 9. *Hexadecimal* numbers, or hex numbers for short, are based on 16—the ten digits 0 through 9 and the six letters A through F. To distinguish them from decimal numbers, hex numbers are usually written in one of three ways:

1. followed by an h (e.g. 13h or 6Ah)
2. preceded by a dollar sign (e.g. \$13 or \$6A).
3. preceded by an ampersand and H (e.g. &H13 or &H6A)

All have the same meaning; it depends on which book you are reading. In this book, we use the first style; hex numbers are followed with an h, as in 6Ah.

The ASCII codes in hexadecimal are \$00h to \$FFh. Whether you use decimal or hexadecimal ASCII codes depends on your computer system and which software program you are using. Appendix B contains a complete list of all the ASCII codes with their decimal and hex values.

PETASCII Codes

There are two versions of ASCII codes available on the MPS 1250, standard ASCII and PETASCII. Since standard ASCII codes are limited to letters, numbers, punctuation, symbols and certain control codes, there are extended versions of ASCII systems that feature additional characters and control codes. The extended version that you may make use of with this printer, PETASCII (the Commodore version of ASCII), differs from standard ASCII in a few ways. One difference is in the characters available. Additionally, the hex values are sometimes different between the versions.

The hex values are slightly different for the same characters in ASCII and PETASCII. In this manual, where we list the BASIC language and hex value formats for escape sequences and control codes, we include both the upper/lowercase PETASCII hex values and ASCII hex values. Both ASCII and PETASCII values are listed in Appendix B.

DIP switch 2 sets ASCII translation. When it is set in the OFF position, the printer uses PETASCII code, the ON position sets ASCII. With the MPS 1250 set to PETASCII, both upper/lowercase and uppercase/graphic character sets are available; with ASCII, only the upper/lowercase (text mode) set is used, although many Commodore block graphic characters are available in the upper/lowercase character set.

When switch 2 is set to the ON position (for ASCII), two things happen. First, the MPS 1250 uses only the characters in the upper/lowercase character set, regardless of the secondary address used in the OPEN statement (see later in this chapter for secondary addresses). Second, standard ASCII codes for alphabetic characters (A through Z and a through z) received by the MPS 1250 are translated to their corresponding PETASCII values before printing.

In other words, with switch 2 set On, the MPS 1250 expects the computer to send ASCII rather than PETASCII character codes. This is useful when using commercial programs like word processors, which have standard printer setup or installation routines.

Remember, PETASCII is only used with the serial connector.

WHICH BASIC ??

If you're not using a commercial program, you have to use a programming language to communicate with your printer. Since BASIC is the most popular programming language, we're using it in this manual to demonstrate the MPS 1250's features. The MPS 1250 works just as well with other high-level languages such as C or PASCAL. Simply send the same ASCII or PETASCII codes with whatever print statements your language uses.

There are many different versions of BASIC around. The programs to come in this manual illustrating how to use the Commodore MPS 1250 printer's features are written in both Commodore BASIC and Microsoft BASIC. In the next couple of pages we will review both Commodore and Microsoft BASIC as it relates to printers.

Commodore BASIC

Commodore BASIC does not use the LPRINT statement, which is used in many other BASICs. Instead, it uses the OPEN, PRINT# and CLOSE commands.

The OPEN statement allows your computer to access devices such as disk drives, monitor screens and, for our purposes, printers.

Add the OPEN statement at the beginning of a program to enable communication with the printer. The word OPEN is followed by a logical file number, which is the number to which all other BASIC statements will refer. This number can be from 1 to 255. The second number after the file number is the device number. The device number for the printer can be either 4 or 5. So, a line such as

```
open 1,4
```

opens a channel with the file number 1 to use the printer, assuming the device select switch is set to device 4.

There can be a third number, known as a **secondary address**, which will be discussed shortly.

Any file that you open must be closed when you're done with it. The command for this is straight-forward enough—the CLOSE command.

This command completes and closes any files used by OPEN statements. The number following the word CLOSE is the file number to be closed, so the command CLOSE 1 closes logical file 1.

In between the opening and closing of a file, you communicate with the printer. The main statement you use in Commodore BASIC for this is the PRINT# statement.

There are a few differences between this statement and the PRINT. First of all, the word PRINT# is followed by a number, which refers to the device or data file previously opened. The number is followed by a comma, and a list of things to be PRINTed. In this manual, PRINT# statements will be used for issuing instructions to the printer on what type or special effects to use, spacing, tabs, graphics, etc. in addition to text characters.

Here's a short example of an instruction to the printer:

```
5 open 1,4
10 print #1, "hello there!"
20 close 1
```

```
HELLO THERE!
```

You'll be seeing a lot of short (and not-so-short) examples like this in the very near future.

Listing A Program

You can print out a listing of a program on your printer with the following:

```
open 1,4
cmd 1
list
print #1:close 1
```

(The PRINT#1 command in the last line was used to clear the buffer.)

CMD sends the output which normally would go to the screen (i.e. PRINT statement, LISTS, but not POKEs into the screen) to another device instead. This could be a printer, or a data file on tape or disk. This device or file must be OPENed first. The CMD command must be followed by a number or numeric variable referring to the file. In the example above, the file number was 4, from the OPEN command.

Secondary Addresses

The secondary address is an additional parameter to use with the OPEN command. The secondary address allows you to perform some printer control functions, such as setting the number of lines per page or line spacing in a manner compatible with Commodore dot matrix printers such as the 1525/MPS 801, MPS 803, 1526/MPS 802 and 1250.

The OPEN statement with a secondary address would look like this:

```
open 1,4,n
```

with 1 being the file number, 4 specifying the printer and n determining the secondary address command issued. The available values for n in the secondary address are 0, 3, 6, 7 and 10. Table 2.1 lists what each does:

Table 2-1. Secondary Address Functions.

n	Function
0	Selects uppercase/graphics character set
3	Sets number of lines per page (see Chapter 4)
6	Sets line feed pitch (see Chapter 4)
7	Selects uppercase/lowercase character set
10	Resets printer

If the OPEN statement does not include a third number specifying the secondary address, a value of 0 is assumed.

Choosing a Character Set with the Secondary Address

Using the statement

10 open 1,4,7

instructs the printer to interpret the codes for characters received from the computer in upper and lower case rather than as capitals and graphic symbols (which is the default with switch 2 set to PETASCII.) Figure 2-3 shows both character sets.

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

Figure 2-3. Commodore mode character sets

The programs in this manual all include the secondary address of 7 in the OPEN statements so the program listings appear in upper/lower case when they're printed out. Without this character set in use, the programs would appear in uppercase letters and graphic symbols. The same codes would still be sent to the printer and the printer would act exactly the same, but the reader of this manual probably wouldn't fare as well as the printer in following the programs.

NOTE: When you type in a program you must type all BASIC commands in lower case. Escape codes and any other characters in quotes should be typed in exactly as shown (upper or lower case) in this manual.

MICROSOFT® BASIC

The most common version of BASIC is the one developed by Microsoft Corporation. It is used by Radio Shack, IBM, IBM-compatibles, and most CP/M computers.

NOTE: Strictly speaking, MBASIC, TRS-80 BASIC, and IBM BASIC are not the same. However, the differences are very slight and, for our purposes, we will treat them as one. Where the differences matter, we will tell you.

Microsoft BASIC uses an L before the PRINT and LIST commands to direct the output to the printer (for example, LPRINT, LLIST). Other BASICs treat the printer as an output file or port and use plain PRINT commands redirected to that output.

Another difference in BASIC versions is how certain ASCII control codes are handled. Many computers change some ASCII codes when they send them to the printer. The ASCII codes for a horizontal tab (CHR\$(9)), carriage return (CHR\$(13)), and line feed (CHR\$(10)) are often changed, as are the high-bit ASCII codes 128 to 255.

Because Microsoft BASIC is used by more different types of computers than any other, we will use it in our examples. If your computer does not use MBASIC (or IBM BASIC, or GW BASIC), you may have to modify the example programs to suit your version of BASIC.

Read the section that follows pertaining to your computer to see what modifications to make.

IBM And Compatible Computers

You should not have to modify the example programs in this book that are written in Microsoft BASIC. The only thing you need to be aware of is that most of these computers automatically insert a carriage return and line feed after 80 characters. To avoid this when printing graphics, set the line width of the printer to 255 by adding the statement WIDTH "LPT1:", 255 or WIDTH LPRINT 255. Also remember that a line feed is added with every CHR\$(13). If you use CHR\$(13) in a graphics program, you can avoid unwanted line feeds in the middle of your graphic image by treating the

printer as a random file and using PRINT# statements instead of LPRINT statements:

```
10 OPEN, "LPT1:" AS #1
20 WIDTH #1, 255
30 PRINT #1, "RANDOM FILE PRINTING"
```

Apple II™ Computers

Applesoft BASIC™ does not use LPRINT and LLIST commands. Instead Applesoft uses a PR# command to send the output to the printer rather than the screen. You can modify the sample programs by changing LPRINT to PRINT and adding the Applesoft PR#1 (substitute your printer slot, if not in slot 1) command to direct the output of the PRINT statements to the printer.

Depending on the particular version of Applesoft you are using, add the statement PR#1 or PRINT CHR\$(4) "PR#1" at the beginning of the program. To return output to the screen add PR#0 or PRINT CHR\$(4) "PR#0" at the end of the program.

```
10 PR#1
20 PRINT "APPLE PRINT STATEMENT"
30 PR#0
```

To print lines longer than 40 or 80 columns add the statement PRINT CHR\$(9) "255N". This allows lines up to 255 characters to be sent to the printer. It is especially important for graphics and compressed print.

Listing a program on an Apple® follows the same procedure. Use a PR#1 command to direct the listing to the printer and PR#0 to return output to the screen when the listing is finished.

```
PR#1
LIST
PR#0
```

When you try the example programs in this manual, you will find two ASCII codes that are problems with Applesoft. They are ASCII codes 9 and 13.

In Applesoft, CHR\$(9) or CTRL 1 is used to initialize the printer interface. This code and one or more codes following it are inter-

cepted by the interface and never sent to the printer. CHR\$(9), however, is the 120-D's horizontal tab code.

To bypass this problem, you can change the printer initialization code to another value. For example:

```
PR#1
PRINT CHR$(9); CHR$(26)
```

makes CHR\$(26), or CTRL Z, the printer initialization code. You will then not be able to send CHR\$(26) to the printer, but the code is rarely used anyway.

CHR\$(13) is the code for a carriage return. It is a problem when used in graphics because the Apple automatically sends a line feed, CHR\$(10), with each carriage return. It is a good idea to avoid using CHR\$(13) in graphics programs.

If you want to get fancy, you can solve both of these problems by poking the codes directly to the printer output port. For example, this routine will send CHR\$(9) to the printer:

```
100 IF PEEK (46901) > 127 GOTO 100
110 POKE 49296,9
```

Line 100 is necessary to make sure the printer is ready to receive the data. Substitute the code you want for 9 in line 110.

One last difficulty with the Apple concerns the high-bit ASCII codes 128 through 255. The Apple printer interface subtracts 128 from these codes before it sends them to the printer. This puts a crimp in your style if you want to use the MPS 1250's italic or graphic characters.

Fortunately, the MPS 1250 has a way around this limitation. Sending the command ESC>(CHR\$(27)">") to the MPS 1250 tells it to use the high-bit ASCII codes no matter what code it receives from the computer. In a sense, the MPS 1250 adds back the 128 that the interface card subtracts. If you're a programmer, it sets the high-order bit. For example, to print an italic A, you can use the following:

```
10 PR#1
20 PRINT CHR$(27) ">"
30 PRINT CHR$(65)
```

Line 20 tells the MPS 1250 to add 128 to all the ASCII codes it receives. It thus prints CHR\$(193), an italic A.

When you want to return to roman print, you must cancel the high-bit setting with an ESC # code. See the explanation of ESC > and ESC # in Chapter 9.

TRS-80® Computers

If you are using a Model II™ you must initialize your system with the FORMS command to send statements to the printer.

The only modifications to make to the example programs concern the ASCII codes 0, 10, 11 and 12. Radio Shack computers do not pass any of these codes to the printer properly. To use these codes you must bypass BASIC and send them directly to the printer port. For example, use the following statements to send CHR\$(12):

```
100 IF PEEK (14312) <> 63 THEN 100
110 POKE 14312,12
```

Substitute the decimal ASCII value for the code you wish to send for the value 12 in line 110. Line 100 checks to see if the printer is ready to receive data.

CP/M® Computers

Most CP/M computers (including Kaypro®, Osborne®, Morrow®, Sanyo®, and Apple with a CP/M card) use MBASIC. The example programs therefore need very little modification for these computers.

There are, however, two things to be aware of. Some of these computers change CHR\$(9) to a group of spaces to simulate a horizontal tab. To send a horizontal tab to the MPS 1250 with these computers, use the high-bit ASCII tab value CHR\$(137) instead.

Some computers also add a carriage return and line feed every 80 characters. Add the statement WIDTH LPRINT 255 to the example programs to prevent these unwanted codes.

Atari® Computers

Atari BASIC™ has some unique characteristics to keep in mind. It requires that all strings be dimensioned, and the maximum string length is 99 characters as opposed to 255 in other BASICs. Therefore, when using graphics you will have to break up strings into 99 character sections and join them together with a statement such as A\$(LEN(A\$) + 1) = B\$, which adds the string B\$ to the end of A\$.

Because Atari BASIC adds spaces to print lines when you use LPRINT, it is best to use the PRINT# command instead. Add a line to the example programs to open the printer as a device first and then change the LPRINT statements to PRINT# statements. For example:

```
10 OPEN #4,8,0, "P"
20 PRINT #4; "ATARI PRINT STATEMENT"
```

Add a statement like CLOSE #4 at the end of the program to close the printer as a device.

Atari BASIC requires semicolons between elements in a print statement. Change the print statements in the example programs to this format:

```
PRINT #4; CHR$(27); "B"; CHR$(3)
```

Atari BASIC does not use the LLIST command to list programs. To list a program use the statement LIST "P:".

LISTING A PROGRAM

One of the simplest things you can do with BASIC is list a program on your printer. To make sure you know how to activate the MPS 1250 with your computer's BASIC, let's print a program listing.

Load a program into your computer's memory. (If you aren't sure how to do this, check the user's manual for your computer's BASIC. Most computers use a simple command like LOAD followed by the program name.)

To LIST the program on the 1250, use the command LLIST if you are using Microsoft BASIC or use whatever routine is necessary for your computer. Check the previous section on your computer if you are not sure what method to use.

CONTROL CODES AND ESCAPE SEQUENCES

Now that we've reviewed some BASIC commands to communicate with the MPS 1250, let's consider how you actually **tell** it what you want it to do: control codes and escape sequences. As we said earlier, the MPS 1250 has three modes, Commodore, IBM-graphic and Epson modes, where it behaves differently when you give it certain instructions (although most commands get the same result in either mode). These instructions to the printer come in the form of control codes or escape sequences.

A control code is a command given to the printer in the form of a non-printing ASCII or PETASCII code. An example would be

```
10 print #1, chr$(14)
```

which would tell the printer to turn expanded print on. All the control codes available on the MPS 1250 are covered in the upcoming chapters, and Appendix C contains all the control code commands for Commodore, IBM and Epson modes.

Many MPS features are controlled with escape sequences. Escape sequences are the same for the MPS 1250 in both Commodore and Epson modes. They are called escape sequences because the command starts with the ASCII/PETASCII code for ESCape (CHR\$(27)) and is followed by other codes which determine the instruction for the printer. The sequence ESC 4 sets **italic** characters, and can be issued with the command

```
20 print #1, chr$(27); chr$(52)
```

That doesn't look like ESC 4, but it is; CHR\$(27) is the ASCII code for ESC (get used to it, you'll be using it a lot) and CHR\$(52) is the code for 4.

The MPS 1250's escape sequences are explained with examples for each throughout this manual. Appendix C also contains a complete list of all the escape codes and their functions, showing both the PETASCII and ASCII versions.

If you enter your program with your computer set to upper/lowercase (text) mode, and your printer is set to PETASCII mode,

you may enter the escape sequences using the familiar Epson-standard characters. For example, the above command to set italic characters may be written as:

```
20 print #1, chr$(27)"4"
```

When keying in the example programs that follow, pay close attention to the case (upper or lower) of the letters in the escape sequence. If the sequence requires a capital "E", make sure you hold down the shift key when you type "E".

Because ESC is used so often, many programmers define CHR\$(27) as a string variable in their programs with an assignment statement. To turn on italics, for example, you could use:

```
5 open 1,4,7
10 esc$ = chr$(27)
20 print #1, esc$"4"; "ITALIC ON"
30 print #1, esc$"5"; "ITALIC OFF"
35 close 1
```

```
10 ESC$ = CHR$(27)
20 LPRINT ESC$"4"; "ITALIC ON"
30 LPRINT ESC$"5"; "ITALIC OFF"
```

ITALIC ON

ITALIC OFF

ESC\$ is much shorter to type than CHR\$(27). Adding one assignment statement at the beginning of a long program can save a lot of typing.

Remember, to clear a program from the computer's memory, type NEW and press RETURN before entering a new program. This does **not** reset the printer; other ways beside turning the printer off and on will be explained at the end of this chapter.

PRINTER INSTALLATION

The MPS 1250 is compatible with most commercial programs—word processors, spreadsheets, database and graphic drawing programs. Before you can see some printing, however, most programs require that you “install” your printer, that is, tell your program what kind of printer you have.

Choosing the Right Configuration

This is where the question of which way (Commodore-compatible, IBM-compatible or Epson-compatible) you want your MPS 1250 configured needs to be answered. Let’s look at the differences between the configurations.

The differences between the three major configurations are not great. A few of the control codes, which are instructions from your computer to the MPS 1250, work differently in the three configurations. Also, while the standard characters stay the same, many of the special characters that the MPS 1250 can print are different in the three configurations.

Generally, if you are writing or using programs written in BASIC, you probably want your MPS 1250 configured as a Commodore PETASCII printer. (DIP switches 2 and 3 “OFF”).

If you have a Commodore computer, and if you are using commercial software designed to support a variety of printers (such as word processors, spread sheet programs, etc.), you should probably select the Epson FX compatible mode (switch 3 “ON”). Nearly all software supports Epson printers, and will allow the MPS 1250 to produce special printing effects such as bold, italics, underline, superscripts, and subscripts under program control by the commercial software.

If your software does not allow selection of PETASCII (or CBM ASCII) along with the choice of Epson compatible printer control, then set DIP switch 2 to “ON”, which will permit the software to send true ASCII characters to the MPS 1250, and your printer will print the characters properly.

Software Printer Choices

Many programs, especially word processors, include an installation routine for your printer. Typically, the installation routine gives you a choice of several printers or printer types. It may also ask some questions about backspacing, line feeds, and form feeds.

Any of the following printer choices will work for the MPS 1250: “MPS801”, “MPS803”, “MPS 1250”, “Commodore printer”, “Commodore compatible printer”, “IBM graphics printer”, “Epson printer”, “TTY-type printer with backspace”, “ASCII dot matrix printer.” Selecting one of these options should do the trick.

The following summarizes the most likely uses for the configurations of switches 2 through 4. In particular, note the settings as they apply to graphic drawing programs, whether the program in question was designed for use with a Commodore or Epson-compatible printer for screen dumps.

Serial Port Users:

Switch 2	Switch 3	Potential Use
OFF	OFF	MPS 801, MPS 803 emulation with Commodore 64 software packages such as EasyScript, Jane™ and Print Shop™, which use Commodore Bit Map graphics.
OFF	ON	BASIC programmers who want to make use of standard control codes, such as backspace, compressed print, etc.
ON	ON	Epson FX emulation with Commodore 64 or 128 commercial software packages which have Epson-compatible ASCII printer drivers. These software packages generate standard ASCII upper and lowercase characters, and often embed escape sequences in their output streams.
ON	OFF	No real practical use for this switch combination.

Parallel Port Users:
(switch 1 must be set to ON)

Switch 3	Switch 4	Potential Use
ON	ON	If your computer is a Commodore PC10, or IBM PC, or other close relative, you probably want your MPS 1250 configured as an IBM Graphics Printer. Almost all software written for the IBM-PC compatible market supports the IBM Graphics Printer, and this configuration gives you the same character set as the IBM-PC computer.
OFF	OFF	If you don't need to imitate an IBM character set, then you should probably select the EPSON FX #1 configuration. Epson printers are widely supported by nearly all software in the microcomputer world.
ON or OFF	OFF ON	If you don't need to imitate an IBM character, but want easy access (by the flip of a DIP-switch) to international character sets, then you should probably select the Epson FX #2 or Epson FX #3 configuration. For information on the differences between Epson FX #2 and Epson FX #3 see Appendix D.

Amiga owners may choose either IBM or Epson FX modes, but you need to make sure you select the proper printer driver with the preferences utility.

If you are still not sure which printer mode to use, looking at the available character sets in Appendix B can help you to decide. Each character set is available in only one major mode.

Whichever configuration you choose, you won't miss any of the features of the MPS 1250. It's actually easy to switch back and forth between the two configurations "on-the-fly" with a simple command from your computer. We'll show you how to use that command in Chapter 3.

Some programs need more information about your printer, however. If your program wants to know, the MPS 1250 printer:

- uses the list output driver (LST: or LPT1:)

- uses device number 4 or 5
- uses no communications protocol
- does not require a printer initialization string (for normal 80-column printing)
- can backspace (ASCII 8) if set to Epson or IBM modes
- can underline (ASCII 95 or escape sequence)
- does an automatic line feed in Commodore mode
- does not do an automatic line feed in Epson mode, unless you change internal switch
- can do a form feed (ASCII 12)

If your program asks other questions, or doesn't have any printer choices that resemble those above, eliminate the choices involving letter quality or daisy-wheel printers (with names like Diablo® and Spinwriter®) and experiment. The worst that will happen is that you'll get very strange results or no results at all and you can make a different printer choice.

Once you've completed the installation, you're ready to use your new MPS 1250 printer. Try a short printing sample using your program. You will see what a good choice you made in purchasing the MPS 1250 printer.

WORD PROCESSORS

Strange as it may seem, the special printing effects built into many word processing programs are limited to boldface and underlining. Fortunately, most programs provide a way to send special codes to the MPS 1250 to take advantage of its additional capabilities such as italics, compressed and double width print, superscripts and subscript, graphics characters, and so on. But it takes a little maneuvering.

The trick is to get your word processing program to place the necessary nonprinting codes into your text file and send them on to the printer without interpreting them as its own commands.

With the notable exception of WordStar®, most word processing programs allow you to do this by providing a special “literal” character. (If you’re using WordStar, check your Installation Manual for details about using “print control codes” to access the MPS 1250’s print features.

Literal Characters

A “literal” character tells the word processing program that the character following it is to be accepted literally (placed in the text file as is) and not interpreted as a word processing command. The literal character in many word processing programs is itself a particular nonprinting control character. Different programs use different keys, such as ALT or ESCape. Check your word processor’s user manual to see how to insert nonprinting codes into your file.

For example, to select emphasized print, you must send the code ESCape E to the MPS 1250. To enter ESC E into your text file, key your word processor’s literal character, ESC, and then E. It doesn’t matter how this sequence shows on your screen; when you print the file, the MPS 1250 will get the message that you want emphasized print.

When in serial mode, remember, when inserting escape sequences manually, to send the proper version of ASCII code related to how DIP switch 2 is set. Since PETASCII (switch 2 OFF) and ASCII (switch 2 ON) are slightly different, make sure the version that you use is consistent with how switch 2 is set.

SPREADSHEETS, DATABASES, AND OTHER PROGRAMS

Most of these programs provide a setup option in their output or print mode that asks you to make two settings for your printer: the number of characters per line, and the codes to be sent to the printer at the start of printing, called the “printer initialization string.”

The two settings are related. The number of characters per line depends on the print mode, which is determined by the initialization string you send. Table 2-2 shows printer initialization strings for some common print modes.

Table 2-2. Printer Initialization Strings

Print Mode	Characters per Line	Initialization String
10-pitch Pica	80	None
12-pitch Elite	96	ESC M
Compressed Pica	136	ESC CHR\$(15)*
Compressed Elite	160	ESC M ESC CHR\$(15)

*If you plan to use your printer mostly for financial applications, you may want to set the internal switches so that compressed mode is automatically selected when the MPS 1250 is turned on (see Appendix D). If you make this change, the initialization string for compressed print is not needed when you send your output to the printer.

Initializing The Printer

When you *initialize* the MPS 1250, you clear any special settings you have made and return the printer to the settings specified by the current internal switch settings and the Read Only Memory (ROM) of the printer.

There are three ways to initialize the printer:

1. By turning the power switch OFF, then ON again.
2. By sending the software command ESC@.
3. When you are in Commodore mode, by sending a secondary address of 10 in a print channel (OPEN) command.

Table 2-3 shows you what happens during initialization:

Table 2-3. Printer Initialization Settings

Setting	Description
Print head	Returned to the home position (the extreme left)
On-line status	Placed on line, unless out of paper
Print buffer	Cleared, including download characters
Margins	All margins are cleared
Tab settings	All tab settings are cleared; horizontal tabs are set at every eight columns
Character pitch	10 characters per inch, or in serial mode set by switch 8*
Line spacing	1/6 inch
Page length	11 inches
Top of form	Current paper position
Switch settings	Records current settings
Cut sheet feeder	Initialized, if installed; any paper is ejected

*For details concerning internal switch settings, refer to Appendix D.

In this manual, the term *power on default values*, or simply *defaults*, are those set by initialization.

IMPORTANT: It is a good idea to **reset the printer** after running each program in this manual. To reset the printer you may either turn the printer OFF, then ON or use the master reset command described on page 3-29.

Chapter 3

Printing Text

Starting with this chapter we'll look at each of the MPS 1250's features in detail—what the feature does, how it works, and how to use it. We'll show you example programs that illustrate how to send the control codes to the MPS 1250.

If you plan to write your own programs, you'll find the programs in this section provide examples of proper command syntax and may be useful as subroutines. If you don't know BASIC, you can still use all of the MPS 1250's features. Just follow the code syntax in the example programs.

This chapter covers the commands that control the way the MPS 1250 prints text. You'll learn how to get near letter quality print and proportional spacing, how to change pitch and character width and height, how to use doublestrike, emphasized, italic, reverse print, underlining, and how to print superscripts and subscripts.

When you finish this chapter you'll be able to customize your text printing exactly to your task and needs.

NOTE: So that your sample programs come out the same, we assume that you have internal switch 2 OFF (to configure your MPS 1250 as a PETASCII printer) or switches 1, 3,4 ON (to configure your MPS 1250 as an IBM graphics printer).

HINT: As you will soon find out, the MPS 1250 has quite a number of text printing features, with a different command to turn each feature ON and OFF. If you do not remember which features you have turned on and which ones you haven't you might want to reset your printer at the beginning of each new program. You can do this either by turning the power for the printer OFF and then on again, or you can use the master reset command:

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

For further information on this command see the MASTER COMMANDS section later in this chapter.

NEAR LETTER QUALITY

	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

Near letter quality (NLQ) printing is a feature you will use often. In this mode, the MPS 1250 uses a special character set very similar to the type on a typewriter or letter-quality printer. Using NLQ printing for your correspondence and reports gives them a polished professional look.

To make the commands easy to remember, many of the MPS 1250's features are turned on and off in the same fashion. Adding a 1 to the command turns the feature on; adding a 0 to the command turns the feature off. NLQ mode uses this scheme.

The NLQ command is ESC x (the x must be lower case). To turn on near letter quality mode, send ESC x1 to the MPS 1250; to turn it off, send ESC x0. Try it by typing the following BASIC program:

```
10 open 1,4,7
20 print #1, chr$(27)"x1"; "NLQ Mode"
30 print #1, chr$(27)"x0"; "Not The NLQ Mode"
40 close 1
```

```
10 LPRINT CHR$(27)"x1"; "NLQ Mode"
20 LPRINT CHR$(27)"x0"; "Not The NLQ Mode"
```

NLQ Mode
Not The NLQ Mode

Using ASCII codes, the same program becomes:

```
10 open 1,4,7
20 print #1, chr$(27); chr$(88); chr$(49); "NLQ Mode"
30 print #1, chr$(27); chr$(88); chr$(48);
  "Not The NLQ Mode"
40 close 1
```

```
10 LPRINT CHR$(27); CHR$(120); CHR$(49); "NLQ Mode"
30 LPRINT CHR$(27); CHR$(120); CHR$(48);
  "Not The NLQ Mode"
```

Sometimes it is more convenient to use their PET ASCII or ASCII codes rather than typing "x1" and "x0".

NOTE: Because the 1 and 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.

The following program demonstrates the difference between near letter quality characters and standard characters:

```
10 open 1,4,7
20 for n = 32 to 90:a$ = a$ + chr$(n):next n
30 print #1, chr$(27)"x1"; "NLQ Mode"
40 print #1, a$
50 print #1, chr$(27)"x0"; "Not The NLQ Mode"
60 print #1, a$
70 close 1
```

```

10 FOR N=32 TO 90
20 A$=A$+CHR$(N)
30 NEXT N
40 LPRINT CHR$(27)"x1"; "NLQ Mode"
50 LPRINT A$
60 LPRINT CHR$(27)"x0"; "Not the NLQ Mode"
70 LPRINT A$

```

```

NLQ Mode
!"#$%&'()*+,-./0123456789:;<=>?@abcdefghijklmnopqrstuvwxy
Not The NLQ Mode
!"#$%&'()*+,-./0123456789:;<=>?@abcdefghijklmnopqrstuvwxy

```

When you run this program, the complete character set for near letter quality followed by the complete standard set will be printed.

Near letter quality printing looks good, doesn't it? So why not use this mode all the time? For certain applications, you may want to do that. But there are some things about near letter quality mode you should know first.

Near letter quality achieves its crisp appearance by printing each line twice. The speed of near letter quality print is therefore slower than standard print. If you are printing a long document, the slower speed can make a considerable difference.

In some cases, you may want to change between near letter quality and standard mode without using BASIC to send the MPS 1250 a command. For example, when using a word processor you may want to use a standard mode for quick notes and draft copies, and near letter quality mode for finished products. For these applications, the MPS 1250 provides a way to turn near letter quality mode on and off using the control panel.

With the MPS 1250 on-line, hold the LF (line feed) switch down while pressing the On-line switch. To change back to standard mode, repeat the procedure.

You can use the control panel to change between near letter quality and standard mode any time the on-line and ready lights are lit, even if the mode was previously changed by a program command. For example, you can have your word processor select near letter quality mode automatically by including ESC "xl" in its printer initialization string. If you later want to print a quick draft copy, you can use the control panel to change to standard mode.

NOTE: Some word processing programs send a reset code to the printer as they start printing. This reset code will change the printer back to draft printing. These programs won't allow you to change to near letter quality using the control panel, unless you can make the word processing program pause during printing so that you can change modes.

NLQ (Commodore mode only)

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

With DIP switch 3 set to 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:

```

10 open 1,4,7
20 print #1, chr$(31); "NLQ Mode--Commodore mode only"
30 print #1, chr$(159); "Not The NLQ Mode"
40 close 1

```

NLQ Mode--Commodore mode only
Not The NLQ Mode

In the IBM configuration, you can also select correspondence quality with the following escape code:

	ON	OFF
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 (with either ESC I; (4); or ESC I; (6); refer to chapter 8 for more information.

CHARACTER PRINT WIDTH

The MPS 1250 has three ways to change the width of a printed character: (1) changing the basic pitch, (2) expanding the characters, and (3) compressing the characters. By combining these three methods, the MPS 1250 can print in eight different character widths as shown in Table 3.1.

Table 3.1 Character Widths

Character Width	Characters/Inch	Max. Characters/Line
Pica Standard	10	80
Pica Expanded	5	40
Pica Compressed	17	136
Pica Compressed Expanded	8.5	68
Elite Standard	12	96
Elite Expanded	6	48
Elite Compressed	20	160
Elite Compressed Expanded	10	80

We'll cover the commands for each of these print widths in this section.

Pitch

The pitch tells you how many characters will be printed in one inch. It is another term for characters per inch, or CPI.

The MPS 1250 is capable of two basic pitches: 10-pitch, called pica, and 12-pitch, called elite. They are described below.

Pica Pitch

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

Pica is the default pitch. When you first turn on the MPS 1250, it will print at 10 characters per inch by default until you change it. Pica pitch does **not** cancel other width commands such as expanded or compressed print. Pica pitch can be turned off by selecting the other pitch command, which is elite.

Elite Pitch

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

You tell the MPS 1250 to change to 12-pitch elite by sending the command ESC M. To change back to 10-pitch pica, send the command ESC P.

To see the difference between 10- and 12-pitch, run the following program:

```

5 open 1,4,7
10 print #1, chr$(27)"P"
20 print #1, "Compare this line in 12 pitch elite"
30 print #1, chr$(27)"M"
40 print #1, "to this line in 10 pitch pica":print#1
50 print #1, chr$(27)"P"; "You can also have"chr$(27)"M";
60 print #1, " both pitches in one line"; chr$(27)"P";
70 print #1, " if you like."
100 close 1

```

```

10 LPRINT CHR$(27); "P"
20 LPRINT "Compare this line in 12 pitch elite"
30 LPRINT CHR$(27); "M"
40 LPRINT "to this line in 10 pitch pica"
50 LPRINT CHR$(27); "P"; "You can also have";
60 LPRINT CHR$(27); "M"; "both pitches in one line";
70 LPRINT CHR$(27); "P"; "if you like."
80 LPRINT CHR$(18); CHR$(27); "P"

```

Compare this line in 12 pitch elite

to this line in 10 pitch pica

You can also have both pitches in one line if you like.

You will see these results:

The semicolons in program lines 50 and 60 tell BASIC not to send a carriage return and line feed at the end of the print statement. This BASIC technique allows you to send the MPS 1250 strings of characters mixed with commands and still have everything print on one line.

Pitch can also be changed with the master pitch command, ESC~3, and with the master select command, ESC !. These master commands are described later in this chapter.

In the IBM configuration, you can also select elite pitch with ESC:.

Expanded Print

	ON	OFF
BASIC	CHR\$(27) "W1"	CHR\$(27) "W0"
PETASCII Hex	1B D7 31	1B D7 30
ASCII Hex	1B 57 01	1B 57 00

Both of the MPS 1250's pitches can be expanded to twice their normal width. In expanded print, the width of the characters and the spaces are doubled. This means the maximum number of characters per line is cut in half.

Expanded pica prints 5 characters per inch, so you can print a maximum of 40 characters per line on the MPS 1250. Expanded elite prints 6 characters per inch, for a maximum of 48 characters per line.

The command to select expanded print is ESC W. Like the NLQ command, the expanded print command uses a 1 and 0 as its on and off switches. Sending ESC W1 to the MPS 1250 turns on expanded print; sending ESC W0 turns off expanded print. Try the following statements:

```
10 open 1,4,7
20 for n=97 to 110:a$=a$+chr$(n):next n
30 if x=1 then 60
40 print #1, chr$(27); "P"; "Pica"
50 goto 70
60 print #1, chr$(27)"M"; "Elite"
70 print #1, chr$(27)"W1"; "expand it"
80 print #1, a$
90 print #1, chr$(27)"W0"; "no, don't"
100 print #1, a$
110 print #1
120 x=x+1:if x<2 then 30
130 close 1
```

```
10 FOR N = 65 TO 78:A$=A$+CHR$(N):NEXT N
20 LPRINT CHR$(27)"P";
25 LPRINT "Pica"
30 GOSUB 80
40 LPRINT
50 LPRINT CHR$(27)"M"; "Elite"
60 GOSUB 80
70 END
80 LPRINT CHR$(27)"W1"; "expand it"
90 LPRINT A$
100 LPRINT CHR$(27) "W0": "no. don't"
110 LPRINT A$
120 RETURN
```

```
Pica
expand it
ABCDEFGHIJKLMN
no, don't
ABCDEFGHIJKLMN
```

```
Elite
expand it
ABCDEFGHIJKLMN
no, don't
ABCDEFGHIJKLMN
```

Now change the pitch to elite with ESC M and try expanded print again. You'll see what a difference pitch can make.

In Commodore mode, you can also 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.

One frequent use for expanded print is for headlines and titles. In this case, you need to turn on expanded print for just one line and then return to a normal character width. You can do this by sending ESC W1, printing the headline, and then sending ESC W0. But there is an easier way.

One-line Expanded Print

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

Parallel and Epson modes only

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

The command ESC CHR\$(14), or CHR\$(14) in Epson mode, turns on expanded print for one line only. The MPS 1250 automatically returns to normal print for the next line. Type these statements to see how it works:

```
10 open 1,4,7
20 print #1, chr$(27); chr$(14); "This line will be expanded."
30 print #1, "But this line won't."
40 close 1
```

```
10 LPRINT CHR$(27)CHR$(14); "This line will be expanded."
20 LPRINT "But this line won't"
```

This line will be expanded.
But this line won't.

If you want only part of a line in expanded print, the command CHR\$(20) in Epson mode can be used in mid-line to cancel CHR\$(14) or ESC CHR\$(14). The following example shows this:

```
10 open 1,4,7
20 print #1, "Both "; CHR$(27); CHR$(14); "expanded";
   chr$(20); "and normal print"
30 close 1
```

```
10 LPRINT "Both "; CHR$(27)CHR$(14); "expanded"; CHR$(20);
   "and normal print"
```

Both **expanded** and normal print

Note that while you can cancel one-line expanded set by ESC CHR\$(14) or CHR\$(14) with ESC W0, you cannot cancel ESC W1 with a CHR\$(20) or CHR\$(15).

Compressed Print

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

Parallel and Epson modes only

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

The characters in both of the MPS 1250's pitches can be compressed to approximately 60% of their width so you can print more characters per line. As with expanded print, both characters and spaces are affected.

Compressed pica prints 17 characters per inch, for a maximum of 136 characters per line. Compressed elite prints 20 characters per inch, so you can print a maximum of 160 characters per line.

You can compress the print in either pitch by sending ESC CHR\$(15) (or just CHR\$(15) in Epson mode). The command ESC CHR\$(18) (or just CHR\$(18) in Epson mode) turns off compressed print and returns you to either pica or elite pitch, whichever you set last.

Note that compressed print is not turned off automatically at the end of a line, as was one-line expanded print. Run the following program to see the effect of compressed print:

```
10 open 1,4,7
20 print #1, chr$(27); chr$(15); "This would never fit comfortably on
  a single line . . ."
30 print #1, chr$(27); chr$(18); "if it were all regular print"
40 close 1
```

```
10 LPRINT CHR$(27); CHR$(15); "This would never fit comfortably
  on a single line . . ."
20 LPRINT CHR$(27); CHR$(18); "if it were all regular print"
```

This would never fit comfortably on a single line...
if it were all regular print

Compressed Expanded Print

You are also able to turn on both compressed and expanded print in combination with pica or elite pitch. The result is a character width about 85% of the normal pitch. Compressed expanded pica prints 8.5 characters per inch, a maximum of 68 characters per line. Compressed expanded elite prints 10 characters per inch, which is a maximum of 80 characters per line.

The following program demonstrates all eight of the MPS 1250's character widths. Key in the program, run it, and keep the printout as a guide to the MPS 1250's different characters widths.

```
10 open 1,4,7
20 sc$ = chr$(27)
30 print #1, "CPI = Characters Per Inch":print #1,
40 print #1, sc$"M"; sc$; chr$(15);
50 print #1, "Elite Compressed:20 CPI"
60 print #1, sc$"P"; sc$; chr$(15);
70 print #1, "Pica Compressed:17 CPI"
80 print #1, sc$"@"; sc$"M";
```

```
90 print #1, "Elite Standard:12 CPI"
100 print #1, sc$"P";
110 print #1, "Pica Standard:10 CPI"
120 print #1, sc$"M"; sc$; chr$(15); sc$"W1";
130 print #1, "Elite Compressed Expanded:10 CPI"
140 print #1, sc$"P"; chr$(27); chr$(15);
150 print #1, "Pica Compressed Expanded:8.5 CPI"
160 print #1, sc$"M"; sc$; chr$(18);
170 print #1, "Elite Expanded:6 CPI"
180 print #1, sc$"P";
190 print #1, "Pica Expanded:5 CPI"
200 print #1, sc$"W0";
210 close 1
```

```
10 ESC$ = CHR$(27)
20 LPRINT "CPI = Characters Per Inch":LPRINT
30 LPRINT ESC$"M"; ESC$; CHR$(15);
40 LPRINT "Elite Compressed:20 CPI"
50 LPRINT ESC$"P"; ESC$; CHR$(15);
60 LPRINT "Pica Compressed:17 CPI"
70 LPRINT ESC$"@"; ESC$"M";
80 LPRINT "Elite Standard:12 CPI"
90 LPRINT ESC$"P";
100 LPRINT "Pica Standard:10 CPI"
110 LPRINT ESC$"M"; ESC$; CHR$(15); ESC$"W1";
120 LPRINT "Elite Compressed Expanded:10 CPI"
130 LPRINT ESC$"P"; ESC$; CHR$(15); ESC$"W1";
140 LPRINT "Pica Compressed Expanded:8.5 CPI"
150 LPRINT ESC$"M"; ESC$; CHR$(18);
160 LPRINT "Elite Expanded:6 CPI"
170 LPRINT ESC$"P";
180 LPRINT "Pica Expanded:5 CPI"
190 LPRINT ESC$"W0"
```

CPI=Characters Per Inch

```
Elite Compressed:20 CPI
Pica Compressed:17 CPI
Elite Standard:12 CPI
Pica Standard:10 CPI
Elite Compressed Expanded:10 CPI
Pica Compressed Expanded:8.5 CPI
Elite Expanded:6 CPI
Pica Expanded:5 CPI
```

PROPORTIONAL PRINT

	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

Until now, all of the print widths we have discussed have been fixed. That is, each character has the same width; in pica printing, an "i" occupies 1/10 of an inch, an "M" occupies 1/10 of an inch, an "o" occupies 1/10 of an inch, etc. But because the shapes of the letters are quite different, some characters (notably "i" and "1") are printed with a lot of space around them. A step forward in readability and aesthetics comes with proportional printing, where the space each printed character occupies is proportional to its shape.

The command to turn on proportional print is ESC pl; to return to normal fixed spacing, use ESC p0. Note that you must use a lower case p.

```
5 open 1,4,7
10 print #1, chr$(27)"p1";
20 print #1, "A step forward in readability and aesthetics "
30 print #1, "comes with "; chr$(27)"4"; "proportional printing ";
40 print #1, chr$(27)"5"; "where the"
50 print #1, "width each printed character occupies is"
60 print #1, "proportional to its shape."
70 close 1
```

```
10 LPRINT CHR$(27)"p1";
20 LPRINT "A step forward in readability and aesthetics"
30 LPRINT "comes with "; CHR$(27)"4"; "proportional printing ";
40 LPRINT CHR$(27)"5"; "where the"
50 LPRINT "width each printed character occupies is"
60 LPRINT "proportional to its shape."
```

A step forward in readability and aesthetics comes with *proportional printing* where the width each printed character occupies is proportional to its shape.

Proportional characters are always printed in emphasized print and are compatible with all of the styles and widths we have discussed so far: draft, neat letter quality, expanded, compressed, elite and pica. By changing the width (say, from pica to elite), you change the overall width, but the printing will be the same as either regular pica or regular elite.

Using the previous program, add the line below to make everything print with proportional characters. Compare the results to your earlier printout; they will be similar, but noticeably different.

PROPORTIONAL SPACING

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

If you think we've discussed character print width just about enough, bear with us for one more variation! In addition to changing the width of the actual printed characters, you can also vary the space between the characters. This feature can be used in creating fancy justified text or if you just want the print to appear "looser."

The command for proportional spacing is, appropriately enough, ESC (space). Following the space is the number of additional print columns (or dots) that you would like to place between each character. To specify this number, you must use the CHR\$ function; you cannot use a statement like PRINT#1,CHR\$(27)“ 9” and expect to add 9 dots between characters.

This short program should demonstrate the effect of the proportional spacing command:

```
10 open 1,4,7
15 for n=1 to 10
20 print #1, chr$(27)“ ” chr$(n);
30 print #1, “The same letters, different spacing”
40 next n
50 print #1, chr$(27)“ ”chr$(0)
60 close 1
```

```
10 FOR N = 1 TO 10
20 LPRINT CHR$(27)“ ” CHR$(N);
30 LPRINT “The same letters, different spacing”
40 NEXT N
50 LPRINT CHR$(27)“ ”CHR$(0)
```

```
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
The same letters, different spacing
```

The last statement returns the MPS 1250 to its default overall character spacing: 0 dots. Proportional spacing can be combined with all print features, including proportional printing.

JUSTIFIED PRINTING

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

Justified printing prints lines in the NLQ mode that are aligned in any of four different ways. To use this command, send ESC a followed by the ASCII code for a number from 0 to 3 to specify the type of justification you want (see Table 3.2).

