

# LC24-10

## USERS MANUAL

NOT INTENDED FOR SALE

PN 80821322

**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 or printer with respect to the receiver
- Move the computer or printer away from the receiver
- Plug the computer or printer into a different outlet so that it and the 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, D.C., 20402, Stock No. 004-000-00345-4.

For compliance with the Federal Noise Interference Standard, this equipment requires a shielded cable.

*The above statement applies only to printers marketed in the U.S.A.*

**Self Declaration**

Radio interference regarding this equipment has been eliminated according to Vfg 1046/1984 announced by the DBP. DBP has been informed of the introduction of this special equipment and has been granted the right to examine the whole series.

It is the user's responsibility to see that his own assembled system is in accordance with the technical regulations under Vfg 1046/1984.

To conform to FTZ-regulations it is necessary to make all connections to the printer with shielded cable.

The equipment may only be opened by qualified service representatives.

*The above statement applies only to printers marketed in West Germany.*

**Trademark Acknowledgements**

**LC24-10, NB-15, NB24-10, NB24-15:** Star Micronics Co., Ltd.

**IBM PC, Proprinter X24, Proprinter II, PC-DOS:** International Business Machines Corp.

**Microsoft BASIC, MS-DOS:** Microsoft Corporation

**LQ-800, LQ-1000, LQ-1500:** Seiko Epson Corp.

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## HOW TO USE THIS MANUAL

This manual is organized into five chapters and four appendixes. To learn how to make the best use of your printer you are urged to read all of chapters 1 through 5. The appendixes can be referred to as necessary.

**Chapter 1** explains how to get the printer unpacked and set up. Read this chapter before you do anything else.

**Chapter 2** explains the control panel. After getting set up, read this chapter and try out the procedures in it to find out how the printer works.

**Chapter 3** gives tips on using word-processing programs and other commercial software with this printer. Read this chapter in conjunction with your software manual.

**Chapter 4** is addressed to do-it-yourself programmers. It shows simple programming examples using DOS commands and BASIC.

**Chapter 5** covers maintenance and troubleshooting. Look through this chapter to see what it contains, then refer to it as necessary later.

**Appendix A** lists the printer's technical specifications.

**Appendix B** details the functions of escape sequences and other printer commands.

**Appendix C** presents a BASIC program you can use to define and download new characters.

**Appendix D** presents tables of the printer's character sets.

## **FEATURES OF THE PRINTER**

This printer is a compact, convenient, monochrome printer with a full complement of features, making it an excellent partner for a personal computer. It supports the IBM/Epson printer commands and character sets, enabling it to print just about anything your computer can generate, both text and graphics. Some of its main features are the following:

- Extensive software support

Since it is compatible with the Epson and IBM printers, it works with any software that supports those printers. That includes most word-processing and graphics programs, spreadsheets, and integrated software packages.

- Easy operation

Clearly understandable lamp displays and beep tones provide immediate feedback when you press the switches on the control panel. The four switches can operate in combinations to perform a surprising variety of functions, including micro-alignment.

- Easy care and maintenance

The ribbon cartridge can be replaced in seconds; the print head in a few minutes.

- Versatile paper handling

Single sheets, fanfold forms, and multi-copy forms (up to triple-ply) are all accepted, and you can use either tractor or friction feed. A special feature enables you to keep fanfold forms parked in readiness while printing on other paper.

- High-resolution letter-quality printing

When you select an LQ type style, the printer slows down and employs a dense matrix of up to 24 by 35 dots to print clear, well-formed characters.

- Large variety of type styles and sizes

The printer has one draft style and four LQ styles (Courier, Prestige, Orator, and Script), plus italics for all styles, plus condensed print, bold print, double-sized print, quadruple-sized print — see the samples on the next page:

Type styles are:

Draft characters, Courier characters,  
Prestige characters, ORATOR CHARACTERS,  
*Script characters,*  
*and italics for ALL styles.*

Print pitches are:

Pica pitch (10 CPI), Elite pitch (12 CPI),  
Semi-condensed pitch (15 CPI), Condensed pica pitch (17 CPI),  
Condensed elite pitch (20 CPI),  
Normal proportional, and condensed proportional.

Double-height,

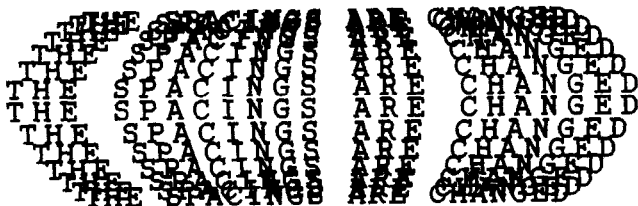
Double width,

Triple width,

Double-sized,

Quad-sized.

Various line and character spacings:



Other features:

**OUTLINED, SHADOWED, OUTLINED WITH SHADOWED,**

**Emphasized, Double-strike,**

**Underlining, Overlining,**

**SUPERSCRIP<sup>T</sup>, SUBSCRIP<sub>T</sub>,**

**Download characters: \*\*\*\*\***

**Dot graphics:**

S&S

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# Chapter 1

## SETTING UP THE PRINTER

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Subjects covered in Chapter 1 include —

- Locating the printer
- Unpacking and inspection (names of parts)
- Setting up
- Loading single sheets
- Loading and parking fanfold forms
- Test printing
- Adjusting the printing gap
- Setting the DIP switches

### LOCATING THE PRINTER

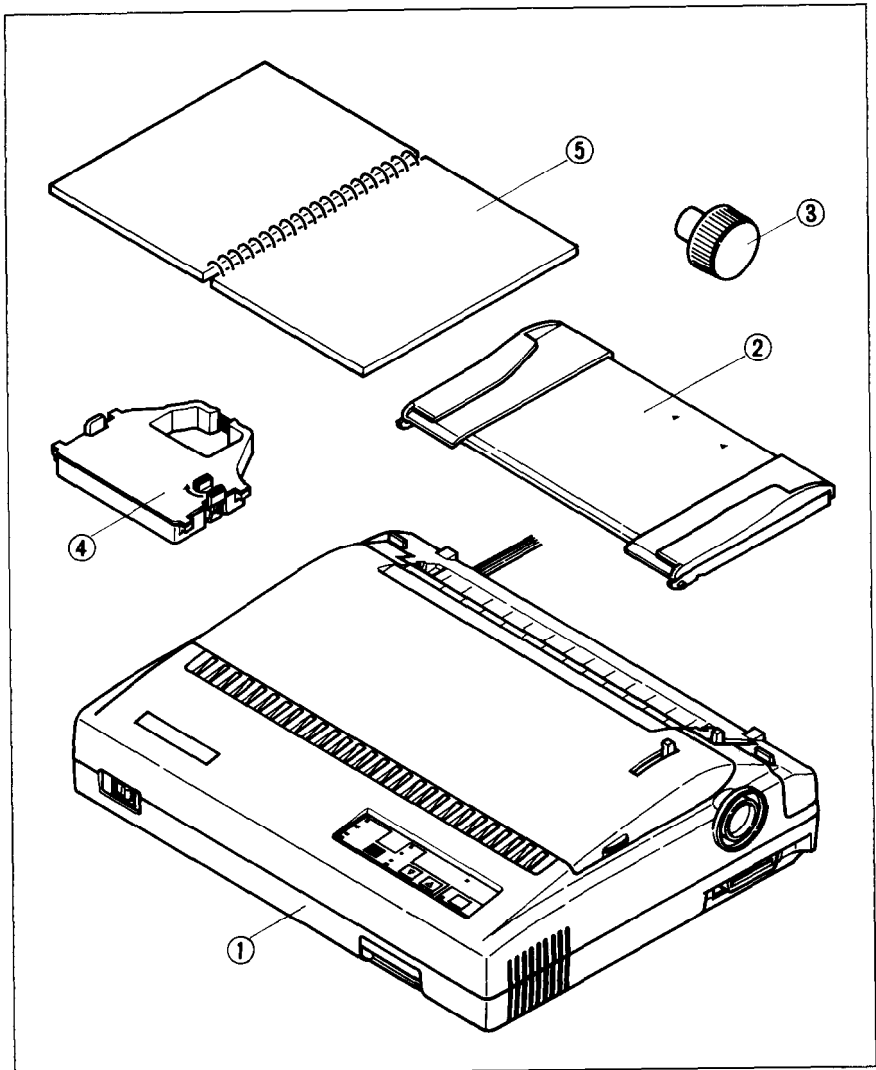
Give some thought to the best place to put the printer. Both the printer and computer should be used in a normal indoor environment. For best performance, we recommend:

- Place the printer on a flat surface.
- Keep it out of direct sunlight and away from heat-producing appliances.
- Use it only in temperatures where you are comfortable.
- Avoid locations with dust, grease, or high humidity.
- Supply it “clean” electricity. Don’t connect it to the same circuit as a large, noise-producing appliance such as a refrigerator.
- Make sure the line voltage is within 10% of the voltage specified on the identification plate.
- If you will be using fanfold forms, place the printer where the forms can feed up to it from below, with at least a full page hanging free.

### UNPACKING AND INSPECTION

#### *Check the carton contents*

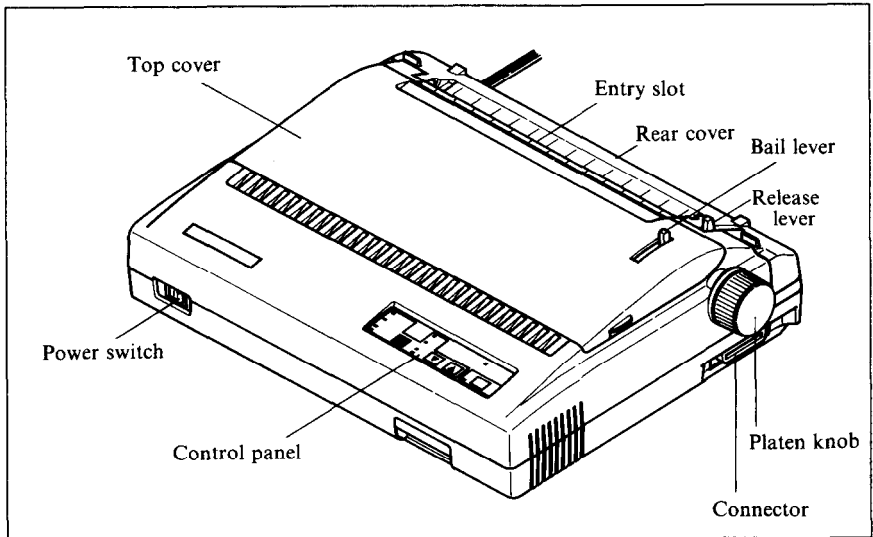
Open the carton and check each item in the box against Figure 1-1 to make sure that you have everything (there should be five items).



**Figure 1-1.** Check to make sure you have all five items: 1) Printer, 2) Paper guide, 3) Platen knob, 4) Ribbon cartridge, and 5) User's manual.

Make an external inspection of the printer. Note the locations of the following parts:

**Bail lever:** opens and closes the paper bail which holds the paper against the platen.



**Figure 1-2.** The printer's external parts

- Release lever:** releases the platen. This lever must be down for printing on single sheets, and up for fanfold forms.
- Top cover:** protects the print head and other parts.
- Rear cover:** protects the sprocket feed mechanism.
- Entry slot:** for inserting single sheets of paper.
- Control panel:** controls various printer functions.
- Power switch:** switches power on and off.
- Connector:** for connecting the computer to the printer.

## SETTING UP

### **Mount the platen knob**

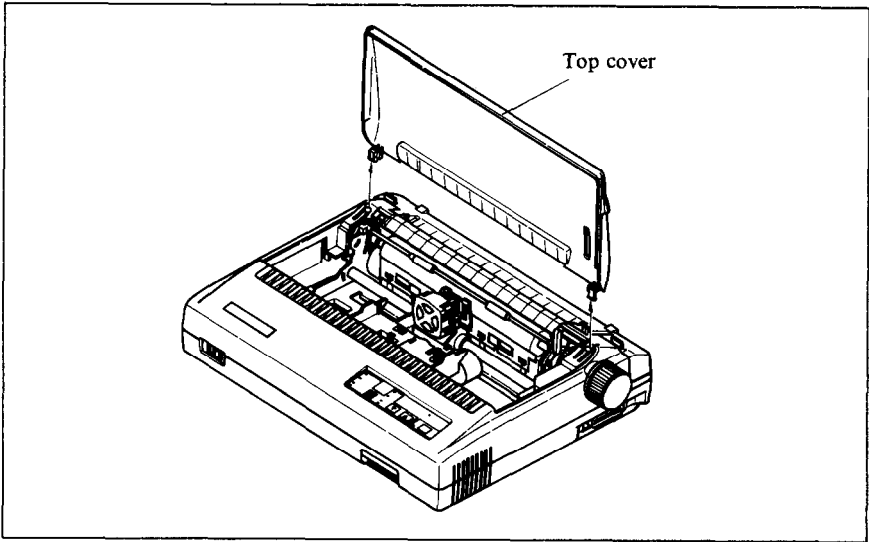
The platen knob is packed into a recess of the white foam packing material which held your printer inside the packing box. Be careful to remove the knob before disposing of the packing.

Mount the platen knob on its shaft on the right side of the printer. Turn it until you can push it in all the way.

Power should always be off when you turn the platen knob. Turning the platen by hand while power is on can damage the printer's gears.

### **Remove the top cover**

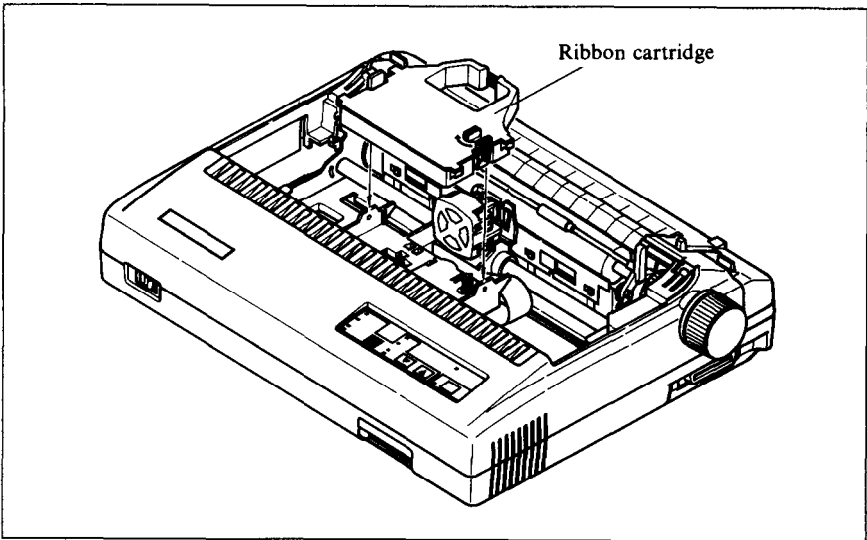
Lift the front edge of the printer's clear plastic top cover. Then disengage the tabs at the back of the cover and remove the cover completely.



**Figure 1-3.** Removing the top cover

### ***Install the ribbon cartridge***

The top side of the ribbon cartridge has a handle for turning the ribbon. Turn this handle in the direction of the arrow to tighten the ribbon.



**Figure 1-4.** Installing the ribbon cartridge

Next place the ribbon cartridge on the print head carriage, guiding the ribbon between the print head and the platen. Press down firmly on the cartridge until it snaps into place.

### **Replace the top cover**

Hold the cover upright and engage the tabs at the back. Then swing the front edge down until the cover is closed.

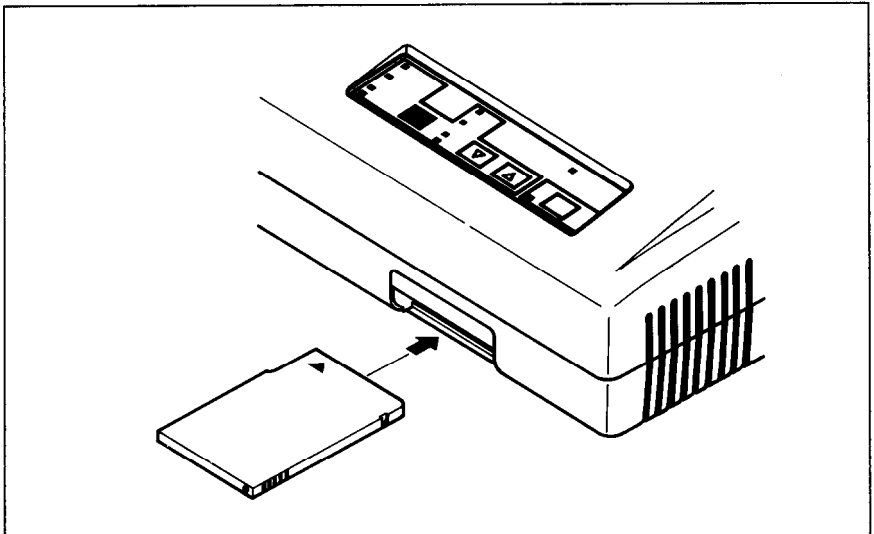
Leave the cover closed during normal operation. It keeps out dust and dirt and reduces the printer's operating sounds. Open the cover only to change the ribbon or make an adjustment.

### **Install the optional IC card**

This printer has five built-in character styles (fonts), and a 7 K-byte data buffer.

You can add more fonts or expand the data buffer by installing optional IC cards (Font card or RAM card).

To install or change an IC card, first turn off the power switch. Then, insert the IC card into the slot at the bottom right front of the printer and slide it all the way in.

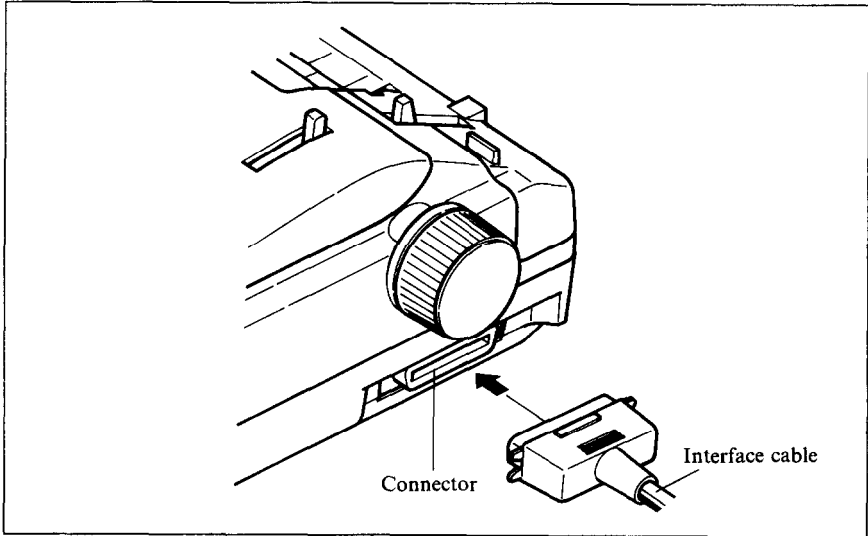


**Figure 1-5.** Slide the IC card into the front slot with the power switch off.

## **Connect the printer to the computer**

Connect the printer end of the interface cable to the connector socket on the right side of the printer as shown in Figure 1-6.

Make sure the computer is turned OFF, then connect the other end of the cable to your computer as described in the computer manual.



**Figure 1-6.** Connecting the interface cable

## **Connect the printer's power cord**

Check that the printer's power switch (located at the left front) is OFF. Then plug the printer's power cord into an AC wall outlet.

Never plug or unplug the power cord while the printer is turned on.

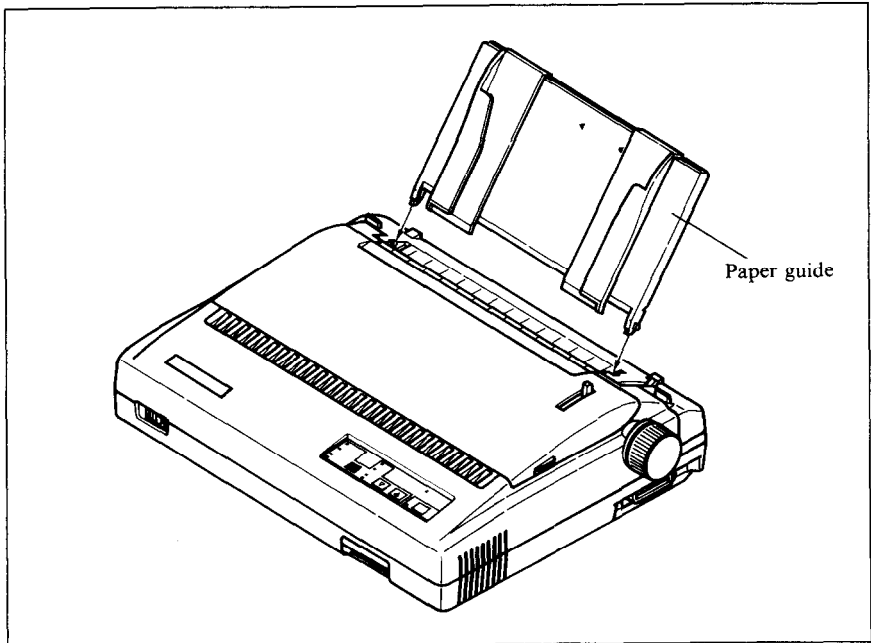
## **LOADING SINGLE SHEETS**

This section will take you through the procedures for loading single sheets of paper.

If you are using the optional automatic sheet feeder (ASF), read the ASF instruction booklet.

## **Mount the paper guide**

The paper guide fits into the two holes on top of the rear cover. Mount the guide and raise it to the upright position.

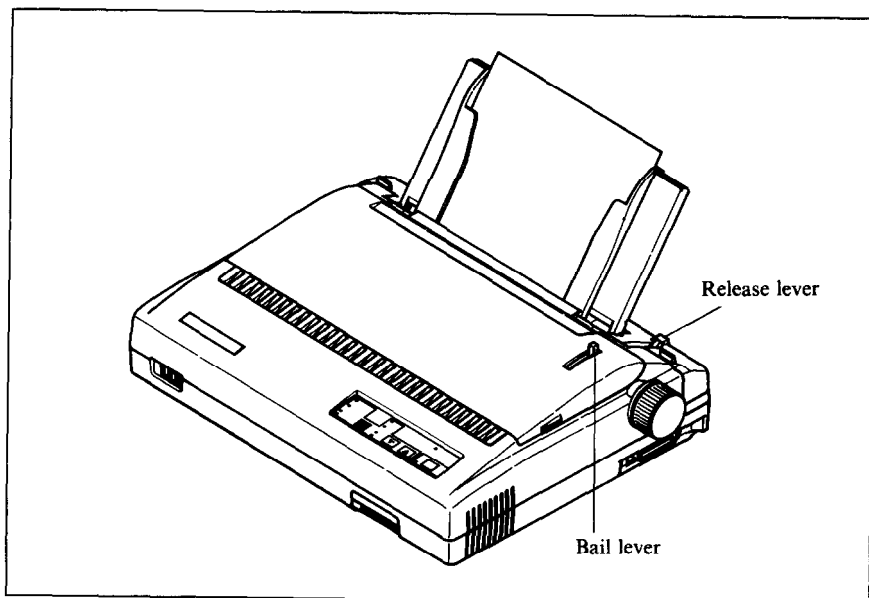


**Figure 1-7.** Mounting the paper guide for single sheets

### **Semiautomatic loading**

Single sheets can be loaded manually with power off, or semiautomatically with power on. We will start the easy way with semiautomatic loading.