Table 3-2. Styles of Justified Printing

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 MPS 1250 adjusts the spaces between every word on a line from 0.5 to 2 characters width. If it fails, the word on the margin is recorrected almost to the original position.

```
10 open 1,4,7
20 print #1, chr$(27)“x1”;
30 print #1, chr$(27)“Q”chr$(40);
40 print #1, chr$(27)“a”chr$(0)
50 print #1, “Flush left”
60 print #1, chr$(27)“a”chr$(1)
70 print #1, “Centered between the margins”
80 print #1, chr$(27)“a”chr$(2)
90 print #1, “Flush right”
100 print #1, chr$(27)“a”chr$(3)
110 print #1, “This text is justified flush on both sides.”
115 print #1, “Notice how it automatically wraps around, justified at
both margins.”
120 print #1, chr$(27)“@”:close 1
```

```

10 LPRINT CHR$(27)"x1":
20 LPRINT CHR$(27)"Q"CHR$(40);
30 LPRINT CHR$(27)"a"CHR$(0)
40 LPRINT "Flush left"
50 LPRINT CHR$(27)"a"CHR$(1)
60 LPRINT "Centered between the margins"
70 LPRINT CHR$(27)"a"CHR$(2)
80 LPRINT "Flush right"
90 LPRINT CHR$(27)"a"CHR$(3)
100 LPRINT "This text is justified flush on both sides.";
110 LPRINT "Notice how it automatically wraps around, ";
120 LPRINT "justified at both margins."
130 LPRINT CHR$(27)"@"

```

Flush left

Centered between the margins

Flush right

This text is justified flush on both sides.
Notice how it automatically wraps around,
justified at both margins.

PRINT DENSITY

When printing text, it is sometimes desirable to have some words stand out darker than the rest. Headlines are often printed in boldface, for example. The MPS 1250 has two features that allow you to vary the darkness, or density, of the print: emphasized and doublestrike print. For very dark printing, you can use both at once.

Emphasized Print

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

In emphasized print, the characters are double-printed in one pass. Each character is printed a second time offset slightly to the right so that the dots overlap and produce a shadow effect.

When proportional printing is in effect, the characters are automatically printed in emphasized mode.

```

5 open 1,4,7
20 print #1, chr$(27)"E"; "YESSIR! RIGHT AWAY, SIR!"
30 print #1, chr$(27)"F"; "... when I get around to it."
40 close 1

```

```

10 LPRINT CHR$(27)"E"; "YESSIR! RIGHT AWAY, SIR!"
20 LPRINT CHR$(27)"F"; "... when I get around to it."

```

YESSIR! RIGHT AWAY, SIR!
...when I get around to it.

Doublestrike Print

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

In doublestrike, the MPS 1250 prints the entire line and then returns to print it a second time. You probably didn't notice, but on the second pass the paper is rolled up very slightly so that the dots print just below those from the first pass.

The names are slightly misleading because both features actually darken the characters by printing them twice. The difference is in the way the second printing is done. To see the difference, try the following program and watch the print head as the program runs.

```

10 open 1,4,7
20 print #1, chr$(27)"E"; "Double strike"
30 print #1, chr$(27)"G"; "Double strike and emphasized"
40 print #1, chr$(27)"F"; CHR$(27)"H"; "Neither"
50 close 1

```

```

10 LPRINT CHR$(27)"E"; "Double strike"
20 LPRINT CHR$(27)"G"; "Double strike and emphasized"
30 LPRINT CHR$(27)"F"; CHR$(27)"H"; "Neither"

```

Your result will look like this:

Double strike
Double strike and emphasized
Neither

Now you know why combining both methods produces such dark print. In emphasized doublestrike, each letter is printed four times.

Emphasized and doublestrike both produce a higher quality print, but they take considerably more time to print. They also take a toll on your printer ribbon. For these reasons, most people use them only for headlines and occasional words that need emphasis.

SPECIAL EFFECTS

Perhaps you think we've covered a lot of special effects already, but the MPS 1250 still has quite a few more to come. In this section we'll cover italics, underlining, reverse print, as well as superscripts and subscripts. Except for reverse print, all of these features can be combined with the print width and print density features we've discussed already in this chapter. Together they produce over 200 varieties of print styles!

Italics

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

Italics are another means of adding emphasis and variety to your printing. The MPS 1250 has a complete italic character set separate from its standard roman characters. Because of this, you can combine any of the features discussed in this chapter with the italic commands. You can print in mean letter quality italics, elite italics, compressed italics, emphasized italics, and so on.

The command to turn on italics is ESC 4. The command ESC 5 turns off italics. However, in the IBM configuration, ESC 4 sets the top-of-form; ESC 5 controls the automatic line feed feature. See Chapter 5 for details. You can select italics in the IBM mode by using the master print mode command, ESC!, described later in this chapter. Try the following program to see the difference between the MPS 1250's roman and italic characters:

```

5 open 1,4,7
10 for n = 97 to 122:a$ = a$ + chr$(n):next n
20 print #1, chr$(27)"4"; "Italic characters"
30 print #1, a$
40 print #1, chr$(27)"5"; "Normal characters"
50 print #1, a$
60 print #1, "Normal--"; chr$(27)"4"; "and italic--";
70 print #1, chr$(27)"5"; "characters"
100 close 1

```

```

10 FOR N = 65 TO 90:A$ = A$ + CHR$(N):NEXT N
20 LPRINT CHR$(27)"4"; "Italic characters"
30 LPRINT A$
40 LPRINT CHR$(27)"5"; "Normal characters"
50 LPRINT A$
60 LPRINT "Normal--"; CHR$(27)"4"; "and italic--";
70 LPRINT CHR$(27)"5"; "characters"

```

You will see the following results:

Italic characters

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Normal characters

ABCDEFGHIJKLMNOPQRSTUVWXYZ

normal--and italic--characters

To print a single word or phrase in italics in the middle of a line of roman print, just insert the italic commands before and after the word as in line 60.

NOTE: Commodore graphic characters do not have an italic font.

Underlining

	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

The MPS 1250 can underline any of its print styles, roman or italic. The underline command is ESC - (hyphen). It uses 1 and 0 as its on and off switches. Sending ESC -1 turns underlining on; sending ESC -0 turns underlining off. You can substitute CHR\$(1) and CHR\$(0) for the actual ASCII codes since 1 and 0 work as on and off switches rather than the actual characters.

Another use for underlining is to draw rules, to set something apart, to create special forms, or for "fill-in-the-blanks." The MPS 1250 underlines everything, spaces and characters, from the point that underlining is turned on to the point that it is turned off.

The following program illustrates a few underlining effects:

```

10 open 1,4,7
20 print #1, "The MPS 1250 can ";
30 print #1, chr$(27) "- 1"; "underline"
40 print #1, chr$(27) "- 0"; "or let you sign on the"
50 print #1, chr$(27) "- 1"; "          "
60 print #1, chr$(27) "- 0"; "          DOTTED LINE"
70 close 1

```

```

10 LPRINT "The MPS 1250 can ";
20 LPRINT CHR$(27) "- 1"; "underline"
30 LPRINT CHR$(27) "- 0"; "or let you sign on the"
40 LPRINT CHR$(27) "- 1"; "          "
50 LPRINT CHR$(27) "- 0"; "          DOTTED LINE"

```

The MPS 1250 can underline
or let you sign on the

DOTTED LINE

NOTE: In the IBM configuration, the MPS 1250 cannot underline the characters ASCII 176 through 223 and 244.

Overscoring

IBM-graphics mode only

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

In the IBM configuration, the MPS 1250 can overscore any of its print styles. The overscore command uses a _ (underline character) as well as 1 and 0 as its on and off switches. Sending ESC "_1" turns overscoring on; ESC "_0" turns overscoring off. 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.

Overscoring can be used in writing technical specifications or in Geometry where some terms are printed with a line above them. It can also be used to draw rules, to set something apart, to create special forms, or for "fill-in-the-blanks."

```

10 LPRINT CHR$(27)"~51"
20 LPRINT "Technical terms like:":LPRINT
30 LPRINT CHR$(27)"_1";"STROBE";
40 LPRINT CHR$(9);"ACKNLG":LPRINT
50 LPRINT CHR$(27)"_0";"can be overscored."
60 LPRINT
70 LPRINT CHR$(27)"_1";
80 LPRINT CHR$(9)"SIGN HERE"
90 LPRINT CHR$(27)"_0";
100 LPRINT CHR$(27)"~50"

```

Technical terms like:

STROBE ACKNLG

can be overscored.

SIGN HERE

NOTE: In the program above, line 10 switches the MPS 1250 to the IBM configuration to use the overscore feature. Line 100 switches back to the Epson FX configuration. The ESC ~5 command is described later in this chapter.

In the IBM configuration, the MPS 1250 cannot overscore the characters ASCII 176 through 223 and 244.

Reverse Print

	ON	OFF
BASIC	CHR\$(27) "r"	CHR\$(27) "t"
PETASCII Hex	1B 52	1B 54
ASCII Hex	1B 72	1B 74
OR		
BASIC	CHR\$(27) CHR\$(126) "21"	CHR\$(27) CHR\$(126) "20"
PETASCII Hex	1B 7E 32 31	1B 7E 32 30
ASCII Hex	1B 7E 32 31	1B 7E 32 30

Commodore mode only

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

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 command 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. You can create many special effects using reverse print with some ingenuity and a little programming.

In Commodore mode, you can also 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.

```

5 open 1,4,7
10 for n=32 to 56:a$=a$+chr$(n):next n
20 print #1, CHR$(27); chr$(126)"21"; "Reverse print"
25 print #1, a$
30 print #1, chr$(27); chr$(126)"20"; "Not reverse print"
35 print #1, a$
40 close 1

```

```

10 FOR N = 32 TO 56:A$ = A$ + CHR$(N):NEXT N
20 LPRINT CHR$(27)"~21"; "Reverse print"
30 LPRINT A$
40 LPRINT CHR$(27)"~20"; "Not reverse print"
50 LPRINT A$

```

Reverse Print

!"#\$%&'()*+,-./012345678

Not reverse print

!"#\$%&'()*+,-./012345678

Superscript

	ON	OFF
BASIC	CHR\$(27) "S0"	CHR\$(27) "T"
PETASCII Hex	1B D3 30	1B D4
ASCII Hex	1B 53 30	1B 54

Subscript

	ON	OFF
BASIC	CHR\$(27) "S1"	CHR\$(27) "T"
PETASCII Hex	1B D3 31	1B D4
ASCII Hex	1B 53 31	1B 54

The superscript and subscript feature prints characters at half their normal height. Superscript prints its characters in the top half of the line, and subscript prints on the bottom half of the line. The width of the "script" characters matches whatever pitch is in effect. Script characters can be used with all of the MPS 1250's features except reverse print.

The script command is ESC S. It uses 0 and 1 differently from the other commands we've looked at. Sending ESC S0 turns on superscript; sending ESC S1 turns on subscript. ESC T (for text) turns off either mode and returns to normal (full-height) characters.

The following program shows how the script command works:

```

10 open 1,4,7
20 print #1, "You"; chr$(27)"S0"; "TM "; chr$(27)"T";
30 print #1, "can print in "; chr$(27)"S0"; "superscript ";
  chr$(27)"T";
40 print #1, "and "; chr$(27)"S1"; "subscript "; chr$(27)"T"
50 print #1, "like this:"
60 print #1, "H"; chr$(27)"S0"; "2"; chr$(27)"T"; "S0";
  chr$(27) "S1"; "4"
70 print #1, chr$(27)"T"
80 close 1

```

```

10 LPRINT "You"; CHR$(27)"S0"; "TM "; CHR$(27)"T";
20 LPRINT "can print in ";
30 LPRINT CHR$(27)"S0"; "superscript "; CHR$(27)"T";
40 LPRINT "and ";
50 LPRINT CHR$(27)"S1"; "subscript "; CHR$(27)"T"
60 LPRINT "like this:"
70 LPRINT "H"; CHR$(27)"S0"; "2"; CHR$(27)"T";
80 LPRINT "S0"; CHR$(27)"S1"; "4"; CHR$(27)"T"

```

YouTM can print in ~~superscript~~ and ~~subscript~~ like this:

H²S₀4

Footnotes and mathematical formulas are probably the most common use of superscript and subscripts, but they have other uses as well, such as packing a lot of text in a small space, as in some legal contracts, for example.

Character Height

The MPS 1250 has another feature which is especially useful for printing signs and headlines: vertically enlarged printing. To print these characters, the print head makes two passes over the paper, printing the top half in the first pass and the bottom half in the second pass. This makes the character twice as high as regular print.

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	

There are two escape sequences you can use to access vertically enlarged print. One sequence is ESC h (note the lower case "h") to turn it on and ESC u to return to normal height printing. The other

command sequence is ESC~11, which requires you to use the ASCII code CHR\$(126) for the tilde. This form of the command uses 1 and 0 as its on and off switches. Sending ESC~11 turns on vertically enlarged print; sending ESC~10 returns to normal height printing.

```
10 open 1,4,7
20 print #1, chr$(27); chr$(126)"11"; "Hey, You!!"
30 print #1, chr$(27)"G"; chr$(27); chr$(126)"10";
   "That sure got your"
40 print #1, chr$(27); chr$(126)"11"; "A"; chr$(27);
   chr$(126)"10"; "ttention"
50 close 1
```

```
10 LPRINT CHR$(27)"~11"; "Hey, You!!"
20 LPRINT CHR$(27)"E";
30 LPRINT CHR$(27)"~10"; "That sure got your"
40 LPRINT CHR$(27)"~11"; "A";
50 LPRINT CHR$(27)"~10"; "ttention"
60 LPRINT CHR$(27)"F"
```

Hey, You!!

That sure got your
Attention

You can use vertically enlarged printing with any of the MPS 1250's character widths: pica, elite, compressed, and expanded. For really professional looking headlines, try near letter quality, expanded, proportional width, vertically enlarged characters. Vertically enlarged printing can also be mixed with most of the MPS 1250's other print styles which you learned about in this chapter.

As you can see in the program that follows, you can combine vertically enlarged characters and regular characters in one line. The characters align at the top.

THE MASTER COMMANDS

As you've seen, the MPS 1250 has quite a number of text printing features, with different commands to turn each feature on and off. So many, in fact, that keeping track of which features are on and off when writing a program can be quite a chore. Consider, for example, how you would tell the MPS 1250 to change from expanded

emphasized pica italic to underlined elite doublestrike. First, you would turn off expanded with ESC W0, turn off emphasized with ESC F, and turn off italic with ESC 5. Then you would turn on underlining with ESC . . . well, you see what we mean.

Fortunately, there is an easier way. The MPS 1250 has three master commands that each control several features at once. They are the master reset command, the master pitch command, and the master print mode command.

Master Reset

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

Master reset is the simplest master command. It cancels all features and allows you to start from "ground zero". It is equivalent to switching off the power to the MPS 1250 and turning it on again. Unless you change the MPS 1250's internal switches, master reset will return you to pica, roman, singlestrike, bidirectional print and set the top-of-form.

NOTE: In serial Epson #1, or Epson #3 modes, DIP switch 8 must be set to the OFF position to reset to pica.

The master reset command is ESC @. Note: Internal switch 1-8 must be set to the OFF position to reset to pica. Try the following program to see how it works:

```
10 open,1,4,7
20 print #1, chr$(27)"E"chr$(27)" - 1"; chr$(27)"W1";
40 print #1, chr$(27)"G"chr$(27)"4"; chr$(27); chr$(15);
   "One with the works"
50 print #1, chr$(27)"@"," . . . and one without."
60 close 1
```

```

10 LPRINT CHR$(27)"E"; CHR$(27)" - 1"; CHR$(27)"W1";
20 LPRINT CHR$(27)"G"; CHR$(27)"4";
30 LPRINT CHR$(27)CHR$(15); "One with the works"
40 LPRINT CHR$(27)"@"," ... and one without."

```

One with the works

...and one without.

In Commodore mode, you can also do a master reset by sending a secondary address of 10. For example, the statements

```
OPEN 10,4,10:PRINT #10:CLOSE 10
```

also reset the printer.

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 00h

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, 5, 6 or 7) after the master pitch command. Table 3-3 shows the values for n and the corresponding pitch selection.

Table 3-3. Values for Master Pitch Numbers

n	Pitch
0	Pica
1	Elite
2	Pica compressed
5	13.3 CPI
6	15 CPI
7	Elite compressed

Unlike some other commands we've covered, you cannot attach the pitch number to the master command with a statement like PRINT#1,CHR\$(27);CHR\$(126);"32". You must use the CHR\$ function to send the pitch number.

```

10 open 1,4,7
20 for x=1 to 6
30 read n
40 print #1, chr$(27)chr$(126)"3"chr$(n)
50 print #1, "This is just one of many spacing possibilities"
60 next X
70 data 0,1,2,5,6,7

```

```

10 FOR X=1 TO 6
20 READ N
30 LPRINT CHR$(27)"~3"CHR$(N)
40 LPRINT "This is just one of many spacing possibilities"
50 NEXT X
60 DATA 0,1,2,5,6,7

```

This is just one of many spacing possibilities

This is just one of many spacing possibilities

This is just one of many spacing possibilities

This is just one of many spacing possibilities

This is just one of many spacing possibilities

This is just one of many spacing possibilities

Master Print Mode

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

The master print mode command is one of the MPS 1250's most powerful commands. With it, you can select most combinations of print pitch, character width, print quality, and special effects—using just one command.

The master print mode command is ESC !. As with the master pitch command, you select the print mode you want by sending the ASCII code corresponding to its print mode number.

Each combination of features on the MPS 1250 is assigned a unique number called the "print mode number." For example, elite emphasized expanded compressed underlined italics, thankfully, is simply mode 237. To select this mouthful, you can send the command ESC ! CHR\$(237). Try it with the program below.

```
10 open 1,4,7
20 print #1, chr$27"!chr$(237)
30 print #1, "With master print, there are over
  100 possible combinations"
40 print #1, chr$(27)"!chr$(0); "And there's always
  vanilla, if you like."
50 close 1
```

```
10 LPRINT CHR$27"!CHR$(237);
20 LPRINT "With master print, ";
30 LPRINT "there are over 100 possible combinations"
40 LPRINT CHR$(27)"!CHR$(0);
50 LPRINT "And there's always vanilla, if you like."
```

With master print, there are over 100 possible combinations
And there's always vanilla, if you like.

The trick to using the master print mode command is knowing the print mode number for the combination of features you want. With over 100 combinations available, learning their numbers is not the answer.

Fortunately, there is a simple way.

Each of the seven features selectable with the master print mode command has a value associated with it as shown in Table 3-4.

Table 3-4. Values for Print Mode Numbers.

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

Each feature is controlled by one bit in a byte of memory. The feature is activated when its bit is on, inactive when its bit is off. A feature's value is the decimal equivalent of the 8-digit binary number with a 1 in the position corresponding to the feature's bit number.

The following program selects any of 256 different print styles. It can be used as a reference chart showing all of the possible print mode numbers along with a sample of each of the MPS 1250's print styles.

```

10 open 1,4,7
20 print #1, chr$(27)“!”chr$(56)
30 print #1, “COMMODORE MPS 1250 PRINT MODE COMMAND”
40 print #1, chr$(27)“!”chr$(0)
50 print #1, “  ULN ITA EXP DBL EMP CMP PRO ELT”
60 print #1, “ 128 64 32 16 8 4 2 1”
70 for n7=0 to 128 step 128
80 for n6=0 to 64 step 64
90 for n5=0 to 32 step 32
100 for n4=0 to 16 step 16
110 for n3=0 to 8 step 8
120 for n2=0 to 4 step 4
130 for n1=0 to 2 step 2
140 for n0=0 to 1 step 1
145 print #1, “ ”;
150 if n7 then print #1, “ !* ”; else print #1, “ ! ”;
160 if n6 then print #1, “ !* ”; else print #1, “ ! ”;
170 if n5 then print #1, “ !* ”; else print #1, “ ! ”;
180 if n4 then print #1, “ !* ”; else print #1, “ ! ”;
190 if n3 then print #1, “ !* ”; else print #1, “ ! ”;
200 if n2 then print #1, “ !* ”; else print #1, “ ! ”;
210 if n1 then print #1, “ !* ”; else print #1, “ ! ”;
220 if n0 then print #1, “ !* ”; else print #1, “ ! ”;
230 n = n0 + n1 + n2 + n3 + n4 + n5 + n6 + n7
240 print #1, “! ”;
250 print #1, chr$(27)“!”chr$(n); “PRINT MODE”; n;
260 print #1, chr$(27)“!”chr$(0)
270 next n0,n1,n2,n3,n4,n5,n6,n7
280 close 1

```

```

10 LPRINT CHR$(27)“!”CHR$(56)
20 LPRINT “COMMODORE MPS 1250 PRINT MODE COMMAND”
30 LPRINT CHR$(27)“!”CHR$(0)
40 LPRINT “ ULN ITA EXP DBL EMP CMP PRO ELT”
50 LPRINT “ 128 64 32 16 8 4 2 1”
60 FOR N7=0 TO 128 STEP 128
70 FOR N6=0 TO 64 STEP 64
80 FOR N5=0 TO 32 STEP 32
90 FOR N4=0 TO 16 STEP 16
100 FOR N3=0 TO 8 STEP 8
110 FOR N2=0 TO 4 STEP 4
120 FOR N1=0 TO 2 STEP 2
130 FOR N0=0 TO 1 STEP 1

```

```

140 IF N7 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
150 IF N6 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
160 IF N5 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
170 IF N4 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
180 IF N3 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
190 IF N2 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
200 IF N1 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
210 IF N0 THEN LPRINT “!* ”; :ELSE LPRINT “ ! ”;
220 N = N0 + N1 + N2 + N3 + N4 + N5 + N6 + N7
230 LPRINT “! ”;
240 LPRINT CHR$(27)“!”CHR$(N); “PRINT MODE”; N;
250 LPRINT CHR$(27)“!”CHR$(0)
260 NEXT N0,N1,N2,N3,N4,N5,N6,N7

```

SPECIAL CHARACTERS AND SYMBOLS

In addition to letters, numbers, and punctuation in both roman and italic, the MPS 1250 also has many accented characters and graphic symbols in its repertoire.

International Character Sets

	ON	OFF
BASIC	CHR\$(27) “R” CHR\$(n)	CHR\$(27) “R” CHR\$(11)
PETASCII Hex	1B D2 nh	1B D2 0Bh
ASCII Hex	1B 52 nh	1B 52 0Bh

The MPS 1250 can print accented characters from nine languages by redefining up to 12 of the character codes to accommodate the accented characters and special symbols used in each language.

NOTE: In the IBM configuration, ESC R clears all horizontal and vertical tabs (htabs and vtabs). See Chapter 5 for details.

To select a particular set of characters, send ESC R followed by the ASCII code number for the set you want. The values of n are shown in Table 3-5. When in Commodore mode the ESC R command may be sent while the printer is in either uppercase/graphics or upper/lowercase (text) mode, but the MPS 1250 will

only print the international characters when in text mode. In upper-case/graphics mode, the standard Commodore graphics character set is used.

Table 3-5. Values of n for International Character Sets.

n	Country
0	U.S.A. (parallel interface default)
1	France
2	Germany
3	England
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II
11	Commodore standard (serial interface default)

To print a character from the international character set you selected, send its PETASCII or ASCII code number (or its equivalent character in standard PETASCII or ASCII). The codes that change and the international characters are shown in Table 3-6.

Table 3-6. International Characters

Country	International PETASCII/ASCII Codes											
	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	*	@	[	\	\]	^	`	{	|	}	~
France	#	*	à	·	ç	§	^	`	é	ù	è	..
Germany	#	*	ß	À	Ö	U	^	`	ä	ö	u	ß
England	£	*	@	[	\	\]	^	`	{	|	}	~
Denmark I	#	*	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	À	Ö	Å	U	é	ä	ö	å	U
Italy	#	*	@	·	\	é	^	ù	à	ò	è	ì
Spain	¤	*	@	í	ñ	¿	^	`	..	ñ	}	~
Japan	#	*	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	U	é	æ	ø	å	U
Denmark II	#	*	É	Æ	Ø	Å	U	é	æ	ø	å	U
Commodore	#	*	@	[£]	↑	—	+	£	!	¤

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

Note that by selecting the U.S.A. character set, the MPS 1250 will print standard ASCII characters not available on other Commodore dot matrix printers.

To restore the international characters to their standard PETASCII form, use the command ESC R CHR\$(11). International characters can be used with any of the MPS 1250's other features, including near letter quality, and italics.

Example:

```

10 open1,4,7
20 print #1, chr$(27)"R"chr$(7)
30 print #1, "[Ma"; chr$(124); "ana en Madrid?"
40 print #1, chr$(27)"R"chr$(2)
50 print #1, "[ch, no! En M"; chr$(125); "nchen."
60 close1

```

```

10 LPRINT CHR$(27)"R"CHR$(7)
20 LPRINT "[Ma"; CHR$(124); "ana en Madrid?"
30 LPRINT CHR$(27)"R"CHR$(2)
40 LPRINT "[ch, no! En M"; CHR$(125); "nchen."

```

¿Mañana en Madrid?

Äch, no! En München.

In the Spanish character set (n = 7), the right bracket is redefined as "¿" and PETASCII code 124, is redefined as ñ.

Switching Configurations

	Epson Config.	(Serial Mode only) Commodore Config.	(Parallel Mode only) 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	1B 7E 35 31

In serial mode this command switches the MPS 1250 printer between the Epson FX configuration, and the Commodore configuration. In parallel mode this command switches the printer between Epson FX and IBM configurations. You can also change the configuration in the hardware by setting DIP switch 3 ON or OFF, but this method overrides the setting of the switch. This command uses 0 and 1 as its on and off switches. Sending the command ESC ~51 switches to Commodore or 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.

Switching configurations changes the functions of several control codes. The following program issues the same control codes in each configuration, with very different results.

```

10 open 4,4,7
20 print#4,"EPSON MODE:"
30 print#4,chr$(27)chr$(126)"50":gosub 50
40 print#4,"COMMODORE MODE:"
45 print#4,chr$(27)chr$(126)"51":gosub 50
46 print#4,chr$(27)"@":close 4:end
50 print#4,chr$(14)"THIS IS chr$(14) COMMAND"
60 print#4,"CONTINUATION OF chr$(14) ON NEXT LINE";
  chr$(27)"W0"
70 print#4,chr$(14)"chr$(14) PLUS"
  chr$(15)" chr(15) ON THE SAME LINE"
80 print#4,chr$(15)"chr$(15) PLUS"
  chr$(18)" chr(18) ON THE SAME LINE"
90 print#4,chr$(14)"chr$(14) PLUS"
  chr$(20)" chr(20) ON THE SAME LINE"
100 print#4:print#4
110 return

```

Epson Mode:

```

This is chr$(14) command
Continuation of chr$(14) on next line
Chr$(14) plus chr$(15) on the same line
Chr$(15) plus chr$(18) on the same line
Chr$(14) plus chr$(20) on the same line

```

Commodore Mode:

```

This is chr$(14) command
Continuation of chr$(14) on next line
Chr$(14) plus chr$(15) on the same line
Chr$(15) plus chr$(18) on the same line
Chr$(14) plus chr$(20) on the same line

```

CHARACTERS FROM ALL CHARACTERS CHART (IBM configuration)

Print Single Character From All Characters Chart

BASIC	CHR\$(27) “^” CHR\$(n)
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 codes.

See ESC\< for further information.

Print Continuously From All Characters Chart

BASIC	CHR\$(27) “\” CHR\$(n ₁) CHR\$(n ₂)
Hex	1B 5C n ₁ hn ₂ h

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 $n_1 + (n_2 \times 256)$.

Chapter 4

Page Formatting

Page formatting commands tell the MPS 1250 *where* to print (as opposed to text printing commands that tell it *how* to print). This chapter describes the commands that control where your text appears on the page—the distance between lines, page margins, and page length.

THE END OF THE LINE

How does the printer know when to start a new line? There are two ASCII codes that control the end of a line—ASCII 13, called a *carriage return*, and ASCII 10, called a *line feed*. Other related commands are ASCII 141, a carriage return without a line feed in Commodore mode and ASCII 141 and 138 which work the same way as ASCII 13 and 10 respectively in Epson or IBM modes.

Carriage Return

BASIC	CHR\$(13)
PETASCII Hex	0D
ASCII Hex	0D

A carriage return brings the print head 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 serial Epson mode by setting internal switch 7 ON if your computer does not add line feeds for you.

In the IBM or parallel/Epson modes set DIP switch 2 ON for automatic carriage returns. (See Appendix D).

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).

Example:

```
5 open 1,4,7
10 print #1, "This is on"; chr$(13); "two lines"
20 print #1, "but these print ";
30 print #1, "on one line."
50 close 1
```

```
10 LPRINT "This is on"; CHR$(10); "two lines"
20 LPRINT "but these print ";
30 LPRINT "on one line."
```

```
This is on
two lines
but these print on one line.
```

NOTE: The semicolon in line 20 tells BASIC not to send a carriage return (and line feed) to the printer, allowing you to continue the next statement on the same printed line.

Line Feed

BASIC	CHR\$(10)
PETASCII Hex	0A
ASCII Hex	0A

A line feed returns the print head 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. (see Appendix D).



Example:

```
10 open 1,4,7
20 print #1, "This is on"; chr$(10); "two lines"
30 print #1, "Even with semicolons"; chr$(10); "it'll be on two lines."
40 close 1
```

```
10 LPRINT "This statement prints"; CHR$(10); "on two lines"
20 LPRINT "Even with semicolons"; CHR$(10); "it'll be on two lines."
```

```
This is on
two lines
Even with semicolons
it'll be on two lines.
```

Carriage Return Without Line Feed (Commodore mode only)

BASIC	CHR\$(141)
PETASCII 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.

```
10 open 1,4,7
20 print #1, "Carriage Return without Line Feed"; chr$(141);
30 print #1, "Carriage Return without Line Feed"
40 close 1
```

Carriage Return without Line Feed

```
10 open 1,4,7
20 print #1, "Underlined Characters"CHR$(141);
30 print #1, " _____ "
40 close 1.
```

Underlined Characters

A Note About BASIC

The MPS 1250 normally starts a new line with each PRINT# statement because BASIC sends an end-of-line code for you automatically. In Commodore BASIC, pressing the RETURN key at the end of PRINT# statement sends a carriage return to the printer. Some commercial software sends both a carriage return and a line feed at the end of each line.

The MPS 1250 can adapt to both situations by means of internal switch 7 (serial mode), or switch 2 (parallel mode). Setting switch 7 ON in Epson or IBM modes adds a line feed to each carriage return the printer receives. It should be on if your software does not send a line feed with each carriage return. If your software sends a line feed with each carriage return, the switch should be OFF. In Commodore mode, the MPS 1250 always adds a line feed to each carriage return, regardless of the setting of switch 7.

You can avoid beginning a new line with a PRINT# statement by ending the previous PRINT# statement with a semicolon.

LINE SPACING

Each time the MPS 1250 receives a line feed, the paper moves a certain distance. But that distance, called the *line spacing*, need not always be the same. The MPS 1250 has several commands that allow you to change the line spacing.

When you turn on the printer the line spacing is set to six lines per inch, standard typewriter spacing. This is the setting you will probably use most often for text, but for some applications you may wish to change to a smaller or larger line spacing.

The line spacing commands are based on multiples of 1/72 of an inch. The reason for this odd measurement is that the pins in the print head are spaced 1/72 inch apart. Using this measure, then, allows you to vary the line spacing by as little as one-third of a dot for very fine graphics.

Fixed Line Spacing

Fixed line spacing commands let you change the distance the paper is advanced in fixed increments of 1/6 inch, 1/8 inch, or 7/72 inch. The three commands are described below.

1/6 inch 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.

Example:

```
10 open 1,4,7
20 print #1, "These lines are spaced"
30 print #1, "at the default setting"
40 print #1, "of six lines per inch."
50 close 1
```

```
10 LPRINT "These lines are spaced"
20 LPRINT "at the default setting"
30 LPRINT "of six lines per inch."
```

These lines are spaced
at the default setting
of six lines per inch.

1/8 inch 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 1, 3 and 4 on), 1/8 inch line spacing can be selected by setting switch 6 on.

Example:

```

10 open 1,4,7
15 print #1, chr$(27)"0"
20 print #1, "These lines are spaced"
30 print #1, "at eight lines per inch"
40 print #1, "using the esc 0 command"
45 print #1, chr$(27)"2"
50 print #1, "and back again"
60 print #1, "to six lines per inch"
70 print #1, "with the esc 2 command."
80 close 1

```

```

10 LPRINT CHR$(27)"0"
20 LPRINT "These lines are spaced"
30 LPRINT "at eight lines per inch"
40 LPRINT "using the ESC 0 command"
50 LPRINT CHR$(27)"2"
60 LPRINT "and back again"
70 LPRINT "to six lines per inch"
80 LPRINT "with the ESC 2 command."

```

These lines are spaced
at eight lines per inch
using the ESC 0 command

and back again
to six lines per inch
with the ESC 2 command.

7/72 inch Line Spacing

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 (see the example below).

Example:

```

10 open 1,4,7
20 print #1, chr$(27)"S0"; chr$(27)"1"
30 print #1, "SMALL PRINT looks good"
40 print #1, "when printed on"
50 print #1, "SMALL LINES"
60 print #1, chr$(27)"@"
70 close 1

```

```

10 LPRINT CHR$(27)"S0" CHR$(27)"1"
20 LPRINT "SMALL PRINT looks good"
30 LPRINT "when printed on"
40 LPRINT "SMALL LINES"
50 LPRINT CHR$(27)"@"

```

SMALL PRINT looks good
when printed on
SMALL LINES

NOTE: This program uses ESC S0 to select superscript.

Variable Line Spacing

The MPS 1250 has three commands that allow you to vary the line spacing in increments of 1/72, 1/144, and 1/216 of an inch—that is, one, one-half, and one-third of a dot. The finer increments are used mainly for graphics. In Commodore mode you can also vary line spacing by movements of 1/216th of an inch using the secondary address.

Line Spacing of n/72 inch

BASIC	CHR\$(27); "A"; CHR\$(n)	(n = 0 to 85)
PETASCII Hex	1B C1 nh	(nh = 00h to 55h)
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. For example, CHR\$(27) "A" CHR\$(24) will change the line spacing to 24/72 of an inch or 3 lines per inch.

NOTE: The MPS 1250 interprets the CHR\$(27) "A" CHR\$(n) command differently in the IBM graphics configuration. You will need to follow ESC A with ESC 2 to activate the newly defined line spacing.

Example:

```
10 open 1,4,7
20 print #1, chr$(27)"A"; chr$(24)
30 for n= 1 to 3
40 print #1, "These lines are 24/72 of an inch apart."
50 next n
60 print #1, chr$(27)"@"
70 close 1
```

EPSON FX CONFIGURATION:

```
10 LPRINT CHR$(27); "A"; CHR$(24)
20 FOR N= 1 TO 3
30 LPRINT "These lines are 24/72 of an inch apart."
40 NEXT
50 LPRINT CHR$(27)"@"
```

IBM GRAPHICS CONFIGURATION:

```
10 LPRINT CHR$(27); "A"; CHR$(24); CHR$(27); "2";
20 FOR N= 1 TO 3
30 LPRINT "These lines are 24/72 of an inch apart."
40 NEXT
50 LPRINT CHR$(27); "A"; CHR$(12); CHR$(27); "2";
```

These lines are 24/72 of an inch apart.

These lines are 24/72 of an inch apart.

These lines are 24/72 of an inch apart.

NOTE: In the IBM graphics program above, line 10 sets a new line spacing with ESC A and is activated by ESC 2 in the same line. After printing the three lines, line 50 resets the line spacing to 1/6-inch (12/72nds).

Line Spacing of n/144 inch

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

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. For example, CHR\$(27) "~0" CHR\$(12) will change the line spacing to 12/144 of an inch or 12 lines per inch.

Example:

```
10 open 1,4,7
20 print #1, chr$(27); chr$(126); "0"chr$(12)
30 for n= 1 TO 3
40 print #1, "These lines are 12/144 of an inch apart."
50 next n
60 print #1, chr$(27)"@"
70 close 1
```

```
10 LPRINT CHR$(27); CHR$(126); "0"CHR$(12)
30 FOR N= 1 TO 3
40 LPRINT "These lines are 12/144 of an inch apart."
50 NEXT N
60 LPRINT CHR$(27)"@"
```

These lines are 12/144 of an inch apart:
 These lines are 12/144 of an inch apart:

Line Spacing of n/216 inch

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

This command sets the line spacing to n/216 of an inch, adjusting the line spacing to 1/3-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. For example, CHR\$(27) "3" CHR\$(24) will change the line spacing to 24/216 of an inch or 9 lines per inch.

Example:

```
10 open 1,4,7
20 print #1, chr$(27)"3"chr$(24)
30 for n = 1 to 3
40 print #1, "These lines are 24/216 of an inch apart."
50 next n
60 print #1, chr$(27)"@"
70 close 1
```

```
10 LPRINT CHR$(27); "3"; CHR$(24);
30 FOR N = 1 TO 3
40 LPRINT "These lines are 24/216 of an inch apart"
40 NEXT N
50 LPRINT CHR$(27); "@"
```

```
These lines are 24/216 of an inch apart.
These lines are 24/216 of an inch apart.
These lines are 24/216 of an inch apart.
```

n/216 inch Spacing with Secondary Address 6 (Commodore mode only)

There's another way to change line spacing, by using 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, a value of 27 produces eight lines per inch, 72 produces three lines per inch, etc. The default value is 36, which produces 6 lines per inch. The following illustrates spacing determined by a secondary address:

```
10 open 4,4,7
20 open 6,4,6
25 for i = 1 to 5
30 read t
40 print#6,chr$(i)
50 print#4,"HHHHH";
60 next i
70 close 6:close 4
100 data 1, 27,36,72,144
```

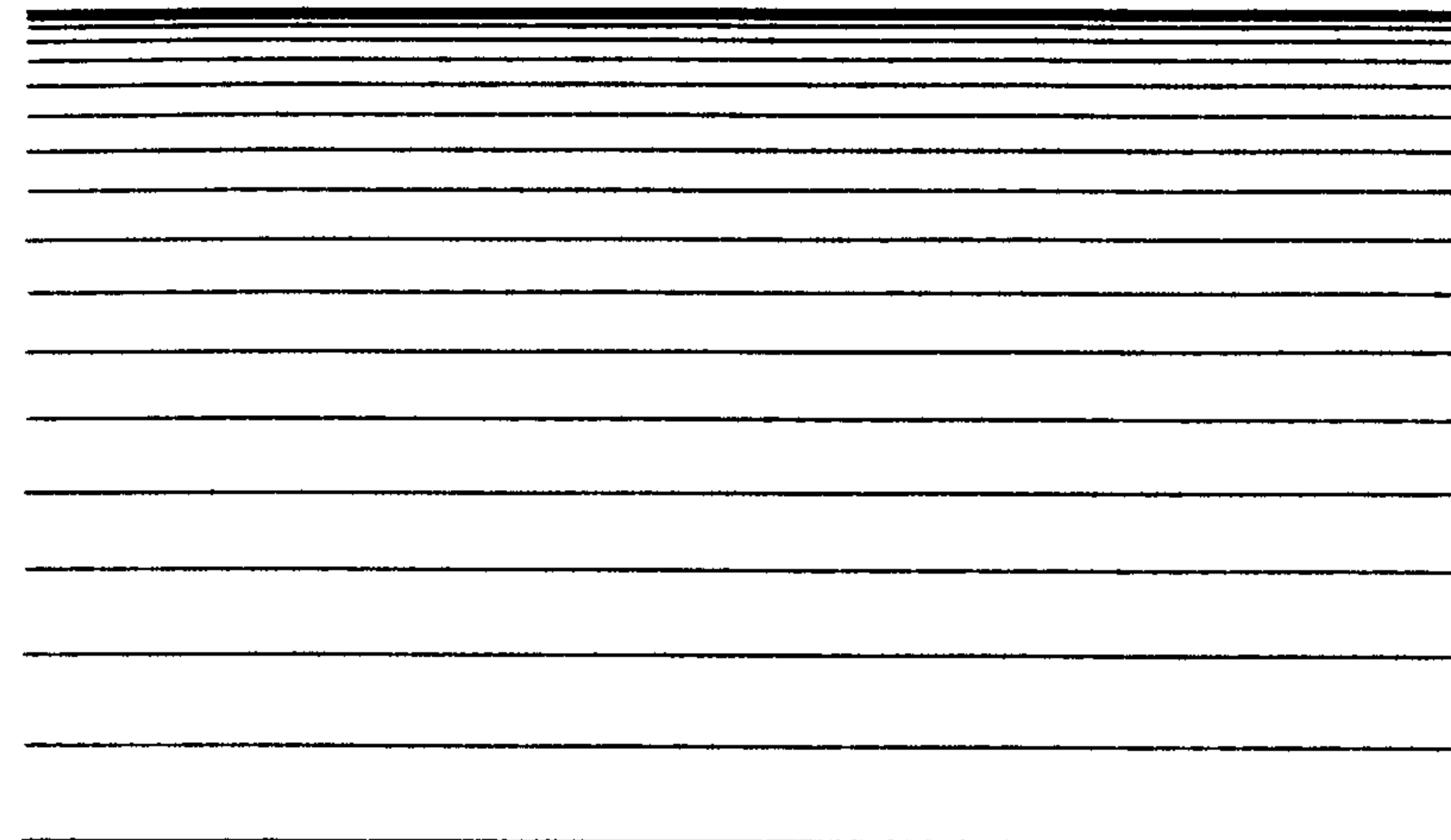
A Variable Line Spacing Example

The following program demonstrates the different spacing you can get with the variable line spacing commands:

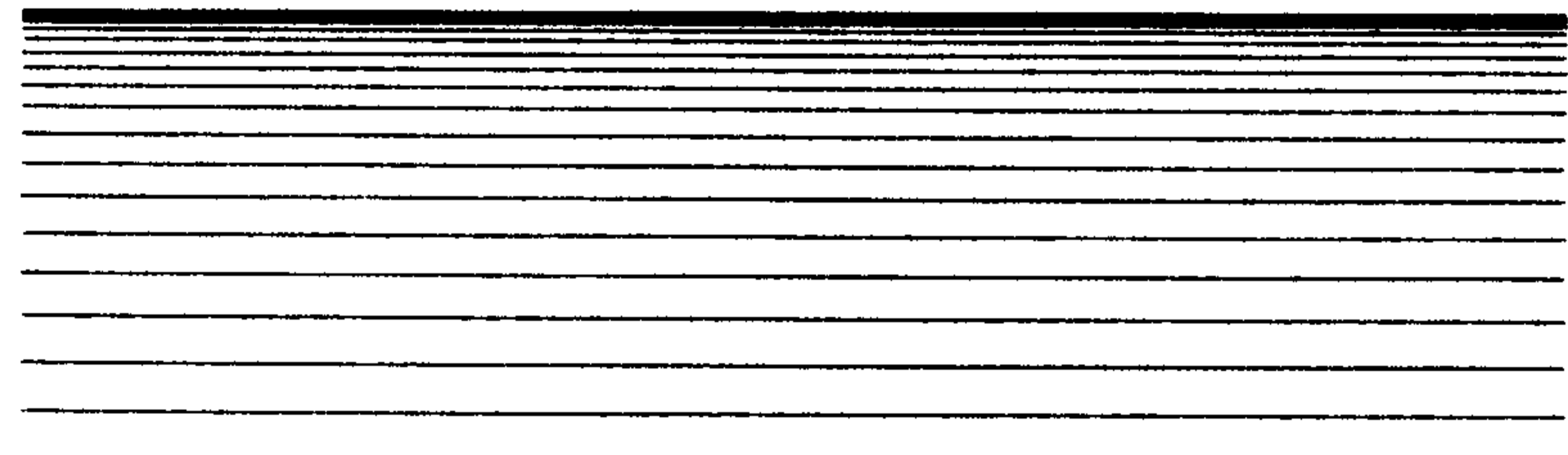
```
10 open 1,4,7
20 k=0:print#1, chr$(27);"-1"
30 sp$(1) = chr$(27) + "A":sp$(2) = chr$(27)
   + chr$(126) + "0":sp$(3) = chr$(27) + "3"
40 print#1,"ESC A varies spacing by 1/72 of an inch":
50 gosub 110
60 print#1,"ESC ~0 varies spacing by 1/144 of an inch":
70 gosub 110
80 print#1,"ESC 3 varies spacing by 1/216 of an inch":
90 gosub 110
100 print#1, chr$(27)" - 0";:close 1:end
110 k = k + 1
120 for n = 0 to 20
130 if n = 9 then goto 170
140 if n = 13 then goto 170
150 print#1,sp$(k);chr$(n);
160 gosub 210
170 next n
180 print#1, chr$(27)"2"
190 print#1
200 return
205 rem next line leave 40 spaces
210 print#1,"
220 return
```

```
10 LPRINT CHR$(27); "~50";
20 K = 0: LPRINT CHR$(27); "-1"
30 SP$(1) = CHR$(27) + "A": SP$(2) = CHR$(27) + "~0":
   SP$(3) = CHR$(27) + "3"
40 LPRINT "ESC A varies spacing by 1/72 inch."
50 GOSUB 110
60 LPRINT "ESC ~0 varies spacing by 1/144 inch."
70 GOSUB 110
80 LPRINT "ESC 3 varies spacing by 1/216 inch."
90 GOSUB 110
100 LPRINT CHR$(27) "- 0"; : END
110 K = K + 1
120 FOR N = 0 TO 20
130 IF N = 9 THEN GOTO 170
140 IF N = 13 THEN GOTO 170
150 LPRINT SP$(K) + CHR$(N);
160 GOSUB 210
170 NEXT
180 LPRINT CHR$(27); "2";
190 LPRINT
200 RETURN
205 REM NEXT LINE LEAVE 40 SPACES
210 LPRINT "
220 RETURN
```

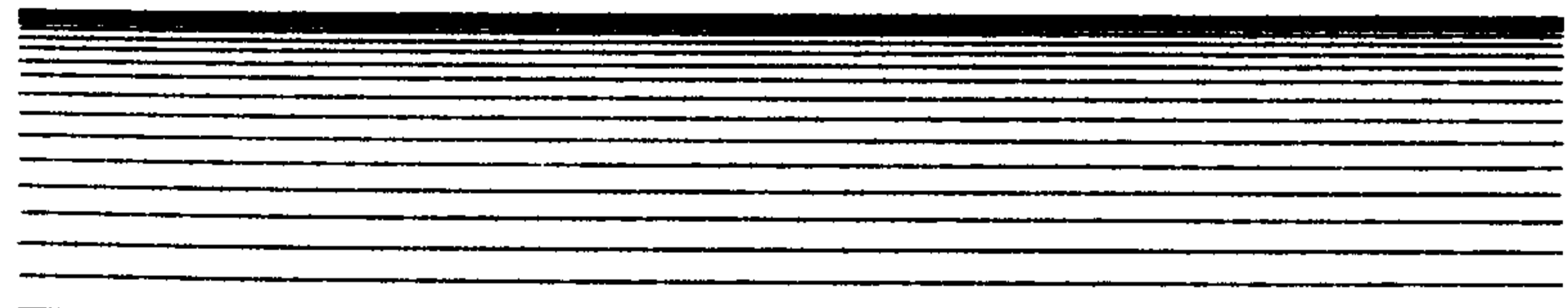
esc A varies spacing by 1/72 inch.



esc ~0 varies spacing by 1/144 inch.



esc 3 varies spacing by 1/216 inch.