1. Check that the release lever is down and the bail lever back (bail closed), then switch power on. You will hear a short beep tone and the Power indicator on the control panel will flash. These are the printer's paper-out signals.
2. Place a single sheet on the paper guide and insert it down into the entry slot as far as it will go.
3. Move the bail lever forward. When the bail opens, the printer feeds the paper automatically.
4. Move the bail lever back. The paper will feed slightly forward again, ending in position to print with a top margin of about one inch.



**Figure 1-8.** Loading a single sheet

### **Manual loading**

It is also possible to load paper manually while the printer's power is off. The procedure is:

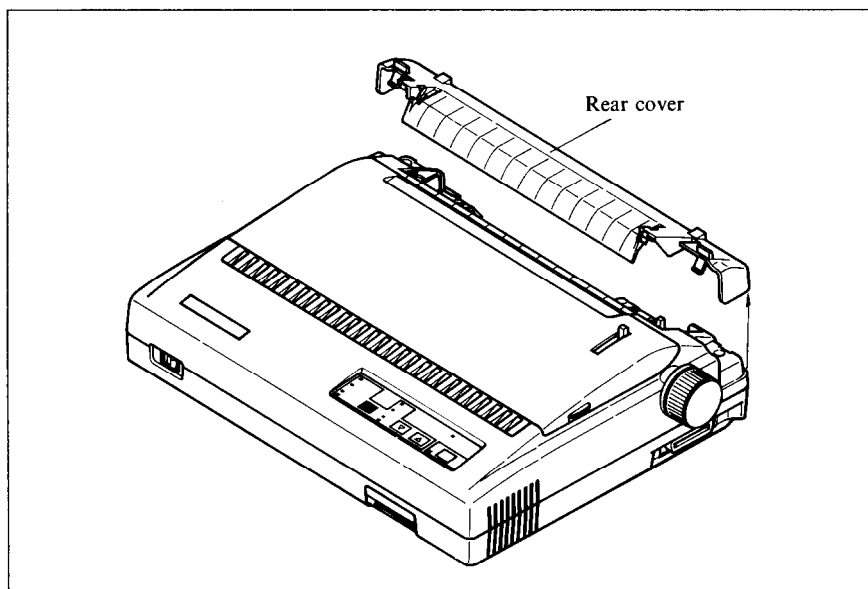
1. Check that printer power is off and the release lever at the back of the printer is down.
2. Insert a single sheet of paper into the entry slot as far as it will go, the same way as for semiautomatic loading.
3. Move the bail lever on top of the printer forward to open the paper bail.
4. Turn the platen knob clockwise until the front edge of the paper comes out from under the top cover.
5. If the paper is not straight, move the release lever to the up position, straighten the paper by hand, then move the release lever back down.
6. Move the bail lever back to close the paper bail.



## LOADING AND PARKING FANFOLD FORMS

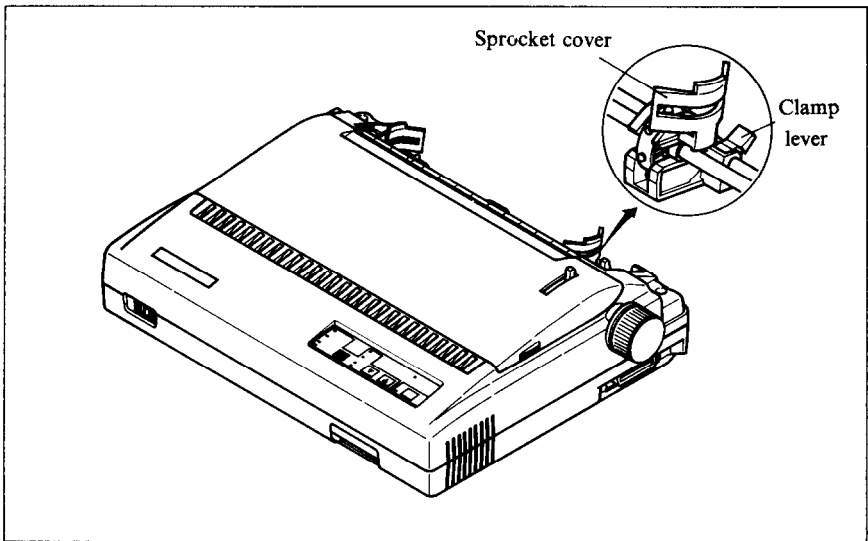
Fanfold forms have holes along the sides and perforations between the sheets. They are also called sprocket forms, punched forms, or just plain "computer paper". This printer accepts forms up to 10" wide. Fanfold forms are loaded, parked, and unparked as explained next.

1. Place a stack of fanfold paper behind and at least one page-length below the printer.
2. Turn the printer's power OFF.
3. Set the release lever to the up position. If there is paper in the printer, remove it. (Since the platen is released, you can just pull the paper out.)
4. Move the bail lever forward to open the bail.
5. Remove the paper guide and put it aside for the moment.
6. Remove the rear cover. Grip it by its front edge and lift upwards and backwards as in Figure 1-9.

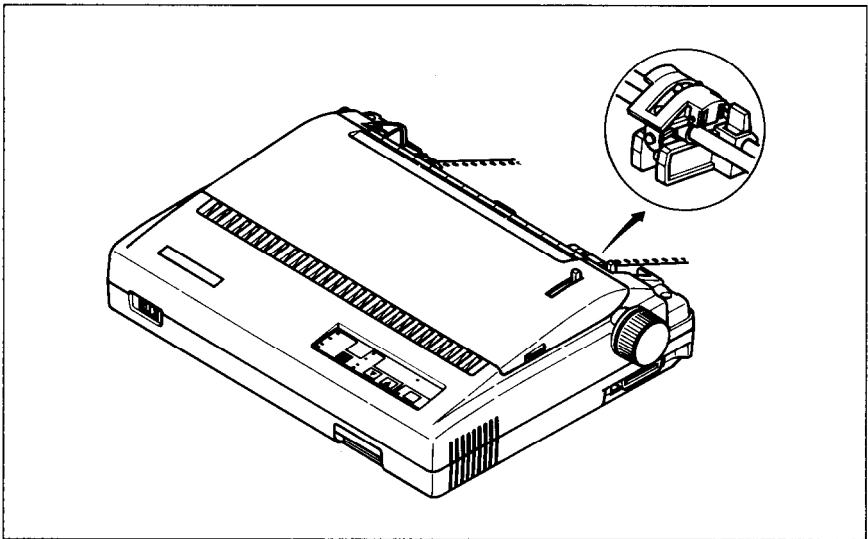


**Figure 1-9.** Opening the rear cover

7. Open the sprocket covers on the right and left sprocket units, as shown in Figure 1-10.
8. Flip the clamp levers down. This allows the two sprocket units to move freely right and left so you can align them with the holes in the paper.
9. Insert the front edge of the paper and tuck it in under the platen.



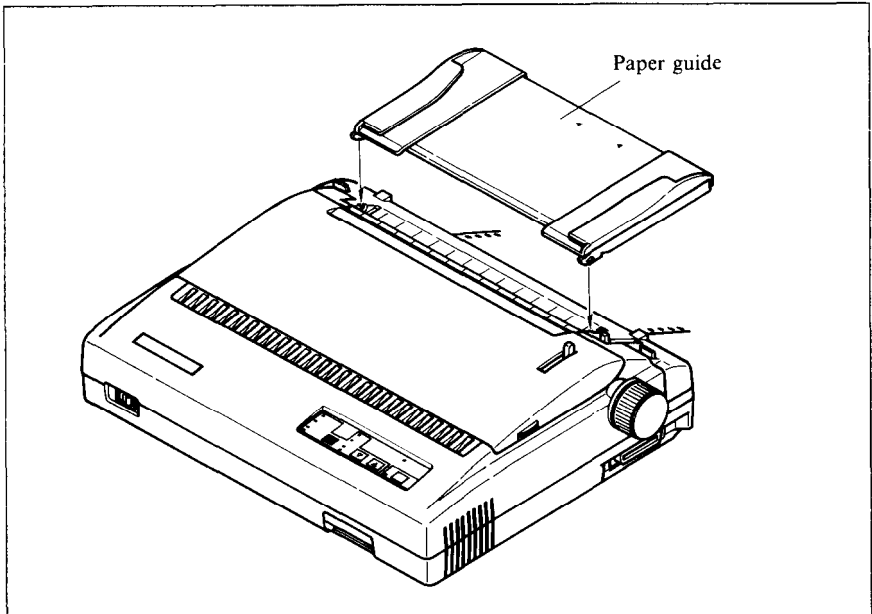
**Figure 1-10.** Opening the sprocket covers to expose the sprocket teeth



**Figure 1-11.** Closing the sprocket covers

10. Fit the holes in the paper over the sprocket pins. Check that the paper is even.
11. Close the sprocket covers (Figure 1-11).
12. Raise one of the clamp levers to lock one sprocket unit in place.

13. Turn the platen knob to feed the paper forward until it comes out from under the top cover.
14. Move the bail lever back to close the bail.
15. Check that the paper is feeding in flat, then raise the other clamp lever to lock the other sprocket unit.
16. Replace the rear cover. Hold it tilted upward and insert the two tabs at the bottom into their slots. Then rotate the cover forward, pressing down on the thumb pads on the left and right to snap it into place.
17. Mount the paper guide in the horizontal position shown in Figure 1-12, so that it will separate the printed from the unprinted paper.



**Figure 1-12.** Mounting the paper guide for fanfold forms

Now you are ready to switch power on and print.

### **Paper parking**

After loading fanfold paper, you do not have to unload it when you want to print on a single sheet. The printer will “park” it for you if you follow the procedure below.

1. Paper parking starts with power ON, fanfold paper loaded in printing position, the release lever up, and the bail lever back.
2. Press the On Line switch on the control panel to set the printer off-line (On Line indicator off).

3. Tear off the printed form at the last perforation, leaving not more than about half a page showing above the top cover. If necessary, press the Paper Feed switch to feed paper forward until a perforation is located just above the top cover, and tear there.
4. Press the Quiet Mode switch on the control panel and hold it down.
5. Still holding the Quiet Mode switch down, press the Paper Feed switch. The printer will automatically feed the fanfold form backward until the paper is completely free of the platen.
6. Move the release lever to the down position.
7. Mount the paper guide in the upright position.

Now you can load single sheets either semiautomatically or manually, as explained previously. The fanfold paper remains parked at the back of the printer.

### ***Paper unparking***

When you want to resume using fanfold paper, the procedure is as follows.

1. Remove all single sheets from the printer and close the paper bail.
2. Mount the paper guide in the horizontal position.
3. Move the release lever to the up position.
4. With power ON, move the bail lever forward. The printer will automatically feed the parked fanfold paper into position for printing.
5. Move the bail lever back to close the bail. Now you are ready to print.

## **TEST PRINTING**

After loading paper, you can test the printer as described next.

### ***Short self test***

This procedure prints a six-line “barber-pole” test pattern. The lines are eight inches wide, so the paper should be at least that wide.

1. Check that paper is in position for printing.
2. With power off, press the On Line switch on the control panel and hold it down.
3. Still holding the On Line switch down, turn the printer’s power on.

The printer will automatically start printing its short test pattern. You can release the On Line switch after printing starts. To remove the paper at the end of the test, switch power OFF, then turn the platen knob. (Don’t turn the platen knob while power is on.)

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

Figure 1-13. Short test pattern

## Long self test

To see the printer's variety of type styles, you can run the long version of the printer's self test.

1. Check that paper is in position for printing.
2. With power off, press the Paper Feed switch on the control panel and hold it down.
3. Still holding the Paper Feed switch down, turn the printer's power ON.

The printer will automatically start printing a test pattern of its full character set in various type styles. Watch the lights on the control panel; they indicate which type style is printing.

This test repeats indefinitely in a long cycle. To stop the test, switch power off.

## Interface test

After confirming that the printer works by itself, it is time to test the interface with the computer. The simplest way to do this is with a direct command. Power up both the printer and computer, load paper, then try a command like one of the following:

MS-DOS or PC-DOS command:

```
A>ECHO THE INTERFACE WORKS>PRN
```

Microsoft BASIC command:

```
LPRINT "THE INTERFACE WORKS"
```

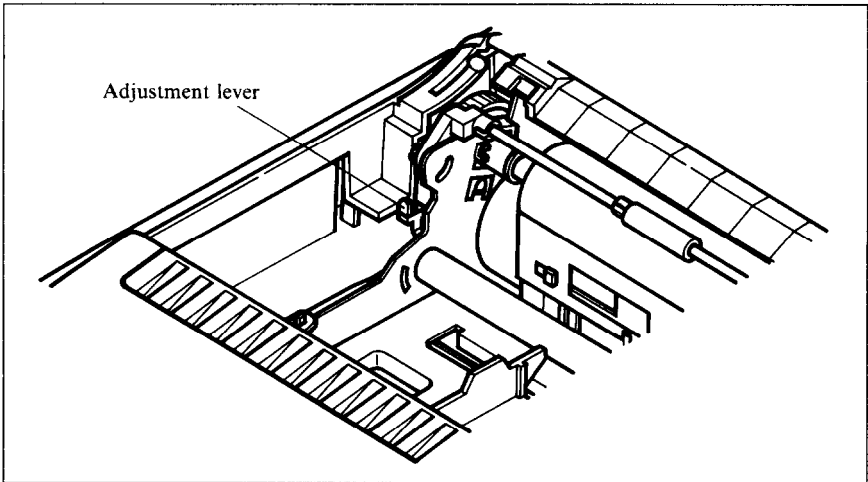
Or you can try any other command understood by your computer to print a line of text. Consult your computer manual if you need help. If you repeat the command a few times, the printout will come into view.

Next you may want to try a test printout with word-processing software, but for this to succeed you will have to set the printer's DIP switches (see the end of this chapter) and install your software to support the printer correctly (see Chapter 3).

## ADJUSTING THE PRINTING GAP

The distance between the print head and the platen can be adjusted to accommodate different paper thicknesses. To make this adjustment, open the top cover. The adjustment lever is located near the left end of the paper bail. Pulling the adjustment lever towards you widens the gap; pushing it away from you narrows the gap.

There are four positions; you can feel the lever clicking into each position. The first position (narrowest gap) is the one most commonly used for single sheets of paper. Try different positions until you get the best printing results.



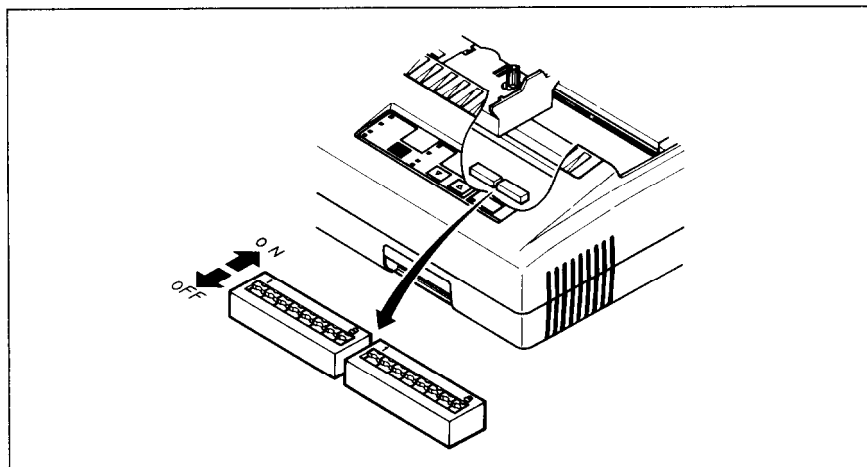
**Figure 1-14.** Adjusting for different thicknesses of paper

## DIP SWITCH SETTINGS

When you remove the printer's cover and look inside, you will see on the green board at the bottom of the printer two groups of small switches marked DSW1 and DSW2. These are the printer's DIP (Dual In-line Package) switches. DSW1 has eight switches, named 1-1 to 1-8 from left to right. DSW2 has eight switches named 2-1 to 2-8.

For all switches, the ON position is towards the back of the printer and the OFF position is towards the front. To set a DIP switch, use a ballpoint pen or other small implement to move the switch to the ON or OFF position.

The printer's power should be off when you set the DIP switches. Settings made while power is on do not take effect until power is switched off, then on again, because the printer reads the DIP switches only at power-up.



**Figure 1-15.** DIP switches

| Switch | Function                        | ON        | OFF       |
|--------|---------------------------------|-----------|-----------|
| 1-1    | Page length                     | 11 inches | 12 inches |
| 1-2    | Auto CR                         | Yes       | No        |
| 1-3    | Bottom margin                   | None      | 1 inch    |
| 1-4    | Auto sheet feeder               | Inactive  | Active    |
| 1-5    | Paper-out detector              | Enabled   | Disabled  |
| 1-6    | Printer mode                    | Standard  | IBM       |
| 1-7    | Character set (Std. Mode)       | Italics   | Graphics  |
|        | Character set (IBM Mode)        | Set #2    | Set #1    |
| 1-8    | Auto LF                         | No        | Yes       |
| 2-1    | Usage of RAM                    | Buffer    | Download  |
| 2-2    | International character set     |           |           |
| 2-3    |                                 |           |           |
| 2-4    |                                 |           |           |
| 2-5    |                                 |           |           |
| 2-6    | Print style and pitch selection |           |           |
| 2-7    |                                 |           |           |
| 2-8    |                                 |           |           |

The printer is delivered with all DIP switch set to the ON position. These are the standard settings. By changing the settings, you can alter various printer functions to match your requirements. The following questions will help you make the right settings.

**Switch 1-1:** Is the page length of your paper 11 inches or 12 inches?

Leave this switch ON if you will be using 11-inch forms. Move it to the OFF position if you will be using 12-inch forms.

**Switch 1-2:** Do you want an automatic carriage return?

Normally you should leave this switch ON. The printer will automatically perform a carriage return by moving to the left margin at each line feed. Even if your software sends a separate carriage-return code, an extra carriage return does no harm because two consecutive carriage returns are the same as one. Set this switch to the OFF position only if you have a program that needs to move the paper vertically without a carriage return, which is fairly unusual.

**Switch 1-3:** Do you want a bottom margin?

Leave this switch ON if you do not want to set the bottom margin. Move it to the OFF position if you want to set the bottom margin to the 1-inch.

**Switch 1-4:** Are you going to use the automatic sheet feeder (ASF)?

To use the automatic sheet feeder, move this switch to the OFF position. Otherwise leave it ON.

**Switch 1-5:** Do you want the printer to stop printing about an inch from the end of the paper, or to keep printing to the bottom?

Leave this switch ON except when you need to print very close to the end of the paper. When this switch is OFF the printer ignores the paper-out detector and prints down to (and beyond) the bottom edge.

**Switch 1-6:** Do you want to use the printer in standard mode or IBM mode?

Select the mode compatible with your computer and software. In standard mode the printer operates like the Epson LQ-800. In IBM mode it operates like the IBM Proprinter X24. The ON position selects standard mode. The OFF position selects IBM mode.

**Switch 1-7:** The action of this switch depends on the mode chosen with switch 1-6.

If you selected standard mode, do you want italics or graphic characters?

Leave this switch ON to print italics in the standard character set. If you set this switch to the OFF position, in place of italics you will get the graphic characters, international characters, and mathematical symbols of IBM character set #2. See Appendix D, character codes 128 to 254.



If you selected IBM mode, do you want IBM character set #1 or #2? ON selects character set #2, which is for computers with an 8-bit interface (the most common kind). OFF selects character set #1, for computers with a 7-bit interface.

**Switch 1-8:** Do you want an automatic line feed?

If you leave this switch at the ON position, a separate line-feed code is required to obtain a line feed. If you move this switch to the OFF position, the printer performs both a carriage return and line feed each time it receives a carriage-return code.

Most computer systems send a line feed code, or both a carriage return and line feed, at the end of each line, so this switch should be left ON.

If you get double line spacing when you expect single spacing, or if lines overprint each other, try changing the setting of this switch.

**Switch 2-1:** Does your software download new characters to the printer?

To download characters this switch must be OFF. The printer then uses its RAM memory for storing character patterns and provides only a one-line print buffer. If you leave this switch ON the printer uses its RAM memory as an input buffer, allowing the computer to send data faster than the printer prints.

**Switches 2-2 to 2-4:** Do you want an international character set?

International character sets differ in their assignment of 14 character codes. See the character tables in Appendix D. With the DIP switches you can select one of eight character sets as follows:

| Country | 2-2 | 2-3 | 2-4 | Country     | 2-2 | 2-3 | 2-4 |
|---------|-----|-----|-----|-------------|-----|-----|-----|
| U.S.A.  | ON  | ON  | ON  | Denmark I * | ON  | ON  | OFF |
| France  | OFF | ON  | ON  | Sweden      | OFF | ON  | OFF |
| Germany | ON  | OFF | ON  | Italy       | ON  | OFF | OFF |
| England | OFF | OFF | ON  | Spain I     | OFF | OFF | OFF |

\* Denmark/Norway when IBM character set #2 is selected.

**Switches 2-5 to 2-8:** What type style and print pitch do you want?

You can select the default type style and print pitch by setting these switches as shown next.

| <b>Type style</b> | <b>Pitch</b> | <b>2-5</b> | <b>2-6</b> | <b>2-7</b> | <b>2-8</b> |
|-------------------|--------------|------------|------------|------------|------------|
| Courier           | 10 CPI       | ON         | ON         | ON         | ON         |
| Courier italic    | 10 CPI       | ON         | ON         | ON         | OFF        |
| Courier           | 12 CPI       | ON         | ON         | OFF        | ON         |
| Courier italic    | 12 CPI       | ON         | ON         | OFF        | OFF        |
| Prestige          | 10 CPI       | ON         | OFF        | ON         | ON         |
| Prestige italic   | 10 CPI       | ON         | OFF        | ON         | OFF        |
| Prestige          | 12 CPI       | ON         | OFF        | OFF        | ON         |
| Prestige italic   | 12 CPI       | ON         | OFF        | OFF        | OFF        |
| Script            | 10 CPI       | OFF        | ON         | ON         | ON         |
| Script            | 12 CPI       | OFF        | ON         | ON         | OFF        |
| Orator            | 12 CPI       | OFF        | ON         | OFF        | ON         |
| Draft             | 10 CPI       | OFF        | ON         | OFF        | OFF        |
| Draft             | 12 CPI       | OFF        | OFF        | ON         | ON         |
| Draft             | 17 CPI       | OFF        | OFF        | ON         | OFF        |
| Option *          | 10 CPI       | OFF        | OFF        | OFF        | ON         |
| Option *          | 12 CPI       | OFF        | OFF        | OFF        | OFF        |

\* If there is no Font Card in the slot, Courier style is selected.

# Chapter 2

## CONTROL PANEL OPERATIONS

The control panel switches can be pressed singly to perform the operations indicated by their names. Other functions can be obtained by holding these switches down when you turn the printer's power on. Still further functions can be executed by pressing the control panel switches in combination. This chapter explains all the switch and indicator functions.