In this program, line 20 initializes the counter K and turns on underlining. Line 30 defines the three variable spacing commands as SP\$(1), SP\$(2), and SP\$(3). The commands are actually sent in the subroutine beginning at line 110. The counter K determines which command is needed and line 150 sends it and the value CHR\$(n) to the printer. The subroutine at line 210 then prints 40 underlined spaces. Line 180 resets the spacing to six lines per inch and skips a line to begin the next set of lines.

VARIABLE LINE FEEDS

If you want to move to another line without returning to the left margin, the MPS 1250 provides one command to do this. It allows you to move down in 1/216 inch increments.

Line Feed of n/216 inch

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.

Example:

```
10 open 1,4,7
20 print#1,"ESC J chr$(18) advances the paper "
   chr$(27)"J"chr$(18);
30 print#1,"one half line."
40 close 1
```

```
10 LPRINT "ESC J chr$(18) advances the paper "CHR$(27) "J"
CHR$(18);
20 LPRINT "one half line"
```

```
ESC J chr$(18) advances the paper one half line.
```

PAGE DESIGN

In addition to the commands to control spacing between lines, the MPS 1250 provides several commands that allow you to adjust the overall placement of the printing on the page.

New Page (Form Feed)

BASIC	CHR\$(12)
PETASCII Hex	0C
ASCII Hex	0C

A form feed advances the paper to the top of the next page, the same as the FF switch on the MPS 1250's control panel does. The MPS 1250 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\$(140) for CHR\$(12) in Epson mode to get the same results.

In the Epson #2 configuration, you can set the power-on default page length to either 11 inches by setting internal switch 8 OFF, or to 12 inches by setting switch 8 ON. All other configurations automatically set the page length to 11 inches. (See Appendix D.) You can also set the page length with ESC C.

Example:

```
10 open 1,4,7
20 print#1,"Top of page 1"
30 print#1, chr$(12);"Top of page 2"
40 close 1
```

```
10 LPRINT "Top of page 1"
20 LPRINT CHR$(12);"Top of page 2"
```


Top of Form (IBM only)

BASIC	CHR\$(27) "4"
ASCII Hex	1B 34

In the IBM Graphics Printer configuration, this command sets the current paper position as the top of the page, or top of form. It is equivalent to setting the top of form when you turn the MPS 1250 on or when you initialize the printer (except that no other settings are changed). For example, if you are in the middle of a page when you set the top of form, a form feed will advance the paper a full page length which will be to the middle of the next page.

NOTE: In the Epson configuration, ESC 4 selects italic printing. See Chapter 4 for details.

Page Length

When you first turn on the MPS 1250, the page length is set to 11 inches. Each form feed, therefore, advances the paper 11 inches. Although this is the most common page length, some applications may require a different page length setting. Labels, envelopes, and computer checks are examples.

You can set the page length through software control in two ways: by the number of lines, or by inches. The command to do this is ESC C.

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. For example, CHR\$(27) "C" CHR\$(6) sets the page length to 6 lines, a typical setting for mailing labels.

The actual page length is set internally in inches, determined by multiplying the lines per page by the line spacing in effect at the time. Later changes in line spacing, therefore, have no effect on the length of the page. (They will change the number of lines per page, however.)

Example:

```
10 open 1,4,7
20 print#1, chr$(27)"C"chr$(6)
30 for n = 1 to 3
40 print#1, "Name"
50 print#1, "Address"
60 print#1, "City, State"
70 print#1, chr$(12)
80 next n
90 close 1
```

```
10 LPRINT CHR$(27)"C"CHR$(6)
20 FOR N = 1 TO 3
30 LPRINT "Name"
40 LPRINT "Address"
50 LPRINT "City, State"
60 LPRINT CHR$(12)
70 NEXT N
```

```
Name
Address
City, State
```

[3 Lines]

```
Name
Address
City, State
```

[3 Lines]

```
Name
Address
City, State
```

In Commodore mode, you can also set page length by using secondary address 3 along with the control codes CHR\$(147) to turn paging on and CHR\$(19) to turn paging off. Send CHR\$(147) first to turn paging on; if you don't include a secondary address of

3, page length defaults to 60 lines (so 6 blank lines are left at the bottom of the page). The number given with the file in the OPEN statement with the secondary address of 3 (CHR\$(56) in line 40) specifies the number of lines per page. So the statements

```
10 open 4,4,7
20 open 2,4,3
30 print#4, chr$(147)
40 print#2, chr$(56)
50 close 2: close 4
```

set the page length to 56 lines. To turn paging off, send the printer CHR\$(19). There's a little more on using CHR\$(147) and CHR\$(19) on setting the top and bottom margins later in this chapter.

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. For example, CHR\$(27) "C" CHR\$(0) CHR\$(7) sets the page length to 7 inches, a typical length for many computer forms. Line spacing has no effect on the page length set in inches.

Example:

```
10 open 1,4,7
20 print#1, chr$(27)"C"chr$(0); chr$(3)
30 print#1, "Customer number: Order number: "
40 print#1, chr$(12); "Customer number: Order number: "
50 print#1, chr$(27)"C"chr$(0); chr$(11)
60 close 1
```

```
10 LPRINT CHR$(27)"C"CHR$(0); CHR$(3)
20 LPRINT "Customer Number: Order Number:"
30 LPRINT CHR$(12);
40 LPRINT "Customer Number: Order Number:"
50 LPRINT#1, CHR$(27)"C"CHR$(0); CHR$(11)
```

Customer Number: Order Number:

Customer Number: Order Number:

When you run the program above, you will see the information printed twice, three inches apart. Line 50 resets the page length to 11 inches.

MARGINS

The MPS 1250 has four commands that let you set the margins on your page. In order for these commands to work properly, the MPS 1250 must know where the top of the page is. Therefore, always make sure the top of the page is lined up with the metal ribbon guide when you turn on the MPS 1250.

Top and Bottom Margins

	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. For example, CHR\$(27) "N" CHR\$(6) skips six lines at the bottom of the page.

To set the top margin, first line up the top of the page at the ribbon guide (the first line prints approximately 3/8 inch from the top, which is equivalent to skipping one line). To increase the top margin, advance the paper the required number of lines—manually or using the LF switch with the MPS 1250 off-line—and then switch the power off and on to reset the new top of the form.

Now, when you send the ESC N command, add the number of lines in the top margin to the number of lines in the bottom margin and use the sum with ESC N. For example, to get a 6-line margin at the top and bottom of each page, the total number of margin lines is 12. Set the top of the page five lines above the ribbon guide and send the command CHR\$(27) "N" CHR\$(12).

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.

Example:

```
5 open 1,4,7
10 print#1,"Set Top/Bottom margins to 3 lines"
20 print#1, chr$(27)"C"chr$(8)
30 print#1, chr$(27)"N"chr$(3)
40 for i=1 TO 14
50 print#1,"line number ";i
60 next i
70 close 1
```

```
10 LPRINT "Set Top/Bottom margins to 3 lines"
20 LPRINT CHR$(27)"C"CHR$(8);
30 LPRINT CHR$(27)"N"CHR$(3);
40 FOR I = 1 TO 14
50 LPRINT "line number ";I
60 NEXT I
```

```
line number 1
line number 2
line number 3
```

```
line number 4
line number 5
line number 6
line number 7
line number 8
```

```
line number 9
line number 10
line number 11
line number 12
line number 13
```

```
line number 14
```

NOTE: In the program above, a top margin of 1 line is set by moving the paper down one line, then turning the power off and on again. The bottom margin is 2 lines.

Setting Margins with the Secondary Address (Commodore mode only)

	ON	OFF
BASIC	CHR\$(147)	CHR\$(19)
PETASCII 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". CHR\$(147) can be very useful in

long BASIC programs. With this code, you can print out a long listing skipping over the page perforation. An example of this application for LISTing long BASIC programs.

```
open4,4,7:cmd4,CHR$(147);:list:print#4;close4
```

Left Margin

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

The ESC I (lower case "I") command sets the left margin at column n. Printing starts at column (n + 1). To use it, send ESC I followed by the ASCII code for the column number you want. For example, CHR\$(27) "I" CHR\$(10) sets the left margin at column 10, leaving 10 blank columns (printing will start in column 11). 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.

Example:

```
10 open 1,4,7
20 print#1, "123456789012345678901234567890"
30 print#1, "The power-on left margin"
40 print#1, "starts at the left-most"
50 print#1, "print position."
60 print#1, chr$(27)"I"chr$(10);
70 print#1, "the left margin now starts"
80 print#1, "at column (n + 1) which"
90 print#1, "is column 11."
100 print#1, chr$(27)"I"chr$(0);
110 print#1, "Default left margin again."
120 close 1
```

```
10 LPRINT "123456789012345678901234567890"
20 LPRINT "The power-on left margin"
30 LPRINT "starts at the left-most"
40 LPRINT "print position."
50 LPRINT CHR$(27)"I"CHR$(10);
60 LPRINT "The left margin now starts"
70 LPRINT "at column (n + 1) which"
80 LPRINT "is column 11."
90 LPRINT CHR$(27)"I"CHR$(0);
100 LPRINT#1, "Default left margin again."
```

```
123456789012345678901234567890
The power-on left margin
starts at the left-most
print position.
        The left margin now starts
        at column (n + 1) which
        is column 11.
Default left margin again.
```

Right Margin

BASIC	CHR\$(27) "Q" CHR\$(n)	(n = 1 to 255)
PETASCII Hex	1B D1 nh	(nh = 01h to FFh)
ASCII Hex	1B 52 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. For example, CHR\$(27) "Q" CHR\$(70) sets the right margin at column 70. This will allow printing up to (and including) column 70. 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.

NOTE: ESC Q does not work in the IBM configuration.

Example:

```
10 open 1,4,7
20 print#1, "123456789012345678901234567890"
30 print#1, chr$(27)"Q"chr$(15);
40 for i=1 to 50
50 print#1, "x";
60 next i
70 print#1
80 close 1
```

```
10 LPRINT "123456789012345678901234567890"
20 LPRINT CHR$(27)"Q"CHR$(15);
30 FOR I=1 TO 50
40 LPRINT "x";
50 NEXT I
60 LPRINT
```

```
123456789012345678901234567890
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXX
```

Chapter 5

Using Tabs

You have probably used tabs on a typewriter and know that you can use them to move quickly across the page. Tabs on the MPS 1250 work in much the same way—with a few added features. In addition to horizontal tabs that move across the page, the MPS 1250 also has vertical tabs that move down the page.

HORIZONTAL TABS

Horizontal (and vertical) tabs can be set in two different ways: as fixed tabs, and as variable tabs. You can also move a distance relative to your current position with a relative htab. In this manual, horizontal tabs are referred to as *htabs*.

Move to Next Htab

BASIC	CHR\$(9)
PETASCII Hex	09
ASCII 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.

Example:

```
5 open 4,4
10 for n = 1 to 6
20 print#4, chr$(9); "HTAB";
30 next n
40 print#4, chr$(27); "!" ; chr$(5)
50 for n = 1 to 5
60 print#4, chr$(9); "HTAB";
70 next n
80 print#4
90 print#4, chr$(27); "@"
95 close 4
```

```
10 FOR N = 1 TO 6
20 LPRINT CHR$(9); "HTAB";
30 NEXT N
40 LPRINT CHR$(27)"!"CHR$(5)
50 FOR N = 1 TO 6
60 LPRINT CHR$(9); "HTAB";
70 NEXT N
80 LPRINT
90 LPRINT CHR$(27)"@"
```

```
HTAB      HTAB      HTAB      HTAB      HTAB      HTAB
HTAB      HTAB      HTAB      HTAB      HTAB      HTAB
```

NOTE: In the program above, notice that the fixed htab settings remain the same even though elite compressed is selected with the master print command in line 40.

Horizontal Tab (Commodore mode only)

BASIC	CHR\$(16)
PETASCII Hex	10

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.

Example:

```
10 open 1,4,7
20 print#1, chr$(16)"16"; "HTAB"
30 print#1, chr$(16)"08"; "HTAB"
40 print#1, chr$(16)"24"; "HTAB"
50 close 1
```

```
HTAB      HTAB
HTAB      HTAB
HTAB      HTAB
```

Set Fixed Htabs

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

When you first turn on the MPS 1250 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. For example, to set fixed htabs at every sixth column, send the command CHR\$(27) "e" CHR\$(0) CHR\$(6).

Example:

```
5 open 1,4,7
10 print#1, chr$(27)"e"chr$(0); chr$(6)
20 for n = 1 TO 6
30 print#1, chr$(9); "HTAB";
40 next n
50 print#1, chr$(27)"!"chr$(5)
60 for n = 1 TO 6
70 print#1, chr$(9); "HTAB";
80 next n
90 print#1: print#1, chr$(27)"@"
95 close 1
```

```
10 LPRINT CHR$(27)"e"CHR$(0)CHR$(6)
20 FOR N = 1 TO 6
30 LPRINT CHR$(9); "HTAB";
```

```

40 NEXT N
50 LPRINT CHR$(27)“!”CHR$(5)
60 FOR N = 1 TO 6
70 LPRINT CHR$(9); “HTAB”;
80 NEXT N
90 LPRINT: LPRINT CHR$(27)“@”

```

```

HTAB HTAB HTAB HTAB HTAB HTAB
HTAB HTAB HTAB HTAB HTAB HTAB

```

NOTE: In the program above, notice that the variable htab settings remain the same even though elite compressed is selected with the master print command in line 50.

Variable Htabs

BASIC	CHR\$(27) “D” CHR\$(n1) CHR\$(n2).....CHR\$(0) (n = 1 to 137)
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 1250'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. For example, CHR\$(27) “D” CHR\$(5) CHR\$(18) CHR\$(37) CHR\$(0) sets htabs at columns 5, 18, and 37.

The column numbers for variable htabs must be given in ascending numerical order. A sequence such as CHR\$(5) CHR\$(37) CHR\$(18), for example, would set tabs at column 5 and 37 only. The MPS 1250 interprets any code less than the previous one as the ending code for the sequence. In this case, CHR\$(18) would be the ending code.

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.

Example:

```

5 open 1,4,7
10 print#1, chr$(27)“D”chr$(5); chr$(18); chr$(37); chr$(0);
20 for n = 1 to 3
30 print#1, chr$(9);“HTAB”;
40 next n
50 print#1, chr$(27)“!”chr$(5)
60 for n = 1 to 3
70 print#1, chr$(9);“HTAB”;
80 next n
90 print#1, chr$(27)“@”
95 close 1

```

```

10 LPRINT CHR$(27)“D”CHR$(5)CHR$(18)CHR$(37)CHR$(0);
20 FOR N = 1 TO 3
30 LPRINT CHR$(9);“HTAB”;
40 NEXT N
50 LPRINT CHR$(27)“!”CHR$(5)
60 FOR N = 1 TO 3
70 LPRINT CHR$(9);“HTAB”;
80 NEXT N
90 LPRINT:LPRINT CHR$(27)“@”

```

```

HTAB
HTAB

```

```

HTAB
HTAB

```

```

HTAB
HTAB

```

NOTE: In the program above, notice that the fixed htab settings remain the same even though elite compressed is selected with the master print command in line 50.

Relative Htab

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 head 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 head's current position on the page

(fixed and variable htabs are absolute: column 12, for example, is always in the same place on the page, no matter where the print head happens to be). It is the equivalent of printing a number of spaces.

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.

Example:

```
10 open 1,4,7
15 for n = 1 to 5
20 print#1,"widening"; chr$(27)"f"chr$(0)chr$(n);"GAPS"
30 next n
40 print#1, chr$(27)"!"chr$(5)
50 for n = 1 to 5
60 print#1,"widening"; chr$(27)"f"chr$(0)chr$(n);"GAPS"
70 next n
80 close 1
```

```
10 FOR N = 1 TO 5
20 LPRINT "WIDENING";CHR$(27)"f"
  CHR$(0)CHR$(N);"GAPS"
30 NEXT N
40 LPRINT CHR$(27)"!"CHR$(5)
50 FOR N = 1 TO 5
60 LPRINT "WIDENING";CHR$(27)"f"
  CHR$(0)CHR$(N);"GAPS"
70 NEXT N
80 LPRINT CHR$(27)"@"
```

```
WIDENING GAPS
WIDENING  GAPS
WIDENING  GAPS
WIDENING   GAPS
WIDENING   GAPS
```

```
WIDENING GAPS
WIDENING GAPS
WIDENING GAPS
WIDENING GAPS
WIDENING GAPS
```

NOTE: In the program above, notice that the relative htab settings *do not* remain the same when elite compressed is selected with the master print command in line 40. This is because the htab is now a *relative* distance rather than an *absolute* distance.

DOT TABS

The MPS 1250 has another type of horizontal tab to move the print head across the page. It's called a dot tab. These work in much the same way as the other horizontal tabs, except instead of tabbing to a specified character printing position, the MPS 1250 tabs to a particular dot column.

There are 60 columns of dots per inch which, of course, gives you much finer precision in your horizontal tabbing. Dot tabs can be used for very fine spacing increments (for justified text, perhaps) or even for printing a line or a character between other characters.

There are two types of dot tabs: *absolute* dot tabs and *relative* dot tabs.

Absolute Dot Tabs

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)

At 60 dot columns per inch, the MPS 1250 has 480 columns. If you specify a dot column beyond the right margin, the results are unpredictable. The maximum value for n1 is 244; the maximum value for n2 is 1 (if n2 is less than 1, however, then the maximum value for n1 is 255). Let's assume N equals 360:

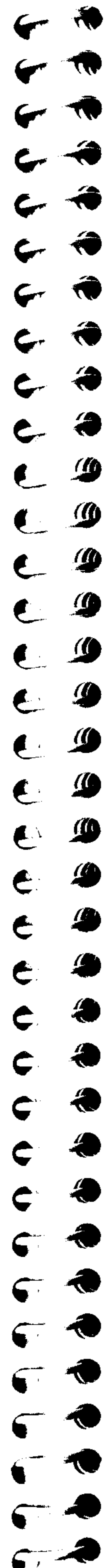
N2 = INT (360/256) = 1
 N1 = 360-(256*1) = 104

This program uses these tab positions:

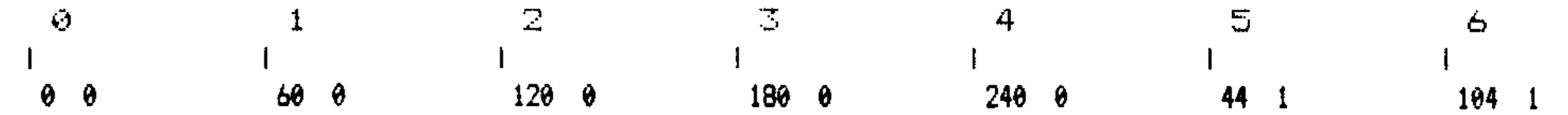
Example:

```
10 open 4,4
20 for i=0 to 360 step 60
30 j=int(i/256):k=i-j*256
50 print#4, chr$(27);"$"; chr$(k); chr$(j); i/60;
60 next i
70 print#4
80 for i=0 to 360 step 60
90 j=int(i/256):k=i-j*256
110 print#4, chr$(27);"$"; chr$(k); chr$(j); "I";
120 next i
130 print#4, chr$(27); chr$(15)
140 for i=0 to 360 step 60
150 j=int(i/256):k=i-j*256
170 print#4, chr$(27);"$"; chr$(k); chr$(j); k;j;
180 next i
190 print#4, chr$(27); chr$(18)
200 close4
```

```
10 FOR I=0 TO 360 STEP 60
20 J=INT(I/256):K=I-J*256
40 LPRINT CHR$(27)"$"CHR$(K)CHR$(J);I/60;
50 NEXT I
60 LPRINT
70 FOR I=0 TO 275 STEP 60
80 J=INT(I/256):K=I-J*256
100 LPRINT CHR$(27)"$"CHR$(K)CHR$(J);"I";
110 NEXT I
120 LPRINT CHR$(27)CHR$(15)
130 FOR I=0 TO 275 STEP 60
```



```
140 J=INT(I/256):K=I-J*256
160 LPRINT CHR$(27)"$"CHR$(K)CHR$(J);k;j;
170 NEXT I
180 LPRINT CHR$(27)CHR$(18)
```



Relative Dot Tabs

BASIC	CHR\$(27) "£" CHR\$(n1) CHR\$(n2) (n1 and n2 specify the tab position in dots)
PETASCII Hex	1B 5C n1h n2h
ASCII Hex	1B 5C n1h n2h (n1h and n2h specify the tab position in dots)

Relative dot tabs move the print head to the location on the page that is the specified number of dot columns relative to its current position. 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. The values for n1 and n2 are calculated just as they are with the absolute dot tab command (described above).

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 MPS 1250 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).

NOTE: On many computers ASCII HEX 5C is generated by the "\ " key rather than the "£" key shown above.

Example:

```

10 open 1,4,7
20 for i=0 to 20 step 2
30 rel$=chr$(27)+"£"+chr$(i)+chr$(0)
40 print#1,"This";rel$;"shows";rel$;"increasing";
   rel$;"workspace."
50 next i
60 close 1

```

```

10 FOR I=0 TO 20 STEP 2
20 REL$=CHR$(27)+"\ "+CHR$(I)+CHR$(0)
30 LPRINT "This";REL$;"shows";REL$;"increasing";
   REL$;"workspace."
40 NEXT I
50 LPRINT CHR$(27)"@"

```

This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.
This shows increasing workspace.

VERTICAL TABS (VTABS)

Vertical (and horizontal) tabs can be set in two different ways: as fixed tabs, and as variable tabs. You can also move a distance relative to your current position with a relative vtab. Still another command lets you set vertical tab channels for flexibility with multi-page forms. In this manual, vertical tabs are referred to as *vtabs*.

Move to Next Vtab

BASIC	CHR\$(11)
PETASCII Hex	0B
ASCII Hex	0B

Vertical tabs move down the page by lines. They are useful when working with forms or to leave space for pictures or diagrams in your text. 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 MPS 1250's vtab command is CHR\$(11). Unlike horizontal tabs, vtabs have no default settings. When you first turn on the MPS 1250, a vtab advances the paper one line.

Example:

```

10 open 1,4,7
20 for n=1 to 4
30 print#1, chr$(11)"Default VTAB"
40 next n
50 close1

```

```

10 FOR N=1 TO 4
20 LPRINT CHR$(11)"Default VTAB"
30 NEXT N

```

Default VTAB

Default VTAB

Default VTAB

Default VTAB

Fixed Vtabs

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 MPS 1250 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. For example, to set vtabs every 6 lines, send the command CHR\$(27) "e" CHR\$(1) CHR\$(6).

Example:

```
10 open 1,4,7
20 print#1, chr$(27)"e"chr$(1); chr$(3);
30 for n=1 to 3
40 print#1, chr$(11);"VTAB #";n;"at line";n*3
50 next n
60 print#1, chr$(27)"@"
70 close 1
```

```
10 LPRINT CHR$(27)"e"CHR$(1)CHR$(3);
20 FOR N=1 TO 3
30 LPRINT CHR$(11);"VTAB #";N;"at line";N*3
40 NEXT N
50 LPRINT CHR$(27)"@"
```

VTAB #1 at line 3

VTAB #2 at line 6

VTAB #3 at line 9

Variable Vtabs

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. For example, CHR\$(27) "B" CHR\$(6) CHR\$(20) CHR\$(26) CHR\$(0) sets vtabs at lines 6, 20 and 26.

The line numbers for variable vtabs must be given in ascending numerical order. A sequence such as CHR\$(6) CHR\$(26) CHR\$(20), for example, would set tabs at column 6 and 26 only. The MPS 1250 interprets any code less than the previous one as the ending code for the sequence. In this case, CHR\$(20) would be the ending code.

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.

Example:

```
10 open 1,4,7
20 print#1, chr$(27)"B"chr$(6); chr$(10); chr$(16); chr$(0)
30 for n=1 to 3
40 print#1, chr$(11);"VTAB"
50 next n
60 print#1: print#1, chr$(27)"@"
70 close 1
```

```
10 LPRINT CHR$(27)"B"CHR$(6)CHR$(10)CHR$(16)CHR$(0)
20 FOR N=1 TO 3
30 LPRINT CHR$(11);"VTAB"
40 NEXT N
50 LPRINT:LPRINT CHR$(27)"@"
```

VTAB

VTAB

VTAB

Relative Vtab

BASIC	CHR\$(27) "f" CHR\$(1) CHR\$(n)	(n = 0 to 127)
PETASCII Hex	1B 46 01 nh	(nh = 00h to 7Fh)
ASCII Hex	1B 66 01 nh	

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 (fixed and variable vtabs are absolute; line 10, for example, is always in the same place on the page, no matter where the paper happens to be). It is the equivalent of printing a number of line feeds.

To use the relative vtab command send the MPS 1250 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 (for a picture to be inserted later perhaps) without having to figure out where you are on the page.

Example:

```
10 open 1,4,7
20 for n=1 to 5
30 print#1,"Line";n;chr$(27)"f"chr$(1);chr$(n)
40 next n
50 close 1
```

```
10 FOR N=1 TO 5
20 LPRINT "Line";N;CHR$(27)"f"CHR$(1)CHR$(N)
30 NEXT N
```

Line 1

Line 2

Line 3

Line 4

Line 5

Vtab Channels

If you work with multi-page forms you may find that you need a different set of vtabs for each page. The MPS 1250 provides a way to save up to eight sets of Vtabs and recall them with a single command as you need them. Each set of vtabs is called a channel and is identified by a number from 0 to 7.

Define Vtab Channel

BASIC	CHR\$(27) "b" CHR\$(N) CHR\$(n1) CHR\$(n2) CHR\$(0)
	(N = 0 to 7; n = 1 to 255)
PETASCII Hex	1B 42 Nh n1h n2h00
ASCII Hex	1B 62 Nh n1h n2h00
	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 1250 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.

For example to define channel 1 to contain vtabs at lines 6, 10, and 14, and channel 2 to contain vtabs at lines 4, 7, 17, and 38, send the commands: CHR\$(27) "b" CHR\$(1) CHR\$(6) CHR\$(10) CHR\$(14) CHR\$(0) and CHR\$(27) "b" CHR\$(2) CHR\$(4) CHR\$(7) CHR\$(17) CHR\$(38) CHR\$(0).

Channel 0 is the default channel. Unless you tell it otherwise, the MPS 1250 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.

Select Vtab 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. For example, to select vtab channel 2, send CHR\$(27) "/" CHR\$(2). Any subsequent vtab command will use the vtabs defined in channel 2.

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

Example:

```

5 open 1,4,7
10 print #1, chr$(27)"b"chr$(0); chr$(5); chr$(8);
   chr$(20); chr$(0)
20 print #1, chr$(27)"b"chr$(1); chr$(3); chr$(10);
   chr$(12); chr$(0)
30 print #1, chr$(27)"b"chr$(2); chr$(18); chr$(24);
   chr$(30); chr$(0)
40 for i=0 to 2
50 print #1, chr$(27)"/"chr$(1);
60 for n=1 to 3
70 print #1, chr$(11);"VTAB";n;"in channel";i;
80 next n
90 print #1, chr$(12);
100 next i
110 close 1

```

```

10 LPRINT CHR$(27)"b"CHR$(0)CHR$(5)CHR$(8)CHR$(20)CHR$(0)
20 LPRINT CHR$(27)"b"CHR$(1)CHR$(3)CHR$(10)CHR$(12)CHR$(0)
30 LPRINT CHR$(27)"b"CHR$(2)CHR$(18)CHR$(24)
   CHR$(30)CHR$(0)
40 FOR I=0 TO 2
50 LPRINT CHR$(27)"/"CHR$(1);
60 FOR N=1 TO 3
70 LPRINT CHR$(11);"VTAB";N;"in n channel";I;
80 NEXT N
90 LPRINT CHR$(12);
100 NEXT I

```

Note: Before you run the program above, make sure the top of your paper is lined up with the ribbon guide. You will see three pages of output on the MPS 1250 with three vtabs identified on each page.

Chapter 6

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 1250 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 1250 contains three complete sets of block and line graphics characters. You can see a complete list of these characters in Appendix B.

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 1250 contains two groups of block and line graphics characters — one in its Epson character set at ASCII 128 to 159, 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 B.

Both of these groups contain line-drawing characters — but with one big difference. The characters in the Epson 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

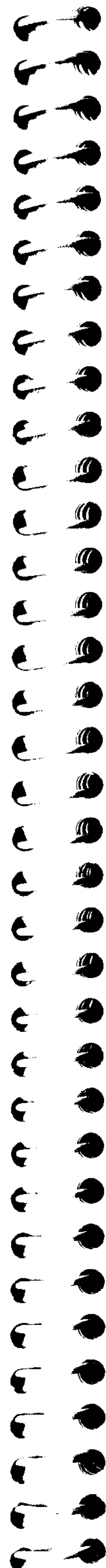
the IBM character set, on the other hand, are based on 12-dots; you can connect them using standard 6 lines-per-inch (12/72-inch) line spacing. (the IBM characters also work with 7/72-inch line spacing by overlapping.)

Example

```

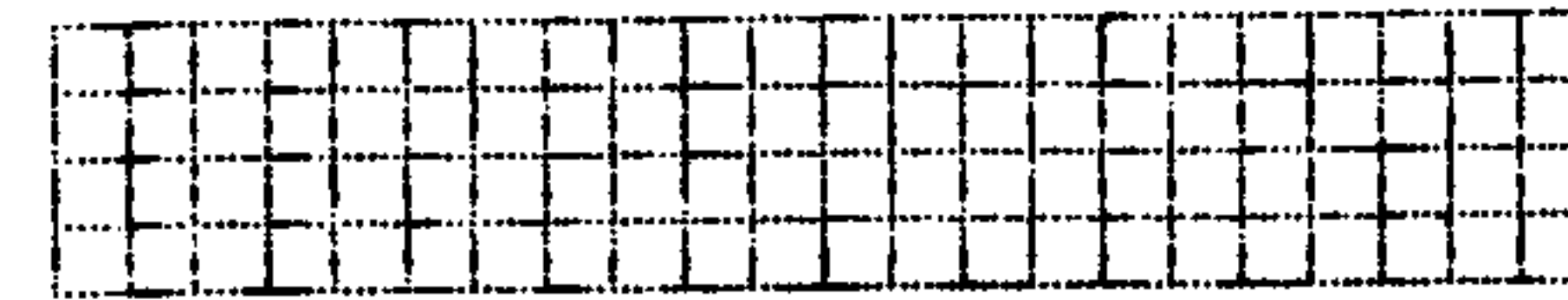
10 LPRINT CHR$(27)"m"CHR$(4);
20 LPRINT CHR$(27)"U1";
30 LPRINT "At 7/72-inch line spacing:":LPRINT
40 LPRINT CHR$(27)"1";
50 GOSUB 110
60 LPRINT "At 12/72-inch line spacing:":LPRINT
70 LPRINT CHR$(27)"2";
80 GOSUB 110
90 LPRINT CHR$(27)"@"
100 END
110 LPRINT CHR$(27)"~50";"Epson character set"
120 GOSUB 160:GOSUB 260
130 LPRINT CHR$(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

```

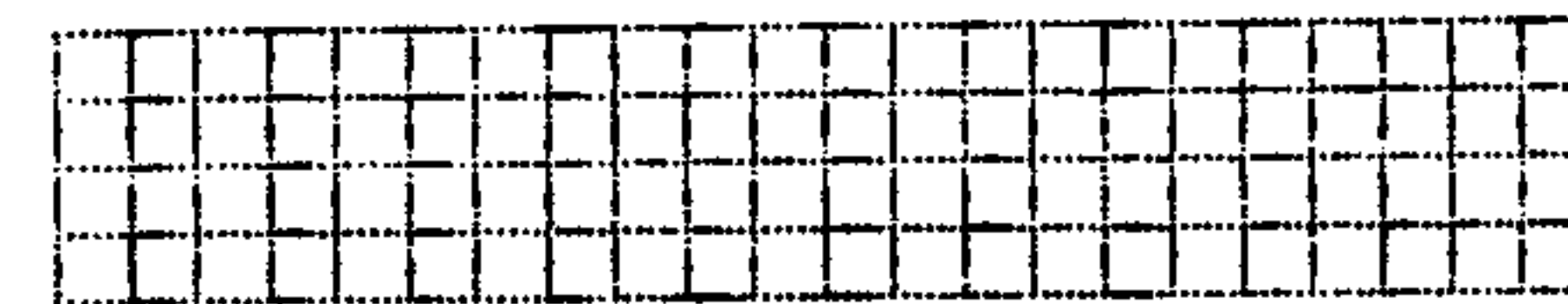


AT 7/72-INCH LINE SPACING:

EPSON CHARACTER SET

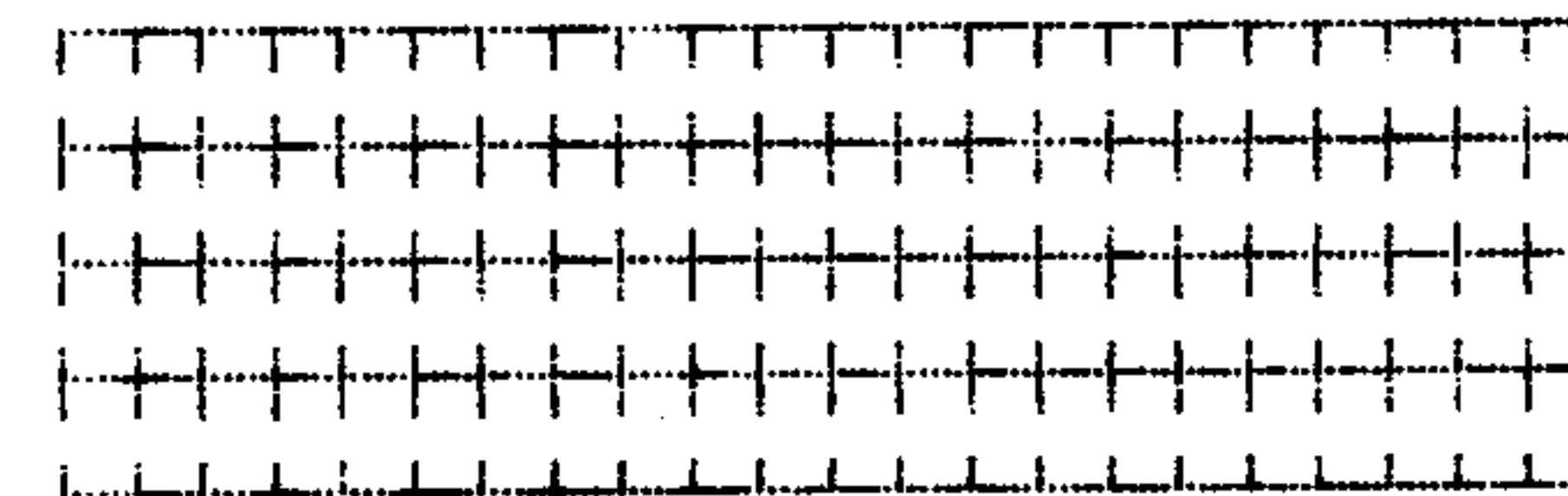


IBM CHARACTER SET

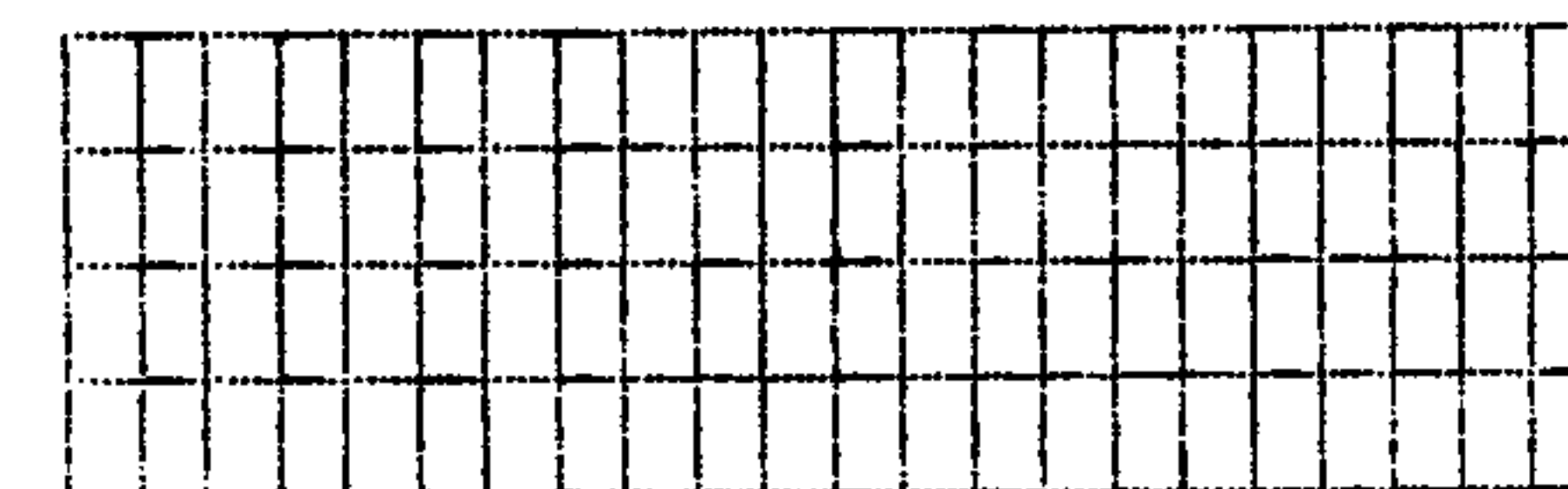


AT 12/72-INCH LINE SPACING:

EPSON CHARACTER SET



IBM CHARACTER SET



In the program above, line 10 points out another difference between line graphics in the Epson character set and those in the IBM character set. As we discussed at the end of Chapter 4, the MPS 1250 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 1250 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 1250 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 1250 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.

As you may recall from Chapter 2, the print head consists of nine pins held 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 bottom 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 1250 can handle seven-pin as well as eight-pin graphics. Seven-pin graphics is covered in detail in Chapter 7.

You can also use all nine pins on the MPS 1250 print head for graphics. Nine-pin graphics is quicker than using eight- or seven-pin, but is a bit more difficult to code.

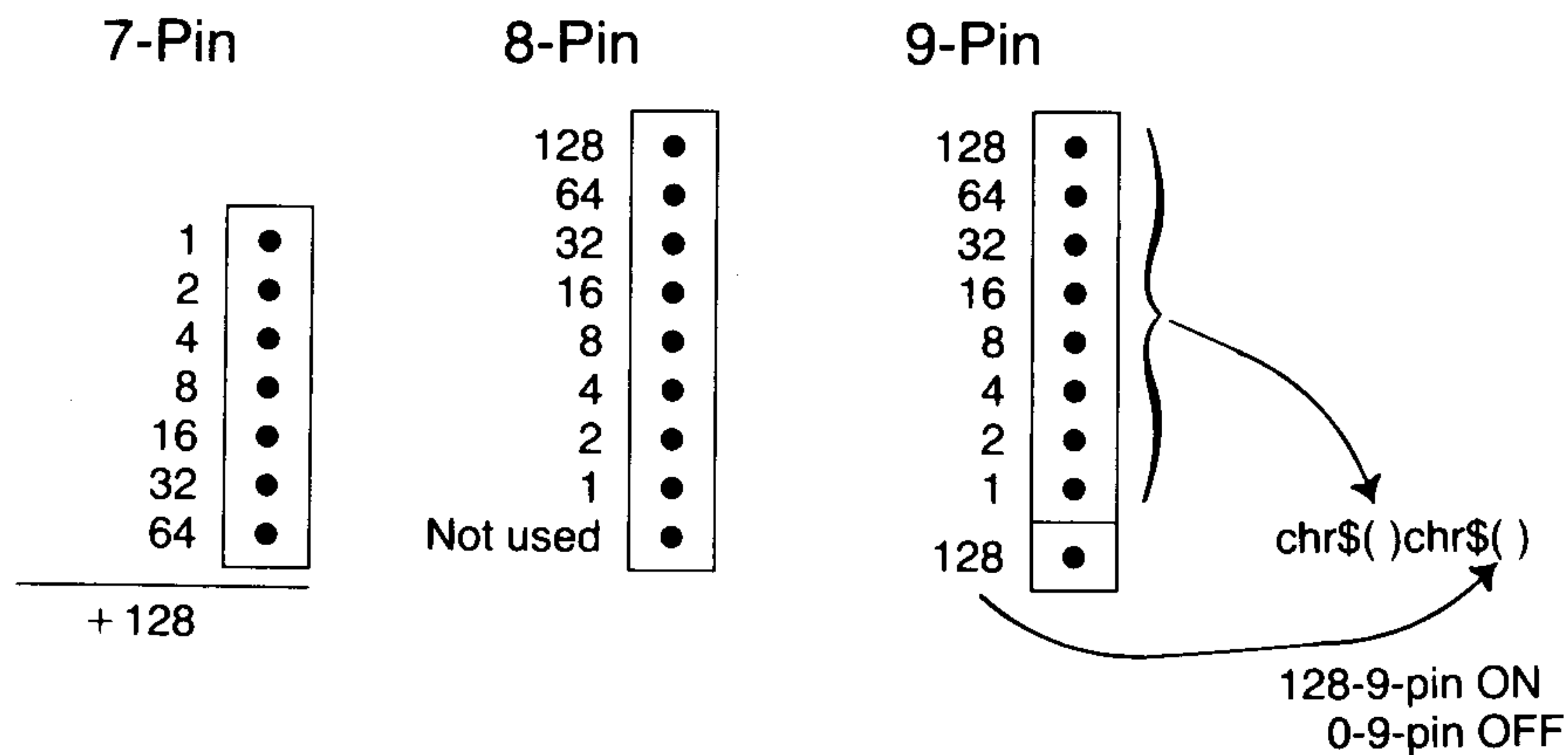
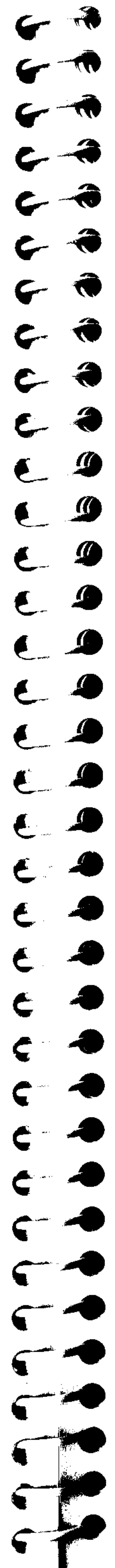


Figure 6-1. Dot Graphics Pin Comparison



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 1250; just set the DIP switches accordingly, and select “Commodore” or “Epson,” or “IBM Graphic” from the printer options listed in the program.