### SWITCHES AND INDICATORS

The control panel has four switches marked:

- On Line
- Paper Feed
- Quiet Mode
- Style/Pitch

The Quiet Mode, and Style/Pitch switches respond with a beep tone when pressed, and indicators beside them indicate their current status. There is also a Power indicator that lights when power is on.

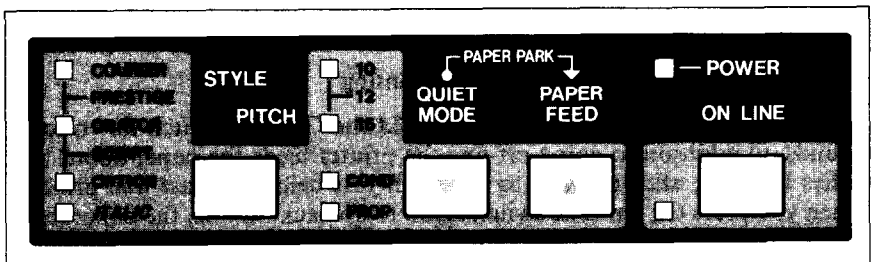


Figure 2-1. Control panel

### Power indicator

The power indicator lights (yellow) when power is on.

When paper is not present, the power indicator flashes. A beep tone also alerts you to the need to load paper.

## **On Line switch**

The On Line switch sets the printer on-line and off-line. The state changes each time you press the switch.

In the on-line state the printer receives data from the computer and prints the data. In the off-line state the printer stops printing and sends the computer a signal indicating that it cannot accept data.

The printer powers up in the on-line state if paper is present. If paper is not present, the printer powers up off-line with the Power indicator flashing. When you load paper the Power indicator stops flashing, but the printer remains off-line. To start printing you must press the On Line switch go on-line.

The three main times when you will want to press the On Line switch are:

- Before and after any other panel operation

The other panel switches operate only in the off-line state. First press the On Line switch to go off-line, then perform the panel operation, then press the On Line switch again to go back on-line.

- To pause during printing

If you press the On Line switch during printing, the printer stops printing and goes off-line, allowing you to check the printout or change a control panel setting. Printing resumes when you press the On Line switch again to go back on-line.

- To cut fanfold forms at the end of printing

When using fanfold forms, if you hold the On Line switch down for 2 seconds, in addition to going off-line the printer feeds the paper about two inches forward, allowing you to cut it off just below the last line printed. When you press the On Line switch again to go back on-line, the paper feeds backward about one inch, stopping in the right place to resume printing.

## **Paper Feed switch**

This switch operates only when the printer is off-line. If you press it once the paper feeds forward by one line. If you hold this switch down, the printer performs consecutive line feeds.

While you are feeding lines, if you also press the On Line switch, the paper will feed to the top of the next page. This is explained later.

When power is on, always use the Paper Feed switch instead of the platen knob to feed paper. Turn the platen knob only when power is off.

## **Quiet Mode switch**

This switch operates off-line to select the printing mode. The printer powers up in normal printing mode. To select the quiet mode, press the On Line switch to go off-line, then press the Quiet Mode switch. The printer will make two passes for each line, resulting in reduced sound (and slower printing). To switch the quiet mode off, press this switch again. Each time you press this switch, quiet mode toggles from on to off or from off to on.

## **Style/Pitch switch**

This switch selects the type style and the print pitch.

To change the type style, press the On Line switch to go off-line, then press this switch once. You will hear two acknowledging beep tones. After the beep tones, you can set the type style using the Quiet Mode switch or the Paper Feed switch. While in this mode, these switches work to select the type style, instead of their normal functions.

The selections cycle in the following order when using the Quiet Mode switch:

- Draft
- Courier
- Courier italic
- Prestige
- Prestige italic
- Orator
- Orator italic
- Script
- Script italic
- Option

When using the Paper Feed switch, the selections cycle in the reverse order.

To change the print pitch, press the On Line switch to go off-line, then press this switch twice. You will hear three acknowledging beep tones. After the beep tones, you can set the print pitch using the Quiet Mode switch or the Paper Feed switch. While in this mode, these switches work to select the print pitch, instead of their normal functions.

The selections cycle in the following order when using the Quiet Mode switch:

- Pica (10 characters per inch)
- Elite (12 characters per inch)
- Semi-condensed (15 characters per inch)
- Condensed pica (17 characters per inch)
- Condensed elite (20 characters per inch)
- Proportional
- Condensed proportional

When using the Paper Feed switch, the selections cycle in the reverse order.

The type style and the print pitch can also be selected by printer commands given in Appendix B.

## POWER-UP FUNCTIONS

In addition to their normal functions, all the control panel switches have special functions that operate if you hold them down while switching power on.

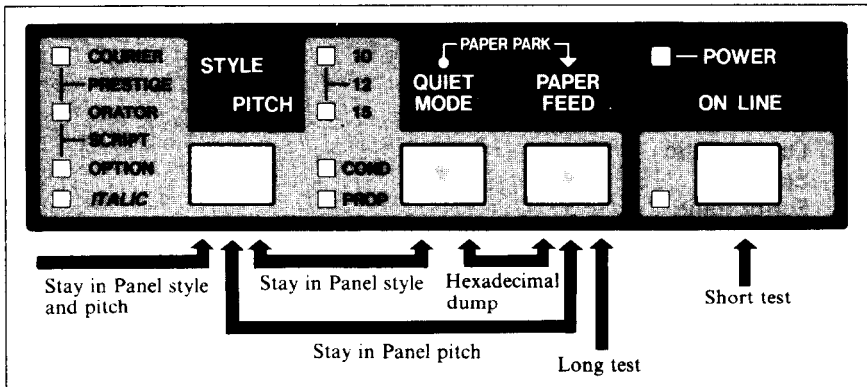


Figure 2-2. Power-up functions of control panel

### Short test pattern: On Line switch

If held down during power-up, this switch prints a short test pattern (shown in Chapter 1).

### Long test pattern: Paper Feed switch

If held down during power-up, this switch prints a long test pattern. The test cycles endlessly. To stop the test you must switch power off.

### **Stay in panel pitch:** Style/Pitch and Paper Feed switch

By holding these switches down during power-up, you can prevent software interference with the print pitch selected from the control panel. You will hear an acknowledging beep as power comes on. After the beep tone, you can set the printer off-line, select a print pitch, then return to on-line and start printing. The pitch you selected will not be reset or otherwise changed by any commands your software may issue.

### **Stay in panel style:** Style/Pitch and Quiet Mode switch

If held down during power-up, these switches prevent software interference with the type style selected from the control panel. There will be an acknowledging beep, after which you can set the printer off-line, select a type style, then return to the on-line state and start printing. The selected type style will not be changed by any commands sent by software.

If you want to protect both the Print Pitch and Type Style settings from software changes, press only the Style/Pitch switch during power-up. There will be two acknowledging beeps.

Pressing these switches during power-up does not prevent you from making any number of changes later from the control panel.

### **Hexadecimal dump:** Paper Feed and Quiet Mode switches

This feature is useful for programmers who are debugging printing programs and want to see the actual codes the printer is receiving. (Some computers change the codes the programmer intended.)

1. Holding both the Paper Feed and Quiet Mode switches down, turn power ON. A beep tone will be heard.
2. Start printing. In place of the usual printout you will get a formatted dump showing exactly what data the printer receives. Each line presents sixteen characters, their hexadecimal codes to the left and printable characters printed on the right.
3. At the end of the hexadecimal dump, set the printer off-line with the On Line switch. This is necessary to print the last line.

The following BASIC program is a simple test you can run in hexadecimal mode:

```
10 FOR I=0 TO 255
20 LPRINT CHR$( I );
30 NEXT I
40 LPRINT
50 END
```

If your system passes the codes directly to the printer without changing them, you will get a printout like Figure 2-3.

```

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 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 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 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 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 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 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 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 FF .....
0D 0A ..

```

Figure 2-3. Sample hexadecimal dump

Most BASICs, however, are not quite that straightforward. For example, the IBM-PC prints the following.

```

00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0A 0E .....
0F 10 11 12 13 14 15 16 17 18 19 1B 1C 1D 1E 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 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 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 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 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 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 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 FF .....
0D 0A ..

```

Figure 2-4. Sample hexadecimal dump with IBM-PC

When the IBM-PC BASIC interpreter sends hex code 0D (carriage return) it adds an extra hex 0A (line feed). Hex code 1A (end-of-file) also gets special treatment: the interpreter does not send it at all. This can cause problems in programs that generate graphics or download character data, but there is a solution. Try changing line 20 in the preceding program and adding the coding shown below.

Coding for IBM-PC with monochrome display:

```

20 GOSUB 100
100 O=INP(&H3BD) :IF O<128 THEN 100
110 OUT &H3BC,I :OUT &H3BE,5 :OUT &H3BE,4
120 RETURN

```



Coding for IBM-PC with color adaptor:

```
20 GOSUB 100
100 O=INP(&H379) :IF O<128 THEN 100
110 OUT &H378,I :OUT &H37A,5 :OUT &H37A,4
120 RETURN
```

## SWITCH COMBINATION FUNCTIONS

Several additional functions can be obtained by pressing the control panel switches in combinations.

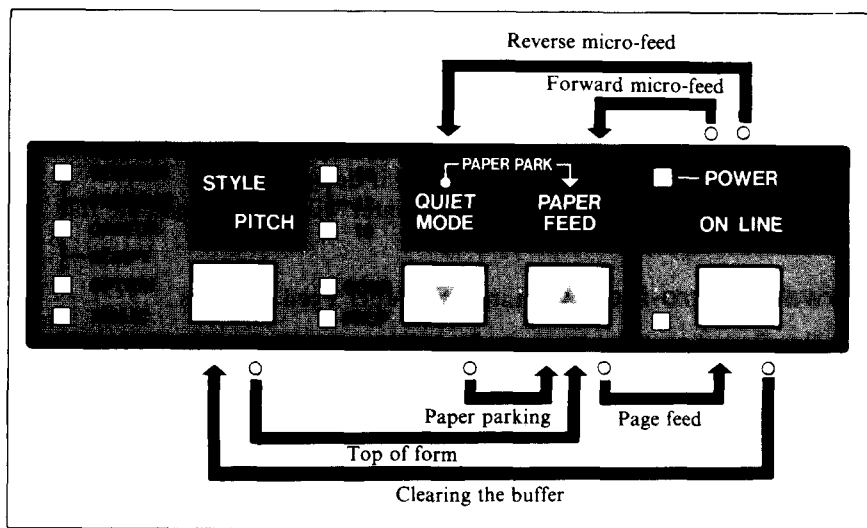


Figure 2-5. Switch combination functions of control panel

### **Paper parking:** Quiet Mode and Paper Feed switches

This procedure feeds the paper backward. It parks the fanfold form at the back of the printer so that you can switch to single-sheet feeding (by moving the release lever to the down position).

Before parking fanfold forms, tear off all but the last page, leaving less (at least three inches less) than a full page showing above the top cover.

1. Press the On Line switch to set the printer off-line.
2. Press the Quiet Mode switch and hold it down.
3. Press the Paper Feed switch. The paper will be fed out backward.

### **Page feed:** Paper Feed and On Line switches

If you are using single sheets, this operation ejects the current page. If you are using fanfold forms, it feeds to the top of the next page.

1. Press the On Line switch to set the printer off-line.
2. Press the Paper Feed switch and hold it down. The printer will start performing successive line feeds.
3. Still holding the Paper Feed switch down, press the On Line switch, then release both switches. The printer will smoothly eject the current page.

### **Top of form:** Style/Pitch and Paper Feed switches

When you turn on printer power, the top-of-form position is automatically set to the current position. If this is not where you want the top of the page to be, you can change the top-of-form position as follows.

1. Press the On Line switch to set the printer off-line.
2. Move the paper to the desired top-of-form position by pressing the Paper Feed switch, or by performing a forward or reverse micro-feed.
3. Press the Style/Pitch switch and hold it down.
4. Press the Paper Feed switch. The printer will beep to indicate that the top-of-form position has been set.

### **Forward micro-feed:** On Line and Paper Feed switches

For fine alignment, you can feed the paper forward in very small increments as follows:

1. Press the On Line switch to set the printer off-line.
2. Press the On Line switch again and hold it down.
3. Press the Paper Feed switch. The paper will start advancing in a series of small steps. When you want to stop, release both switches.

### **Reverse micro-feed:** On Line and Quiet Mode switches

You can also feed the paper in small increments in reverse, to return to a higher position on the same page.

Note: With fanfold forms, do not try to return to a previous page. The perforation may catch inside the printer.

1. Press the On Line switch to set the printer off-line.
2. Press the On Line switch again and hold it down.
3. Press the Quiet Mode switch. The paper will start moving backwards in a series of small steps. When you want to stop, release both switches.

### **Clearing the buffer:** On Line and Style/Pitch switches

When DIP switch 2-1 is ON, the printer stores received data in a large memory buffer. This creates a problem when you want to abandon a printing job and restart: the printer may be holding much more data in its buffer than it has actually printed, and this unprinted data must be cleared out before restarting. Turning power off is one way to clear the buffer, but there is another way:

1. Halt the printing program on the computer. If printing stops immediately, the buffer is clear and the rest of this procedure is unnecessary. If printing does not stop, continue as follows:
2. Press the On Line switch to set the printer off-line. Printing will now stop, but there may be data remaining in the buffer.
3. Press the On line switch and hold it down.
4. Press the Style/Pitch switch and hold it down. You will hear a beep tone signaling that the buffer has been cleared. If you hold down these switches in about three seconds, you will hear three beep tones signaling that the printer has been reinitialized.
5. Release these switches, make any necessary control panel settings, then set the printer back on-line.

It is essential to halt the printing program on the computer before you go off-line. Otherwise, when you go back on-line the computer will start sending data again and the printer will continue printing, with missing data where the buffer was cleared.

# MEMO

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# Chapter 3 USING THE PRINTER WITH COMMERCIAL SOFTWARE

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There is an abundance of commercial software available: spreadsheet programs, word-processing programs, graphics programs, and more. This printer will work with any program that supports a Star, Epson or IBM dot-matrix printer. Before using the printer with commercial software, however, there are two things you must do:

- Install the software so that it supports the printer
- Set the printer's DIP switches to match the software

## INSTALLING YOUR SOFTWARE

Most commercial software includes an installation program or routine that you can run to customize the software to fit your hardware system. Start by reading the explanation of the installation program in your software manual.

### *Printer menu*

The installation program usually offers a menu of printers from which to choose. If you find this printer on the menu, select it.

If this printer is not listed, look for the Epson LQ-800 or IBM Proprinter X24. If these are not listed, look for another Star, Epson or IBM printer. A few of the choices you may see are given below in order of preference:

|      |         |              |                    |
|------|---------|--------------|--------------------|
| Star | NB-15   | Epson LQ-800 | IBM Proprinter X24 |
|      | NB24-10 | LQ-1000      | Proprinter II      |
|      | NB24-15 | LQ-1500      | Proprinter         |

Some menus are less explicit about model names but offer general descriptions such as "Star printer", "Epson printer", "IBM dot-matrix printer", "dot-matrix ASCII printer", "Centronics-type printer", "Draft printer", or "Standard printer". Any of these selections should work. If you are not sure of the right selection, it does not hurt to experiment. If you choose wrong, you will get strange printing results, but don't worry; just try a different selection. Don't pick any printer described as a daisywheel printer or laser printer.

A few installation programs may ask you not to select a printer but to describe what your printer can do. The answers to the most often asked questions are: Yes, this printer can do a backspace; and Yes, it can do a hardware form feed.

Selecting (or describing) a printer is the main step in the installation process and frequently the only step necessary. If you selected this printer or any Star, Epson or IBM printer you should be able to use software commands for all the standard printer functions, including bold or double-strike printing, underlining, subscripts, superscripts, margin control, line-spacing control, and graphics.

### **Printer command options**

Besides the standard printer functions, however, your printer has some capabilities your software may not be aware of, including double- and quadruple-size printing and the printing of special characters assigned to control codes. Some software enables you to define these capabilities as user options in the installation process. Read your software manual to find out whether you can do this and if so, how.

The most useful thing you can do is to define a way to enter the escape code <ESC>, which is the control character with decimal character code 27 (hexadecimal 1B). This code usually cannot be keyed in directly (pressing the ESC key will not work). As an installation option, however, you may be able to assign it to a function key or a special key combination. Doing so will put the full power of the printer at your disposal.

### **Type styles**

Some word-processing software has commands that enable you to change type styles in the middle of a document without a printing pause. To use these commands you must generally define the printer's type styles (fonts) during installation, by assigning them numbers for example. Read your software manual for details, and refer to Appendix B for the relevant printer commands.

### **Page width**

Spreadsheet programs in particular may ask you to specify the printer's column width. The column width of this printer depends on the character pitch used:

|                 |                                  |
|-----------------|----------------------------------|
| Pica            | 80 columns                       |
| Elite           | 96 columns                       |
| Semi-condensed  | 120 columns (Standard mode only) |
| Condensed pica  | 137 columns                      |
| Condensed elite | 160 columns (Standard mode only) |

The character pitch can be selected from the control panel before you start printing, or possibly by an initialization sequence as described next.

## **Initialization sequence**

One of the installation options may be to specify the commands your software sends at the beginning of each printing job. These commands are called the “initialization sequence” or “setup string.” If necessary, you can use the initialization sequence to adjust the margins to your paper size or select a particular type style or pitch. You can look up the commands you want in Appendix B.

For example, if you selected 96-column width for a spreadsheet program, it would be convenient to add an elite pitch command to the initialization sequence. Appendix B indicates that this command consists of the two characters:

< ESC > “M”

which have decimal character codes 27 and 77 (hexadecimal 1B and 4D). Your software manual or an on-screen prompt will explain how to place these codes in the initialization sequence.

## **SETTING THE DIP SWITCHES**

After completing the installation of your software, check the setting of the printer’s DIP switches, in particular DIP switch 1- 6. If you selected a Star or Epson printer on the installation menu, switch 1-6 should be ON (the factory setting). If you selected an IBM printer, switch 1-6 should be OFF.

DIP switches 1-2 (auto CR), 1-7 (character set), 1-8 (auto LF), and 2-1 (RAM usage) are also related to your software. Read what your software manual has to say about carriage returns, line feeds, character sets, and downloading characters, and refer to the explanation at the end of Chapter 1.

## **USING YOUR SOFTWARE**

With the installation and DIP switch settings correctly completed, you are ready to entrust most of the control of your printer to your software. However, there will still be some things you have to do yourself.

### **Page alignment**

If you are printing on fanfold forms, the first thing to do before you start printing is to align the top of the forms so that printing will start at the right position on the page, a short distance below the perforation. With power off, you can align the forms by turning the platen knob. When power is on, use the Paper Feed switch on the control panel.

## **Type style and pitch selection**

If your software does not control the type style and pitch, you must make these selections on the control panel. The default selections depend on the settings of DIP switches 2-5 to 2-8. If you want a different style or pitch, proceed as follows:

1. Hold the Style/Pitch and Quiet Mode switches down when you turn the printer's power on, if you intend to set the type style. Hold the Style/Pitch and Paper Feed switches down if you intend to set the print pitch. Hold only the Style/Pitch switch down if you intend to make both settings. The printer will beep in acknowledgement as it powers up.
2. Press the On Line switch to set the printer off-line.
3. To select a type style, press the Style/Pitch switch once and press the Quiet Mode or Paper Feed switch one or more times.
4. To select a print pitch, press the Style/Pitch switch again and press the Quiet Mode or Paper Feed switch one or more times.
5. Press the On Line switch to set the printer back on-line.

Most programs begin each printing job by sending a command that resets the printer. That is why you must press these switches as you power up. If you do not press these switches during power-up, the reset command will reset your panel selections to the settings of DIP switches.

If you want to change the type style or pitch in the middle of a printing job, one way to do this is to insert a printing pause command in your file at the point of the change. When the printer pauses, press the On Line switch to go off-line. If the change occurs in the middle of a line, the printer will print the first part of the line. Now make the change with the control panel switches, set the printer back on-line, then command your software to resume printing.

If you were able to define software commands for print pitch and type style, changes like these can be inserted in your text file and made on the fly without a printing pause.

## **Other printer commands**

If your software enables you to place the escape code in your files, or if you were able to define this as a user option during installation, you are in a very powerful position: you can embed almost any printer command in your files. The printer commands are explained in detail in Appendix B.



Most printer commands consist of the escape code followed by one or more letters or numbers. Some examples are:

|         |                         |
|---------|-------------------------|
| <ESC>W1 | Double-width characters |
| <ESC>W0 | Normal width            |
| <ESC>4  | Italic                  |
| <ESC>5  | Upright                 |

Two lines with these commands embedded are shown below, together with the printed result.

File:

```
<ESC>W1PRINTER COMMANDS<ESC>W0  
can help you to use <ESC>4italic<ESC>5 print.
```

Printout:

```
PRINTER COMMANDS  
can help you to use italic print.
```

You will probably not see the symbol <ESC> on the screen, but a different symbol such as ^E or, ^[ or perhaps no symbol at all. This depends on your software.

After printing the first page of a long job, you may want to pause to check that the printing is correctly formatted. Press the On Line switch, setting the printer off-line. Printing will stop immediately. To resume printing, press the On Line switch again.

If you need to abandon a printing job before it is finished, your software should provide a command for this purpose. Another simple expedient is to switch the printer's power off.

# MEMO

---

# **Chapter 4**      **USING THE PRINTER**

## **WITH DOS AND BASIC**

---

Although you will probably do most of your printing with the aid of commercial software, at times you will want to employ direct commands or programs of your own. This chapter will give you some ideas. Three subjects are covered:

- Hard-copying the screen
- Programming the printer with DOS commands
- Programming the printer with BASIC

### **HARD-COPYING THE SCREEN (MS-DOS AND PC-DOS)**

If your computer has a PRTSC (or PrtSc) key, there is an easy way to get hard copy of the screen. Press the SHIFT and PRTSC keys. The printer will print the current screen contents. The PRTSC key works both at the system command level and while you are running application software.

Normally the PRTSC key prints only text data, but if your DOS system includes a file named GRAPHICS.COM, you can hard-copy graphics displays by first typing the command:

**A>GRAPHICS**

You will find that graphics printing takes considerably more time than text printing. See your DOS manual for further information on the GRAPHICS command.

At the DOS command level, there is also a simple way to have the printer print hard copy continuously, instead of one screen at a time. Press the CTRL key, hold it down, then also press the PRTSC key. If your computer does not have a PRTSC key, press the CTRL and P keys. Nothing visible will happen, but you have just switched on the print-screen function. After this, the printer will hard-copy all text displayed. For example, try typing the directory command:

**A>DIR**

You will obtain a printed directory.

To switch printer output off, press CTRL-PRTS or CTRL-P again. Each time you press this key combination, hard copy toggles from on to off or from off to on.

## **PROGRAMMING THE PRINTER WITH DOS COMMANDS**

If your system includes the file PRINT.COM you can use the main DOS printing command. Simply type the word PRINT followed by the name of the file you want to print. To print a file named README.DOC, for example, type:

```
A>PRINT README.DOC
```

The computer may respond with the following message, asking which printer to use:

```
Name of list device [PRN]:
```

If your computer is connected to only one printer, press RETURN to select the default choice (PRN). Printing will begin and the A> prompt will reappear. You can execute other commands or programs while the file is being printed.