The MPS 1250 prints dot graphics in lines, just as it does predefined characters. The print head moves across the paper striking the appropriate pins against the ribbon 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 1250 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 1250 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 1250 how many pieces of data to expect. First, let's see how the MPS 1250 prints graphics.

Pin Numbers

To tell the MPS 1250 which pins to print in each column, you need a way to identify the pins in the print head. The MPS 1250 assigns each pin a number as shown in Figure 6.1. Skipping the unused bottom pin, they are numbered as powers of 2: $2^0, 2^1, 2^2 \dots 2^7$, or in everyday numbers, 1,2,4,8,16,32,64, and 128. Once you've told

the MPS 1250 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.

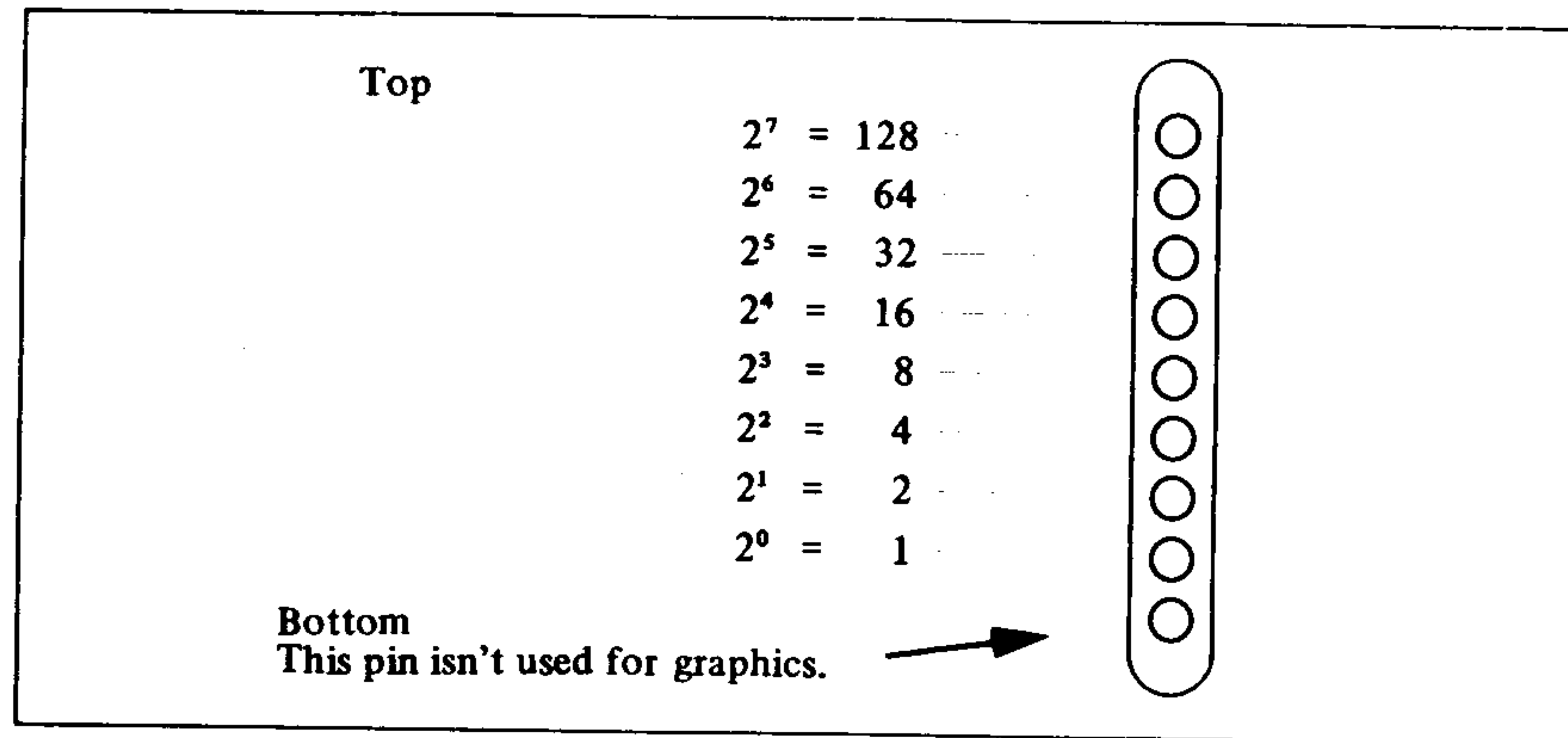


Figure 6-2. Print head numbers (Epson mode).

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 $n1 + (256 \times n2)$.

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 $n1 + (256 \times n2)$.

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 $n1 + (256 \times n2)$.

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 $n1 + (256 \times n2)$.

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\$(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 1250 can print 480 columns of dots in an 8-inch line. And at 240 dots per inch the MPS 1250 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 1250 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 = 224 + 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:

$$n2 = \text{INT}(x/256)$$
$$N2 = X - 256 * n2$$

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

Table 6-1. 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 semicolon. 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.

GRAPHICS FOR SPECIAL APPLICATIONS

The MPS 1250 has several graphics configurations that can be used for special applications. In addition to the four graphics densities we've covered so far, there are four additional ones, making a total of eight available densities. The four additional densities are especially useful for making screen dumps and for plotting, but they can also be used to just add variety to your graphics.

Master Graphics Command

Format	
BASIC	CHR\$(27)"*"CHR\$(m)CHR\$(n1)CHR\$(n2) (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 MPS 1250's eight densities. Each density is assigned a graphics mode number, from 0 to 7, as shown in Table 6-2. 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.

Table 6-2. Graphics Density Modes

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

```

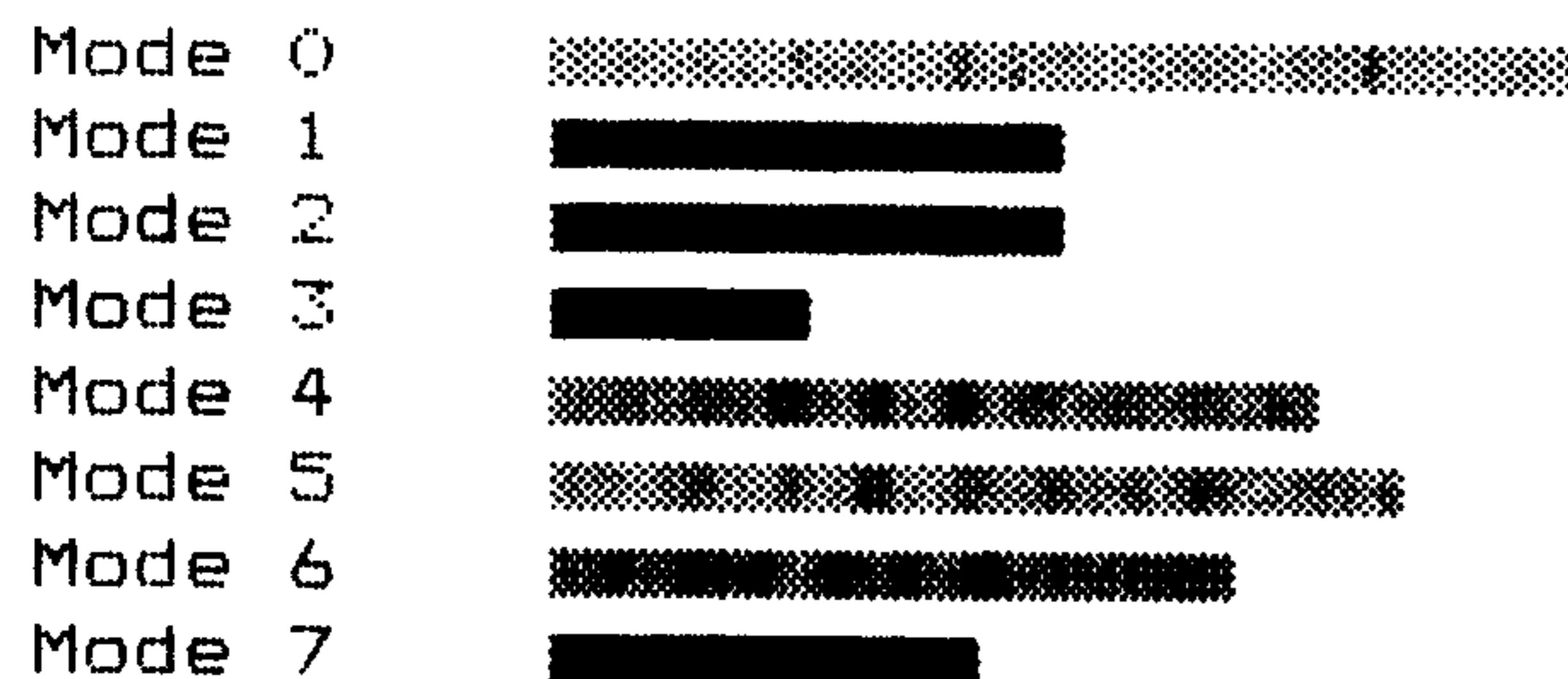
10 open 1,4,7
20 for m = 0 to 7
30 print#1, "Mode"; m; " ";
40 print#1, chr$(27)"*"chr$(m)chr$(120)chr$(0);
50 for n = 1 to 60
60 print#1, chr$(85)chr$(42);
70 next n
80 print#1
90 next m
100 close 1

```

```

10 WIDTH "LPT1:",255
20 FOR M = 0 TO 7
30 LPRINT "Mode"; M; " ";
40 LPRINT CHR$(27)"*"CHR$(M)CHR$(120)CHR$(0);
50 FOR N = 1 TO 60
60 LPRINT CHR$(85)CHR$(42);
70 NEXT N
80 LPRINT
90 NEXT M

```



Changing Graphic Density

Format	CHR\$(27)"?n"CHR\$(m)	(n = K, L, Y or Z) (m = 0 to 7)
BASIC	1B 3F nh mh	(nh = CBh, CCh, D9h, DAh)
PETASCII Hex	1B 3F nh mh	(mh = 00h to 07h)
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 above in Table 6.2.

```

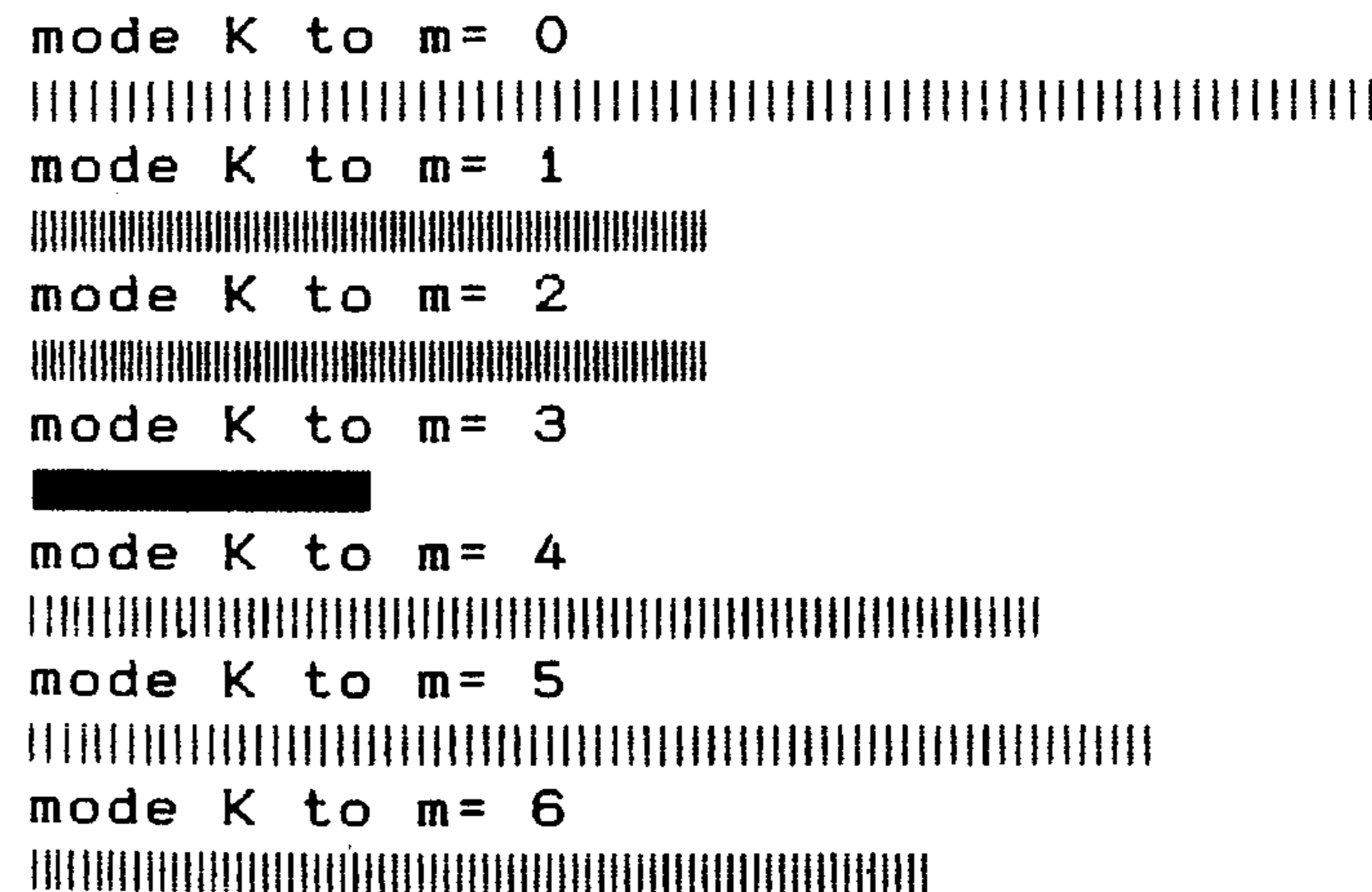
10 open 1,4,7
20 for m=0 to 6
30 print#1, "Mode K to m="; m;
40 print#1, chr$(27)"?K"chr$(m);
50 print#1, chr$(27)"K"chr$(210)chr$(0);
60 for i=1 to 70
70 print#1, chr$(255)chr$(0)chr$(0);
80 next i
90 print#1,
100 next m
110 close 1

```

```

10 WIDTH "LPT1:",255
20 FOR M = 0 TO 6
30 LPRINT "Mode K to m = ";M;
40 LPRINT CHR$(27)"?K"CHR$(M);
50 LPRINT CHR$(27)"K"CHR$(210)CHR$(0);
60 FOR I = 1 TO 70
70 LPRINT CHR$(255)CHR$(0)CHR$(0);
80 NEXT I
90 LPRINT
100 NEXT M

```



Nine-pin Graphics

Format	
BASIC	CHR\$(27)" ↑ "CHR\$(m)CHR\$(n1)CHR\$(n2) (m = 0 to 1)
PETASCII Hex	1B 5E mh n1h n2h
ASCII Hex	1B 5E mh n1h n2h

At the beginning of this chapter we mentioned that the bottom-most pin on the print head was not normally used for graphics. It is possible to use this ninth pin, although it requires a little more programming.

The nine-pin graphics mode has the advantage of being a little faster than the normal seven- or eight-pin mode since nine dots at a time instead of seven or eight. The disadvantages are that only single and double density are available with nine pins, and that it requires twice as much data—two ASCII codes for each column of dots.

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 128 or greater prints the bottom pin; a code less than 128 does not print the bottom pin. Because of this, nine-pin graphics is not used for routine applications. But for very intense graphics applications such as screen dumps and plotter graphics, the increase in speed may make the additional programming effort worthwhile.

The nine-pin graphics command is ESC ↑. To use it send the MPS 1250 ESC ↑, followed by CHR\$(0) for single density or CHR\$(1) for double density, followed by the usual CHR\$(n1) and CHR\$(n2) to set the line length.

NOTE: On many computers, ASCII Hex 5E is generated by the “^” key, rather than the “↑” key shown above. Refer to your computer’s manual for more information.

DESIGNING GRAPHICS

Graphics can be designed in two ways. In the first method you define the shapes by sketching them on paper and then tell the MPS 1250 the exact pin numbers to print in each column. In the second method, sometimes called plotting, the shapes and pin numbers are calculated by the computer according to a formula you supply in a program.

Defining Shapes

Any graphic pattern can be defined using graph paper as shown in Figure 6-3. Each horizontal row on the graph paper corresponds to a pin number and each vertical column corresponds to a column of dots. You simply sketch the shape you want on the paper and note the blocks where dots are to be printed. Then add the required pin numbers in each column to determine the pin number codes.

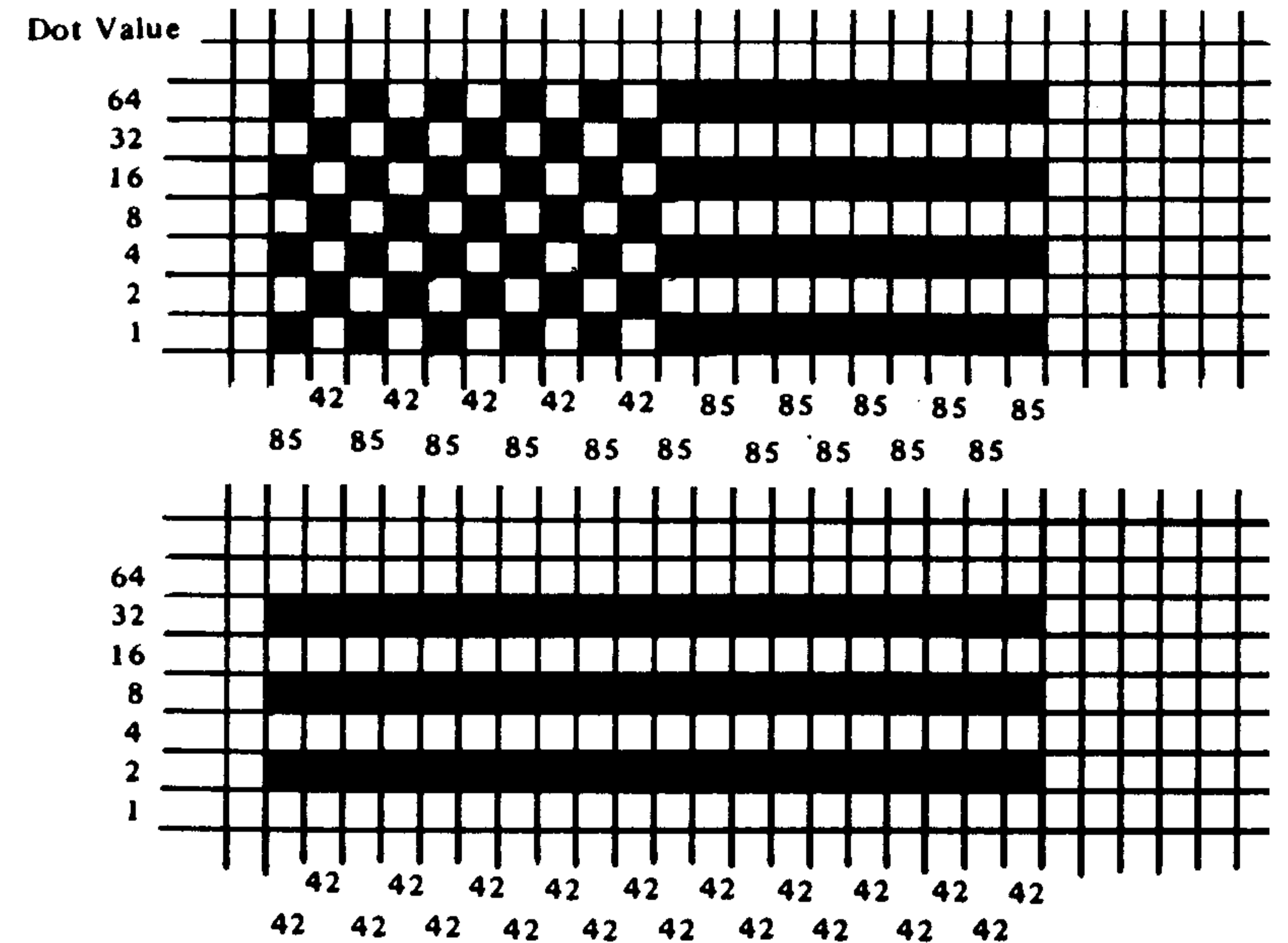


Figure 6-4. Designing a graphic figure.

You then print your defined shape using a program with the pin number codes placed in data statements. The program reads the codes, usually accumulating them in a string variable, and prints the shape exactly as you defined it. The following program prints the design shown in Figure 6-3 and demonstrates the technique.

```

10 open 1,4,7
20 print#1, chr$(27)"1"
30 for n = 1 to 20
40 read x
50 flag$ = flag$ + chr$(x)
60 next n
70 print#1, chr$(27)"K"chr$(20)chr$(0)flag$
80 flag$ = ""
90 for n = 1 to 20
100 read x
110 flag$ = flag$ + chr$(x)
120 next n
130 print#1, chr$(27)"K"chr$(20)chr$(0)flag$
140 close 1

200 data 85,42,85,42,85,42,85,42,85,42
210 data 85,85,85,85,85,85,85,85,85,85
220 data 42,42,42,42,42,42,42,42,42,42
230 data 42,42,42,42,42,42,42,42,42,42

10 WIDTH "Lpt1:",255
20 LPRINT CHR$(27)"1"
30 FOR N = 1 TO 20
40 READ x
50 FLAG$ = FLAG$ + CHR$(x)
60 NEXT N
70 LPRINT CHR$(27)"K"CHR$(20)CHR$(0)FLAG$
80 FLAG$ = ""
90 FOR N = 1 TO 20
100 READ x
110 FLAG$ = FLAG$ + CHR$(x)
120 NEXT N
130 LPRINT CHR$(27)"K"CHR$(20)CHR$(0)FLAG$
140 END
150 DATA 85,42,85,42,85,42,85,42,85,42
160 DATA 85,85,85,85,85,85,85,85,85,85
170 DATA 42,42,42,42,42,42,42,42,42,42
180 DATA 42,42,42,42,42,42,42,42,42,42

```

Result:



The letters are printed in two lines—first the top half of the flag and then the bottom half. In order to make the halves meet, the line spacing is set to 7/72" in line 20. Lines 30 through 60 form a loop that reads the 20 pin numbers that form the top half of the flag from the data statements and accumulates them in the variable FLAG\$. Line 70 then sets a single-density graphics line 20 columns wide and prints FLAG\$. After clearing FLAG\$ in line 80, lines 90 through 130 repeat the procedure for the bottom half of the flag.

Notice the data statements in the program. Even relatively small graphic patterns require a considerable amount of data. For example, our program uses 40 pieces of data to print a small flag. You can appreciate why so much data is required when you consider the number of positions you can place dots on an 8½ × 11-inch page—380,160! And that's using single density.

Commodore computers have programs available that calculate the graphics data for you. The programs allow you to draw on the screen using a joystick, mouse, graphics tablet, or light pen, and then "dump" the screen to the printer. If you plan to print large amounts of complex graphics, such a program can be worthwhile.

Calculated Shapes (Plotting)

Another way to ease the task of defining graphic shapes is to let your computer design the shapes for you. This is how computer plotters work, and your MPS 1250 can function as a plotter too. Any shape that can be defined by a mathematical equation can be calculated and plotted on the MPS 1250.

Plotting calculated shapes generally requires some fairly advanced programming skills, which are beyond the scope of this manual. To get started, however, we'll describe some general programming approaches and show you one program that produces a shape we call a "squiggle."

Plotting programs set aside a part of the computer's memory to store the dots you want to print. In computer terms, that means setting up an array. In effect, the array is the computer's "graph paper."

The first thing to do in setting up an array is to define size—called "dimensioning the array." Like graph paper, the array must have two dimensions. One is the horizontal dimension (the number of

columns of dots), and the other is the vertical dimension (the number of printing lines).

As with defined shapes, the next step is to mark which dots are to be printed. This is done by the program. As it calculates the shape, it changes the values in the appropriate array locations from zero to the necessary pin numbers.

When all the points in the shape have been calculated and their pin numbers stored in the array, the final step prints the array on the MPS 1250.

Aside from the programming required, two other limiting factors with calculated shapes are the memory size and the processing speed of your computer. Arrays use up computer memory very quickly. For example, in single density, a one inch square contains 4,320 dot positions. Using 8 dots per column, that is 540 array locations. That may not sound like a lot, but since each array location requires at least two bytes of memory, this one-inch square uses up over 1K of memory. To plot an 8 × 8-inch square—less than one page—you'll need over 64K of memory just for the array!

The processing speed of your computer also becomes a consideration when using calculated shapes. Depending on the particular equation and the programming used to calculate it, a shape even only an inch or so square can require tens of thousands of calculations (each calculation does not necessarily fill an array location), and several minutes or even hours of processing time before any results are sent to the printer for plotting. Moreover, the number of required calculations can increase geometrically with the size of the shape. Our simple demonstration program, for example, takes several minutes to run. A program that plots a complex figure the size of the page can easily take hours to run!

Even if you don't understand all of the programming in it, try the following program to see how a graphics plotting program runs. The calculations in the program will take a few minutes, before printing starts. Lines 100-280 calculate the sine curve, and lines 320-440 plot the points.

```

10 REM -----
20 REM     sine curve plotter
30 REM -----
40 ESC$ = CHR$(27)

```

```

50 PI = 3.14159265
60 REM -----
70 REM     calculate the curve
80 REM     and fill the array
90 REM -----
100 DIM PT%(480,20)
110 d× = 2*PI/240
120 FOR K = 239 TO 0 STEP -1
130 Y1 = 64*(SIN(×1*10)/(×1*PI/2+1)+1)
140 YI = INT(Y1+.5)
150 ROW = INT(YI/6)
160 BIT = YI - ROW*6
170 PT%(K,ROW) = PT%(K,ROW) OR 2^(6-bit)
180 ×1 = ×1 + d×
190 NEXT K
200 ×1 = d×
210 FOR K = 240 TO 479 STEP 1
220 Y1 = ABS(64*(SIN(×1*10)/(×1*PI/2+1)-1))
230 YI = INT(Y1+.5)
240 ROW = INT(YI/6)
250 BIT = YI - ROW*6
260 PT%(K,ROW) = PT%(K,ROW) OR 2^(6-BIT)
270 ×1 = ×1 + D×
280 NEXT K
290 REM -----
300 REM     print the sine curve
310 REM -----
320 OPEN 1,4
330 PRINT#1,ESC$+"A"+CHR$(6) : REM set line spacing to 6/72
    inch
340 FOR ROW = 2 TO 19
350 P$ = "#":Q$ = ""
360 PRINT#1,ESC$+"K"+CHR$(224)+CHR$(1); : REM set single
    density graphics
370 FOR COL = 0 TO 239
380 P$ = P$ + CHR$(PT%(COL,ROW))
390 NEXT COL
400 FOR COL = 240 TO 479
410 Q$ = Q$ + CHR$(PT%(COL,ROW))
420 NEXT COL
430 PRINT#1,P$;Q$;CHR$(10)
440 NEXT ROW
450 PRINT#1,ESC$+"2"; : REM return to default line spacing
460 CLOSE 1
470 END

```

Chapter 7

Commodore Dot Graphics

BIT IMAGE CODING (Commodore mode only)

BASIC	ON
PETASCII Hex	CHR\$(8) 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	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
4	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
16	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
32	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
64	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

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	○	○	○	○	○	○	●	●	○	○	○	○	○	○	○	○
2	○	○	●	●	●	●	●	●	●	●	●	○	○	○	○	○
4	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○
8	●	●	●	●	○	○	●	●	○	○	●	●	●	●	○	○
16	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○
32	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○
64	○	○	●	●	○	○	●	●	○	○	●	●	○	○	○	○

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, 254, 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:

```
##
##
##
##
##
```

Combining Bit Images to Form a Larger Image

You can create images larger than the seven row grid allows by combining grids. The following program provides an example of how you can design a larger character by using DATA statements to place three programmed bit images together to form a larger character.

```
10 open 1,4,7
20 for r=1 to 3
30 for c=1 to 16
40 read a:a$(r)=a$(r)+chr$(a)
50 next c
60 next r
70 print#1, chr$(8);
80 for r=1 to 3
90 print#1, a$(r)
100 next r
110 print#1, chr$(15)
120 for i=1 to 8:print#1:next i
130 close 1
140 end
200 data 129,129,250,250,158,158,255,255
210 data 158,158,250,250,129,129,128,128
220 data 128,128,159,159,243,243,179,179
230 data 243,243,159,159,128,128,128,128
240 data 128,128,130,130,131,131,128,128
250 data 131,131,130,130,128,128,128,128
```


Dot Address Determination

BASIC	ON CHR\$(27);CHR\$(16);CHR\$(n1);CHR\$(n2) (n1 and n2 specify the line position in dots)
PETASCII Hex	1b 10 n1h n2h

You won't always want to place characters at the left margin of the paper. The dot address determination sequence lets you specify where on a line you want a bit image character (or anything else) to be printed.

In the escape sequence for dot address determination, "n1" and "n2" are dot positions on the line where printing is to start. These values are two-digit binary numbers ranging from 0 to 479. When a number greater than 479 is specified, printing starts at the beginning of the next line. This program positions an "alien" bit image character 300 dots into the page. Note that the only difference between this and the program earlier in this chapter is line 90.

Also note that in contrast to the graphics programs in the previous chapter, n1 and n2 are "reversed" in Commodore mode, where n1 is the integer part of the quotient when the dot position is divided by 256, and n2 is the remainder.

```
10 open 1,4,7
20 for r=1 to 3
30 for c=1 to 16
40 read a:a$(r)=a$(r)+chr$(a)
50 next c
60 next r
70 print#1,chr$(8)
80 for r=1 to 3
90 print#1,chr$(16);chr$(1);chr$(44);a$(r)
100 next r
110 print#1,chr$(15)
120 for i=1 to 8:print#1:next i
130 close 1
140 end
```



```
200 data 129,129,250,250,158,158,255,255
210 data 158,158,250,250,129,129,128,128
220 data 128,128,159,159,243,243,179,179
230 data 243,243,159,159,128,128,128,128
240 data 128,128,130,130,131,131,128,128
250 data 131,131,130,130,128,128,128,128
```

Result:



Chapter 8

Creating Characters

Even with its correspondence quality, pica, elite, proportional, expanded, compressed, emphasized, doublestrike, italic, vertically enlarged print, reverse print, superscript and subscript styles, some folks still can't find just the right character style on their MPS 1250. For these discriminating people we have just one thing to say: go ahead—design your own characters. And with the MPS 1250 you can!

This feature is useful not only for the artists with a discriminating eye who want to add a little flair to their printing. Instead, you could design a few unique characters for special applications such as business, scientific, or a foreign language not included in the MPS 1250's international character sets.

HOW THE MPS 1250 PRINTS CHARACTERS

In Chapter 2, we discussed how a dot matrix printer like the MPS 1250 prints characters. The key is in the print head, in which the pins strike the ribbon in a predetermined pattern as it sweeps across the page. Figures 2-1 and 2-2 show a few of those patterns for the H, y, and r.

It's no coincidence that the dots that form the characters appear to be in neat rows and columns, for that's the way they must be designed. When the MPS 1250's character sets were designed, the engineers used a matrix six dots wide and nine dots high (there are nine wires in the print head, remember?). Figure 8-1 shows just such a matrix with a character design superimposed. There is a similar design for every character the MPS 1250 knows how to print, and the data from these patterns is stored in the printer's memory.

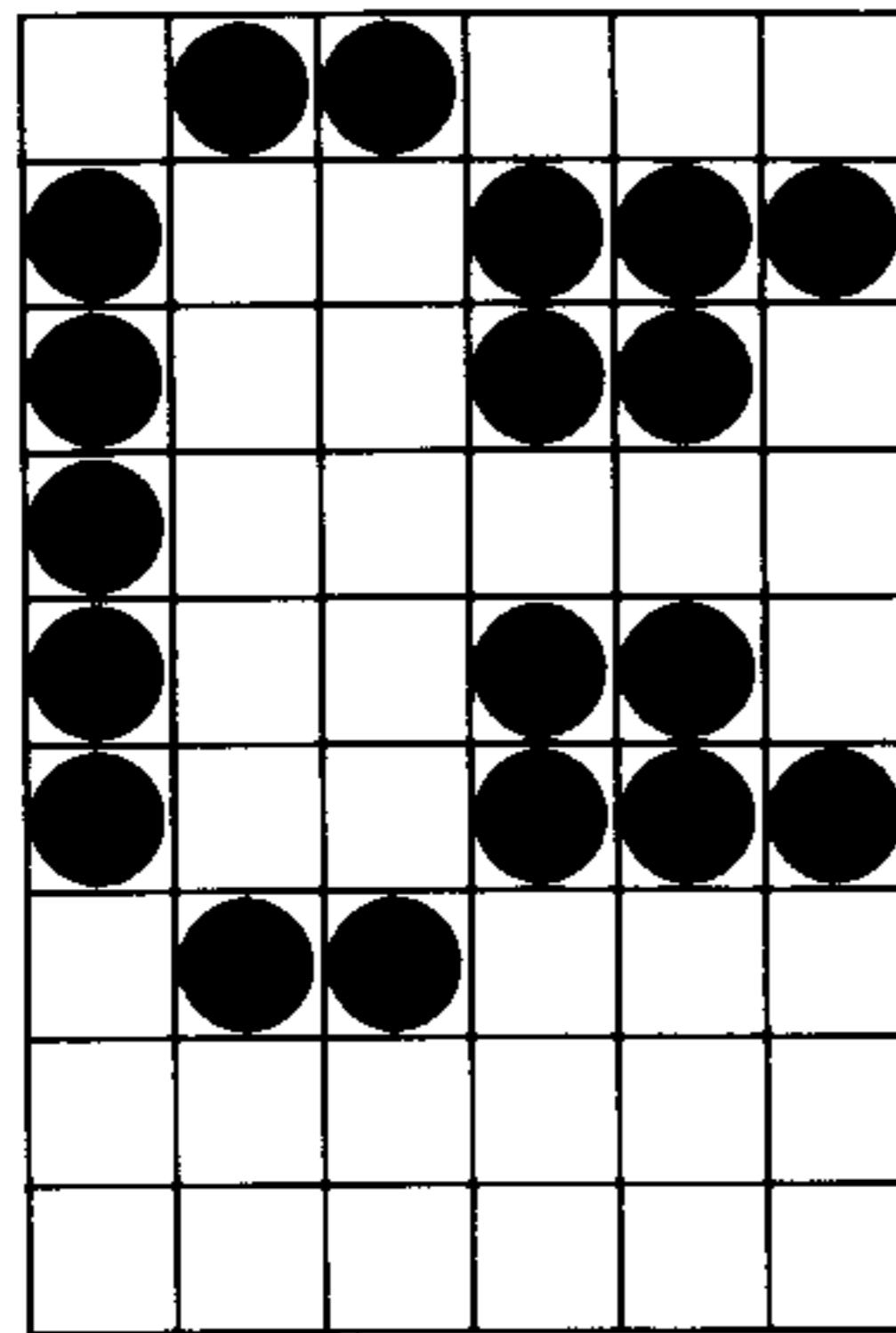


Figure 8-1. All characters are designed on a matrix like this.

DESIGNING YOUR OWN CHARACTERS

When you design characters to be printed, you'll use the same type of matrix. For your convenience, we've included a couple of blank ones in Figure 8-2. Feel free to photocopy them; they can be used to design your own characters.

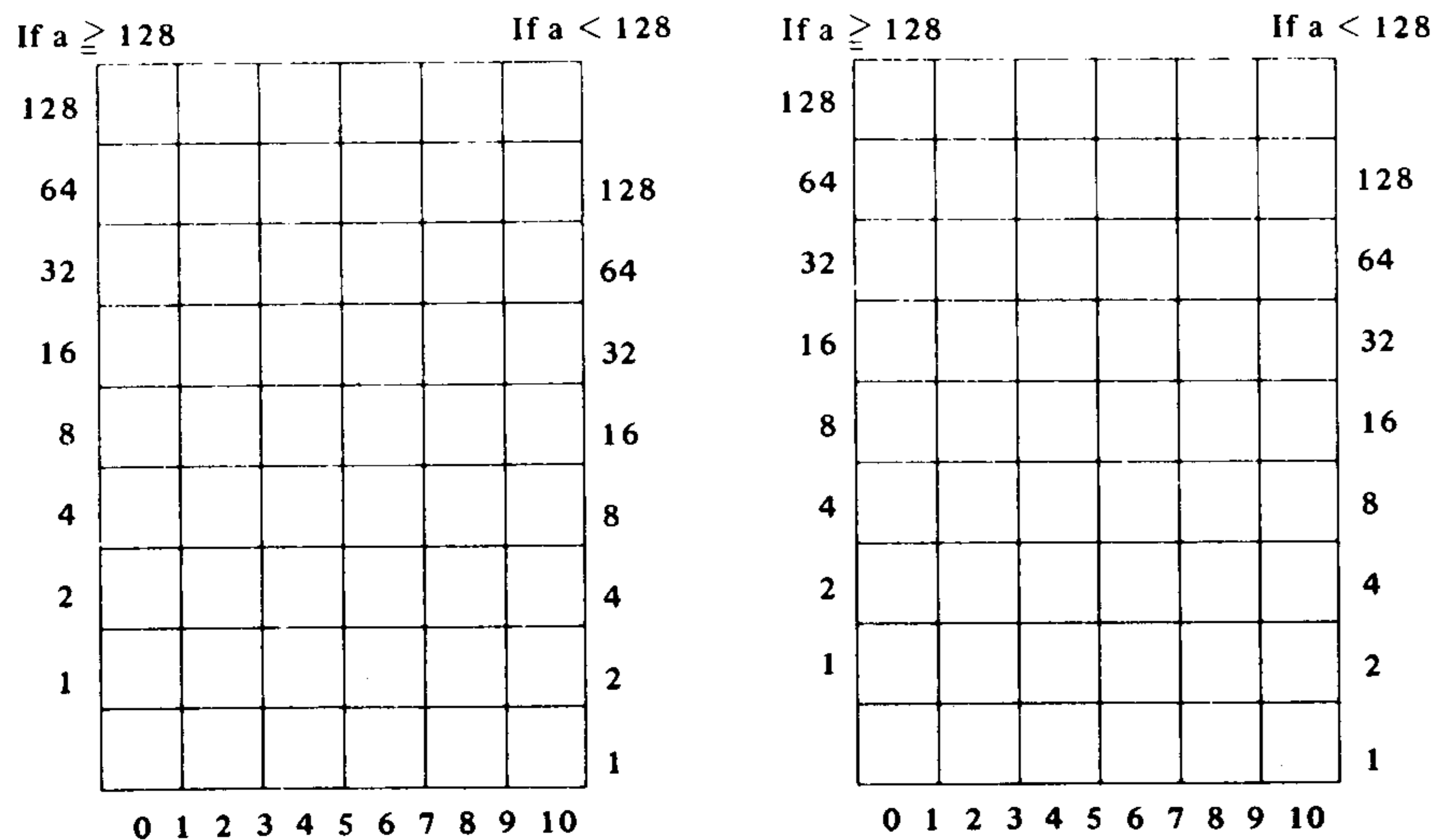


Figure 8-2. Use these matrices to design your characters.



The first step in creating your own characters is to lay out the dots in the matrix as you want them to print. Even though the matrix is nine dots high, the characters can be only eight dots high, like the MPS 1250's standard characters. (This is a limitation of the size of a data byte, which has eight bits, not of the print head itself.) Most characters use only the top seven dots, while the descenders (such as p and g) use the bottom seven pins.

And the characters you design can be eleven dots wide. How can that be done on a matrix that is six dots wide? In addition to the six dots inside the squares of the matrix, there are five intermediate columns of dots. They are centered on the lines that separate the six columns. The only limitation here is that you cannot define a character which has two immediately adjacent dots (that is, one in a box and one on the line next to it in the same row). Figure 8-3 shows the correct and incorrect ways.

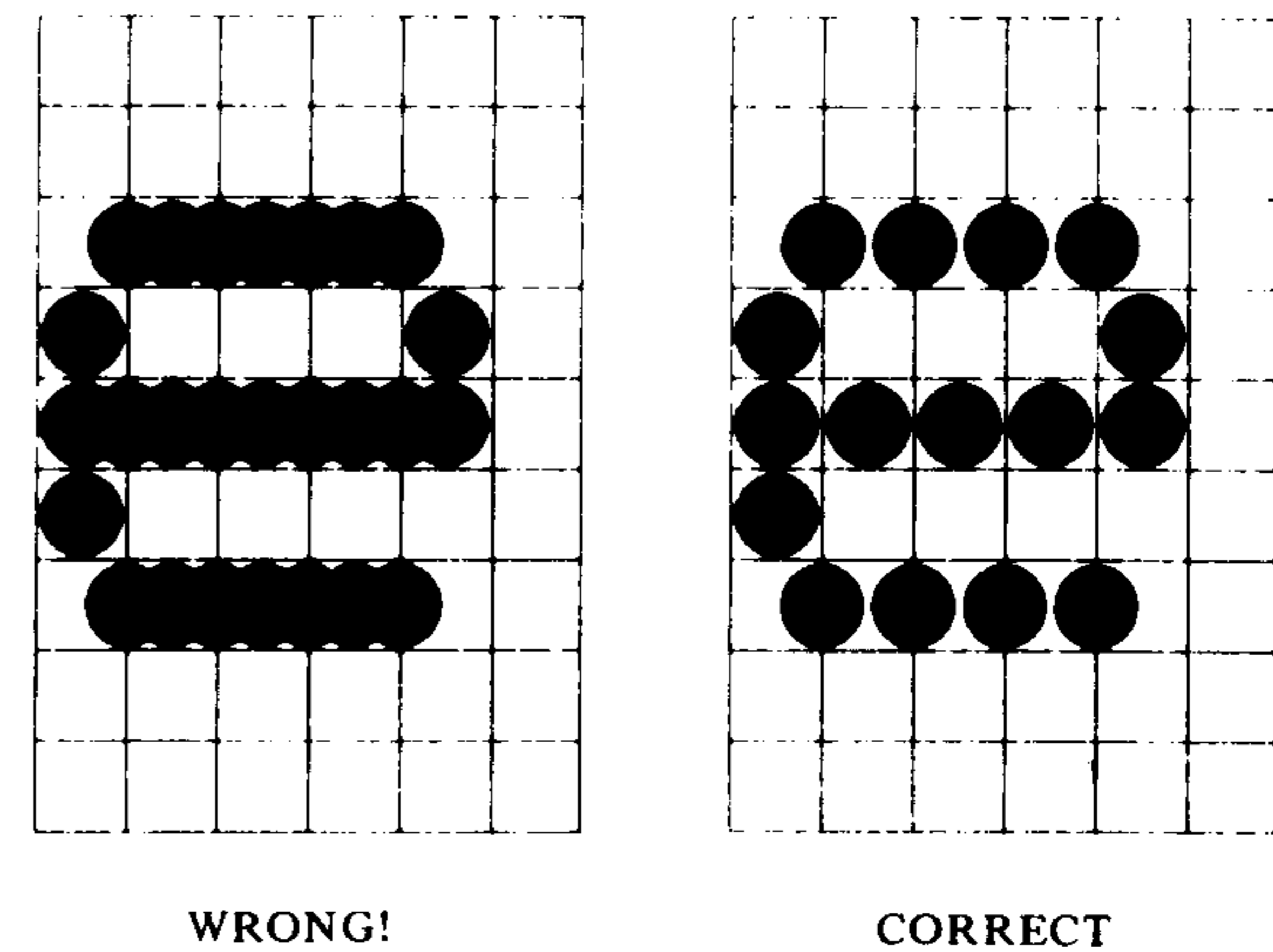


Figure 8-3. Dots cannot be printed in immediately adjacent columns.

One more consideration in designing characters: normally the last two columns (the sixth square and the line to the left of it) are left blank. This forms the space between characters. In some instances you may want the characters to touch. If so, use all eleven dot columns. And if you want to design an entire type font that just won't fit in nine columns, you can always use the proportional spacing command to add space between characters (see Chapter 3).

Copying Standard Characters

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

Many users of user-defined characters don't define an entire alphabet; instead they define only a few special characters that they need for their specific applications. Because of the way the MPS 1250 stores character designs, it's easy to combine standard and user-defined characters in your printouts.