A single PRINT command can print two or more files. List the file names consecutively on the same line, or use wild-card characters (\* and ?). Each file will be printed starting on a new page. The PRINT command also has control options. For example, you can terminate a printing job in progress with the /T option. (The printer may not stop printing immediately; it may have considerable data stored ahead in its buffer.) For the /T option, type:

```
A>PRINT/T
```

See your DOS manual for further information about the PRINT command. If your system does not include PRINT.COM, you can print files by using the PRN device name in COPY or TYPE commands such as the following:

```
A>COPY README.DOC PRN  
A>TYPE README.DOC > PRN
```

COPY and TYPE do not permit you to execute other commands while the file is printing.

If you want a particular type style or print pitch you can make these settings from the control panel before you start printing. See Chapter 2.

If you print from the DOS command level very often, it will be advantageous to create a printer setup file. Then instead of setting pitches etc. manually each time, you can complete the setup with a single command from your computer. For example, you can create a file containing printer commands to set the right and left margins, select letter quality, and select elite pitch. You can find the commands in Appendix B. We suggest the following:

- Letter quality                    <ESC> “x”    “l”
- Elite pitch                        <ESC> “!”    <l>
- Left and right margins    <ESC> “X” <l2> <92>

<ESC> “!” <l> is a powerful command that, in addition to selecting elite pitch, cancels unwanted features such as underlining which might be left from previous commands. The angle brackets around the <l> indicate character code l, which is a control code, not the printable digit “l”.

<ESC> “X” <l2> <92> sets the left margin in column 12 and the right margin in column 92. This will give a 6.7-inch, 80-column printed line with a one-inch left margin. (Elite has 12 characters per inch). <l2> is a control code; <92> is the character “\”, as you can verify in Appendix D.

You may want to place additional commands in this file, such as line spacing and bottom margin commands. Or you may want to create a variety of setup files with a different set of commands in each.

To avoid excess line feeds, you should place the commands on one line in the setup file. You may or may not be able to generate a setup file with word-processing software; it depends on whether your software lets you enter control codes. If your system includes the file EDLIN.COM, however, you can easily create a setup file with the DOS line editor.

An appropriate name for this setup file would be LQELITE.DAT. To use the DOS line editor, type the command EDLIN LQELITE.DAT, then type the underlined parts of the following display. Press RETURN at the end of each line. Don't type the symbol “^”. This symbol means to hold the CTRL key down while pressing the next key: for example, ^V means to type CTRL-V. ^C means to type CTRL-C, which indicates the end of the input.

```
A>EDLIN LQELITE.DAT
New file
*I
```

```
1: *^V[x1^V[!^VA^V[X^VL\
2: *^C
```

### \*E

^V indicates that the following character is a control code. ^V[ enters the <ESC> code. <ESC> has character code 27, and “[” is the 27th character in ASCII sequence from A. Similarly, ^VA enters the control code <1> and ^VL enters the control code <12>. See your DOS manual if you need further information about EDLIN.

You can now set up the printer by sending it the file LQELITE.DAT. To avoid unnecessary logging of commands, switch hard-copy output off (by pressing CTRL-PRTSC if hard copy is on). To print the file README.DOC in LQ elite type, give the following two commands:

```
A>COPY LQELITE.DAT PRN
A>PRINT README.DOC
```

For greater convenience you can make a batch file that will set up the printer and print any specified file with a single command. To create such a batch file with the name LQPRINT.BAT, type in the first four lines shown next. ^Z means to press the CTRL and Z keys simultaneously. To use this file to print README.DOC, type the fifth line.

```
A>COPY CON LQPRINT.BAT
COPY LQELITE.DAT PRN
PRINT %1
^Z
A>LQPRINT README.DOC
```

The first above line is a copy command from the CONsole screen to a file named LQPRINT.BAT. The next two lines are the contents of this file. The %1 is a dummy parameter: whatever file name you type after LQPRINT will be substituted for %1 and printed.

## **PROGRAMMING THE PRINTER WITH BASIC**

As an example of programming the printer in Microsoft BASIC, we have listed the program for the IBM-PC that printed the sample of features shown at the beginning of this manual. This program runs in the printer's Standard mode (DIP switch 1-6 ON).

```

1000 ' Set control codes
1010 E$=CHR$(27) 'Escape code
1020 D$=E$+"x0" 'Draft quality
1030 L$=E$+"x1" 'Letter quality
1040 C$=E$+"k0"+L$ 'Courier characters
1050 P$=E$+"k2"+L$ 'Prestige characters
1060 O$=E$+"k3"+L$ 'Orator characters
1070 S$=E$+"k4"+L$ 'Script characters
1080 H$=CHR$(9) 'Horizontal tab
1090 P1$=E$+"P" 'Pica pitch
1100 ' Start printing
1110 WIDTH "LPT1:",255
1120 LPRINT E$;"D";CHR$(3);CHR$(24);CHR$(0);
1130 LPRINT C$;"Type styles are:"
1140 LPRINT H$;D$;"Draft characters,";
1150 LPRINT H$;C$;"Courier characters,"
1160 LPRINT H$;P$;"Prestige characters,";
1170 LPRINT H$;O$;"Orator characters,"
1180 LPRINT H$;S$;"Script characters,"
1190 LPRINT E$;"4"; 'Select italics
1200 LPRINT H$;D$;"and ";C$;"italics ";P$;"for ";
1210 LPRINT O$;"all ";S$;"styles."
1220 LPRINT E$;"5" 'Cancel italics
1230 LPRINT C$;"Print pitches are:"
1240 LPRINT H$;P1$;"Pica pitch (10 CPI),";
1250 LPRINT H$;E$;"M";"Elite pitch (12 CPI),"
1260 LPRINT H$;E$;"g";"Semi-condensed pitch (15 CPI),";
1270 LPRINT H$;P1$;
1280 LPRINT CHR$(15); 'Select condensed print
1290 LPRINT "Condensed pica pitch (17 CPI),"
1300 LPRINT H$;E$;"M";"Condensed elite pitch (20 CPI),";
1310 LPRINT CHR$(18) 'Cancel condensed print
1320 LPRINT H$;E$;"p1"; 'Select proportional spacing
1330 LPRINT P1$;"Normal proportional, ";
1340 LPRINT H$;CHR$(15);"and condensed proportional.";
1350 LPRINT CHR$(18);
1360 LPRINT E$;"p0" 'Cancel proportional spacing
1370 LPRINT
1380 LPRINT H$;E$;"w1";"Double-height,";E$;"w0"
1390 LPRINT H$;E$;"W1";"Double width,";E$;"W0"
1400 LPRINT H$;CHR$(28);"E";CHR$(2);"Triple width,";
1410 LPRINT CHR$(28);"E";CHR$(0)
1420 LPRINT H$;E$;"h";CHR$(1);"Double-sized,"
1430 LPRINT H$;E$;"h";CHR$(2);"Quad-sized.";
1440 LPRINT E$;"h";CHR$(0)
1450 LPRINT :LPRINT :LPRINT
1460 LPRINT E$;"Q";CHR$(47) 'Set right margin
1470 LPRINT C$;"Various line and character spacings:"
1480 LPRINT E$;"a1" 'Center text
1490 FOR I=1 TO 7
1500 LPRINT E$;"A";CHR$(I); 'Set line spacing
1510 LPRINT E$;" " ";CHR$(I); 'Increase character space
1520 LPRINT "THE SPACINGS ARE CHANGED"
1530 NEXT I
1540 FOR I=7 TO 1 STEP -1
1550 LPRINT E$;"A";CHR$(I); 'Set line spacing

```

```

1560 LPRINT E$;" ";CHR$(I); 'Increase character space
1570 LPRINT "THE SPACINGS ARE CHANGED"
1580 NEXT I
1590 LPRINT E$;"a0"          'Left justify
1600 LPRINT E$;"3";CHR$(30); 'Set 1/6" line spacing
1610 LPRINT E$;" ";CHR$(0); 'Normal character space
1620 LPRINT :LPRINT
1630 LPRINT C$;"Other features:"
1640 LPRINT H$;E$;"q";CHR$(1);"OUTLINED";",", ";E$;"q";CHR$(0);
1650 LPRINT E$;"q";CHR$(2);"SHADOWED";",", ";E$;"q";CHR$(0);
1660 LPRINT E$;"q";CHR$(3);"OUTLINED WITH SHADOWED";",", ";
1670 LPRINT E$;"q";CHR$(0)
1680 LPRINT H$;E$;"E";"Emphasized";E$;"F";",", ";
1690 LPRINT E$;"G";"Double-strike";E$;"H";",", "
1700 LPRINT H$;E$;"-1";"Underlining";E$;"-0";",", ";
1710 LPRINT E$;" 1";"Overlining";E$;" 0";",", "
1720 LPRINT H$;E$;"SO";"SUPERSCRIPT";E$;"T";",", ";
1730 LPRINT E$;"S1";"SUBSCRIPT";E$;"T";",", "
1740 LPRINT H$;C$;"Download characters: ";
1750 GOSUB 2520
1760 LPRINT E$;"SO";          'Select superscript
1770 LPRINT E$;"%1";         'Select download character
1780 FOR I=1 TO 5
1790 LPRINT CHR$(60);       'Print download character
1800 NEXT I
1810 LPRINT E$;"%0";        'Select normal character
1820 LPRINT E$;"T";         'Cancel superscript
1830 GOSUB 2650
1840 LPRINT E$;"%1";        'Select download character
1850 FOR I=1 TO 5
1860 LPRINT CHR$(60);       'Print download character
1870 NEXT I
1880 LPRINT E$;"%0";        'Select normal character
1890 GOSUB 2520
1900 LPRINT E$;"S1";        'Select subscript
1910 LPRINT E$;"%1";        'Select download character
1920 FOR I=1 TO 5
1930 LPRINT CHR$(60);       'Print download character
1940 NEXT I
1950 LPRINT E$;"%0";        'Select normal character
1960 LPRINT E$;"T"          'Cancel subscript
1970 LPRINT H$;C$;"Dot graphics:";CHR$(13);
1980 DIM LOGO$(4)
1990 RESTORE 3230
2000 FOR ROW=1 TO 4
2010 FOR COL=1 TO 100
2020 READ GD
2030 LOGO$(ROW)=LOGO$(ROW)+CHR$(GD)
2040 NEXT COL
2050 NEXT ROW
2060 LPRINT E$;"A";CHR$(8); 'Set 8/60" line spacing
2070 FOR ROW=1 TO 4
2080 LPRINT E$;"f0";CHR$(17);
2090 LPRINT E$;"*";CHR$(0); 'Select normal density
2100 LPRINT CHR$(100);CHR$(0);
2110 LPRINT LOGO$(ROW)