The standard characters are all stored in the MPS 1250's ROM (Read Only Memory). Each time your computer sends an ASCII code to the printer, the MPS 1250 prints the character. User defined characters are stored in a different area of the MPS 1250's memory (it is called RAM, for Random Access Memory), but are accessed in the same way. You are, in effect, temporarily replacing the MPS 1250's standard characters with your newly designed characters (without losing the standard characters).

When you turn the MPS 1250 on or reset it with the ESC @ (master reset) command, the user-defined RAM is empty: there are no character definitions. Therefore, if you want to design a few special characters to be used with the standard alphabet, you can start by copying all of the standard characters from MPS 1250's ROM to RAM with the ESC: CHR\$(0) CHR\$(0) CHR\$(0) command. Then you can use both your own newly created characters with the standard characters. You'll see how in just a minute.

Saving Character Designs In the MPS 1250's Memory (Epson/Commodore mode)

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

After you've designed a character on a paper grid, the next step is to send that character definition (or group of definitions) to the MPS 1250 so that the characters can be printed. Doing this requires the MPS 1250's most complicated command (but it's really not so bad after you've tried it a few times).

The command is ESC “&” CHR\$(0) CHR\$(n1) CHR\$(n2) CHR\$(a) CHR\$(d0)...CHR\$(d10). The first three characters, ESC “&” CHR\$(0), are easy enough, but what about the rest of it?

First, n1 and n2 are variables that specify the range of characters that you wish to define with this command. As you know, each standard character has a corresponding ASCII code (these codes can be found in Appendix B). n1 and n2 are asking for the ASCII codes of the first and last character you wish to define. Any ASCII codes from 32 to 63 can be replaced. The codes that follow CHR\$(a) CHR\$(d0)...CHR\$(d10) are repeated for each character in the specified range. If you are defining only one character, n1 and n2 are the same.

To save character designs in IBM mode, see pg. 8-10.

Attribute byte

The variable a is the attribute byte, for it describes some of the characteristics of the character you have defined. The first characteristic is whether the MPS 1250 should print your character with the top eight pins of the print head or the bottom eight pins. This is done with the high order bit of the attribute byte. If it is on (i.e. equal to one), the top eight pins are used; if it is off (zero), the bottom eight pins are used. Put another way, if the variable a has a value of 128 or more, the top pins are used; if it is less than 128, the bottom pins will be used. This is shown in Figure 8-4.

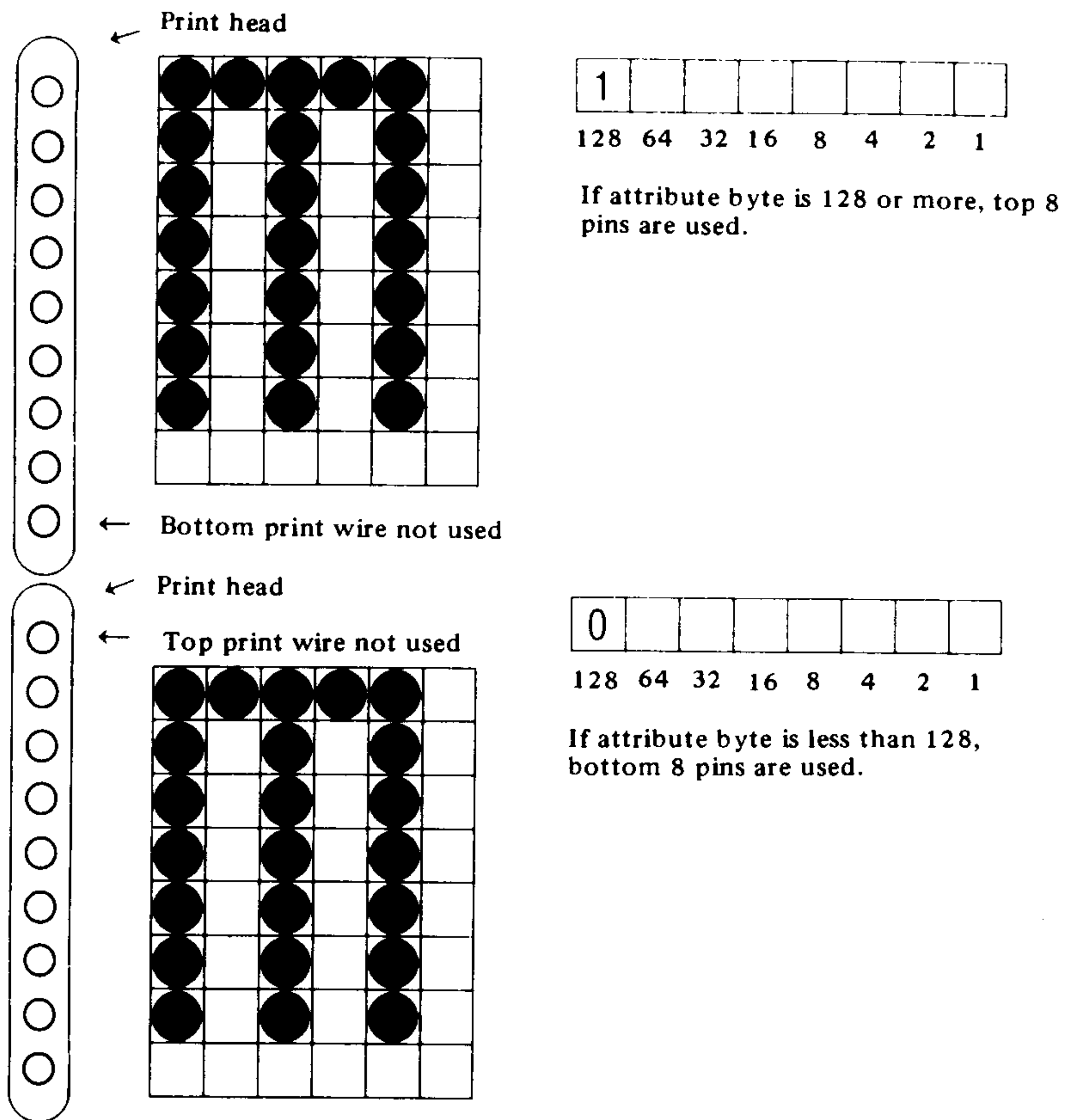


Figure 8-4. The high order bit of the attribute determines which pins will be used.

The attribute byte also contains information that can be used if you want to print your characters with proportional width (Chapter 3 tells how to select proportional printing). With proportional width printing some characters will be narrower than others. You must still send data (even if it is zero) for all eleven dot columns. With the attribute byte you can specify the starting and ending columns that you want to print. The columns, which are numbered 0 through 10, are identified at the bottom of Figure 8-5. Bits 4, 5, and 6 are used to specify the starting column. The ending column is defined by bits 0 to 3.



The entire attribute byte (which is 8 bits) consists of three parts: bit 7 determines which pins (top eight or bottom eight) will be used; bits 4, 5, and 6 specify the starting column; and bits 0, 1, 2, and 3 specify the ending column number. A sample attribute byte is shown in Figure 8-5.

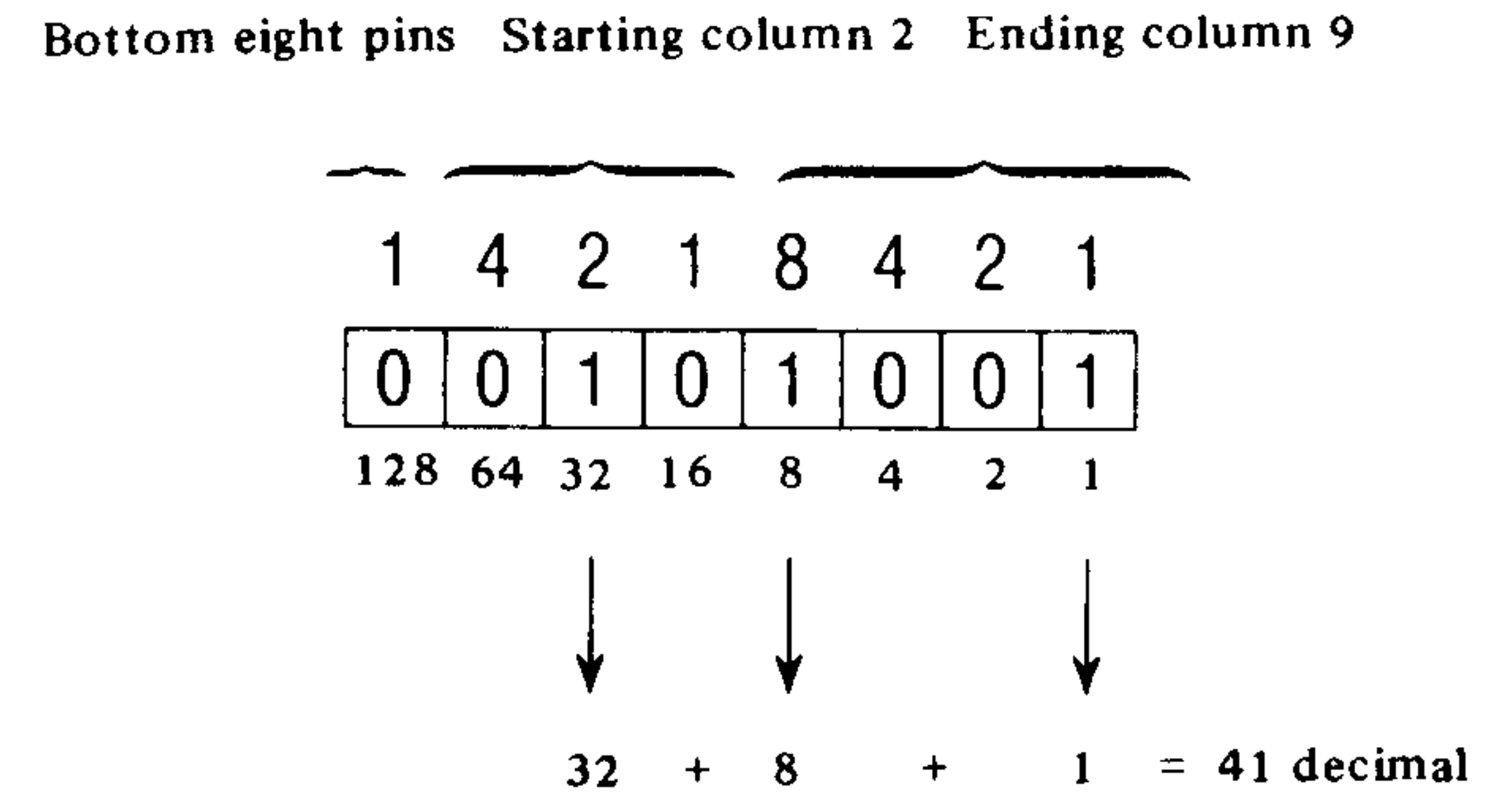


Figure 8-5. A sample attribute byte.

Data bytes

After those last three codes the rest is easy! The variables d0 through d10 are data bytes. Their value is calculated exactly the way data bytes are calculated for dot graphics (see Chapter 6). Each pin in the print head is assigned a value. Add the values of each of the pins that you want to print in a given column, and the total for the column is the value of that data byte.

In the sample character matrices in Figure 8-2, there are numbers on either side of the matrix. Use the numbers on the left for the dot values if you are going to use the top eight pins (attribute byte of 128 or more). If you are going to use the bottom eight pins (attribute byte less than 128), use the numbers on the right as dot values.

A sample should make all of this more easily understood. Figure 8-6 shows the stylized characters we have designed. The program that follows sends these character definitions to the MPS 1250 (but does not print anything—that's next).

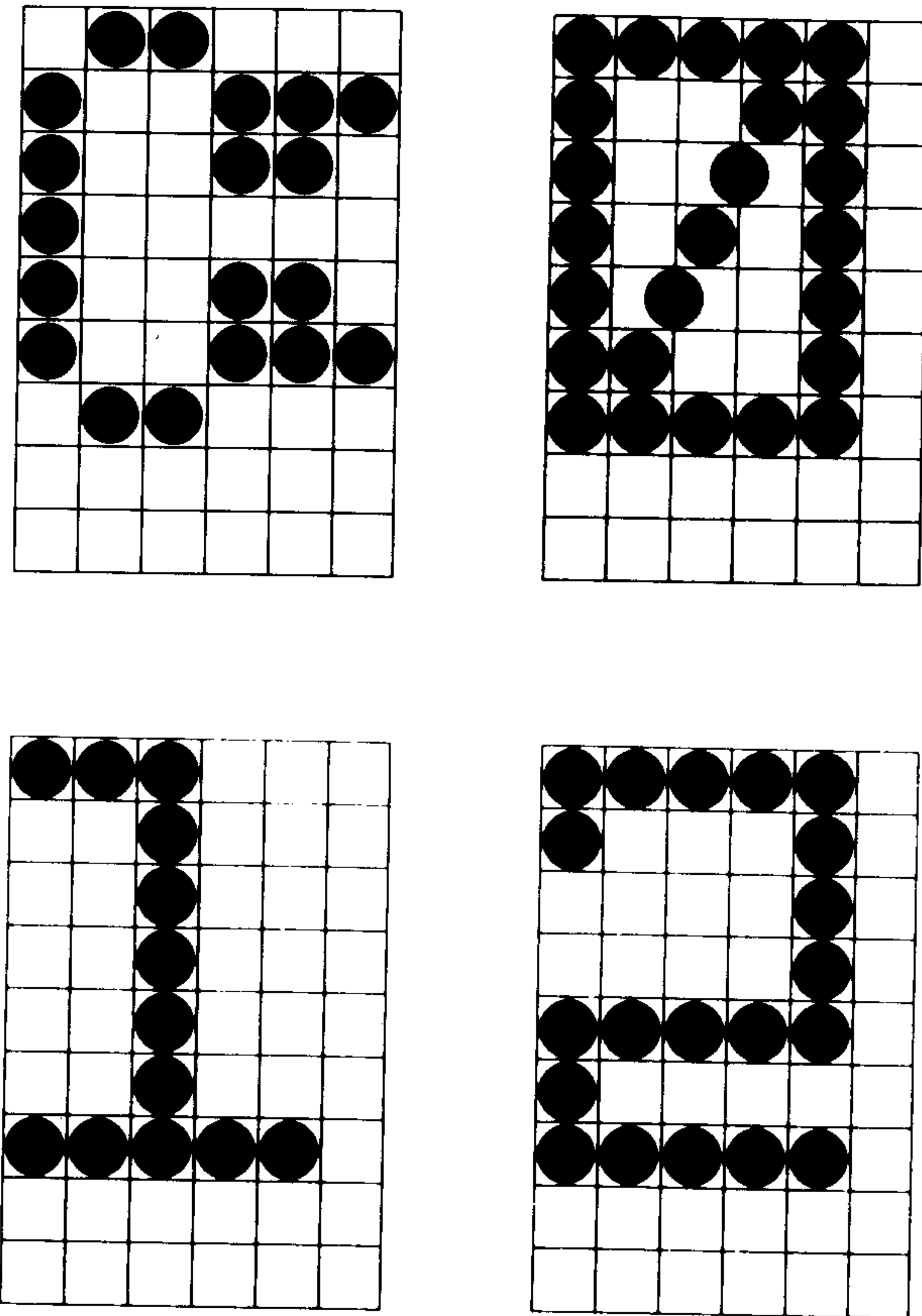


Figure 8-6. These characters are defined and printed in the example programs.

Example:

```

5 open 1,4,7
10 print#1, chr$(27);“:”; chr$(0); chr$(0); chr$(0)
20 print#1, chr$(27);“&”; chr$(0);“***”; chr$(128);
30 for j=0 to 10
40 read d
50 print#1, chr$(d);
60 next j
70 print#1, chr$(27);“&”; chr$(0);“02”;
80 for i=0 to 2

```

```

90 for j= -1 to 10
100 read d
110 print#1, chr$(d);
120 next j,i
130 close 1
140 end
300 data 124,0,130,0,130,0,108,0,108,0,68
310 data 128,254,0,134,8,146,32,194,0,254,0,0
320 data 128,130,0,130,0,254,0,2,0,2,0,0
330 data 128,206,0,138,0,138,0,138,0,250,0,0


```

```

10 LPRINT CHR$(27)“:”CHR$(0)CHR$(0)CHR$(0)
20 LPRINT CHR$(27)“&”CHR$(0);“***”;CHR$(128);
30 FOR J = 1 TO 11
40 READ D
50 LPRINT CHR$(D);
60 NEXT J
70 LPRINT CHR$(27)“&”CHR$(0);“02”;
80 FOR I = 1 TO 3
90 FOR J = 1 TO 12
100 READ D
110 LPRINT CHR$(D);
120 NEXT J, I
130 END
300 DATA 124,0,130,0,130,0,108,0,108,0,68
310 DATA 128,254,0,134,8,146,32,194,0,254,0,0
320 DATA 128,130,0,130,0,254,0,2,0,2,0,0
330 DATA 128,206,0,138,0,138,0,138,0,250,0,0

```

NOTE: This program doesn't print anything; it merely places your user defined character into the printer's memory.

The first data line contains the information for the  character. This data is sent in lines 30 through 60. The data contained in lines 310 through 330 is for the digits 0 through 2. It is sent to the printer in the loop from line 80 to 120.

(IBM mode)

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

This command sequence allows you to create your original characters in the IBM configuration as though it were in the Epson configuration. But there is a difference between sending data to the IBM and Epson configurations.

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

$$\text{Total value} = (\text{number of characters} \times 13) + 2$$

If the total value is less than 256, then n1 = total value and n2 = 0. If the total value is greater than or equal to 256, then divide the number of bytes by 256. n1 = the remainder and n2 = the integer part of the result. For example, for 64 characters,

$$\begin{aligned} \text{Total value} &= (64 \times 13) + 2 = 834 \\ 834 / 256 &= 3 \text{ } 66 / 256 \\ \text{that is, } n1 &= 66, n2 = 3 \end{aligned}$$

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 d0 through d10 are data byte. 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 commands ESC I CHR\$(4) or ESC I CHR\$(6). For more information refer to chapter 3; printing text, correspondence quality.

PRINTING DEFINED CHARACTERS

	ON	OFF
BASIC	CHR\$(27) "%1" CHR\$(0)	CHR\$(27) "%0" CHR\$(0)
Hex	1B 25 31 00	1B 25 30 00

Designing characters and sending their definitions to the printer is the hard part of using your own characters. Actually putting those definitions to use is as easy as selecting any of the MPS 1250's other print styles; it is done with a single command.

That command is necessary because of the way the MPS 1250's characters are stored. The command simply selects between the MPS 1250's two banks of memory: ROM, which stores all of the standard characters (and their variations), and RAM, which stores the user-defined characters.

The command to select the user-defined character set is ESC %1 CHR\$(0). To return to the standard character set, use this command: ESC %0 CHR\$(0). The program below prints the characters created in the last example, by adding the statements in lines 130 through 260.

NOTE: Before you run this program you must run the program on page 8-9 in order to set your user defined character into the printers memory.

Example:

```

5 open 1,4,7
10 print#1, chr$(27);":"; chr$(0); chr$(0); chr$(0)
20 print#1, chr$(27);"&"; chr$(0); "*" ; chr$(128);
30 for j=0 to 10
40 read d
50 print#1, chr$(d);
60 next j
70 print#1, chr$(27);"&"; chr$(0);"02";
80 for i=0 to 2
90 for j=-1 to 10
100 read d
110 print#1, chr$(d);
120 next j,i
130 print#1, chr$(27);"%1"chr$(0);
140 gosub 200

```



```

100 print#1, chr$(27) chr$(126)"21";"Reverse: ";:gosub 130
110 print#1, chr$(27) chr$(126)"11"; "Vertically enlarged: ";:
    gosub 130
120 end
125 close 1
130 print#1, chr$(27)"%1"chr$(0)" *ommodore MPS 1250"
140 print#1, chr$(27)"!"chr$(0) chr$(27)"T" chr$(27)
    chr$(126)"10" chr$(27) chr$(126)"20" chr$(27)"%0" chr$(0)
150 return

```

```

10 LPRINT CHR$(27)"P";"Pica: ";:GOSUB 130
20 LPRINT CHR$(27)"M";"Elite: ";:GOSUB 130
30 LPRINT CHR$(27)CHR$(15)"Compressed: ";:GOSUB 130
40 LPRINT CHR$(27)CHR$(14)"Expanded: ";:GOSUB 130
50 LPRINT CHR$(27)"E";"Emphasized: ";:GOSUB 130
60 LPRINT CHR$(27)"G";"Double strike: ";:GOSUB 130
70 LPRINT CHR$(27)" - 1";"Underlining: ";:GOSUB 130
80 LPRINT CHR$(27)"S0";"Superscript: ";:GOSUB 130
90 LPRINT CHR$(27)"S1";"Subscript: ";:GOSUB 130
100 LPRINT CHR$(27)CHR(126)"21";"Reverse: ";:GOSUB 130
110 LPRINT CHR$(27)CHR(126)"11";"Vertically enlarged: ";:GOSUB
    130
120 END
130 LPRINT CHR$(27)"%1"CHR$(0)" *ommodore MPS 1250"
140 LPRINT CHR$(27)"!"CHR$(0)CHR$(27)"T"CHR$(27)
    CHR$(126)"10"CHR$(27)CHR$(126)"20"
    CHR$(27)"%0"CHR$(0)
150 RETURN

```

Pica: Commodore MPS 1250

Elite: Commodore MPS 1250

Compressed: Commodore MPS 1250

Expanded: Commodore MPS 1250

Emphasized: Commodore MPS 1250

Double Strike: Commodore MPS 1250

Underlining: Commodore MPS 1250

Superscript: Commodore MPS 1250

Subscript: Commodore MPS 1250

~~Reverse: Commodore MPS 1250~~

Vertically enlarged: Commodore MPS 1250

Chapter 9

Odds and Ends

In this chapter we'll cover some special features and techniques that are useful with both text and graphics but don't fit into any particular category.

LOCAL CHARACTER SET SELECTION (Commodore mode only)

.....		
Lower/Uppercase Character Set		Uppercase/Graphics Character Set	
BASIC	CHR\$(17)		CHR\$(145)
PETASCII 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.

This program shows how each local mode can be used.

```

10 open 7,4,7: rem UPPER/LOWERCASE MODE
20 print#7, "SSSS 4 hearts?"
30 print#7, chr$(145);"SSSS 4 hearts!"
40 close 7:
50 open 1,4,0: rem UPPERCASE/GRAPHICS MODE
60 print#1, "XXXX 4 clubs!"
70 print#1, chr$(17);"XXXX 4 clubs?"
75 close 1:
80 open 2,4,7: print#2
90 print#2, "I "; chr$(145);"S"; chr$(17);"New York!"
100 close 2

```

```

SSSS 4 hearts?
◆◆◆◆ 4 HEARTS!
◆◆◆◆ 4 CLUBS!
XXXX 4 clubs?

```

```
I ◆ New York!
```

QUOTE MODE (Commodore mode only)

```

.....
BASIC          CHR$(34)
Hex            22
.....

```

CHR\$(34) in Commodore mode instructs the MPS 1250 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. This is useful when you are listing BASIC programs containing these control characters. The following is a short example of the result of sending CHR\$(34) to the printer in a program.

```

10 open 1,4,7
20 print#1, chr$(34)"Cursor Symbols [00]"
30 close 1

```

```
"Cursor Symbols [00]"
```

BUFFER COMMANDS

The MPS 1250 has an internal buffer, an electronic holding area, that can hold a full line of characters and codes. When you send information to the MPS 1250 with a PRINT statement all of the characters and codes are actually sent to the MPS 1250's buffer. They are held there until the buffer is filled or a control code such as a carriage return is received that instructs the MPS 1250 to empty the buffer. The accumulated information is then processed one piece at a time. Codes are interpreted and characters are printed.

Most of the time this operation is of no concern. The MPS 1250 just accumulates, interprets, and prints without notice. But there may be times when you would like to erase some or all of the information in the buffer before it is printed. The MPS 1250 has three commands that allow you to do that: delete, cancel, and master reset.

Delete (IBM and Epson modes only)

BASIC	CHR\$(127)
PETASCII Hex	7F
ASCII Hex	7F

This buffer command is CHR\$(127), appropriately called delete. It deletes the one text character previous to it when it is received in the buffer. For delete to work properly, it must be sent to the printer before the buffer is emptied (that is, before a carriage return is sent and before a full line of characters have been sent).

Example:

```

10 LPRINT "DELETE eats characters one at a time";CHR$(127)
20 LPRINT "Or it can eat them in one gulp—all at once";
30 FOR N=1 TO 11
40 LPRINT CHR$(127);
50 NEXT N
60 LPRINT

```

DELETE eats characters one at a time
Or it can eat them in one gulp--

Cancel (IBM and Epson modes only)

BASIC	CHR\$(24)
ASCII Hex	18

This command, CHR\$(24), is the cancel command. It cancels all information currently in the buffer when it is received. For cancel to work properly, it must be sent to the MPS 1250 before the buffer is emptied (that is, before a carriage return is sent and before a full line of characters have been sent).

Example:

```

10 LPRINT CHR$(27)!"CHR$(1);
20 LPRINT "The entire"CHR$(24)"buffer is cleared by cancel"
30 LPRINT"This line contains more than enough characters to fill one
   line and therefore the cancel command cannot erase the entire lin-
   e"CHR$(24)

```

buffer is cleared by cancel
This line contains more than enough characters to fill one line and therefore the cancel command

Master Reset

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

The master reset command, ESC @, which we discussed in Chapter 3, cancels all information in the buffer just as the cancel command does. But, in addition, it resets all print functions to their default setting.

Example:

```

10 open 1,4,7
20 print#1, chr$(27)!" chr$(237);"With master reset"
30 print#1, "The entire"; chr$(27)@";"buffer and all print modes"
40 print#1, "are cleared by master reset"
50 close 1

```

```

10 LPRINT CHR$(27)!"CHR$(237);
20 LPRINT "With master reset"
30 LPRINT "The entire";CHR$(27)@";
40 LPRINT "buffer and all print modes"
50 LPRINT "are cleared by master reset"

```

With master reset

buffer and all print modes
are cleared by master reset

BACKSPACE (IBM and Epson mode only)

BASIC	CHR\$(8)
ASCII Hex	8

The backspace does just what it sounds like. It moves the print head back one space enabling you to print another character over the previous one. It is a handy way to create special symbols and unusual effects.

When the printer is in Commodore mode, CHR\$(8) initiates Bit Image graphic printing mode.

Example:

```
10 LPRINT CHR$(27)“W1”
20 LPRINT “FUTURE PRINT”;
30 FOR N=1 TO 12:LPRINT CHR$(8);:NEXT N
40 LPRINT CHR$(27)“4”;“FUTURE PRINT”
50 LPRINT CHR$(27)“@”
```

FUTURE PRINT

NOTE: In the program above, line 40 backspaces 12 times. Line 40 then changes to italics and prints the words “FUTURE PRINT” again, directly on top of the first printing.

UNIDIRECTIONAL PRINT

The MPS 1250 normally prints one line left to right and then prints the next line right to left. This is called *bidirectional* printing. It is the fastest way to print and it is one of the reasons the MPS 1250 can print at 120 characters per second.

With bidirectional print, however, the vertical alignment of characters from one line to the next is not always exact. The misalignment is very small and not noticeable in most applications. But occasionally, particularly when using block and line graphics, it becomes more obvious.

For applications where vertical alignment is more critical than speed, printing in only one direction—unidirectional print—is the answer.

Continuous Unidirectional Print

Format	ON	OFF
BASIC	CHR\$(27) “U1”	CHR\$(27) “U0”
PETASCII Hex	1B D5 31	1B 05 30
ASCII Hex	1B D5 31	1B 05 30

The command ESC U controls continuous unidirectional print. With unidirectional print, the print head prints all lines from left-to-right.

The command uses 1 and 0 as its on and off switches. Sending the printer ESC “U1” turns unidirectional print on; ESC “U0” turns unidirectional print off. 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.

Example:

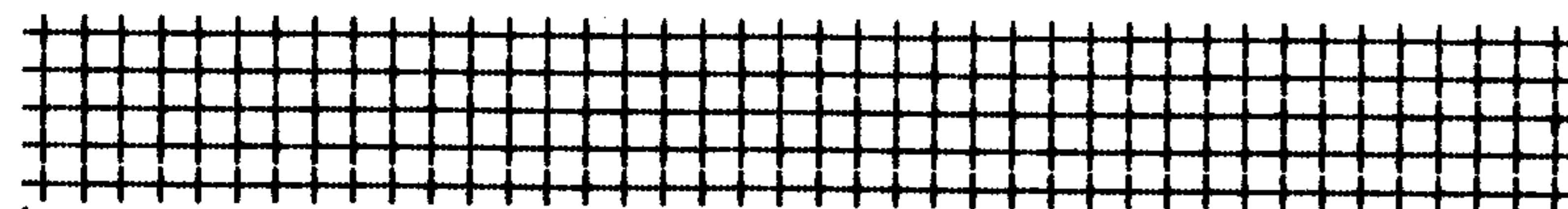
```
10 open 1,4,7
20 print#1, chr$(27)“U1”;“Unidirectional Printing”
30 gosub 200
40 print#1,“Compare the alignment with:”
50 print#1:
60 print#1, chr$(27)“U0”;“Bi-directional Printing”
70 gosub 200
80 print#1, chr$(27)“@”
90 close 1
100 end
200 print#1, chr$(27)“1”
210 print#1, chr$(27)“Q” chr$(40)
220 for k=1 to 5
230 for n=1 to 40
240 print#1, “+”;
250 next n:next k
260 print#1: print#1
270 return
```

```

20 LPRINT CHR$(27)“U1”;“Unidirectional Printing”
30 GOSUB 200
40 LPRINT “Compare the alignment with:”
50 LPRINT
60 LPRINT CHR$(27)“U0”; “Bi-directional Printing”
70 GOSUB 200
80 LPRINT CHR$(27)“@”
100 END
200 LPRINT CHR$(27)“1”;
210 LPRINT CHR$(27)“Q”CHR$(40)
220 FOR K=1 TO 5:
230 FOR N=1 TO 40
240 LPRINT “+”;
250 NEXT:NEXT
260 LPRINT:LPRINT
270 RETURN

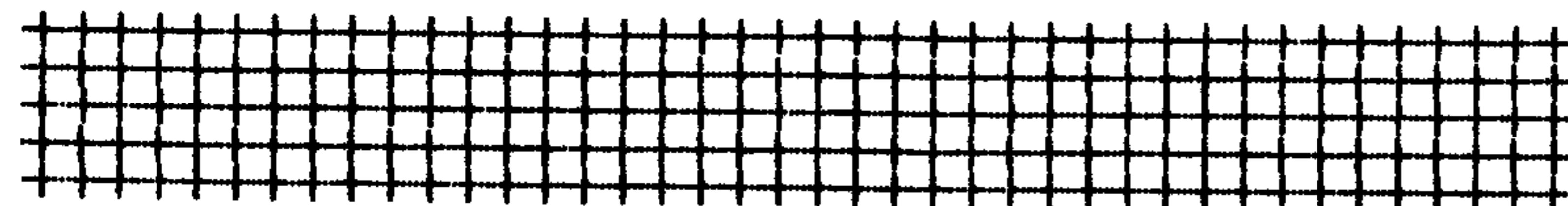
```

Unidirectional Printing



Compare the alignment with:

Bidirectional Printing



One-Line Unidirectional Print

BASIC	CHR\$(27) “<”
PETASCII Hex	1B 3C
ASCII Hex	1B 3C

Sometimes it is necessary to print just one line using unidirectional print. With this command, the print head prints one line from left-to-right, then returns to bidirectional print.

SLASHED ZERO

	ON	OFF
BASIC	CHR\$(27) “~41”	CHR\$(27) “~40”
PETASCII Hex	1B 7E 34 31	1B 7E 34 30
ASCII Hex	1B 7E 34 31	1B 7E 34 30

In some technical printing applications, it is customary to distinguish between the letter 0 and the number zero by placing a slash mark through the zero. The command ESC~4 instructs the printer to do that for you. Use CHR\$(126) for the tilde (~).

The command uses 1 and 0 as its on and off switches. Sending the printer ESC~41 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.

In the Epson #1 configuration, the slashed zero feature can also be turned on permanently by setting DIP switch 6 ON, or turned OFF by setting switch 6 OFF. (See Appendix D).

Example:

```

10 open 1,4,7
20 print#1, chr$(27); chr$(126)“4” chr$(49)“1,000,000 or ”;
30 print#1, chr$(27); chr$(126)“4” chr$(48)
   “1,000,000 is still a million”
40 close 1

```

```

10 LPRINT CHR$(27)“~41”;“1,000,000 or ”;
20 LPRINT CHR$(27)“~40”;“1,000,000 ”;
30 LPRINT “is still a million”

```

1,000,000 or 1,000,000 is still a million

PAPER OUT SENSOR

	ON	OFF
BASIC	CHRS(27) "9"	CHRS(27) "8"
PETASCII Hex	1B 39	1B 38
ASCII Hex	1B 39	1B 38

The MPS 1250 is equipped with a sensor that detects when the paper is about to run out. As the last page of paper runs under the platen, the sensor detects the end of the page. It flashes the red Paper Out signal on the control panel, stops the printer from printing about two inches from the bottom of the page, and turns the printer off-line. If you change or add more paper and then press the control panel on-line switch, you will resume printing without losing a character.

This is a handy feature if you are using continuous paper, but can be a nuisance if you are using single sheets and want to print closer than two inches from the bottom of the page. The MPS 1250, therefore, provides commands to control the paper out sensor. The command ESC 8 turns off the paper-out sensor, and ESC 9 turns on the sensor.

In Serial mode DIP switch 6 also can be used to set the paper end sensor. With internal switch 6 set to off, the paper sensor is enabled, when switch 6 is on, the sensor is disabled.

THE EIGHTH BIT

Some computers send only seven bits of information to their printer instead of the more common eight bits. Since the standard ASCII character set (ASCII 0 to 127) uses only seven bits for its codes, this limitation isn't normally a problem.

But the MPS 1250 uses high-bit, or eight-bit, PETASCII codes (ASCII 128 to 255) for uppercase letters, block and line graphics and many other special characters. Using the three commands described below, you can force the MPS 1250 to interpret subsequent codes as having their high bit set or cleared.

Eighth Bit On

	CHRS(27) ">"
BASIC	
PETASCII Hex	1B 3E
ASCII Hex	1B 3E

The command ESC > instructs the printer to interpret all subsequent codes as high-bit codes even if your computer is sending seven- or low-bit codes. In effect, it adds 128 to any ASCII code in the range of 0 to 127. Once you send ESC > to the MPS 1250, the printer will continue to add 128 to any code it receives in the range of 0 to 127 until you tell it to stop with the command ESC #.

There is one exception to this rule: escape sequences sent while the printer is in high-bit mode will be interpreted using the actual 8-bit codes—the printer will not add 128 to any ASCII characters in the sequence.

The ESC > command can be turned off with either ESC = or ESC #. The difference is that ESC # allows the MPS 1250 to receive all codes—whether seven-bit or eight-bit—as they are sent from your computer. ESC = forces all codes to their seven-bit value even if your computer sends eight bits.

Eighth Bit Off

	CHRS(27) "="
BASIC	
PETASCII Hex	1B 3D
ASCII Hex	1B 3D

The ESC = command works the opposite of ESC >. It instructs the MPS 1250 to interpret all subsequent codes as low-bit codes even if the computer sends high-bit codes. In effect, it subtracts 128 from any ASCII code in the range of 128 to 255 until you tell it to stop with the command ESC #.

The exception to this is that escape sequences sent while the printer is in low-bit mode will be interpreted using the full eight bits.

The ESC = command can be turned off with either ESC > or ESC #. The difference is that ESC # allows the MPS 1250 to receive all codes—whether seven-bit or eight-bit—as they are sent from your computer. ESC > forces all codes to their eight-bit value even if your computer sends seven bits.

Cancel Eighth Bit Control

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

The ESC # command cancels the high-bit feature selected by ESC > and ESC = and allows the MPS 1250 to receive both low-bit and high-bit codes again, whichever your computer sends.

HEX DUMP

Hex dump is not a feature that you will use for everyday printing. In this mode, the MPS 1250 prints the hexadecimal value of every code it receives as well as the character, or the control code, each value stands for. And the MPS 1250 goes one step further by actually printing the abbreviation of each control code. Most printers show only a period for these “hard-to-remember” control codes.

Hex dump is a very powerful program debugging feature. When your program doesn't print what it's supposed to, hex dump shows you the exact codes the MPS 1250 is receiving. The codes the MPS 1250 receives may or may not be what you intended, depending on what translations your BASIC and your computer interface make.

Hex dump mode is turned on by holding down both the FF and LF switches on the control panel while you turn on power to the printer.

To see what translations, if any, your computer makes to the ASCII codes, turn on hex dump mode and run the following program. (Line 40 is necessary to clear the buffer so that the last line of codes prints.)

Example:

```
10 FOR N = 0 TO 255
20 LPRINT CHR$(N);
30 NEXT N
40 FOR N = 1 TO 28:LPRINT CHR$(N);:NEXT N
50 LPRINT
```

COMMODORE MPS1250 EPSON-ASCII MODE VER 1.00 HEX DUMP

```
(0000) 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(0020) 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(0040) 3F 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(0060) 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(0080) 7F 80 81 82 83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F 90 91 92 93 94 95 96 97 98 99 9A 9B 9C 9D 9E .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(00A0) 9F A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF B0 B1 B2 B3 B4 B5 B6 B7 B8 B9 BA BB BC BD BE .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(00C0) BF C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(00E0) DF E0 E1 E2 E3 E4 E5 E6 E7 E8 E9 EA EB EC ED EE EF F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 FA FB FC FD FE .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
(0100) FF 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 0D 0A .!@#%&'()*+,-./0123456789:;=<=>?@ABCDEFGHIJKLMN
```

To get out of hex dump mode, reset the printer. Appendix B contains a table listing all the control code abbreviations in hex dump and what they mean.

Appendix A

Maintenance

The Commodore MPS 1250 printer requires very little routine maintenance. In fact, the best maintenance for your MPS 1250 printer is preventive. If you follow the suggestions in Chapter 1 for locating the MPS 1250 in an area free of excessive dust and heat when you set up your printer, your MPS 1250 will give you long and troublefree performance.

Periodic cleaning, replacement of the ribbon, and, after a very long time, replacement of the print head are about the only maintenance tasks you'll encounter. We'll cover these items in this chapter.

WARNING: Always turn the power off, unplug the power cord, and disconnect the printer cable when performing any type of maintenance.

CLEANING

Dirt and dust are the MPS 1250's biggest enemies. The printer cover will keep most dirt from the printer mechanism, but an occasional cleaning to remove paper particles is a good idea.

If you're just giving the MPS 1250 a general cleaning, you don't have to remove the upper case. First, turn the power off and disconnect the power cord. Then just remove the printer cover and the ribbon cartridge and clean the areas you can easily reach, following the cleaning suggestions in this section. When you're done, replace the ribbon cartridge and printer cover and reconnect the power cord.

To clean the inside of the printer completely, first remove the upper case as described below:

1. Turn the power off, unplug the power cord, and disconnect the printer cable.

2. Remove any paper and the tractor-feed mechanism (if installed). Remove the paper feed knob.
3. Remove the printer cover and ribbon cartridge.
4. Remove the retaining screw that secures the upper case. It is located just above the MPS 1250 logo where the ribbon cartridge sits (see Figure A-1).
5. With a screwdriver, release the two tabs at the front of the upper case. Lift up the front of the case and free the upper case from the rear of the printer. Set the upper case aside for now.

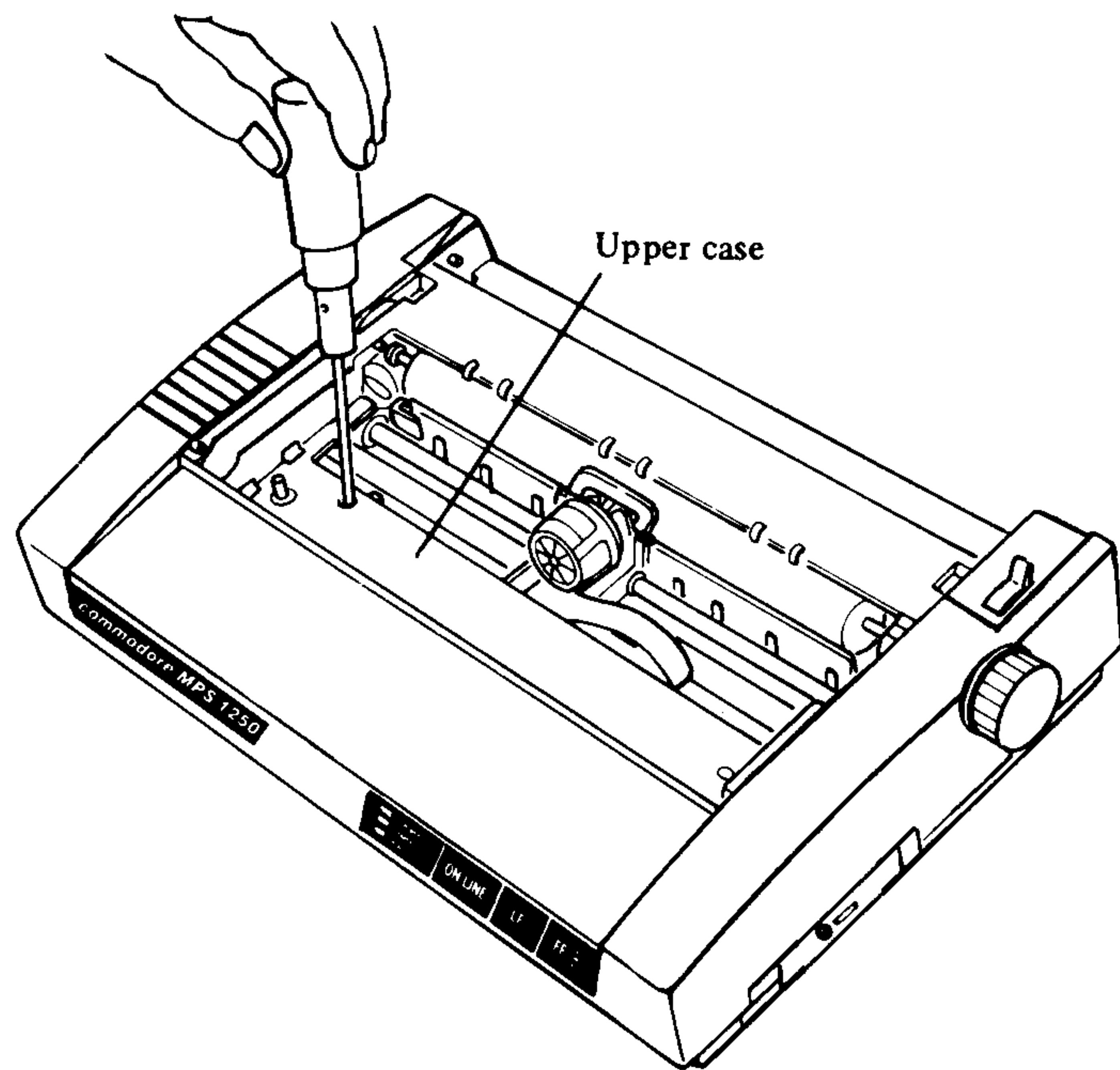


Figure A-1. Removing the upper case.

To clean the inside of the printer, use a soft brush to whisk lint and dust away from the print head area, being careful not to damage any of the cables and pulleys. Do not dust the circuit board area.

The outside of the printer case can be cleaned when needed with a damp rag and alcohol.

When you're finished, reverse the process above to reassemble the printer.

RIBBON CARTRIDGE

The inked ribbon in the cartridge is a continuous loop and will print about two million characters before needing replacement. When printed characters begin to appear faint, it is a sign to replace the ribbon cartridge.

Replacing the ribbon is a simple matter of snapping out the old cartridge and replacing it with a new one. Before removing the old cartridge, however, always turn off the power and slide the print head to the left edge to avoid damage to the print head cable. See the ribbon installation section in Chapter 1 for details.

PRINT HEAD

The print head has a very long life, printing as many as 100 million characters before it shows any signs of wear. You will know that it needs replacement when printed characters are faint even with a new ribbon cartridge.

The MPS 1250 is designed so that you do not have to get inside the printer to change the print head. Follow these simple steps to replace the print head:

1. Turn the power off and disconnect the power cable.
2. Remove the printer cover and the ribbon cartridge.
3. Locate the print head to the most left position and its connection as shown in Figure A-2. Grasp the cable and the plastic reinforcer that covers it and gently pull the cable free from the connector.

4. Unlock the print head by moving the locking lever to the right. Then pulling up on the print head, remove it from the head guide.
5. Place the new print head into position in the head guide and press down until it snaps securely in place.
6. Bring the cable around in front of the pulley and insert it into the connector as shown in Figure A-3.

When you're finished, replace the ribbon cartridge and printer cover. You're ready to start printing again.

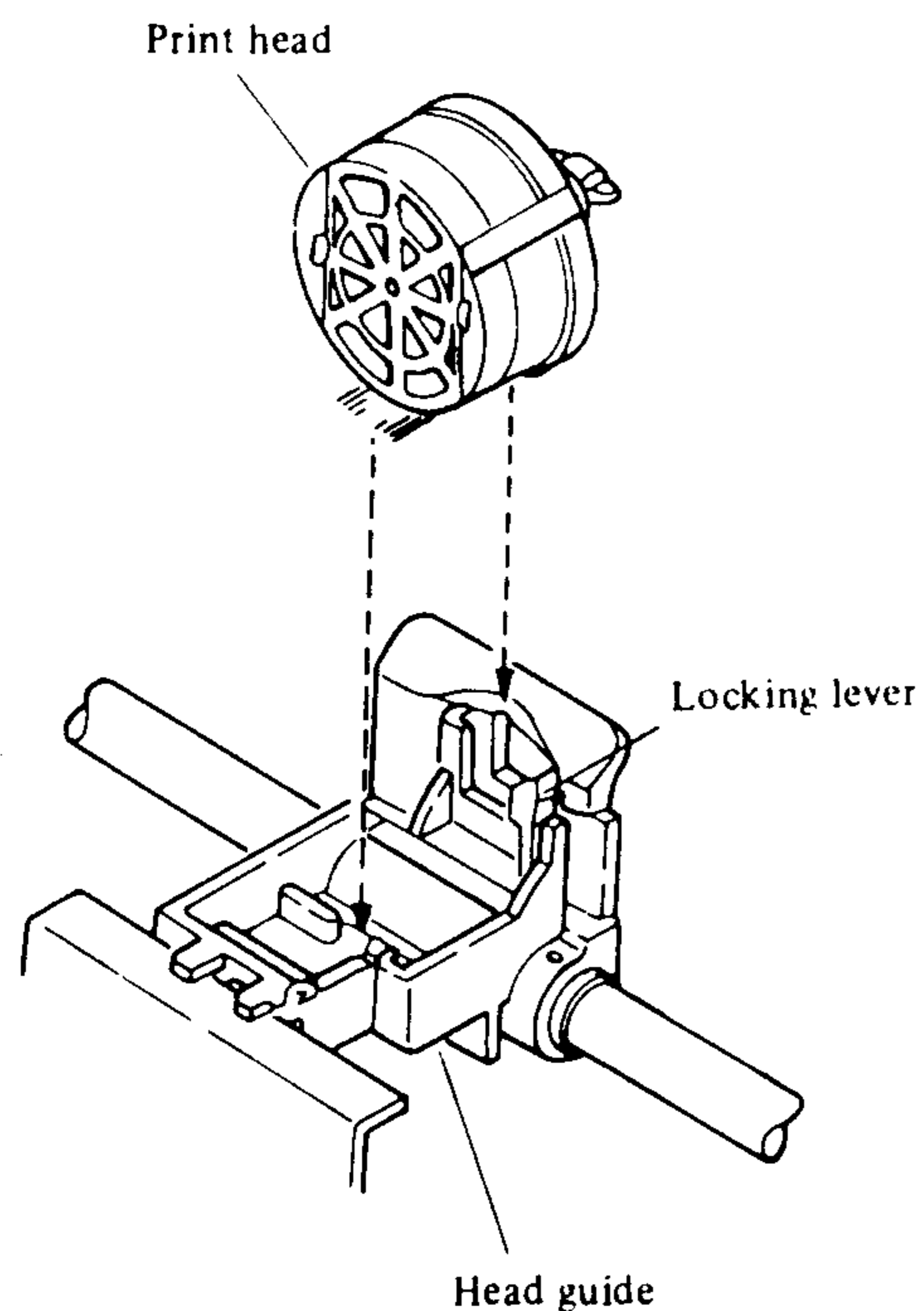


Figure A-2. Replacing the print head.

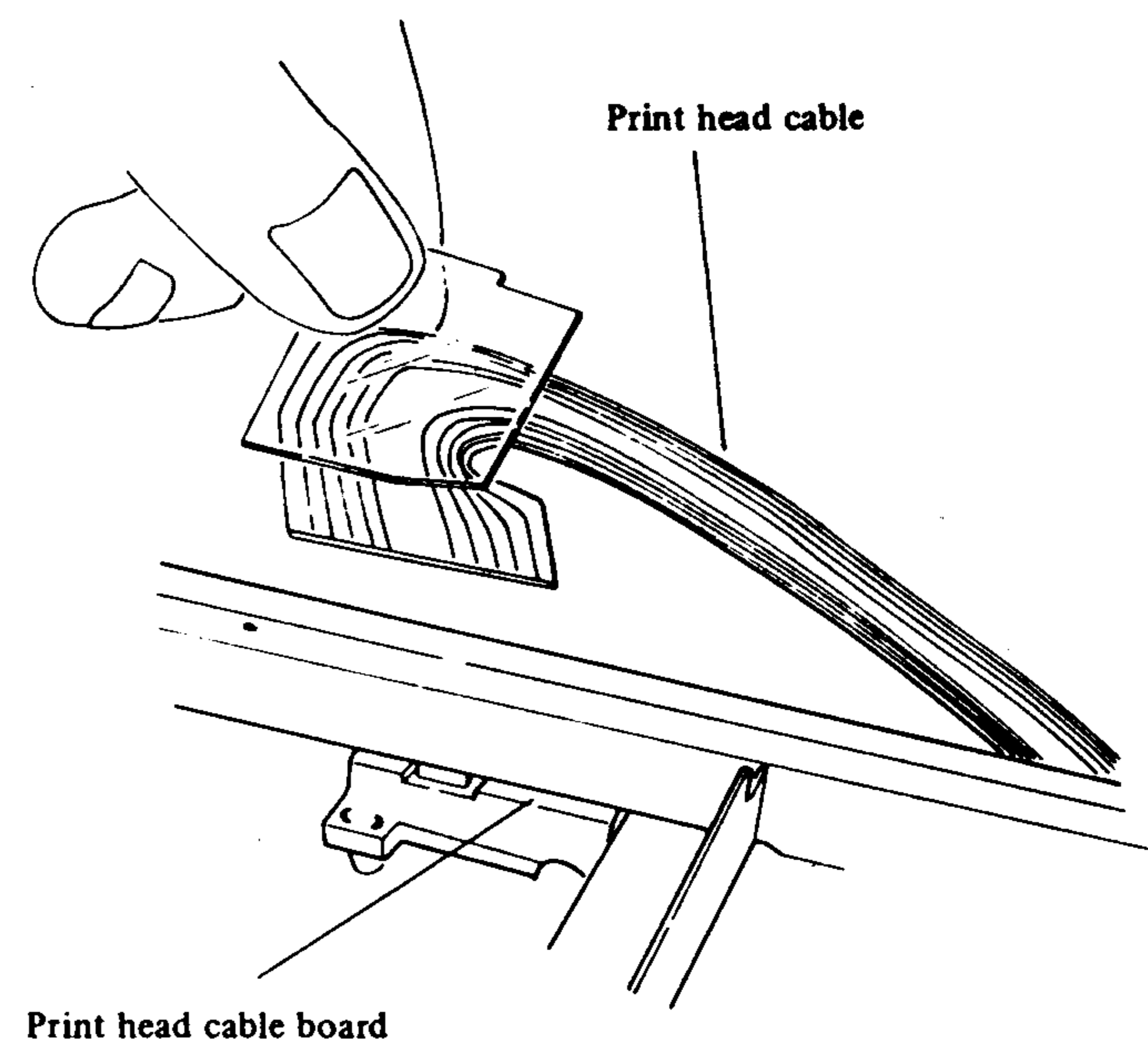


Figure A-3. Reconnecting the print head cable.

Appendix B

MPS 1250

Character Sets

This appendix contains a number of tables showing the characters of each of the eight fonts the MPS 1250 produces.

Tables B-1 and B-2 list each font and tell you how to select it.

Tables B-3 through B-10 list each character set by its ASCII values.

Table B-3	PETASCII Uppercase/Graphics Characters
Table B-4	PETASCII Upper/Lowercase Characters
Table B-5	ASCII Character Set
Table B-6	Epson Standard Characters
Table B-7	Epson Graphics Characters
Table B-8	IBM Graphics—Character Set 1
Table B-9	IBM Graphics—Character Set 2
Table B-10	IBM Graphics—All Characters

Table B-11 lists international characters.

Table B-12 lists Hex Dump Control Codes.

For more information on fonts, ASCII, international characters, etc., see Chapters 2 and 3.

Table B-1. Choosing an MPS 1250 Serial Character Set

PETASCII (Commodore mode) Uppercase/Graphics	<ul style="list-style-type: none"> • 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.
Upper/Lower Case	<p>NOTE: You can not use any of the international characters sets in this mode.</p> <ul style="list-style-type: none"> • Use secondary address 7.
ASCII	<ul style="list-style-type: none"> • Turn DIP switch 2 on.
International Characters*	<ul style="list-style-type: none"> • Select Upper/Lowercase or ASCII characters, then send ESC R CHR\$(n), where n refers to a value in table 3-5.

Table B-2. Choosing an MPS 1250 Parallel Character Set

Epson FX Standard Graphics	<ul style="list-style-type: none"> • This is the printer's default character set. • Turn DIP switch 5 ON.
IBM Graphics Set 1 Set 2 All Characters	<ul style="list-style-type: none"> • This is the IBM graphics mode default characters set. • While in the IBM graphics mode (DIP switches 3 and 4 ON), turn DIP switch 5 ON. • Send ESC m CHR\$(4) while in IBM graphics mode. • Send ESC “^” CHR\$(n) where n is the ASCII value that you wish to print.
International Characters*	<ul style="list-style-type: none"> • Send ESC R CHR\$(n), where n refers to a value in Table 3-5.

NOTE: International characters are not really a character set on their own, but are substitute characters for ASCII codes 35,36,64, 91-96,123-126.

Table B-3. PETASCII Uppercase/Graphics 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	•
2	02	none	34	22	"	66	42	B	98	62	|
3	03	none	35	23	#	67	43	C	99	63	-
4	04	none	36	24	\$	68	44	D	100	64	-
5	05	none	37	25	%	69	45	E	101	65	-
6	06	none	38	26	&	70	46	F	102	66	-
7	07	none	39	27	'	71	47	G	103	67	|
8	08	BS	40	28	(	72	48	H	104	68	|
9	09	HT	41	29	)	73	49	I	105	69	~
10	0A	LF	42	2A	*	74	4A	J	106	6A	~
11	0B	VT	43	2B	+	75	4B	K	107	6B	~
12	0C	FF	44	2C	,	76	4C	L	108	6C	L
13	0D	CR	45	2D	-	77	4D	M	109	6D	~
14	0E	SO	46	2E	.	78	4E	N	110	6E	~
15	0F	SI	47	2F	/	79	4F	O	111	6F	∟
16	10	POS	48	30	0	80	50	P	112	70	∟
17	11	CRSR DWN	49	31	1	81	51	Q	113	71	•
18	12	DC2	50	32	2	82	52	R	114	72	-
19	13	DC3	51	33	3	83	53	S	115	73	•
20	14	DC4	52	34	4	84	54	T	116	74	|
21	15	none	53	35	5	85	55	U	117	75	~
22	16	none	54	36	6	86	56	V	118	76	×
23	17	none	55	37	7	87	57	W	119	77	□
24	18	CAN	56	38	8	88	58	X	120	78	•
25	19	none	57	39	9	89	59	Y	121	79	|
26	1A	SUB	58	3A	:	90	5A	Z	122	7A	•
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	NLQ ON	63	3F	?	95	5F	+	127	7F	∟

Table B-3. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	none	160	A0	SHT SP	192	C0	—	224	E0	space
129	81	none	161	A1	▀	193	C1	•	225	E1	▀
130	82	none	162	A2	▁	194	C2	|	226	E2	▁
131	83	none	163	A3	▂	195	C3	—	227	E3	▂
132	84	none	164	A4	▃	196	C4	—	228	E4	▃
133	85	none	165	A5	|	197	C5	—	229	E5	|
134	86	none	166	A6	▄	198	C6	—	230	E6	▄
135	87	none	167	A7	|	199	C7	|	231	E7	|
136	88	BS	168	A8	▅	200	C8	|	232	E8	▅
137	89	HT	169	A9	▆	201	C9	~	233	E9	▆
138	8A	LF	170	AA	|	202	CA	~	234	EA	|
139	8B	VT	171	AB	†	203	CB	~	235	EB	†
140	8C	FF	172	AC	▇	204	CC	L	236	EC	▇
141	8D	CS	173	AD	█	205	CD	~	237	ED	█
142	8E	SO	174	AE	▉	206	CE	~	238	EE	▉
143	8F	SI	175	AF	▊	207	CF	▏	239	EF	▊
144	90	none	176	B0	▋	208	D0	▏	240	F0	▋
145	91	CRSR UP	177	B1	▌	209	D1	•	241	F1	▌
146	92	DC2	178	B2	▍	210	D2	—	242	F2	▍
147	93	DC3	179	B3	▎	211	D3	•	243	F3	▎
148	94	DC4	180	B4	|	212	D4	|	244	F4	|
149	95	none	181	B5	|	213	D5	~	245	F5	|
150	96	none	182	B6	|	214	D6	×	246	F6	▀
151	97	none	183	B7	—	215	D7	□	247	F7	—
152	98	CAN	184	B8	—	216	D8	•	248	F8	—
153	99	none	185	B9	▏	217	D9	|	249	F9	▏
154	9A	none	186	BA	▏	218	DA	•	250	FA	▏
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	NLQ OFF	191	BF	▏	223	DF	▏	255	FF	∏

Table B-4. PETASCII Upper/Lowercase 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	POS	48	30	0	80	50	p	112	70	P
17	11	CRSR DWN	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	SUB	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	NLQ ON	63	3F	?	95	5F	←	127	7F	⌘

*These characters may be different if you are using an international character set other than the Commodore set. The characters for each set are shown in Table B-4.

Table B-4. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	none	160	A0	SHT SP	192	C0	—	224	E0	space
129	81	none	161	A1	█	193	C1	A	225	E1	█
130	82	none	162	A2	█	194	C2	B	226	E2	█
131	83	none	163	A3	█	195	C3	C	227	E3	█
132	84	none	164	A4	█	196	C4	D	228	E4	█
133	85	none	165	A5	|	197	C5	E	229	E5	|
134	86	none	166	A6	█	198	C6	F	230	E6	█
135	87	none	167	A7	|	199	C7	G	231	E7	|
136	88	BS	168	A8	█	200	C8	H	232	E8	█
137	89	HT	169	A9	█	201	C9	I	233	E9	█
138	8A	LF	170	AA	|	202	CA	J	234	EA	|
139	8B	VT	171	AB	|	203	CB	K	235	EB	|
140	8C	FF	172	AC	█	204	CC	L	236	EC	█
141	8D	CS	173	AD	█	205	CD	M	237	ED	█
142	8E	SO	174	AE	█	206	CE	N	238	EE	█
143	8F	SI	175	AF	█	207	CF	O	239	EF	█
144	90	none	176	B0	█	208	D0	P	240	F0	█
145	91	CRSR UP	177	B1	█	209	D1	Q	241	F1	█
146	92	DC2	178	B2	█	210	D2	R	242	F2	█
147	93	DC3	179	B3	█	211	D3	S	243	F3	█
148	94	DC4	180	B4	|	212	D4	T	244	F4	|
149	95	none	181	B5	|	213	D5	U	245	F5	|
150	96	none	182	B6	|	214	D6	V	246	F6	|
151	97	none	183	B7	█	215	D7	W	247	F7	█
152	98	CAN	184	B8	█	216	D8	X	248	F8	█
153	99	none	185	B9	█	217	D9	Y	249	F9	█
154	9A	none	186	BA	█	218	DA	Z	250	FA	█
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	NLQ OFF	191	BF	█	223	DF	█	255	FF	█

Table B-5. ASCII Character Set

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	POS	48	30	0	80	50	P	112	70	p
17	11	CRSR DWN	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	SUB	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	NLQ ON	63	3F	?	95	5F	~	127 7F		~

*These characters may be different if you are using an international character set other than the Commodore set. The characters for each set are shown in Table B-4.

Table B-5. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	none	160	A0	SHT SP	192	C0	—	224	E0	space
129	81	none	161	A1	█	193	C1	A	225	E1	█
130	82	none	162	A2	█	194	C2	B	226	E2	█
131	83	none	163	A3	█	195	C3	C	227	E3	█
132	84	none	164	A4	█	196	C4	D	228	E4	█
133	85	none	165	A5	|	197	C5	E	229	E5	|
134	86	none	166	A6	█	198	C6	F	230	E6	█
135	87	none	167	A7	|	199	C7	G	231	E7	|
136	88	BS	168	A8	█	200	C8	H	232	E8	█
137	89	HT	169	A9	█	201	C9	I	233	E9	█
138	8A	LF	170	AA	|	202	CA	J	234	EA	|
139	8B	VT	171	AB	|	203	CB	K	235	EB	|
140	8C	FF	172	AC	█	204	CC	L	236	EC	█
141	8D	CS	173	AD	█	205	CD	M	237	ED	█
142	8E	SO	174	AE	█	206	CE	N	238	EE	█
143	8F	SI	175	AF	█	207	CF	O	239	EF	█
144	90	none	176	B0	r	208	D0	P	240	F0	r
145	91	CRSR UP	177	B1	+	209	D1	Q	241	F1	+
146	92	DC2	178	B2	T	210	D2	R	242	F2	T
147	93	DC3	179	B3	+	211	D3	S	243	F3	+
148	94	DC4	180	B4	|	212	D4	T	244	F4	|
149	95	none	181	B5	|	213	D5	U	245	F5	|
150	96	none	182	B6	|	214	D6	V	246	F6	|
151	97	none	183	B7	█	215	D7	W	247	F7	█
152	98	CAN	184	B8	█	216	D8	X	248	F8	█
153	99	none	185	B9	█	217	D9	Y	249	F9	█
154	9A	none	186	BA	█	218	DA	Z	250	FA	█
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	NLQ OFF	191	BF	█	223	DF	█	255	FF	█

Table B-6. 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 B-6. (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 B-7. 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	0	48	30	0	80	50	P	112	70	p
17	11	1	49	31	1	81	51	Q	113	71	q
18	12	2	50	32	2	82	52	R	114	72	r
19	13	3	51	33	3	83	53	S	115	73	s
20	14	4	52	34	4	84	54	T	116	74	t
21	15	5	53	35	5	85	55	U	117	75	u
22	16	6	54	36	6	86	56	V	118	76	v
23	17	7	55	37	7	87	57	W	119	77	w
24	18	8	56	38	8	88	58	X	120	78	x
25	19	9	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 B-7. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	+	160	A0		192	C0	@	224	E0	`
129	81	⊥	161	A1	!	193	C1	A	225	E1	a
130	82	⊥	162	A2	"	194	C2	B	226	E2	b
131	83	⊥	163	A3	#	195	C3	C	227	E3	c
132	84	⊥	164	A4	\$	196	C4	D	228	E4	d
133	85	—	165	A5	%	197	C5	E	229	E5	e
134	86	|	166	A6	&	198	C6	F	230	E6	f
135	87	└	167	A7	'	199	C7	G	231	E7	g
136	88	└	168	A8	(	200	C8	H	232	E8	h
137	89	└	169	A9	)	201	C9	I	233	E9	i
138	8A	└	170	AA	*	202	CA	J	234	EA	j
139	8B	▣	171	AB	+	203	CB	K	235	EB	k
140	8C	▣	172	AC	,	204	CC	L	236	EC	l
141	8D	▣	173	AD	-	205	CD	M	237	ED	m
142	8E	▣	174	AE	.	206	CE	N	238	EE	n
143	8F	•	175	AF	/	207	CF	O	239	EF	o
144	90	◦	176	B0	0	208	D0	P	240	F0	p
145	91	♠	177	B1	1	209	D1	Q	241	F1	q
146	92	♥	178	B2	2	210	D2	R	242	F2	r
147	93	♦	179	B3	3	211	D3	S	243	F3	s
148	94	♣	180	B4	4	212	D4	T	244	F4	t
149	95	♫	181	B5	5	213	D5	U	245	F5	u
150	96	♣	182	B6	6	214	D6	V	246	F6	v
151	97	♠	183	B7	7	215	D7	W	247	F7	w
152	98	♣	184	B8	8	216	D8	X	248	F8	x
153	99	♣	185	B9	9	217	D9	Y	249	F9	y
154	9A	♣	186	BA	:	218	DA	Z	250	FA	z
155	9B	↑	187	BB	;	219	DB	[	251	FB	{
156	9C	↓	188	BC	<	220	DC	\	252	FC	|
157	9D	×	189	BD	=	221	DD	]	253	FD	}
158	9E	÷	190	BE	>	222	DE	^	254	FE	~
159	9F	±	191	BF	?	223	DF	_	255	FF	

Table B-8. IBM Graphics-Character Set 1

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 B-8. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	none	160	A0	á	192	C0	L	224	E0	α
129	81	none	161	A1	í	193	C1	⊥	225	E1	β
130	82	none	162	A2	ó	194	C2	⊥	226	E2	Γ
131	83	none	163	A3	ú	195	C3	⊥	227	E3	π
132	84	none	164	A4	ñ	196	C4	⊥	228	E4	Σ
133	85	none	165	A5	Ñ	197	C5	⊥	229	E5	σ
134	86	none	166	A6	à	198	C6	⊥	230	E6	μ
135	87	none	167	A7	ò	199	C7	⊥	231	E7	τ
136	88	BS	168	A8	ì	200	C8	⊥	232	E8	ϖ
137	89	HT	169	A9	í	201	C9	⊥	233	E9	θ
138	8A	LF	170	AA	î	202	CA	⊥	234	EA	Ω
139	8B	VT	171	AB	ÿ	203	CB	⊥	235	EB	δ
140	8C	FF	172	AC	ÿ	204	CC	⊥	236	EC	∞
141	8D	CR	173	AD	ï	205	CD	⊥	237	ED	∞
142	8E	SO	174	AE	«	206	CE	⊥	238	EE	€
143	8F	SI	175	AF	»	207	CF	⊥	239	EF	∩
144	90	none	176	B0	⊥	208	D0	⊥	240	F0	≡
145	91	DC1	177	B1	⊥	209	D1	⊥	241	F1	±
146	92	DC2	178	B2	⊥	210	D2	⊥	242	F2	≥
147	93	DC3	179	B3	⊥	211	D3	⊥	243	F3	≤
148	94	DC4	180	B4	⊥	212	D4	⊥	244	F4	∫
149	95	none	181	B5	⊥	213	D5	⊥	245	F5	∫
150	96	none	182	B6	⊥	214	D6	⊥	246	F6	+
151	97	none	183	B7	⊥	215	D7	⊥	247	F7	≈
152	98	CAN	184	B8	⊥	216	D8	⊥	248	F8	°
153	99	none	185	B9	⊥	217	D9	⊥	249	F9	°
154	9A	none	186	BA	⊥	218	DA	⊥	250	FA	°
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	²
158	9E	none	190	BE	⊥	222	DE	⊥	254	FE	
159	9F	none	191	BF	⊥	223	DF	⊥	255	FF	space

Table B-9. IBM Graphics-Character Set 2

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 B-9. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	ç	160	A0	á	192	C0	Ł	224	E0	α
129	81	ü	161	A1	í	193	C1	ł	225	E1	β
130	82	é	162	A2	ó	194	C2	Ŧ	226	E2	Γ
131	83	â	163	A3	ú	195	C3	ŧ	227	E3	π
132	84	ä	164	A4	ñ	196	C4	—	228	E4	Σ
133	85	à	165	A5	Ń	197	C5	†	229	E5	σ
134	86	á	166	A6	ă	198	C6	‡	230	E6	μ
135	87	ç	167	A7	o	199	C7	‡	231	E7	τ
136	88	è	168	A8	ı	200	C8	‡	232	E8	ϖ
137	89	ë	169	A9	ı	201	C9	‡	233	E9	θ
138	8A	è	170	AA	ı	202	CA	‡	234	EA	Ω
139	8B	ı	171	AB	ı	203	CB	‡	235	EB	δ
140	8C	ı	172	AC	ı	204	CC	‡	236	EC	∞
141	8D	ı	173	AD	ı	205	CD	‡	237	ED	∅
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	ö	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	ü	185	B9	⋮	217	D9	‡	249	F9	•
154	9A	Ü	186	BA	⋮	218	DA	‡	250	FA	-
155	9B	ϕ	187	BB	⋮	219	DB	‡	251	FB	√
156	9C	£	188	BC	⋮	220	DC	‡	252	FC	°
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

Table B-10. IBM Graphics-All 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 B-10. (cont.)

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
128	80	ç	160	A0	á	192	C0	L	224	E0	α
129	81	ü	161	A1	í	193	C1	⌊	225	E1	β
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	Ń	197	C5	⌎	229	E5	σ
134	86	â	166	A6	ă	198	C6	⌏	230	E6	μ
135	87	ç	167	A7	ǫ	199	C7	⌐	231	E7	τ
136	88	ê	168	A8	ı	200	C8	⌑	232	E8	ϖ
137	89	ë	169	A9	ˆ	201	C9	⌒	233	E9	θ
138	8A	è	170	AA	˘	202	CA	⌓	234	EA	Ω
139	8B	ï	171	AB	˙	203	CB	⌔	235	EB	δ
140	8C	î	172	AC	˚	204	CC	⌕	236	EC	ϖ
141	8D	ı	173	AD	ı	205	CD	⌖	237	ED	ϖ
142	8E	À	174	AE	«	206	CE	⌗	238	EE	€
143	8F	Á	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	ö	179	B3	⋮	211	D3	⌜	243	F3	≤
148	94	õ	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	ÿ	185	B9	⋮	217	D9	⌢	249	F9	•
154	9A	Ü	186	BA	⋮	218	DA	⌣	250	FA	-
155	9B	ϕ	187	BB	⋮	219	DB	⌤	251	FB	√
156	9C	£	188	BC	⋮	220	DC	⌥	252	FC	ˆ
157	9D	¥	189	BD	⋮	221	DD	⌦	253	FD	ˆ
158	9E	℞	190	BE	⋮	222	DE	⌧	254	FE	•
159	9F	ƒ	191	BF	⋮	223	DF	⌨	255	FF	space

Table B-11. 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 11 international character sets.

n	Country	35	36	64	91	92	93	94	96	123	124	125	126
0	U.S.A.	#	\$	@	[\]	^	`	()	~	
1	France	#	\$	à	•	ç	§	^	`	é	ù	è	¨
2	Germany	#	\$	ß	À	Ö	U	^	`	ä	ö	ü	ß
3	England	£	\$	@	[\]	^	`	()	~	
4	Denmark I	#	\$	ø	Æ	Ø	À	^	`	æ	ø	à	~
5	Sweden	#	¤	é	Å	Ö	À	U	é	ä	ö	å	u
6	Italy	#	\$	@	•	\	é	^	ù	à	ò	è	ì
7	Spain	₧	\$	@	ı	Ñ	¿	^	`	¨	ñ	ı	~
8	Japan	#	\$	@	[¥]	^	`	()	~	
9	Norway	#	¤	é	Æ	Ø	À	U	é	æ	ø	à	u
10	Denmark II	#	\$	é	Æ	Ø	À	U	é	æ	ø	à	u
11	Commodore	#	\$	@	[	£	]	↑	—	+	£	ı	¤

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

Table B-12. Hex Dump Control Code Abbreviations

When you run a program in hex dump mode, the control codes print out as abbreviation symbols. This lists these abbreviations and what they represent.

Decimal	Hex	Abbreviation	ASCII Name	Representation
0	00	N _U	NUL	Null
1	01	S _H	SOH	Start of Heading
2	02	S _X	STX	Start of Text
3	03	E _X	ETX	End of Text
4	04	E _T	EOT	End of Transmission
5	05	E _Q	ENQ	Enquiry
6	06	A _K	ACK	Acknowledge
7	07	B _L	BEL	Bell
8	08	B _S	BS	Backspace
9	09	H _T	HT	Horizontal Tab
10	0A	L _F	LF	Line Feed
11	0B	V _T	VT	Vertical Tab
12	0C	F _F	FF	Form Feed
13	0D	C _R	CR	Carriage Return
14	0E	S _O	SO	Shift Out
15	0F	S _I	SI	Shift In
16	10	D _L	DLE	Data Link Escape
17	11	D ₁	DC1	Device Control 1
18	12	D ₂	DC2	Device Control 2
19	13	D ₃	DC3	Device Control 3
20	14	D ₄	DC4	Device Control 4
21	15	N _K	NAK	Negative Acknowledge
22	16	S _Y	SYN	Synchronous Idle
23	17	E _B	ETB	End of Transmission Block
24	18	C _N	CAN	Cancel
25	19	E _M	EM	End of Medium
26	1A	S _B	SUB	Substitute Character
27	1B	E _C	ESC	Escape
28	1C	F _S	FS	Field Separator
29	1D	G _S	GS	Group Separator
30	1E	R _S	RS	Reader Stop
31	1F	U _S	US	Unit Separator

The same codes are repeated for codes 128-159 (\$80-\$9F).

Appendix C

Command Reference

This appendix provides a quick reference to the MPS 1250's commands, in numerical order. It uses two conventions you should know about.

Commands that use 1 and 0 as on and off switches, strictly speaking, use ASCII 1 and ASCII 0. However, the MPS 1250 also accepts the characters 1 and 0 (ASCII 49 and 48) in many cases. Because sending the characters 1 and 0 is more convenient in BASIC than sending the codes ASCII 1 and 0, characters are shown in the BASIC command formats whenever possible. The hex format of the commands, however, shows the true values—hex 01 and 00.

Both PETASCII and ASCII hex values are listed for the escape sequence commands in Table C-2. When in serial mode, the appropriate values depend on the setting of internal (DIP) switch 2. In all other modes use ASCII hex.

Table C-1. Printer Control Codes

Serial Interface

CONTROL CODE				
Name	Dec	Hex	COMMODORE Mode	EPSON Mode
BS	8	08	Commodore Graphics Mode	Backspace
HT	9	09	Horizontal Tab	Horizontal Tab
LF	10	0A	Line Feed + Carriage Ret	Line Feed + Carriage Return
VT	11	0B	Vertical Tab	Vertical Tab
FF	12	0C	Form Feed	Form Feed
CR	13	0D	Carriage Return + Line Feed	Carriage Return
SO	14	0E	Double-Width On	One-line Double-Width On
SI	15	0F	Double-Width Off	Compressed On
POS	16	10	"n1 n2" Horiz. Tab	Ignore
DC1	17	11	Text Mode—One Line	Ignore
DC2	18	12	Reverse On	Compressed Off
DC3	19	13	Paging Off	Ignore
DC4	20	14	Ignore	One-Line Double-Width Off
CAN	24	18	Ignore	Cancel Line
SUB	26	1A	Bit Image Repeat	Ignore
ESC	27	1B	Escape	Escape
	31	1F	NLQ On	Ignore
	34	22	Quote Mode On	Print " Normally (Quote)
DEL	127	7F	Printable Character	Delete Last Character
BS	136	88	Ignore	Backspace
HT	137	89	Ignore	Horizontal Tab
LF	138	8A	Ignore	Line Feed
VT	139	8B	Ignore	Vertical Tab
FF	140	8C	Ignore	Form Feed
CS	141	8D	Carriage Return (no LF)	Carriage Return (no LF)
SO	142	8E	Ignore	One-Line Double-Width On
SI	143	8F	Ignore	Compressed On
DC1	145	91	Graphics Mode—One Line	Ignore
DC2	146	92	Reverse Off	Compressed Off
DC3	147	93	Paging On	Ignore
DC4	148	94	Ignore	One-Line Double-Width Off
CAN	152	98	Ignore	Cancel Line
ESC	155	9B	Escape	Escape
	159	9F	NLQ Off	Ignore

Table C-2. Printer Control Codes (cont.)

Parallel Interface

Control Keys	Dec	Hex	Function
CTRL H	8	08	Backspace
CTRL I	9	09	Horizontal Tab (htab)
CTRL J	10	0A	Line Feed
CTRL K	11	0B	Vertical Tab (vtab)
CTRL L	12	0C	Form Feed
CTRL M	13	0D	Carriage Return
CTRL N	14	0E	Sets one-line expanded print
CTRL O	15	0F	Sets compressed print
CTRL R	18	12	Cancel compressed print
CTRL T	20	14	Cancel one-line expanded print
CTRL X	24	18	Cancel line
CTRL [	27	1B	Escape
DEL	127	7F	Delete Last Character

Table C-3. Escape Sequence Commands

Escape Sequence	PETASCII (Hex)	ASCII (Hex)	Function
ESC CHR\$(14)	1B 0E	1B 0E	Sets one-line expanded print
ESC CHR\$(15)	1B 0F	1B 0F	Sets compressed print
ESC CHR\$(16) CHR\$(n1) CHR\$(n2)	1B 10 n1 n2	1B 10 n1 n2	Print position in 1/60 inch units (ESC POS)
ESC CHR\$(18)	1B 12	1B 12	Cancels compressed print
ESC CHR\$(25) CHR\$(n)	1B 19 n	1B 19 n	Enables/Disables optional cut sheet feeder (n=1 ON, n=0 OFF)
ESC (space) CHR\$(n)	1B 20 n	1B 20 n	Increases proportional spacing by n dots
ESC ! CHR\$(n)	1B 21 n	1B 21 n	Selects print mode number n
ESC #	1B 23	1B 23	Cancels high-bit/low-bit code conversion
ESC \$ CHR\$(n1) CHR\$(n2)	1B 24 n1 n2	1B 24 n1 n2	Absolute dot tab
ESC %n CHR\$(0)	1B 25 3n 00 or, 1B 25 n 00	1B 25 3n 00 or, 1B 25 n 00	Selects/Cancels defined characters (n=1 ON, n=0 OFF)
ESC & CHR\$(0) CHR\$(n1) CHR\$(n2) CHR\$(a) CHR\$(d0) ... CHR\$(d10)	1B 26 00 n1 n2 a d0 ... d10	1B 26 00 n1 n2 a d0 ... d10	Define characters
ESC * CHR\$(m) CHR\$(n1) CHR\$(n2)	1B 2A m n1 n2	1B 2A m n1 n2	Sets graphic mode m
ESC - n	1B 2D 3n or, 1B 2D n	1B 2D 3n or, 1B 2D n	Sets/Cancels underlined print (n=1 ON, n=0 OFF)
ESC / CHR\$(n)	1B 2F n	1B 2F n	Sets vtabs in channel n as current vtabs (except IBM)
ESC 0	1B 30	1B 30	Sets 1/8 inch line spacing
ESC 1	1B 31	1B 31	Sets 7/72 inch line spacing
ESC 2	1B 32	1B 32	Sets 1/6 inch line spacing (except IBM) Sets line spacing defined by ESC A or defaults to 1/6 inch (IBM only)
ESC 3 CHR\$(n)	1B 33 n	1B 33 n	Sets n/216 inch line spacing
ESC 4	1B 34	1B 34	Sets italic characters (except IBM) Sets top-of-form at current paper position (IBM only)
ESC 5	1B 35	1B 35	Cancels italic characters (except IBM)
ESC 5n	1B 35 n	1B 35n	Enables/disables auto line feed (IBM only) (n=1 ON, n=0 OFF)
ESC 6	1B 36	1B 36	Sets accented characters (IBM only)
ESC 7	1B 37	1B 37	Cancels accented characters (IBM only)
ESC 8	1B 38	1B 38	Disables paper-out sensor
ESC 9	1B 39	1B 39	Enables paper-out sensor
ESC : CHR\$(0) CHR\$(0) CHR\$(0)	1B 3A 00 00 00	1B 3A 00 00 00	Copy standard characters (except IBM)
ESC :	1B 3A	1B 3A	Selects elite pitch (IBM only)
ESC <	1B 3C	1B 3C	Sets one-line unidirectional print
ESC =	1B 3D	1B 3D	Sets low-bit (except IBM) Defines characters (IBM only)

Table C-3. Escape Sequence Commands (cont.)

Escape Sequence	PETASCII (Hex)	ASCII (Hex)	Function
ESC >	1B 3E	1B 3E	Sets high-bit
ESC ?n CHR\$(m)	1B 3F m	1B 3F m	Change from graphic mode n to graphic mode m
ESC @	1B 40	1B 40	Resets printer to power-on default settings and clears buffer
ESC A CHR\$(n)	1B C1 n	1B 41 n	Sets n/72 inch line spacing
ESC B CHR\$(n1) CHR\$(n2) ... CHR\$(0)	1B C2 n1 n2 ... 00	1B 42 n1 n2 ... 00	Sets variable vtabs at lines n1, n2, ...
ESC C CHR\$(n)	1B C3 n	1B 43 n	Sets page length to n lines
ESC C CHR\$(0) CHR\$(n) 1B C3 00 n	1B C3 00 n	1B 43 00 n	Sets page length to n inches
ESC D CHR\$(n1) CHR\$(n2) ... CHR\$(0)	1B C4 n1 n2 ... 00	1B 44 n1 n2 ... 00	Sets variable htabs at columns n1, n2, ...
ESC E	1B C5	1B 45	Sets emphasized print
ESC F	1B C6	1B 46	Cancels emphasized print
ESC G	1B C7	1B 47	Sets doublestrike print (except IBM) Sets correspondence quality (IBM only)
ESC H	1B C8	1B 48	Cancels doublestrike print
ESC In		1B 49 n	Selects download characters in draft (n=4) print. Selects standard character set in draft (n=0) or correspondence quality (n=2) print (IBM only)
ESC J CHR\$(n)	1B CA n	1B 4A n	One-time line feed of n/216 inches
ESC K CHR\$(n1) CHR\$(n2)	1B CB n1 n2	1B 4B n1 n2	Sets single-density graphics
ESC L CHR\$(n1) CHR\$(n2)	1B CC n1 n2	1B 4C n1 n2	Sets low-speed double-density graphics
ESC M	1B CD	1B 4D	Selects elite pitch
ESC N CHR\$(n)	1B CE n	1B 4E n	Sets bottom margin at n lines
ESC O	1B CF	1B 4F	Cancels bottom margin
ESC P	1B D0	1B 50	Selects pica pitch
ESC Q CHR\$(n)	1B D1 n	1B 51 n	Sets right margin at column n (except IBM)
ESC R CHR\$(n)	1B D2 n	1B 52 n	Selects accented (international) character set n (except IBM)
ESC R		1B 52	Clears all htabs and vtabs (IBM only)
ESC S0	1B D3 30 or, 1B D3 00	1B 53 30 or, 1B 53 00	Sets superscript characters
ESC S1	1B D3 31 or, 1B D3 01	1B 53 31 or, 1B 53 01	Sets subscript characters
ESC T	1B D4	1B 54	Cancels super/subscript characters
ESC Un	1B D5 3n or, 1B D5 n	1B 55 3n or, 1B 55 n	Sets/cancels unidirectional print (n=1 ON, n=0 OFF)

Table C-3. Escape Sequence Commands (cont.)

Escape Sequence	PETASCII (Hex)	ASCII (Hex)	Function
ESC Wn	1B D7 3n or, 1B D7 n	1B 57 3n or, 1B 57 n	Sets/cancels continuous expanded print (n = 1 ON, n = 0 OFF)
ESC Y CHR\$(n1) CHR\$(n2)	1B D9 n1 n2	1B 59 n1 n2	Sets double-density graphics
ESC Z CHR\$(n1) CHR\$(n2)	1B DA n1 n2	1B 5A n1 n2	Sets quadruple-density graphics
ESC £ CHR\$(n1) CHR\$(n2)	1B 5C n1 n2	1B 5C n1 n2	Relative dot tab (except IBM)
ESC \ CHR\$(n1) CHR\$(n2)	1B 5C n1 n2	1B 5C n1 n2	Prints continuously from all characters chart (IBM only)
ESC ↑ CHR\$(m) CHR\$(n1) CHR\$(n2)	1B 5E m n1 n2	1B 5E m n1 n2	Sets nine-pin graphics (m = 0 Single- density, m = 1 Double-density) (except IBM)
ESC “^” CHR\$(n)		1B 5E n	Prints a single character from all characters chart (IBM only)
ESC _n		1B 5F n	Sets/cancels overscoring (IBM only) (n = 1 ON, n = 0 OFF)
ESC a CHR\$(n)	1B 41 n	1B 61 n	In correspondence quality, justifies text flush left (n = 0), centered (n = 1), flush right (n = 2), or fully justified (n = 3) (except IBM)
ESC b CHR\$(N) CHR\$(n1) CHR\$(n2) . . . CHR\$(0)	1B 42 N n1 n2 . . . 00	1B 62 N n1 n2 . . . 00	Sets vtabs n1, n2, . . . in channel N
ESC e CHR\$(0) CHR\$(n)	1B 45 00 n	1B 65 00 n	Sets htabs every n columns
ESC e CHR\$(1) CHR\$(n)	1B 45 01 n	1B 65 01 n	Sets vtabs every n lines
ESC f CHR\$(0) CHR\$(n)	1B 46 00 n	1B 66 00 n	Moves print head n columns to the right
ESC f CHR\$(1) CHR\$(n)	1B 46 01 n	1B 66 01 n	Advances the paper n lines
ESC h	1B 48	1B 68	Sets vertically enlarged print
ESC l CHR\$(n)	1B 4C n	1B 6C n	Sets left margin at column n
ESC m CHR\$(n)	1B 4D n	1B 6D n	Sets/cancels Epson only FX line and block graphics characters or IBM only accented characters (n = 4 ON, n = 0 OFF)
ESC pn	1B 50 3n or, 1B 50 n	1B 70 3n or, 1B 70 n	Sets/Cancels proportional printing (n = 1 ON, n = 0 OFF)
ESC r	1B 52	1B 72	Sets reverse print
ESC t	1B 54	1B 74	Cancels reverse print
ESC u	1B 55	1B 75	Cancels vertically enlarged print
ESC xn	1B 58 3n or, 1B 58 n	1B 78 3n or, 1B 78 n	Sets/Cancels NLQ mode (n = 1 ON, n = 0 OFF)
ESC CHR\$(126)0CHR\$(n)	1B 7E 30 n	1B 7E 30 n	Sets n/144 inch line spacing
ESC CHR\$(126)1n	1B 7E 31 3n or, 1B 7E 31 n	1B 7E 31 3n or, 1B 7E 31 n	Sets/Cancels vertically enlarged print (n = 1 ON, n = 0 OFF)

Table C-3. Escape Sequence Commands (cont.)

Escape Sequence	PETASCII (Hex)	ASCII (Hex)	Function
ESC CHR\$(126)2n	1B 7E 32 3n or, 1B 7E 32 n	1B 7E 32 3n or, 1B 7E 32 n	Sets/Cancels reverse print (n = 1 ON, n = 0 OFF)
ESC CHR\$(126)3CHR\$(n)	1B 7E 33 n	1B 7E 33 n	Selects master pitch (n = 0, 1, 2, 5, 6, 7)
ESC CHR\$(126)4n	1B 7E 34 3n or, 1B 7E 34 n	1B 7E 34 3n or, 1B 7E 34 n	Sets/Cancels slashed zero feature (n = 1 ON, n = 0 OFF)
ESC CHR\$(126)5n	1B 7E 35 3n or, 1B 7E 35 n	1B 7E 35 3n or, 1B 7E 35 n	Switches between Commodore, Epson, and IBM configurations (n = 0 Epson, n = 1 Commodore—serial or IBM-parallel)

Appendix D

The Internal Dip Switches And How To Set Them

The MPS 1250 contains several internal switches that you can set to determine how your printer functions. These switches are small levers known as DIP switches (Dual In-line Package) and each has only two settings (ON and OFF).

You must set switches 1, 3 and 4 if you want your printer to be in the IBM mode or Epson mode with a parallel interface to your computer. In this case see the Parallel Modes section of this appendix to find out which switches you must change. If you are not sure which printer mode you want, read Chapter 2. It will help you decide.

Otherwise, for most uses the DIP switches can be left as they were set at the factory, but you may want to change them to customize the MPS 1250 to your own needs. See Table 1-1 for the factory settings.

Most of the features that are controlled by the switches can also be changed with software commands regardless of how the switches are set.

The following tables show the functions of all the DIP switches. An explanation of each switch follows the tables.

SERIAL MODE

NOTE: The MPS 1250 is set for Commodore Serial mode at the factory. DIP switches are also at power-on/reset.

**Table D-1. DIP Switch Functions
Serial Mode; switch is OFF**

Switch	Function	OFF	ON	Factory Setting
1	Interface Select	Serial	Parallel	Off
2	ASCII Translation	PETASCII	ASCII	Off
3	Control Code Mode	Commodore	Epson	Off
4	NLQ/Draft	Draft	NLQ	Off
5	Device Select	4	5	Off
6	Paper End Detector	Enabled	Disabled	Off
7	Automatic Line Feed*	Disabled	Enabled	Off
8	Pica/Compressed	Pica	Compressed	Off

*Valid only when Switch 3 is ON.

Switch Functions—Serial Modes

Switch 1

This switch is turned OFF when you are using the serial port, for instance when you are connecting Commodore computers.

Switch 2

This switch is turned on when you are using ASCII Commodore or Epson mode, OFF when you are using PETASCII (Commodore mode only).

Switch 3

This switch is turned ON when you are using Epson control code, OFF when you are using Commodore control mode.

Switch 4

This switch is turned ON when you want printouts in Nearly Letter Quality (NLQ), OFF when you want draft quality printouts.

Switch 5

This switch is turned on for device 5, OFF for device 4. The number that you choose is the device number that you will use to address the printer.

Switch 6

This switch is turned OFF for the printer to detect when the paper is about to run out. The printer then stops printing two inches from the bottom of the page and flashes the red paper out signal. This is a useful feature when you are using continuous paper, but can be a nuisance if you are using single sheets and want to print closer than two inches from the bottom of the page. Turn this switch ON when you are using single sheets of paper.

Switch 7

This switch is turned ON when the printer adds a line feed to each carriage return it receives, OFF when the computer must send a line feed with every carriage return. This switch is only valid in Epson mode.

Switch 8

This switch is turned ON for compressed printing (17 characters per inch), OFF for pica (10 characters per inch).

PARALLEL MODE

If DIP switch 1 is ON, the MPS 1250 is in its parallel mode.

**Table D-1. DIP switch settings for switches 1 through 4
—Parallel Mode**

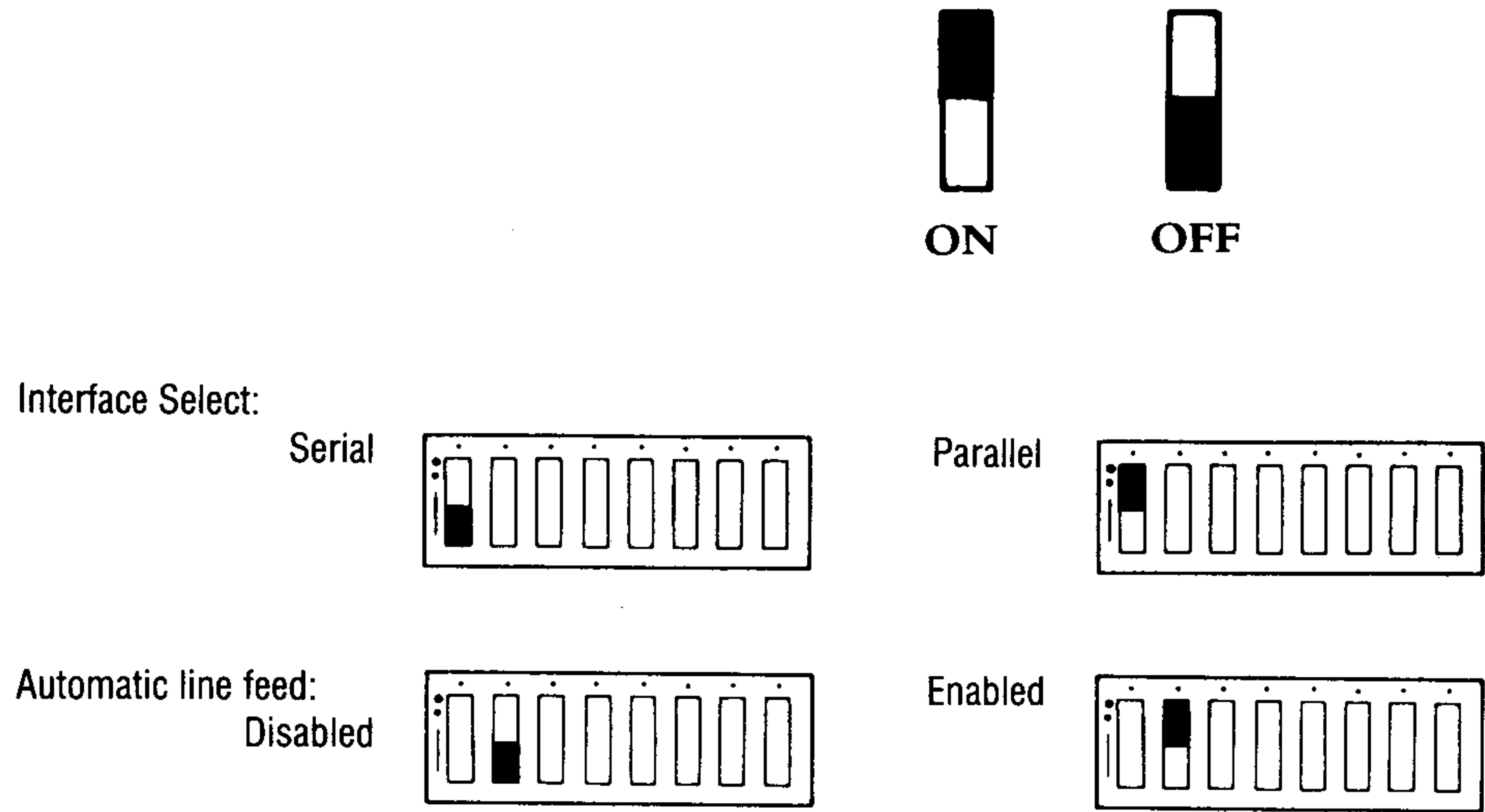


Table D-2. Epson FX #1 configuration

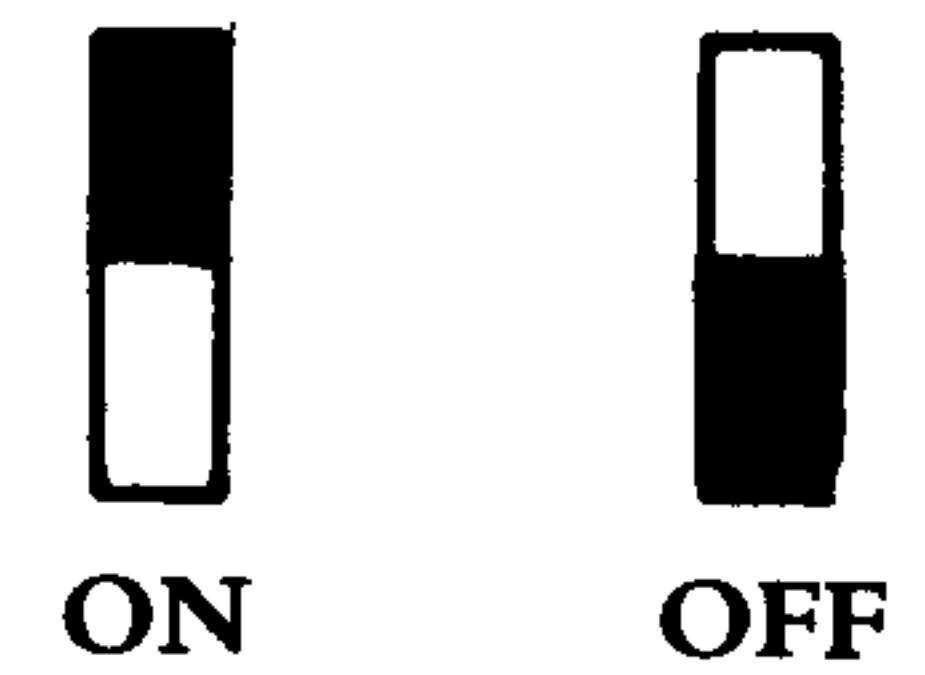
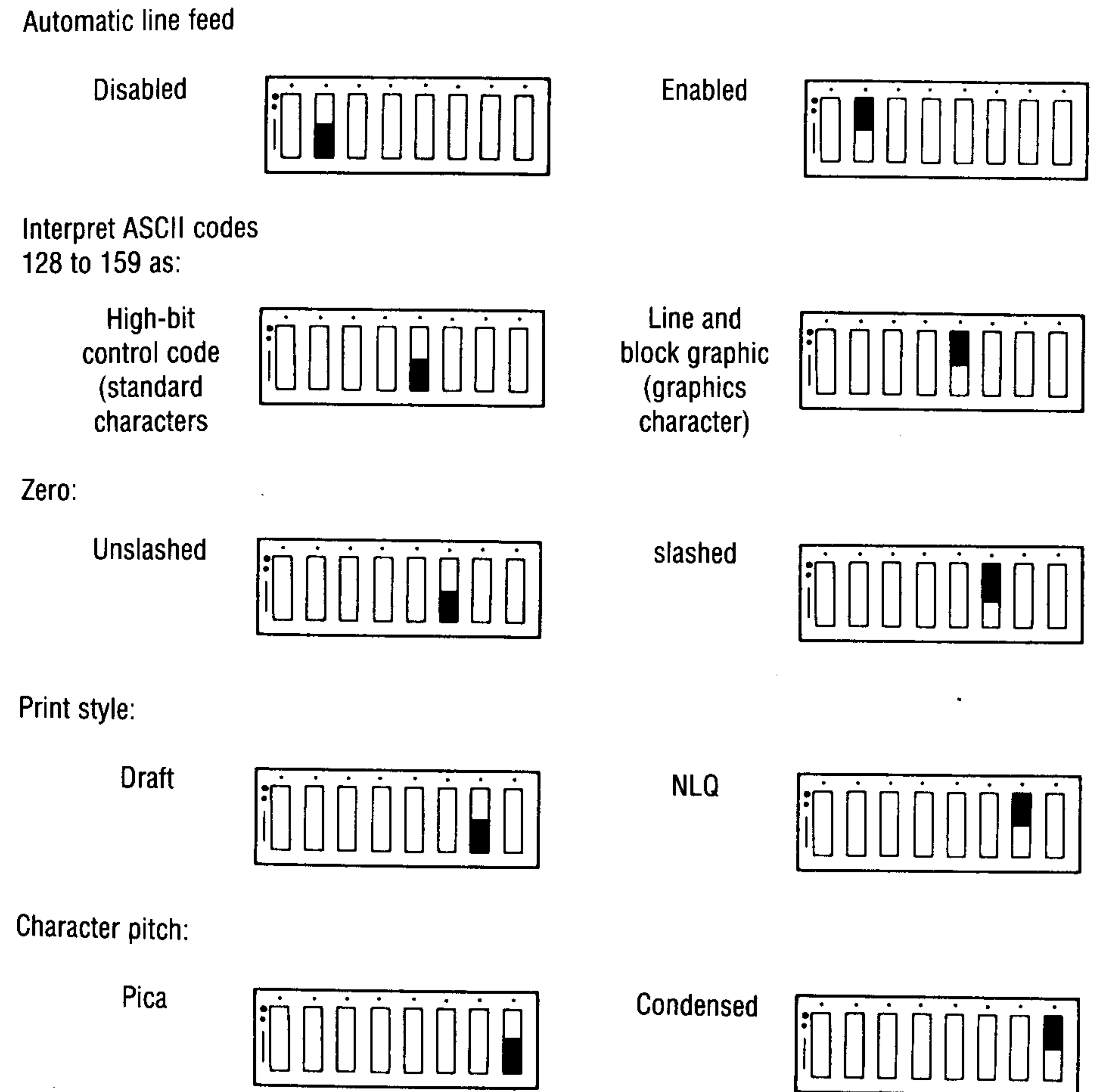
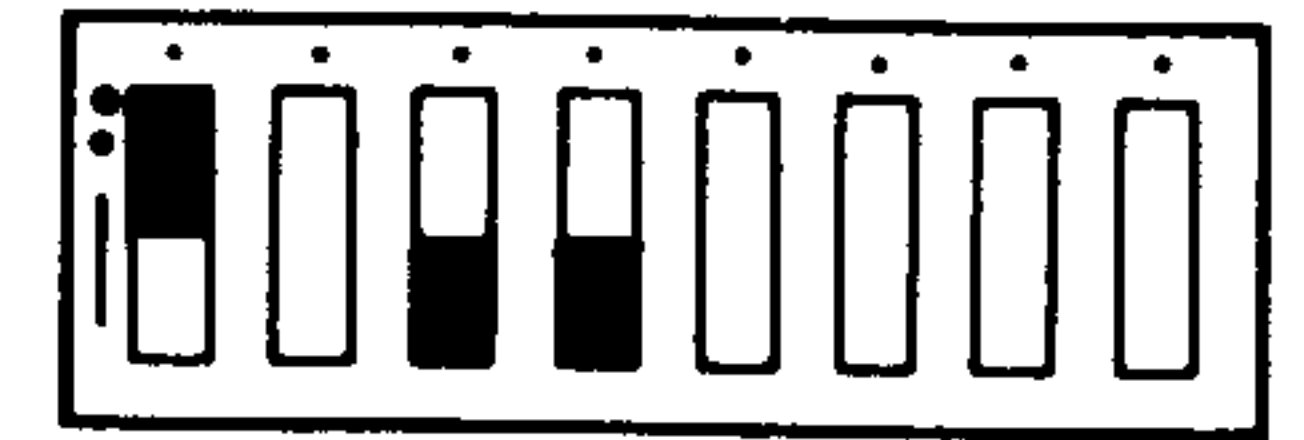
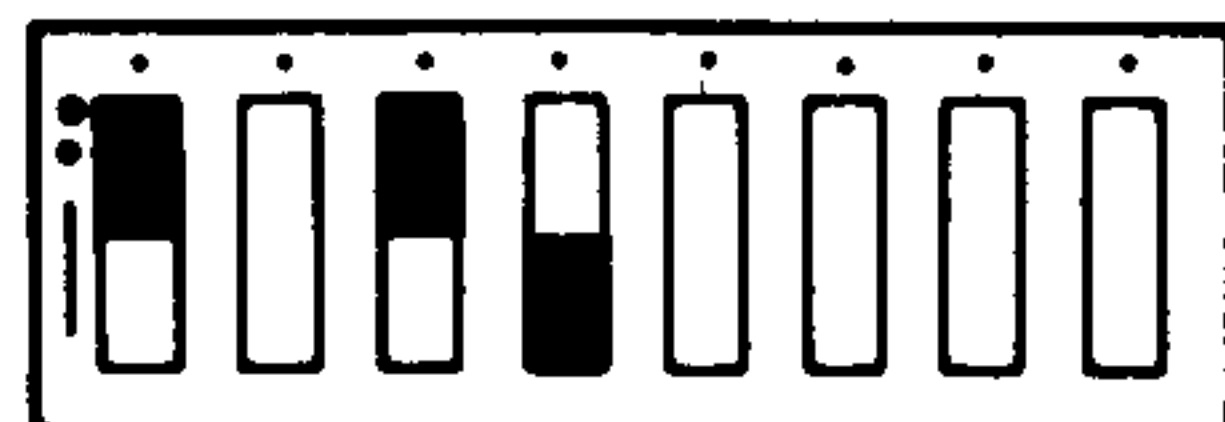
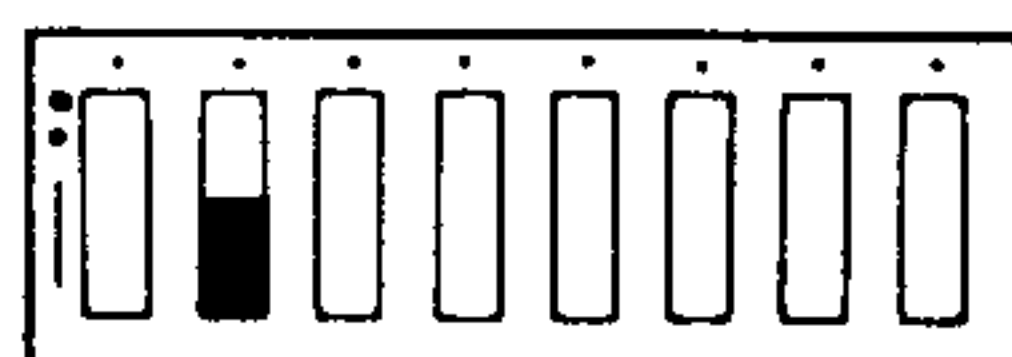


Table D-3. Epson FX #2 configuration

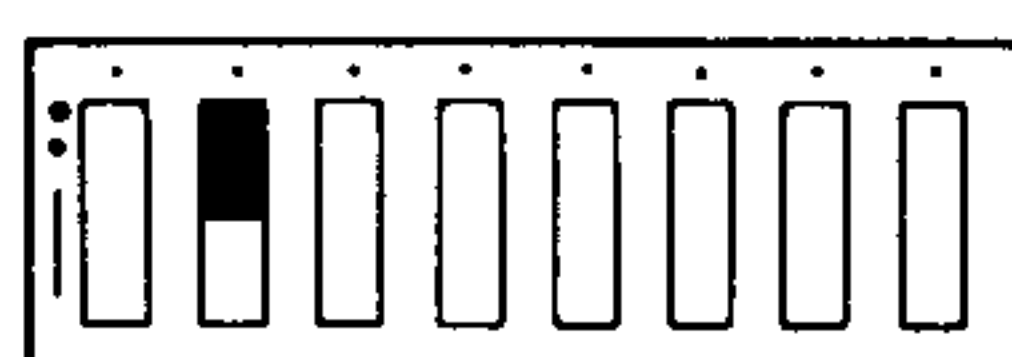


Automatic line feed

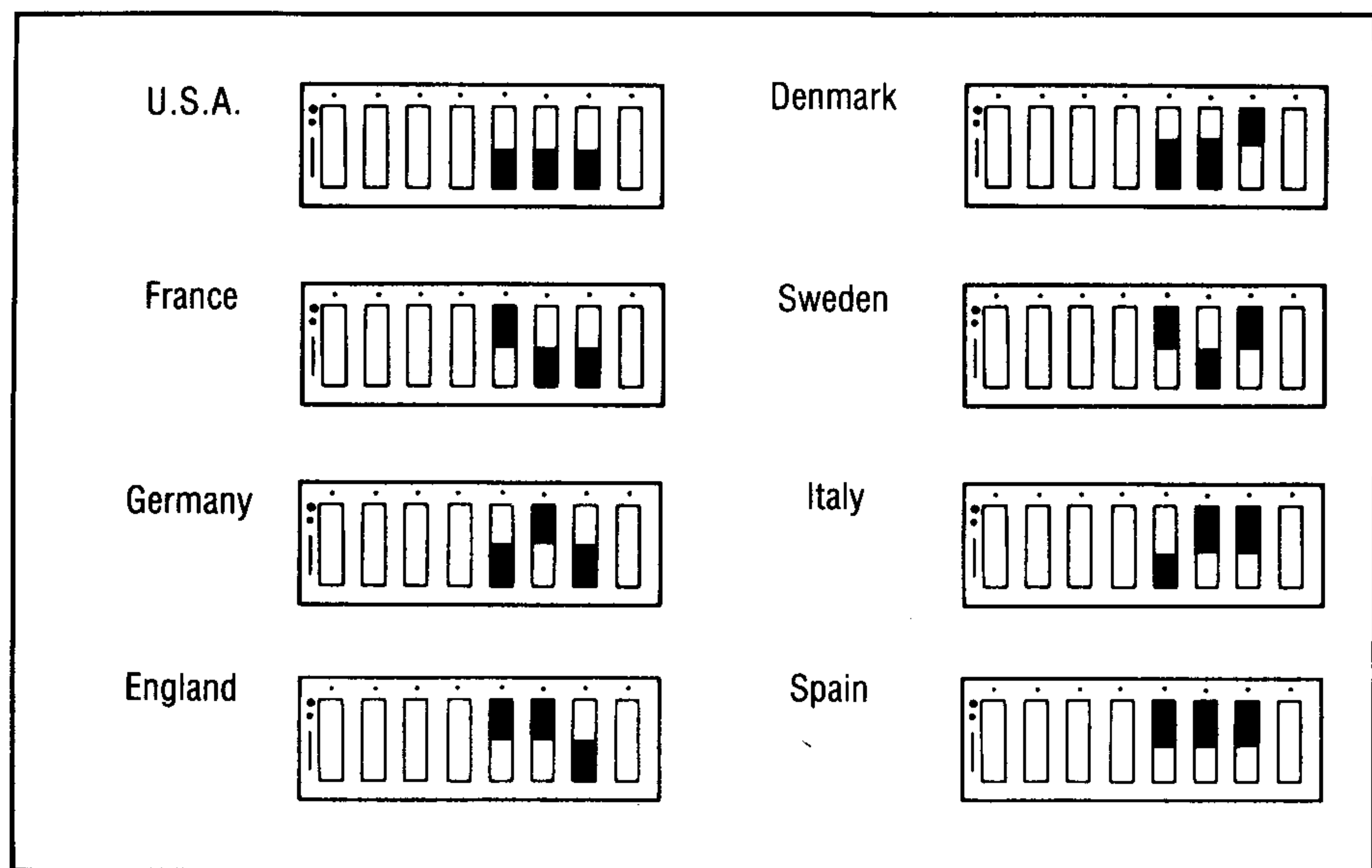
Disabled



Enabled

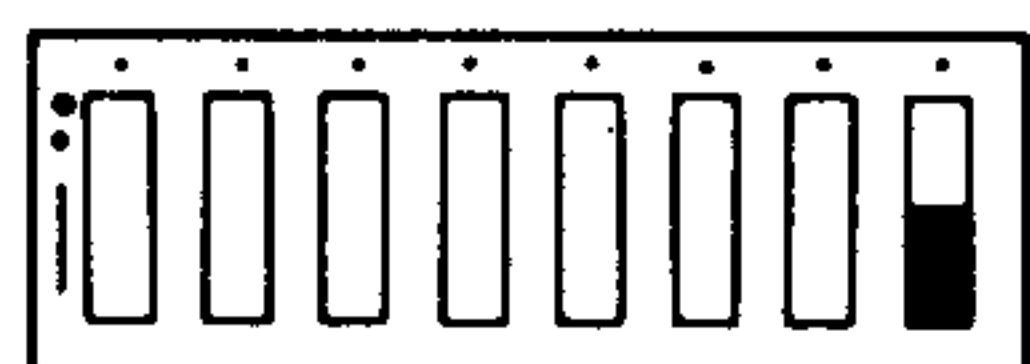


International characters:

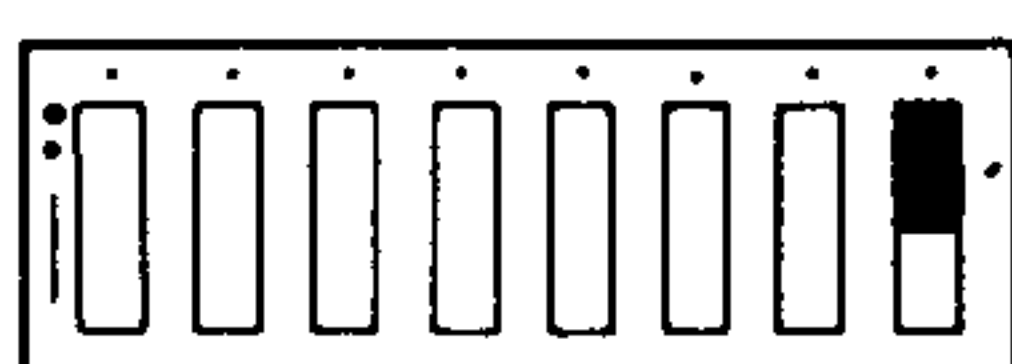


Page length:

11 inches



12 inches



ON



OFF

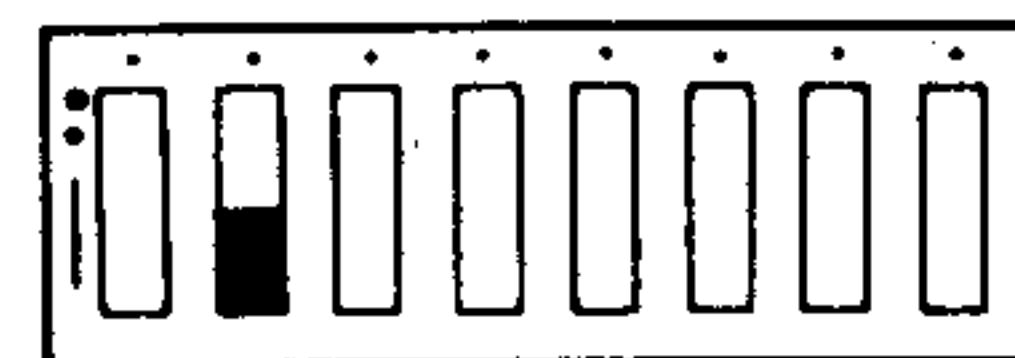
D-6

Table D-4. Epson FX #3 configuration

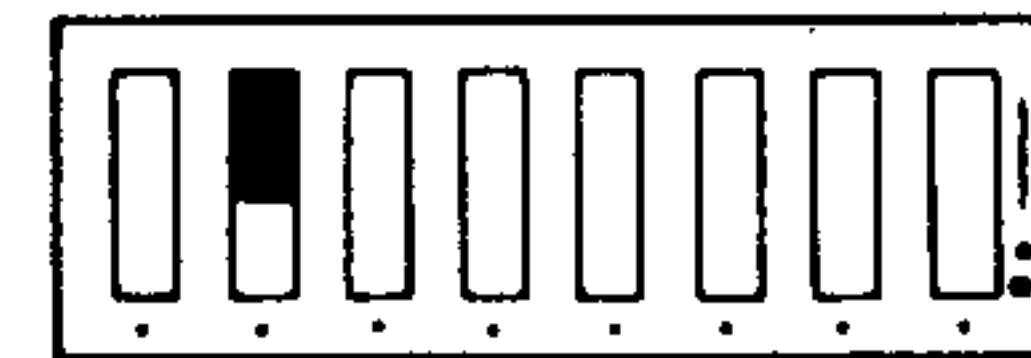


Automatic line feed

Disabled

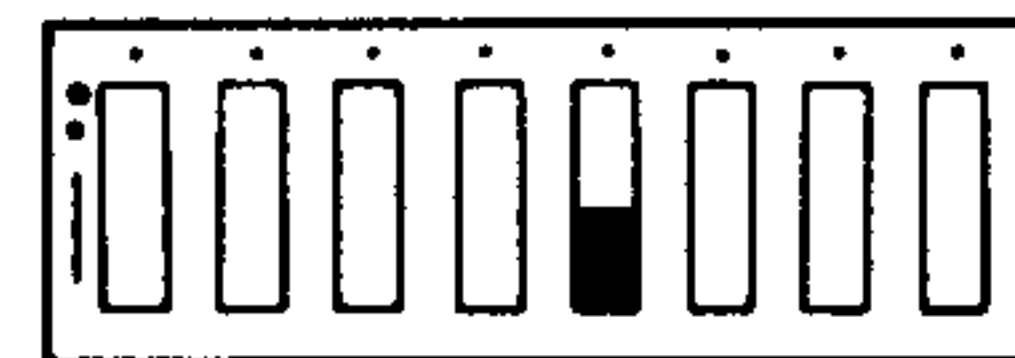


Enabled



Interpret ASCII codes 128 to 159 as:

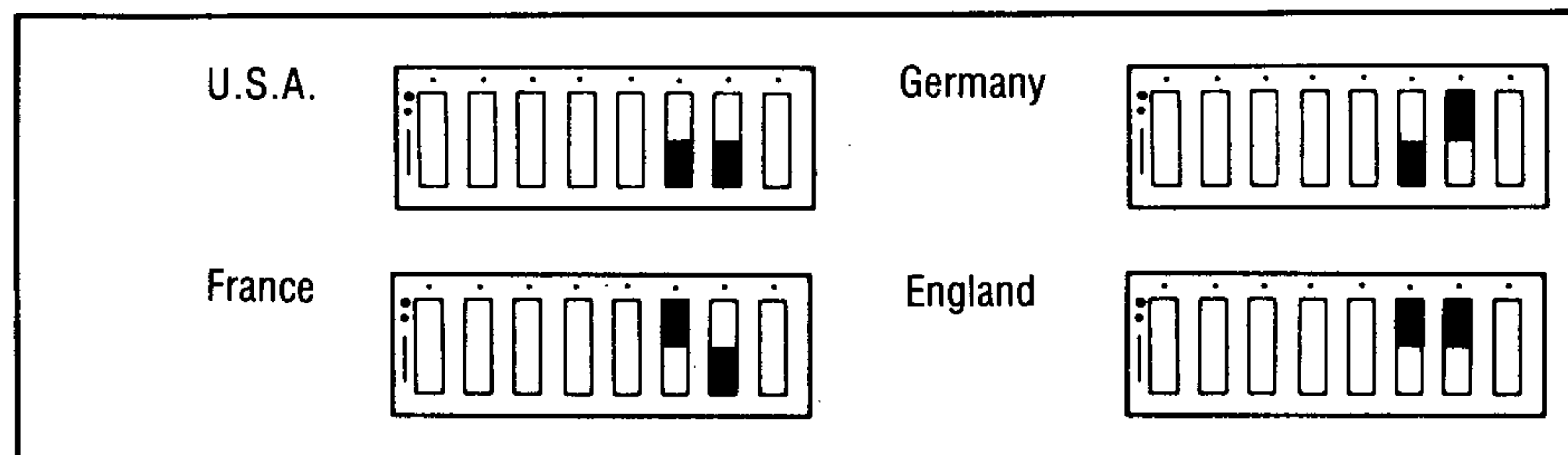
High-bit control codes (standard characters)



Line and block graphics (graphics characters)

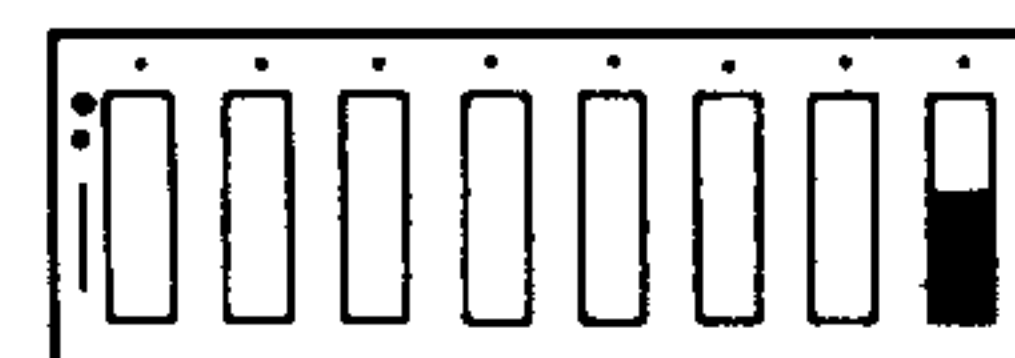


International characters:

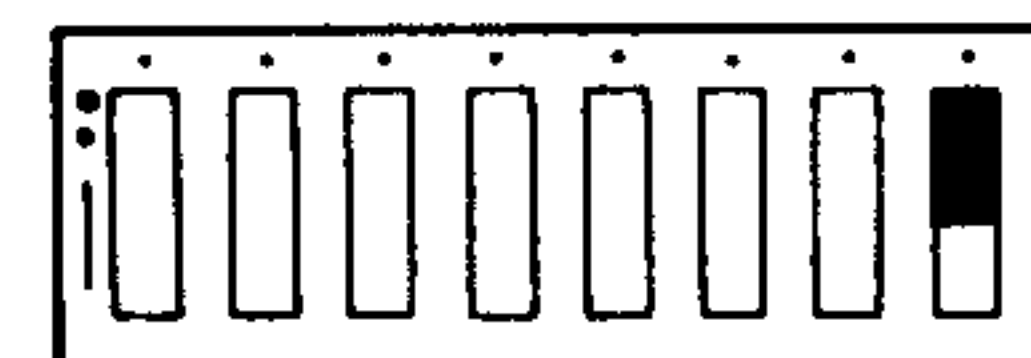


Character pitch:

Pica (10 characters per inch)



Condensed (17 characters per inch)



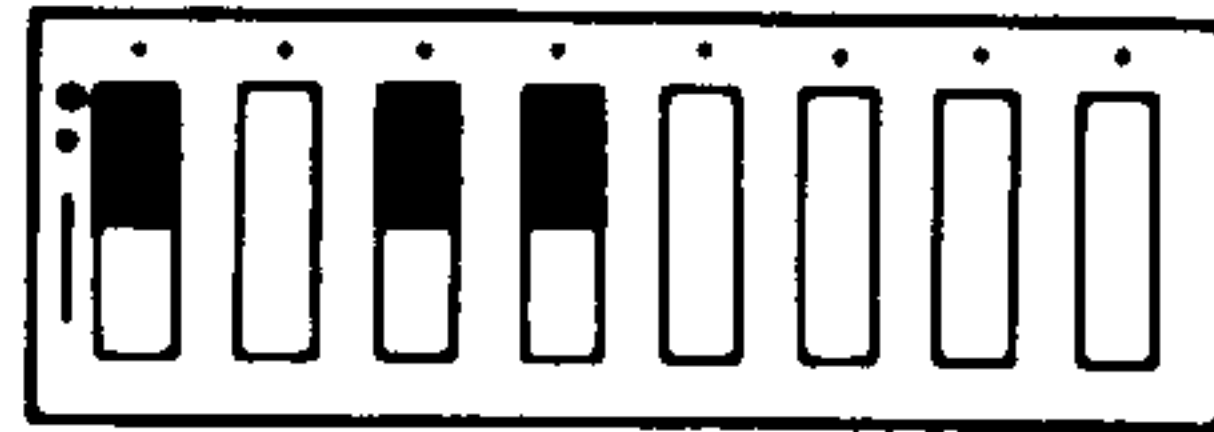
ON



OFF

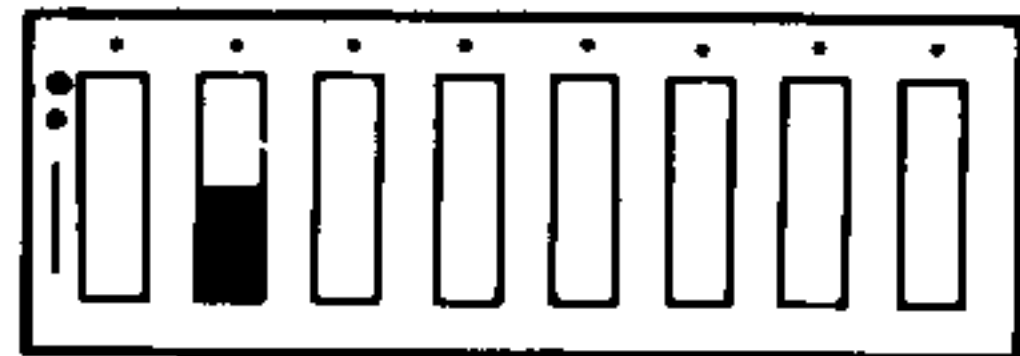
D-7

**Table D-5. IBM Graphics Printer configuration
(SW 3 and SW 4 ON)**

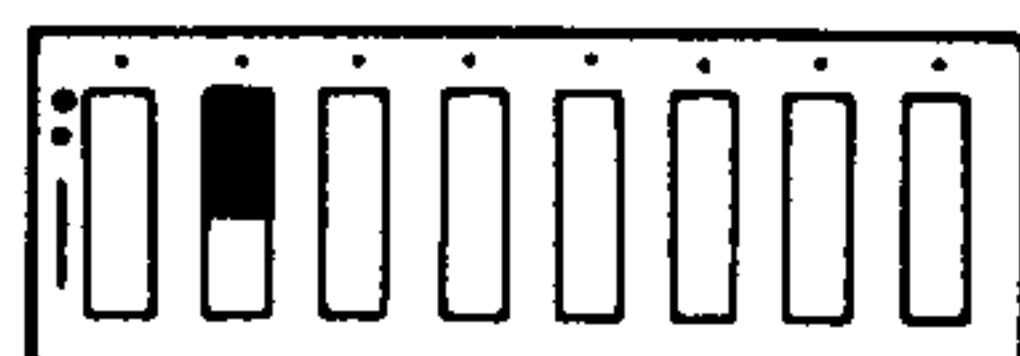


Automatic line feed

Disabled



Enabled



Interpret ASCII codes
128 to 159 as:

High-bit
control codes
(IBM-graphics
set 1)



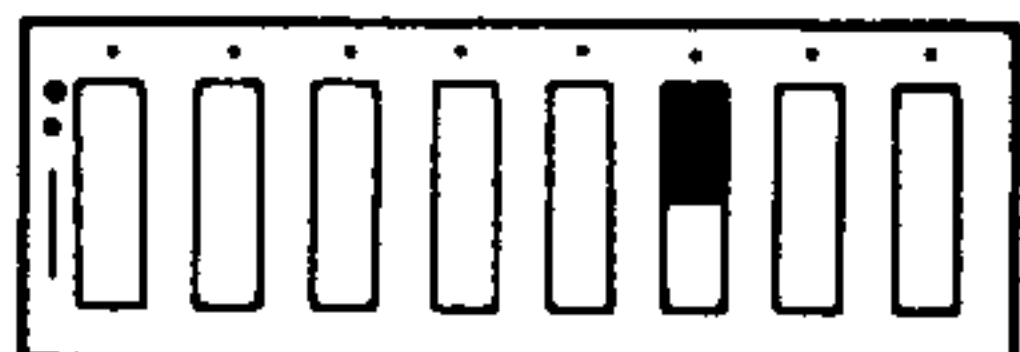
Accented
characters
(IBM-graphics
set 2)



Line spacing:
1/6 inch

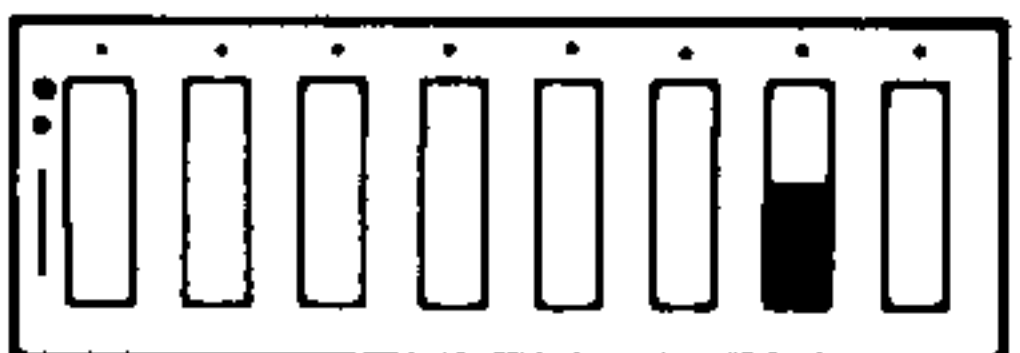


1/8 inch

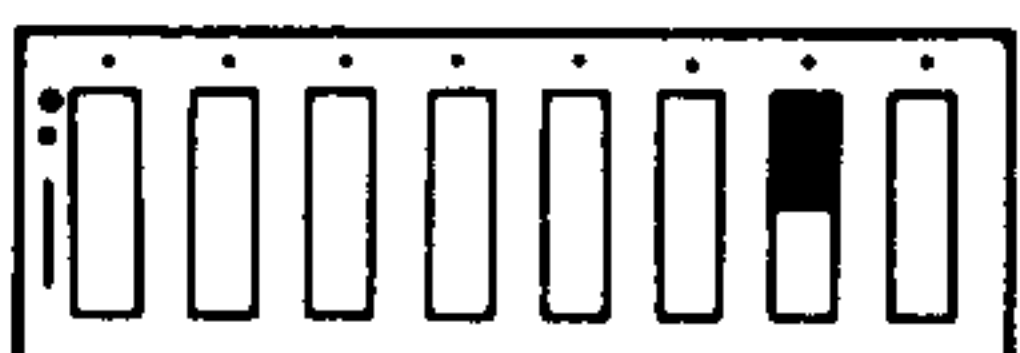


Automatic carriage
return:

Enabled

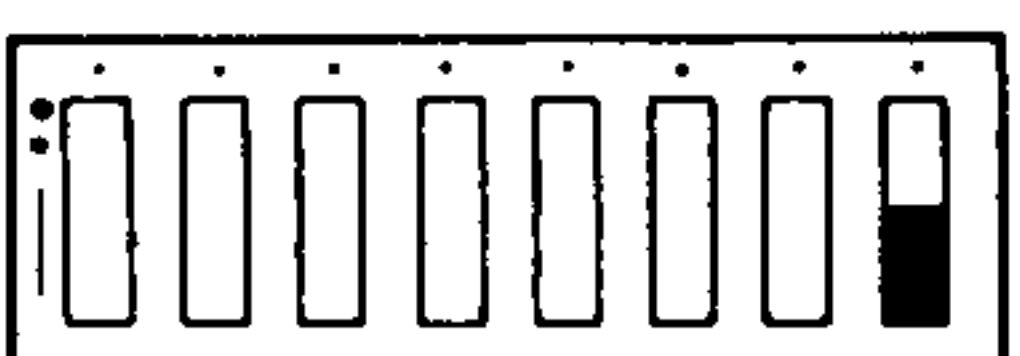


Disabled

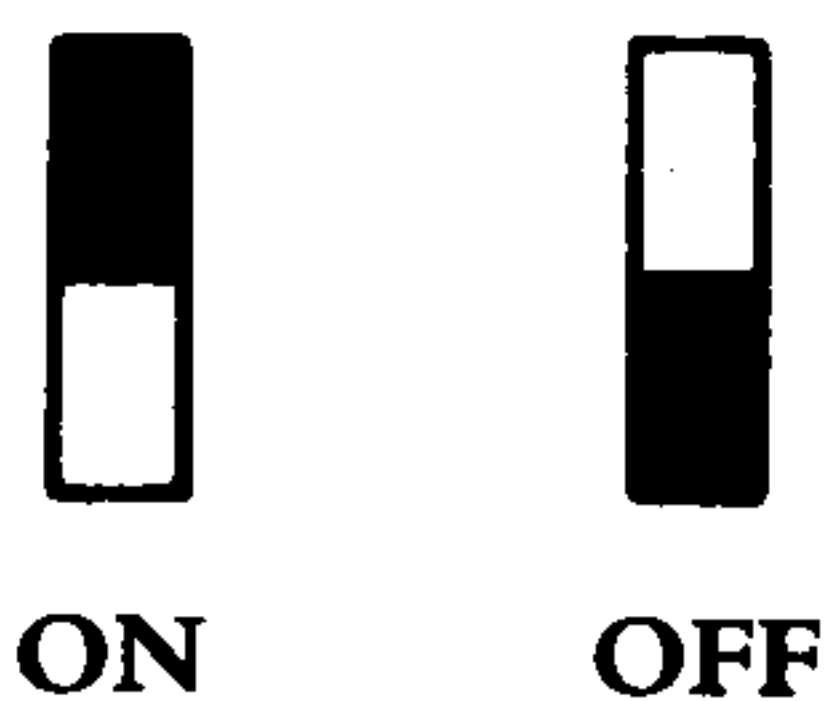
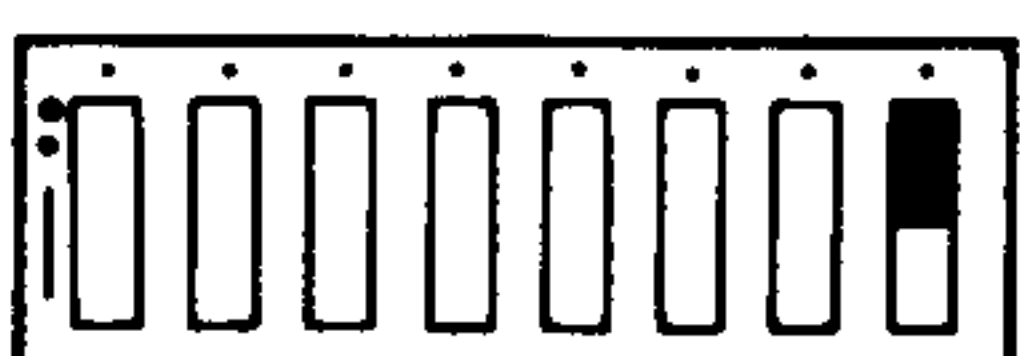


Buffer-full printing:

Enabled



Disabled



Switch 1

This switch is turned ON when you are using the parallel connector, for instance when you are connecting to an Amiga, a Commodore PC, or other IBM compatible.

Switch 2

This switch is turned ON when the printer adds a line feed to each carriage return it receives, OFF when the computer must send a line feed with every carriage return.

The remainder of the switches do not necessarily indicate details of printer function by themselves, but may act in combination with each other. To have your printer behave in the following ways, just set switches 3-8 as indicated:

Switch 3 and 4

These two switches allow you to set up your printer to emulate an IBM Graphics printer or an Epson FX printer. If you choose to emulate the Epson printer you have a choice of 3 different configurations. Each configuration provides you with different options for switches 5 through 8.

Switches 5 through 8

The function of switches 5 through 8 are determined by the configuration you choose for switches 3 and 4.

Epson 1 configuration (SW 3 and 4 OFF):

Switch 5 selects line and block graphics characters (ON) in place of control codes for the high-bit ASCII codes 128 to 159 (OFF).

Switch 6 selects between printing unslashed zeros (OFF) and printing slashed zeros (ON).

Switch 7 selects draft printing (OFF) or correspondence quality printing (ON).

Switch 8 selects pica (10 characters per inch) printing (OFF) or condensed (17 characters per inch) printing (ON).

Epson #2 configuration (SW 3 ON; SW 4 OFF):

Switches 5, 6, and 7 are combined to select one of eight possible international character sets (see Table D-3).

Switch 8 selects a form length of either 11 inches (OFF) or 12 inches (ON).

Epson #3 configuration (SW 3 OFF; SW 4 ON):

Switch 5 selects line and block graphics characters (ON) in place of control codes for the high-bit ASCII codes 128 to 159 (OFF).

Switches 6 and 7 are combined to select one of four possible international character sets (see Table D-4).

Switch 8 selects pica (10 characters per inch) printing (OFF) or condensed (17 characters per inch) printing (ON).

IBM configuration (SW 3 and 4 ON):

Switch 5 selects accented characters (ON) in place of control codes for the high-bit ASCII codes 128 to 159 (OFF).

Switch 6 selects 1/6 inch line spacing (OFF) or 1/8 inch line spacing (ON).

Switch 7 enables (OFF) or disables (ON) the automatic carriage return feature. With this option enabled, a carriage return (CR) is inserted whenever the printer receives a line feed (LF).

Switch 8 determines how the printer acts when it receives more information (without a carriage return) than it can fit on one line. With switch 8 OFF, the printer will print as much as it can on a line and then furnish its own line feed to advance to the next line. With switch 8 ON, the printer will print as much as it can on a line and then just return the print head to the left margin. Therefore, the second line will overprint the first line.

CHANGING THE SWITCH SETTINGS

These switches are easily accessed and not hard to reset. To get to these switches, move the plastic covering on the bottom of the inside of the printer to the right (just in front of the platen—see Figure D-1).

WARNING: Always turn the power OFF before you change the setting of any of these switches. Any changes made while the power is on will be ignored until you turn the printer off and back on.

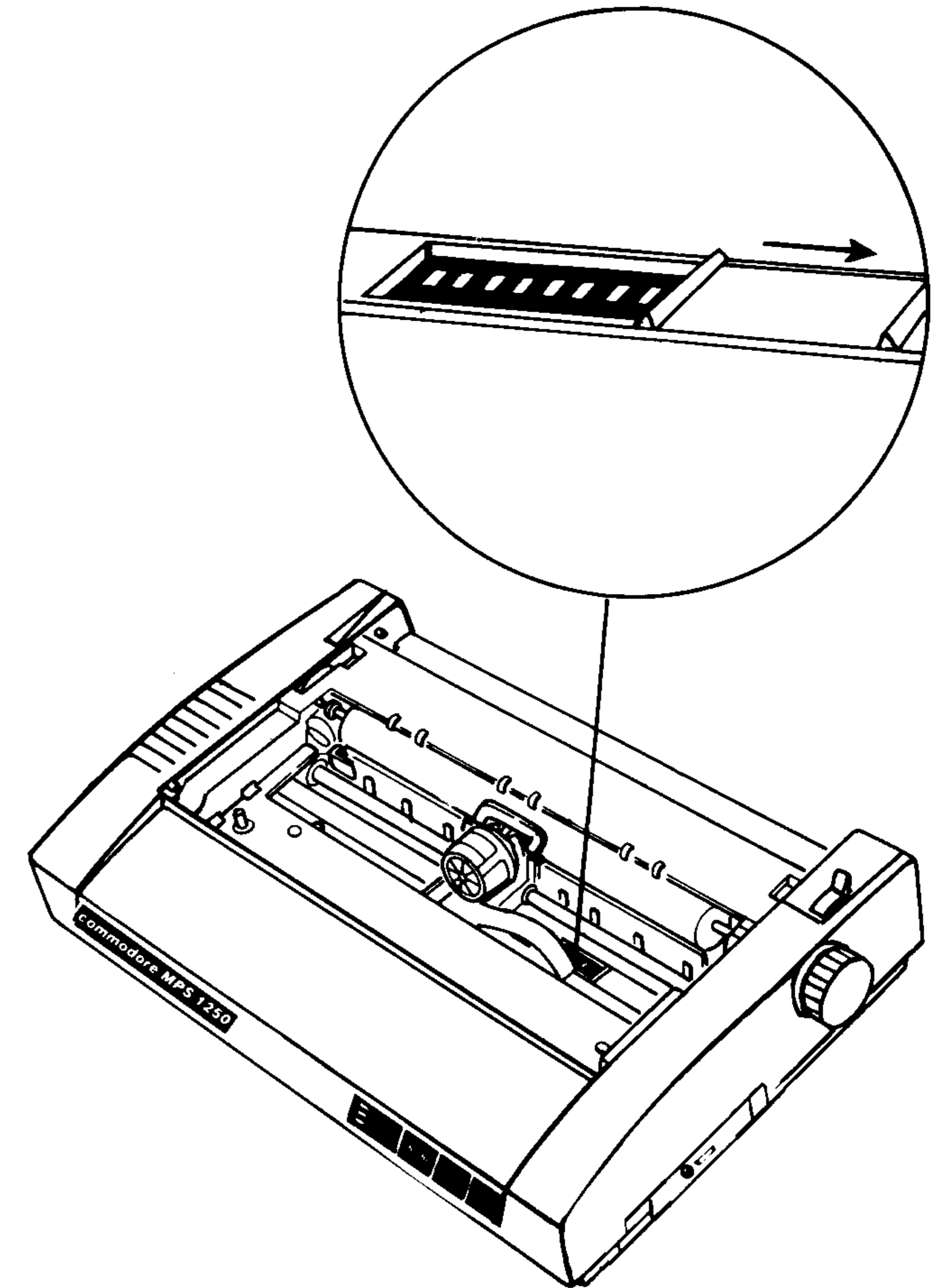


Figure D-1. The DIP switch cover.

The internal switch (Figure D-2) is actually a set of eight switches labeled 1 through 8. Each switch consists of a small lever. As you face the printer, move the lever down to turn the switch OFF; move it up to turn the switch ON. You may want to use a ball point pen to move these tiny switches. Do not use a pencil; the point could snap.

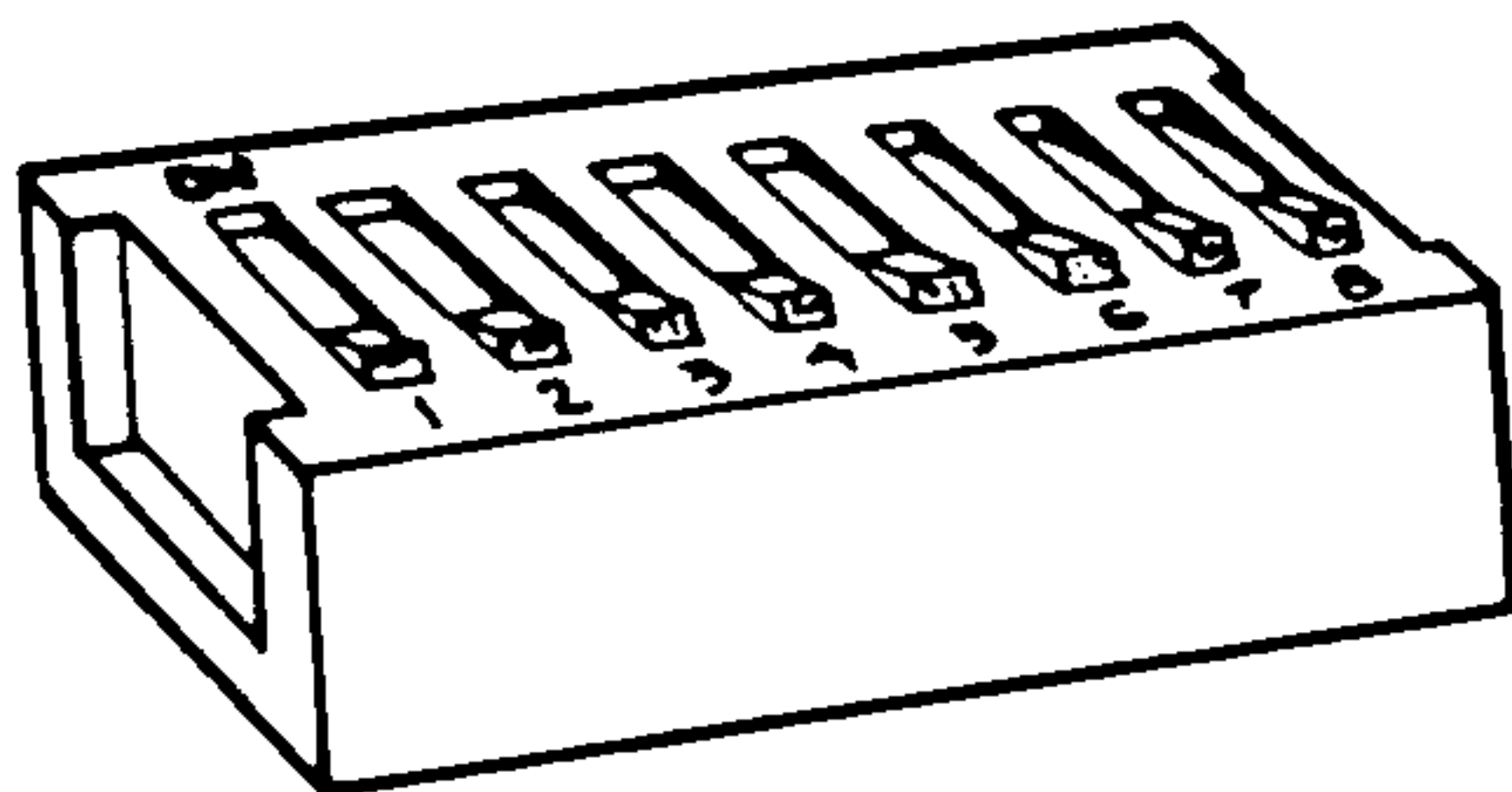


Figure D-2. The internal switch.

Appendix E

Technical Specifications

PRINTING

Printing System

- Bi-directional impact dot matrix
- 9-pin print head

Printing Speed

- Draft quality: 120 CPS
- Near letter quality: 24 CPS

CHARACTERS

Character Matrix

- Standard: 9 × 9 dot matrix
- NLQ: 17 × 17
- Doublestrike: 9 × 9
- Emphasized: 9 × 18
- Double/Emphasized: 9 × 18
- Expanded: 18 × 18
- Graphic characters & special symbols: 8 × 9

Character Sets

- PETASCII—Uppercase/Graphics
Upper/lowercase
- ASCII
- Epson FX—Standard
Graphics
- IBM Graphics—Set 1
Set 2
All characters

Print Types and Styles

- Pica: 10 CPI
- Elite: 12 CPI
- Compressed: 17 CPI (pica); 20 CPI (elite)
- Expanded: Double width characters
- Italic
- Double strike: Each dot printed twice
- Emphasized: Each character reprinted with 1/2 pitch offset to the right

Character Size
Character Spacing
Line Spacing

- Superscript: Prints at upper right
- Subscript: Prints at lower right
- Reverse: Reversed white-on-black characters
- Proportional: Adjusts width by character
- 2.4mm × 2.4mm
- 5, 6, 8.5, 10, 12, 17 or 20 CPI
- Standard: 1/6, 1/8 or 7/72 inch
- Programmable: n/72, n/144, or n/216 inch

PAPER
Paper Type

- Fanfold: 3 to 10 inches
- Cut sheets: 8 to 10 inches
- Roll paper: 8.5 inches
- Max. 3-part forms: 0.06-0.3 mm
- rear or bottom

Paper Thickness
Paper path

PRINTER

Dimensions

- Height: 90 mm
- Width: 402 mm
- Depth: 255 mm
- 8.2 lbs.

Weight
Power

- Voltage: 90-132 VAC
- Frequency: 49.5-60.5 Hz

Ribbon

- Citizen part # Y0810-010A
- Ribbon life: 2 million characters

Environment

- Temperature: 40 to 95°F (5 to 35°C)
- Humidity: 5 to 85%, non-condensing

Printer MTBF
Print head life

- 4500 hours (excluding print head)
- 100 million characters

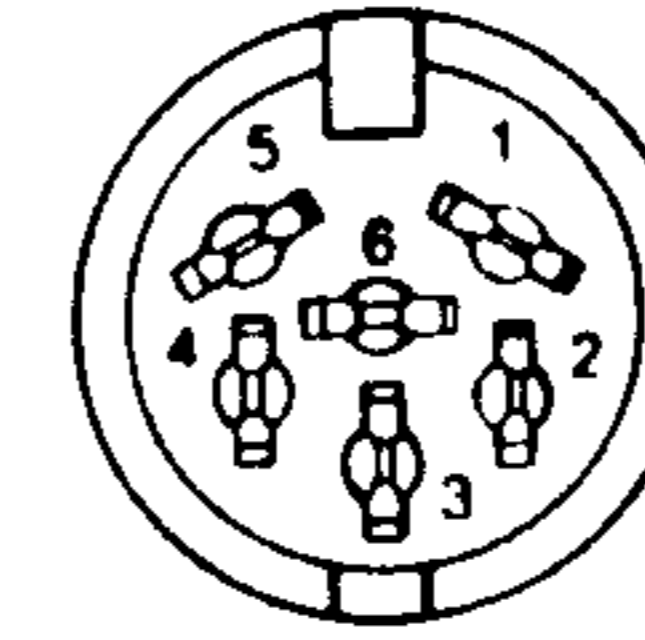
SERIAL INTERFACE

- Commodore serial port (see Figures E-1, E-2)

PARALLEL INTERFACE

- Centronics parallel port (see Figures E-3, E-4)

Connector



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

Figure E-1. Commodore Serial Interface

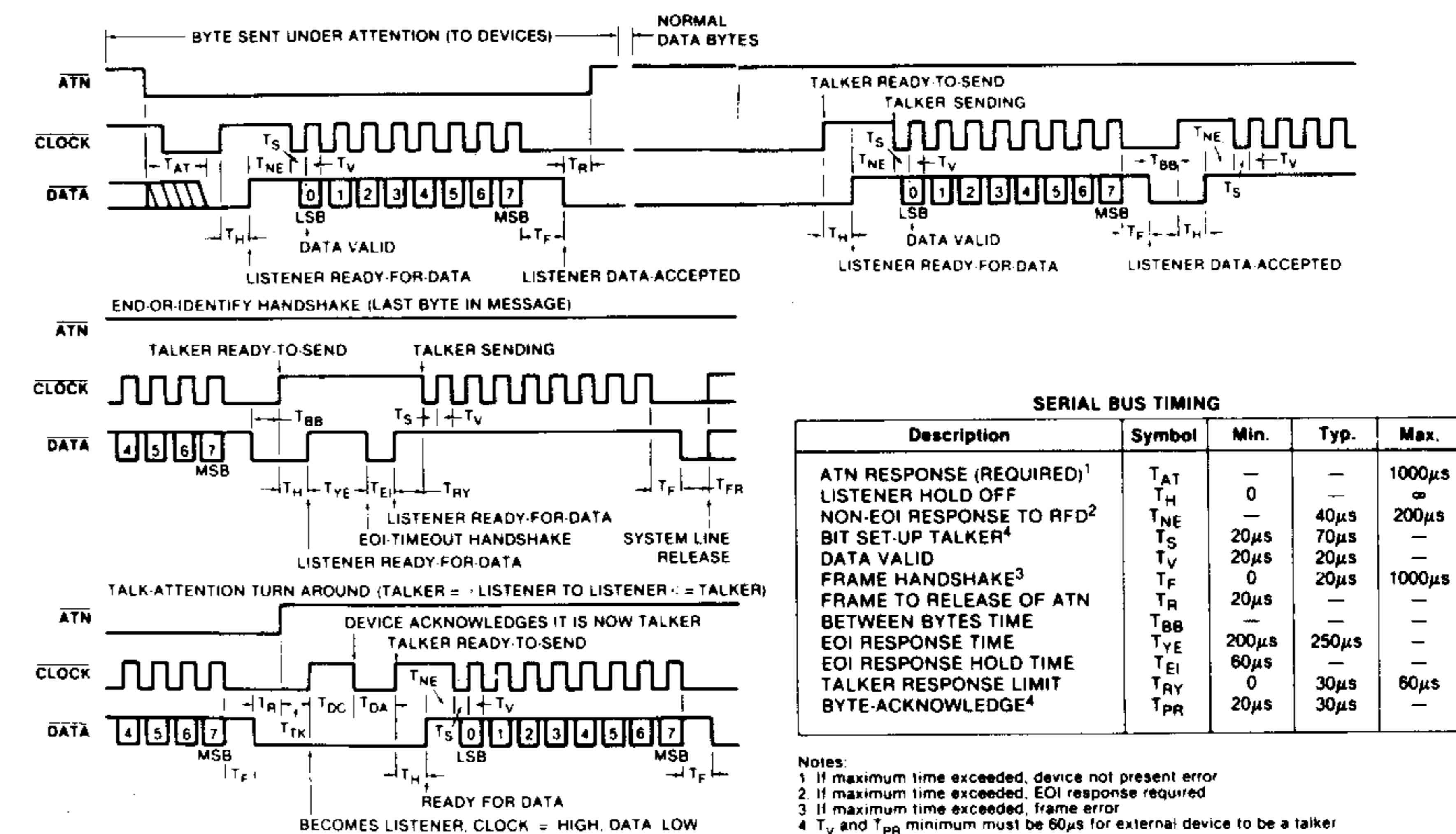


Figure E-2. Serial Interface Signals

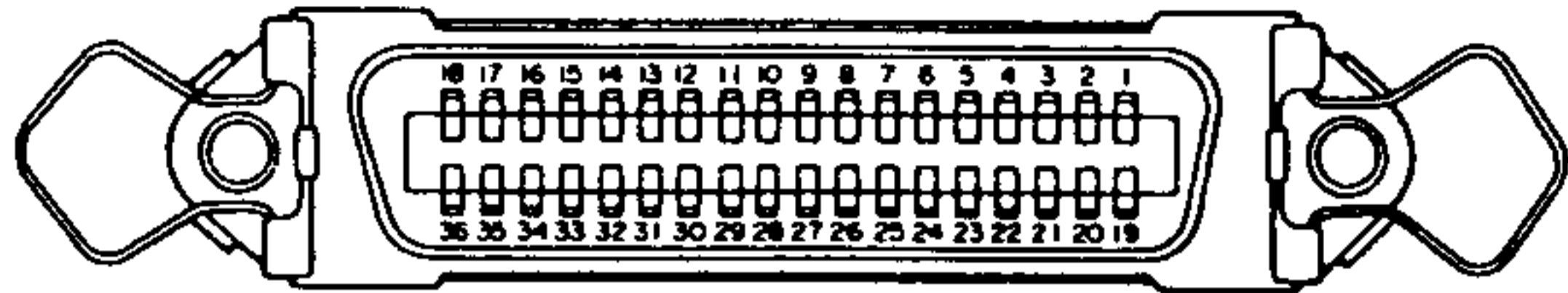


Figure E-3. Connector on the printer side and its pinout.

Pin No.	Return Pin No.	Signal	Transmitter	Functions
1	19	STROBE	CPU	Strobe pulse for data entry Pulse width should be more than 0.5 μ s at the receiving terminal. The signal is "HIGH" in the normal condition, and data are read in after this signal has turned to "LOW".
2	20	DATA 1	CPU	Each signal represents the information up to the 1st bit of parallel data. "HIGH" shows that data is logical "1" and "LOW" shows that data is logical "0".
3	21	DATA 2	CPU	
4	22	DATA 3	CPU	
5	23	DATA 4	CPU	
6	24	DATA 5	CPU	
7	25	DATA 6	CPU	
8	26	DATA 7	CPU	
9	27	DATA 8	CPU	
10	28	ACKNLG	PRINTER	"LOW" indicates that the printer has received data and is ready to accept next data. Pulse width is about 12 μ s.
11	29	BUSY	PRINTER	"HIGH" indicates that the printer is not ready for receiving data, while "LOW" indicates that the printer is ready for receiving data. The signal turns to "HIGH" in the following cases. 1 During data entry 2 Off line condition 3 Error condition

Pin No.	Return Pin No.	Signal	Transmitter	Functions
12	30	PE	PRINTER	"HIGH" indicates that the printer is out of paper.
13	—	SLCT	PRINTER	Pulled up to $\pm 5V$ at 3.3k Ω .
14	—	AUTO FEED XT	CPU	When this signal turns to "LOW", paper is automatically fed one line after printing.
15	—	NC		Not used
16	—	OV	PRINTER	Logic ground OV level
17	—	CHASSIS GND	PRINTER	GND level of printer chassis
18	—	+5V	PRINTER	+5V direct output
19	—	GND		Signal GND level for twisted-pair return
30	—	GND		
31	—	INT	CPU	When this signal turns to "LOW", the printer controller is reset to the initial condition and the print buffer is cleared. The pulse width should be more than 50 μ s at the receiving terminal.
32	—	ERROR	PRINTER	"LOW" indicates that the printer is in: 1 Paper out 2 Off line condition 3 Printer error
33	—	GND	—	Same as specified in pin No. 19-30
34	—	NC	—	Not used
35	—	—	—	Pulled up to +5V through 3.3 Ω resistance.
36	—	SLCT IN	CPU	"LOW" indicates that the printer is selected.

NOTE: A line above a signal name indicates that the signal is active when "LOW"

Data Transfer Sequence

Interface timing

Figure E-4 shows the timing for the parallel interface.

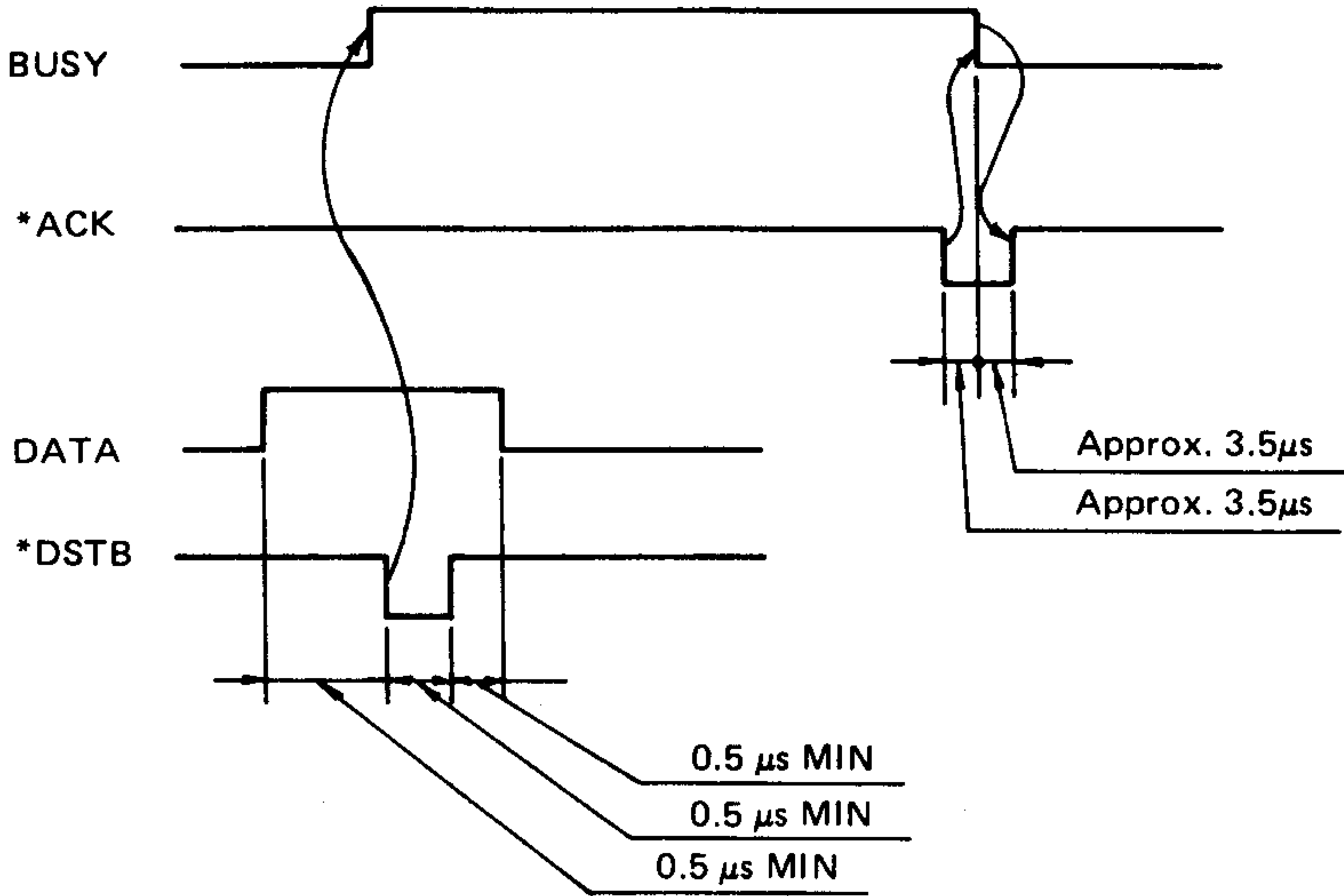


Figure E-4. Parallel interface timing

INDEX

- Accented characters, 3-18, 3-20, 3-35, B-20
- All Characters Chart, 3-40, B-18
- Amiga, i-1
- Apple II computers, 2-10
- ASCII codes, 2-3, B-8
- Atari computers, 2-13
- Attribute byte, 8-5

- Backspace, 9-5
- BASIC programming language, 2-5, 2-17, 4-4
 - Commodore, 2-5
 - Microsoft, 2-9
- Bit image coding, 7-1
- Block and dot graphics, 6-1
- Buffer commands, 9-3
 - Cancel, 9-4
 - Delete, 9-3
 - Master reset, 9-4

- Cable, 1-20
- Cancel, 9-4
- Carriage return, 4-1, 4-2
- Character sets, 2-8, 3-35, 8-1, 9-1, B-1
- CHR\$, 2-14
- Cleaning the printer, A-1
- CLOSE, 2-5
- CMD, 2-7
- Columns, 6-10
- Commands, C-1
- Commercial software, 2-17
- Commodore BASIC, 2-5, 4-4
- Commodore mode, i-1, i-2, 1-21, 1-25, 3-38, 7-1
- Compressed print, 3-11
- Compressed expanded print, 3-12
- Configuration (See Printer installation)
- Connecting your printer, 1-20
- Connecting your computer, 1-20
- Control codes, 2-14, B-21, C-2
- Control panel, 1-7
 - Power light, 1-8
 - Ready light, 1-8
 - Paper out light, 1-8
 - On-line switch, 1-8
 - LF switch, 1-8
 - FF switch, 1-8
- Control Panel Procedure, 1-8
- Copying standard characters, 8-4

- CP/M computers, 2-12
- Creating characters, 7-1, 8-1

- Data bytes, 8-7
- Defined characters, 8-1
 - Designing characters, 8-2
 - Printing defined characters, 8-11
 - Saving defined characters, 8-4
- Delete, 9-3
- Density 6-7, 6-14
- Designing printer characters, 8-2
- Device number, D-2
- Dimensions of Printer, E-2
- DIP switches, 1-24, 2-16, D-1
 - ASCII translation, 2-4, 2-14, D-2
 - Automatic line feed, 4-2, D-2
 - Device number, D-2
 - Page length, D-6
 - Paper end, detector, D-2
 - Print type, 1-18, D-2, D-5
 - Printer modes, 1-24, 2-16, D-1
- Dot address determination, 7-6
- Dot graphics, 6-4, 7-1
 - Commodore bit image, 7-1
 - Epson mode, 6-1
- Dot matrix printing, 2-1
- Dot tabs, 5-7
- Doublestrike print, 3-19

- Eighth bit control, 9-10
 - Cancel eighth bit, 9-12
 - Eighth bit off, 9-11
 - Eighth bit on, 9-11
- Elite pitch, 3-7
- Emphasized print, 3-18
- End of line 4-1
- Epson mode, i-1, i-2, 1-21, 2-17, 3-31, 6-1, B-10, D-4
- Escape sequences, 2-14, C-4
- Expanded print, 3-8
 - One-line expanded print, 3-10

- FF switch, 1-8
- Fonts, i-2, B-1
- Form feeds, 4-15

- Graphics, Commodore mode, 7-1
 - All bit pattern printing, 7-4
 - Bit image coding, 7-1
 - Combining bit images, 7-3

- Dot address determination, 7-6
- Repeat bit image printing, 7-5
- Graphics, Epson mode, 6-1
 - Calculated shapes, 6-19
 - Defining shapes, 6-17
 - Graphics density, 6-7, 6-13
 - Line length, 6-10
 - Nine-pin, 6-16
 - Pin numbers, 6-5
- Hex dump, 9-12, B-21
- Hexadecimal numbers, 2-3
- Horizontal tabs, 5-1
- IBM Graphics Mode, i-1, i-2, 1-21, 2-18, B-14, D-1
- IBM and Compatible Computers, 2-9
- Initializing the printer, 2-21
- Installing the ribbon, 1-3
- Interface, 1-20, D-1, E-2
- Internal switches (see DIP switches)
- International characters, 3-35, B-20, D-6, D-7
- Italic print, 3-21
- Justified printing, 3-17
- LF switch, 1-8, 1-11
- Line feeds, 4-2
 - Variable line feeds, 4-14
- Line spacing, 4-4
 - Fixed line spacing, 4-4
 - 1/6" line spacing, 4-5
 - 1/8" line spacing, 4-5
 - 7/72" line spacing, 4-6
 - Variable line spacing, 4-7
 - n/72" line spacing, 4-7
 - n/144" line spacing, 4-9
 - n/216" line spacing, 4-9
- Secondary address, 2-7
- Listing a program, 2-6, 2-13
- Literal characters, 2-20
- Loading paper, 1-10, 1-14, 1-16
- Local print mode, 9-1
- Maintenance self-test, 1-19
- Margins, 3-17, 4-19
 - Left margin, 4-22
 - Right margin, 4-23
 - Top and bottom margin, 4-19
- Master commands, 3-28
 - Master graphics command, 6-13
 - Master pitch, 3-30
 - Master print mode, 3-31

- Master reset, 3-29
- Modes, i-1
- Near letter quality (NLQ) print, 3-2
- New page (form feeds), 4-15
- Nine-pin graphics, 6-16
- On-line switch, 1-8
- OPEN, 2-5
- Overscoring, 3-23
- Page length, 4-16
 - Set by inches, 4-18
 - Set by lines, 4-16
- Paper, 1-9, E-2
 - Bottom-feed, 1-16
 - Continuous, 1-14
 - Single sheets, 1-10
 - Thickness, 1-17
- Paper feed knob, 1-6
- Paper guide, 1-4, 1-7
- Paper out light, 1-8
- Paper out sensor, 1-5, 9-10
- Paper select lever, 1-7, 1-10
- Paper thickness lever, 1-7, 1-17
- Parallel connection, i-1, 1-22, E-2
- Parallel Mode, i-1
- PETASCII codes, 2-4, B-4
- Pica pitch, 3-6
- Pin numbers, 6-5
- Pitch, 3-6
 - Compressed, 3-11
 - Elite, 3-7
 - Expanded, 3-8
 - Pica, 3-6
- Platen, 1-6
- Plotting, 6-19
- Power, E-2
- Power light, 1-8
- Power switch, 1-6
- Print density, 3-18
 - Doublestrike print, 3-19
 - Emphasized print, 3-18
- Print mode, 3-33
- PRINT#, 2-6
- Printer cover, 1-5
- Printer components, 1-6
 - Paper feed knob, 1-6
 - Paper guide, 1-4, 1-7
 - Paper select lever, 1-7
 - Paper thickness lever, 1-7, 1-17
 - Platen, 1-6
 - Power switch, 1-6
 - Printer cover, 1-5, 1-7

- Print head, 1-3, A-3
- Printer installation, 2-16
- Printer location, 1-1
- Printer maintenance, A-1
- Printer self-test, 1-18
- Proportional print, 3-14
- Proportional spacing, 3-15
- Quote mode, 9-2
- Ready light, 1-8
- Resetting the printer, 2-15, 2-21, 2-22, 3-29, 9-5
- Reverse print, 3-24
- Ribbon cartridge, 1-3, A-3, E-2
- Saving character designs, 8-4
- Secondary addresses, 2-7, 4-10
- Self-tests
 - Maintenance self-test, 1-19
 - Printer self-test, 1-18
- Serial connection, i-1, 1-21, E-2
- Serial mode, i-1
- Setting up your printer, 1-1
- Slashed zero, 9-9, D-5
- Software, 2-17
 - Choosing the right configuration, 2-16
 - Literal characters, 2-20

- Spreadsheets, 2-20
- Word processors, 2-19
- Subscript, 3-26
- Superscript, 3-26, 4-7
- Switching configurations, 3-38
- Tabs, 5-1
 - Dot tabs, 5-7
 - Horizontal tabs, 5-1
 - Vertical tabs, 5-10
- Technical specifications, E-1
- Top of form, 4-16
- Tractor-feed, 1-12
 - Installation, 1-12
- TRS-80 computers, 2-12
- Underlining, 3-22, 4-3
- Unidirectional print, 9-6
- Unpacking your printer, 1-2
- Vertical tabs, 5-10
- Vertically enlarged print, 3-27
- Vtab channels, 5-10
- Width, character, 3-6
- Word processors, 2-19
- Zero, slashed, 9-9, D-5

C MPS 1250

QUICK REFERENCE CARD

Print Style Commands		Page
ESC x (n)	Sets/cancels NLQ print	3-2
CHR\$(31)	Selects NLQ print*	3-5
CHR\$(159)	Cancels NLQ print*	3-5
ESC P	Selects pica pitch	3-6
ESC M	Selects elite pitch	3-7
ESC W (n)	Sets/cancels expanded print	3-8
ESC CHR\$(14)	Sets one-line expanded print*	3-10
CHR\$(14)	Sets one-line expanded print**	3-10
CHR\$(15)	Cancels one-line expanded print*	3-10
CHR\$(20)	Cancels one-line expanded print**	3-10
ESC CHR\$(15)	Selects compressed print	3-11
ESC CHR\$(18)	Cancels compressed print	3-11
CHR\$(15)	Selects compressed print**	3-11
CHR\$(18)	Cancels compressed print**	3-11
ESC p (n)	Sets/cancels proportional print	3-14
ESC (space) CHR\$(n)	Sets/cancels proportional spacing	3-15
ESC a CHR\$(n)	Sets justified printing (except IBM)	3-17
ESC E	Selects emphasized print	3-18
ESC F	Cancels emphasized print	3-18
ESC G	Selects doublestrike print	3-19
ESC H	Cancels doublestrike print	3-19
ESC I CHR\$(n)	Sets/cancels NLQ quality (IBM only)	3-5
ESC 4	Selects italic print (except IBM)	3-21
	Sets top-of-form at current paper position (IBM only)	4-16
ESC 5	Cancels italic print (except IBM)	3-21
ESC - (n)	Sets/cancels underlining	3-22
ESC _n (n = 1 ON, n = 0 OFF)	Sets/cancels overscoring (IBM only)	3-23
ESC r	Selects reverse print	3-24
ESC t	Cancels reverse print	3-24
ESC ~2(n)	Selects/cancels reverse print	3-24
CHR\$(18)	Selects reverse print*	3-25
CHR\$(146)	Cancels reverse print*	3-25
ESC S0	Selects superscript print	3-26
ESC S1	Selects subscript print	3-26
ESC T	Cancels superscript/subscript	3-26
ESC h	Selects vertically enlarged print	3-27
ESC u	Cancels vertically enlarged print	3-27
ESC ~1 (n) (n = 1 ON, n = 0 OFF)	Selects/cancels vertically enlarged print	3-27
ESC @	Resets printer	3-29
ESC ~3 CHR\$(n)	Master pitch selection	3-30
ESC ! CHR\$(n)	Master print mode selection	3-31

*Commodore mode only **Epson and IBM graphics mode only

Special Character Commands

ESC R CHR\$(n)	Selects international character set Character set n (except IBM)	3-35
ESC R	Clears all htabs and vtabs (IBM only)	3-35
ESC ~5(n)	Selects Commodore, IBM, or Epson mode	3-38
ESC ^ CHR\$(n)	Prints a single character from all characters chart (IBM only)	3-40
ESC \ CHR\$(n1) CHR\$(n2)	Prints continuously from all characters chart (IBM only)	3-40

Line Spacing Commands

		Page
CHR\$(13)	Carriage return	4-1
CHR\$(141)	Carriage return without line feed*	4-3
CHR\$(10)	Line feed	4-2
ESC 2	Sets 1/6" line spacing	4-5
ESC 0	Sets 1/8" line spacing	4-5
ESC 1	Sets 7/72" line spacing	4-6
ESC A CHR\$(n)	Sets n/72" line spacing	4-7
ESC ~0 CHR\$(n)	Sets n/144" line spacing	4-9
ESC 3 CHR\$(n)	Sets n/216" line spacing	4-9
ESC J CHR\$(n)	Advances n/216" line spacing on one line	4-14

Page Design Commands

		Page
CHR\$(12)	Form feed	4-15
ESC C CHR\$(n)	Sets page length to n lines	4-16
ESC C CHR\$(0) CHR\$(n)	Sets page length to n inches	4-18
ESC N CHR\$(n)	Sets top and bottom margin	4-19
ESC 0	Returns to default top and bottom margins	4-19
CHR\$(147)	Turns paging on*	4-21
CHR\$(19)	Turns paging off*	4-21
ESC I CHR\$(n)	Sets left margin at column n	4-22
ESC Q CHR\$(n)	Sets right margin at column n (except IBM)	4-23

Horizontal Tab Commands

		Page
CHR\$(9)	Move to next horizontal tab (htab)	5-1
CHR\$(16)	Move to next horizontal tab (htab)*	5-2
ESC e CHR\$(0) CHR\$(n)	Sets horizontal tabs every n column	5-3
ESC D CHR\$(n1) CHR\$(n2) . . .	Sets variable htabs at columns n1, n2, etc.	5-4
ESC F CHR\$(0) CHR\$(n)	Moves print head n columns to the right	5-5
ESC \$ CHR\$(n1) CHR\$(n2)	Sets absolute dot tab	5-7
ESC £ CHR\$(n1) CHR\$(n2)	Sets relative dot tab (Commodore only)	5-9
ESC \ CHR\$(n1) CHR\$(n2)	Relative dot tab (except Commodore)	5-9
ESC CHR\$(16) CHR\$(n1) CHR\$(n2)	Sets print position by n1, n2 columns*	5-2

Vertical Tab Commands

		Page
CHR\$(11)	Move to next vertical tab (vtab)	5-10
ESC e CHR\$(1) CHR\$(n)	Sets vertical tabs every n lines	5-11
ESC B CHR\$(n1) CHR\$(n2) . . . CHR\$(0)	Sets variable vtabs at lines n1, n2 . . .	5-12
ESC f CHR\$(1) CHR\$(n)	Advances the paper n lines	5-14
ESC b CHR\$(N) CHR\$(n1) CHR\$(nn) . . . CHR\$(0)	Sets vtabs n1, —nn in channel N	5-15
ESC / CHR\$(n)	Sets vtabs in channel n as current vtabs (except IBM)	5-16

Epson Mode Graphic Commands

		Page
ESC K CHR\$(n1) CHR\$(n2)	Sets normal-density graphics	6-7
ESC L CHR\$(n1) CHR\$(n2)	Sets double-density graphics	6-7
ESC Y CHR\$(n1) CHR\$(n2)	Sets double-speed double-density graphics	6-7
ESC Z CHR\$(n1) CHR\$(n2)	Sets quadruple-density graphics	6-7
ESC * CHR\$(m) CHR\$(n1) CHR\$(n2)	Sets graphics mode m	6-13
ESC ?(n) CHR\$(m)	Changes from graphics mode n to m	6-14
ESC ↑ CHR\$(m) CHR\$(n1) CHR\$(n2)	Sets 9-pin graphic in single density	6-16

Commodore Mode Graphics Commands*

		Page
CHR\$(8)	Enter Commodore bit image mode*	7-1
CHR\$(8) . . . CHR\$(26) CHR\$(n) CHR\$(m)	Repeat bit image data*	7-5
ESC CHR\$(16) CHR\$(n1) CHR\$(n2)	Sets print position by n1, n2 columns*	7-6

Defined Character Commands

		Page
ESC In	Selects download characters in draft (n = 4) print. Selects standard character set in draft (n = 0) or correspondence quality (n = 2) print (IBM only)	3-5
ESC & CHR\$(0) CHR\$(n1) CHR\$(n2) CHR\$(a) CHR\$(d0) . . . CHR\$(d10)	Defines download characters	8-4
ESC %n CHR\$(0) (n = 1 ON, n = 0 OFF)	Selects/cancels user-defined character set	8-11

Buffer Commands

		Page
CHR\$(127)	Deletes**	9-3
CHR\$(24)	Cancels line**	9-4
ESC @	Initializes printer to power on default settings, clears buffer	3-29

*Commodore mode only **Epson and IBM graphics mode only

*Commodore mode only **Epson and IBM graphics mode only

Miscellaneous Commands			Page
CHR\$(17)	Sets one-line upper/lowercase mode*		9-1
CHR\$(145)	Sets one-line uppercase/graphics mode*		9-1
CHR\$(34)	Sets quote mode*		9-2
CHR\$(8)	Backspace**		9-5
ESC U (n) (n = 1 ON, n = 0 OFF)	Sets/cancels unidirectional print		9-7
ESC <	Sets one-line unidirectional print		9-8
ESC ~4 (n) (n = 1 ON, n = 0 OFF)	Sets/cancels slashed zero		9-9
ESC 9	Enables paper out sensor		9-10
ESC 8	Disables paper out sensor		9-10
ESC >	Sets high bit		9-11
ESC =	Sets low bit		9-11
ESC #	Cancels high-bit/low-bit code conversion		9-12
ESC ~5 (n)	Selects Commodore or Epson mode		3-38

Secondary Addresses

ADDRESS	FUNCTION	Page
0	Selects uppercase/graphics font	2-7
3	Sets number of lines per page	2-7
6	Sets line feed pitch	4-10
7	Selects upper/lowercase font	2-7
10	Resets printer	2-7

Master Select Bit Values

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

*Commodore mode only **Epson and IBM graphics mode only

DIP SWITCH SETTINGS

Switch 1 determines the interface select.	OFF-serial ON-parallel
---	------------------------

PARALLEL DIP SWITCH SETTINGS**Select Printer Configuration:**

Switch	Epson #1	Epson #2	Epson #3	IBM Graphics Printer
3	OFF	ON	OFF	ON
4	OFF	OFF	ON	ON

Epson FX#1 Configuration:

Switch	OFF	ON
5	High-bit control codes	Line and block graphics
6	Unslashed zeros	Slashed zeros
7	Draft print	Correspondence Quality
8	Normal (pica) print	Compressed print

Epson FX#2 Configuration:

Switch	OFF	ON
5		Switches 5 through 7 select international character sets (see next table below)
6		
7		
8	11" page length	12" page length

International Character Sets (Epson #2 configuration):

Switch	USA	France	Germany	England	Denmark	Sweden	Italy	Spain
5	OFF	ON	OFF	ON	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF	OFF	ON	ON
7	OFF	OFF	OFF	OFF	ON	ON	ON	ON

Epson FX#3 Configuration:

Switch	OFF	ON
5	High-bit control codes	Line and block graphics
6		Switches 6 and 7 select international character sets (see next table below)
7		
8	Normal (pica) print	Compressed print

International Character Sets (Epson FX#3 configuration):

Switch	USA	France	Germany	England
6	OFF	ON	OFF	ON
7	OFF	OFF	ON	ON

IBM Graphics Printer Configuration:

Switch	OFF	ON
5	High-bit control codes	Accented characters
6	1/8" line spacing	1/8" line spacing
7	Enable auto carriage return	Disable auto carriage return
8	Normal buffer-full printing	Disable buffer-full printing

NOTE: All switches are set to OFF at factory.**SERIAL DIP SWITCH SETTINGS**

Switch	Function	OFF	ON	Factory Setting
2	ASCII Translation	PET ASCII	ASCII	OFF
3	Control Code Mode	Commodore	Epson	OFF
4	NLQ/Draft	Draft	NLQ	OFF
5	Devise Select	4	5	OFF
6	Paper End Detector	Enabled	Disabled	OFF
7	Automatic Line Feed*	Disabled	Enabled	OFF
8	Pica/Compressed	Pica	Compressed	OFF

*Valid only when Switch 1-3 is ON.

NOTE: All switches are set to OFF at factory.