```



```

2120 NEXT ROW
2130 LPRINT E$;"@"           'Initialize printer
2140 END
2500 '
2510 ' SUBROUTINES
2520 ' Define super/subscript download character
2530 LPRINT E$;"S1";E$;";";CHR$(0);CHR$(0);CHR$(0);
2540 LPRINT E$;"&";CHR$(0);CHR$(60);CHR$(60);
2550 RESTORE 3020
2560 READ LS :LPRINT CHR$(LS);
2570 READ CW :LPRINT CHR$(CW);
2580 READ RS :LPRINT CHR$(RS);
2590 FOR M=1 TO CW*2
2600 READ MM
2610 LPRINT CHR$(MM);
2620 NEXT M
2630 RETURN
2640 '
2650 ' Define LQ pica download character
2660 LPRINT C$;
2670 LPRINT E$;"&";CHR$(0);CHR$(60);CHR$(60);
2680 RESTORE 3100
2690 READ LS :LPRINT CHR$(LS);
2700 READ CW :LPRINT CHR$(CW);
2710 READ RS :LPRINT CHR$(RS);
2720 FOR M=1 TO CW*3
2730 READ MM
2740 LPRINT CHR$(MM);
2750 NEXT M
2760 RETURN
3000 '
3010 ' DATA
3020 ' Super/subscript download character data
3030 DATA 7, 23, 6
3040 DATA 12, 0, 16, 0, 44, 0, 80, 0, 44,120
3050 DATA 64,128, 33,120, 94,128, 33,120, 94,128
3060 DATA 33, 24, 66, 0, 33, 24, 94,128, 33,120
3070 DATA 94,128, 33,120, 64,128, 44,120, 80, 0
3080 DATA 44, 0, 16, 0, 12, 0
3090 '
3100 ' LQ pica download characer data
3110 DATA 4, 29, 3
3120 DATA 7, 0, 0, 8, 0, 0, 23, 0, 0
3130 DATA 40, 0, 0, 19, 15,192, 40, 16, 0
3140 DATA 80, 47,192, 32, 80, 0, 80,175,192
3150 DATA 47, 80, 0, 80,175,192, 47, 80, 0
3160 DATA 80,163,192, 33, 64, 0, 80,163,192
3170 DATA 33, 64, 0, 80,163,192, 47, 80, 0
3180 DATA 80,175,192, 47, 80, 0, 80,175,192
3190 DATA 32, 80, 0, 80, 47,192, 40, 16, 0
3200 DATA 19, 15,192, 40, 0, 0, 23, 0, 0
3210 DATA 8, 0, 0, 7, 0, 0
3220 '
3230 ' Dot graphics data
3240 DATA 0, 0, 0, 0, 1, 3, 7, 7, 7, 15
3250 DATA 14, 14, 14, 14, 14, 7, 7, 3, 3, 15

```

```

3260 DATA 15, 15, 0, 0, 0, 0, 0, 0, 0, 0
3270 DATA 0, 1, 3, 3, 7, 7, 15, 14, 14, 14
3280 DATA 14, 15, 7, 7, 7, 3, 0, 0, 0, 0
3290 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3300 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3310 DATA 1, 3, 7, 7, 7, 15, 14, 14, 14, 14
3320 DATA 14, 7, 7, 3, 3, 15, 15, 15, 0, 0
3330 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3340 DATA 0, 0, 60, 255, 255, 255, 255, 255, 143, 15
3350 DATA 7, 7, 7, 7, 3, 3, 3, 131, 193, 241
3360 DATA 240, 240, 0, 0, 0, 0, 0, 0, 0, 1
3370 DATA 121, 253, 253, 255, 255, 255, 143, 7, 7, 7
3380 DATA 31, 253, 252, 248, 248, 240, 192, 0, 7, 15
3390 DATA 31, 31, 15, 7, 3, 0, 0, 0, 0, 0
3400 DATA 0, 0, 0, 0, 0, 0, 0, 0, 60, 255
3410 DATA 255, 255, 255, 255, 143, 15, 7, 7, 7, 7
3420 DATA 3, 3, 3, 131, 193, 241, 240, 240, 0, 0
3430 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3440 DATA 0, 31, 31, 3, 129, 128, 192, 192, 192, 192
3450 DATA 192, 224, 224, 224, 224, 240, 255, 255, 255, 255
3460 DATA 255, 127, 0, 0, 0, 0, 63, 127, 255, 255
3470 DATA 255, 255, 193, 128, 128, 128, 128, 192, 224, 240
3480 DATA 252, 255, 255, 255, 127, 63, 31, 7, 7, 31
3490 DATA 254, 252, 248, 224, 128, 0, 0, 3, 7, 7
3500 DATA 7, 3, 0, 0, 0, 0, 0, 31, 31, 3
3510 DATA 129, 128, 192, 192, 192, 192, 192, 224, 224, 224
3520 DATA 224, 240, 255, 255, 255, 255, 255, 127, 0, 0
3530 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3540 DATA 0, 248, 248, 240, 224, 224, 112, 112, 56, 56
3550 DATA 56, 56, 56, 120, 120, 240, 240, 224, 224, 192
3560 DATA 128, 0, 0, 0, 0, 0, 192, 224, 240, 240
3570 DATA 240, 248, 248, 248, 120, 120, 56, 56, 56, 56
3580 DATA 48, 112, 224, 224, 224, 224, 240, 240, 248, 248
3590 DATA 120, 120, 56, 56, 56, 56, 120, 240, 224, 224
3600 DATA 192, 128, 0, 0, 0, 0, 0, 248, 248, 240
3610 DATA 224, 224, 112, 112, 56, 56, 56, 56, 56, 120
3620 DATA 120, 240, 240, 224, 224, 192, 128, 0, 0, 0
3630 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

```

## ***How the program works***

This program begins by assigning a number of printer commands to BASIC string variables (lines 1000 to 1090). You can find most of these commands near the beginning of Appendix B.

The WIDTH "LPT1:" 255 statement in line 1110 means infinite line width. It prevents the IBM-PC from inserting unwanted carriage returns and line feeds in graphics data.

Actual printing begins in line 1120. Using the preassigned commands, the program prints samples of its different type styles, including a line showing all styles in italics, followed by samples of the print pitches, then some double and quadruple-sized printing.

Next comes the central attraction of the program: a line of text printed fourteen times in expanding and contracting loops to give a barrel effect. The work is done by four printer commands: a command setting the right margin (line 1460); a centering command (line 1480); a command to vary the line spacing (lines 1500 and 1550); and a command to micro-adjust the space between characters (lines 1510 and 1560).

Next the program returns to normal spacing and gives a demonstration of the printer's word-processing abilities: outlined printing, bold printing, underlining, subscripts, etc.

The row of telephone symbols in the next printed line is created by downloading two new character patterns, which are printed in place of the character "<" (character 60). Details can be found in Appendix C.

The final part of the program uses dot graphics to print an "S&S" logo. The dot pattern of the logo was originally laid out on graph paper, then converted to the data in lines 3240 to 3630 with the help of a calculator. Each number represents eight vertical dots. (See "Graphics commands" in Appendix B for details.)

The pattern is printed in four rows, each eight dots high and 100 dots wide. Lines 1980 to 2050 read the dot data into a string array variable named LOGO\$. Line 2060 sets the line spacing to 8/60 inch so that the rows will connect vertically. The loop in lines 2070 to 2120 does the printing in four passes of the print head.

This program can also be run in IBM mode (DIP switch 1-6 OFF) if you change a few of the lines as shown below to allow for differences in some of the commands. You will get a cylinder instead of a barrel effect, because the IBM mode does not have any command to micro-adjust the character spacing.

Modifications for IBM mode:

```
1090 PI$=CHR$(18)      'Pica pitch
1190 LPRINT CHR$(28);"4"; 'Select italics
1220 LPRINT CHR$(28);"5" 'Cancel italics
1260 ' LPRINT H$;E$;"g";"Semi-condensed pitch (15 CPI),";
1300 ' LPRINT H$;E$;"M";"Condensed elite pitch (20 CPI),";
1400 ' LPRINT H$;CHR$(28);"E";CHR$(2);"Triple width,";
1460 LPRINT CHR$(28);"Q";CHR$(47) 'Set right margin
1500 LPRINT E$;"A";CHR$(1);E$;"2"; 'Set line spacing
1510 ' LPRINT E$;" ";CHR$(1); 'Increase character space
1550 LPRINT E$;"A";CHR$(1);E$;"2"; 'Set line spacing
1560 ' LPRINT E$;" ";CHR$(1); 'Increase character space
```

```
1600 LPRINT E$;"3";CHR$(36); 'Set 1/6" line spacing
1610 ' LPRINT E$;" ";CHR$(0); 'Normal character space
1640 ' LPRINT H$;E$;"q";CHR$(1);"OUTLINED";", ";E$;"q";CHR$(0);
1650 ' LPRINT E$;"q";CHR$(2);"SHADOWED";", ";E$;"q";CHR$(0);
1660 ' LPRINT E$;"q";CHR$(3);"OUTLINED WITH SHADOWED";", ";
1670 ' LPRINT E$;"q";CHR$(0)
2060 LPRINT E$;"A";CHR$(8);E$;"2"; ' Set 8/72" line spacing
2530 LPRINT E$;"S1";CHR$(28);":";CHR$(0);CHR$(0);CHR$(0);
2540 LPRINT E$;"=";CHR$(0);CHR$(60);CHR$(60);
2670 LPRINT E$;"=";CHR$(0);CHR$(60);CHR$(60);
```

---

# Chapter 5

# MAINTENANCE AND TROUBLESHOOTING

---

Dust and heat will make any mechanism wear more quickly. The best maintenance is preventive, and the first step is correct location of the printer. This is covered in greater detail in Chapter 1, but in general an environment comfortable for humans is best for both the computer and the printer. Subjects covered in this chapter are:

- Cleaning the printer
- Replacing the ribbon
- Replacing the print head
- Replacing the battery in the RAM card
- Troubleshooting

## CLEANING THE PRINTER

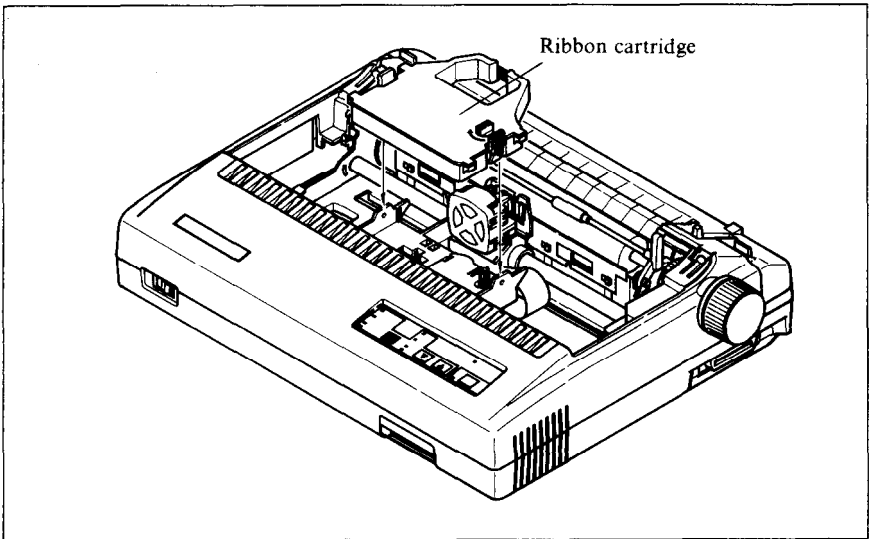
Cleaning the printer regularly will prolong its service life. Use a damp cloth on the exterior every week or so. For stubborn dirt, you may moisten the cloth with alcohol or water containing a mild detergent, but be careful not to spill any liquid into the interior of the printer.

Use a soft brush to remove paper dust and lint from the interior. A small vacuum cleaner can also make this task easier, but be very careful not to bend or injure any electronic parts or wiring. The printer contains delicate electronic parts, so only clean those places where you have easy access.

## REPLACING THE RIBBON

The printer uses an endless-type ribbon cartridge in which the ribbon is recycled automatically. When the print becomes faint, it is time to replace the ribbon cartridge.

To remove the old cartridge, take off the top cover, grasp the ribbon cartridge by the two arms at the both sides and lift straight up. To fit the new cartridge, guide the ribbon between the print head and platen, then press down until the cartridge snaps into place. See Figure 5-1.



**Figure 5-1.** Replacing the ribbon cartridge

## REPLACING THE PRINT HEAD

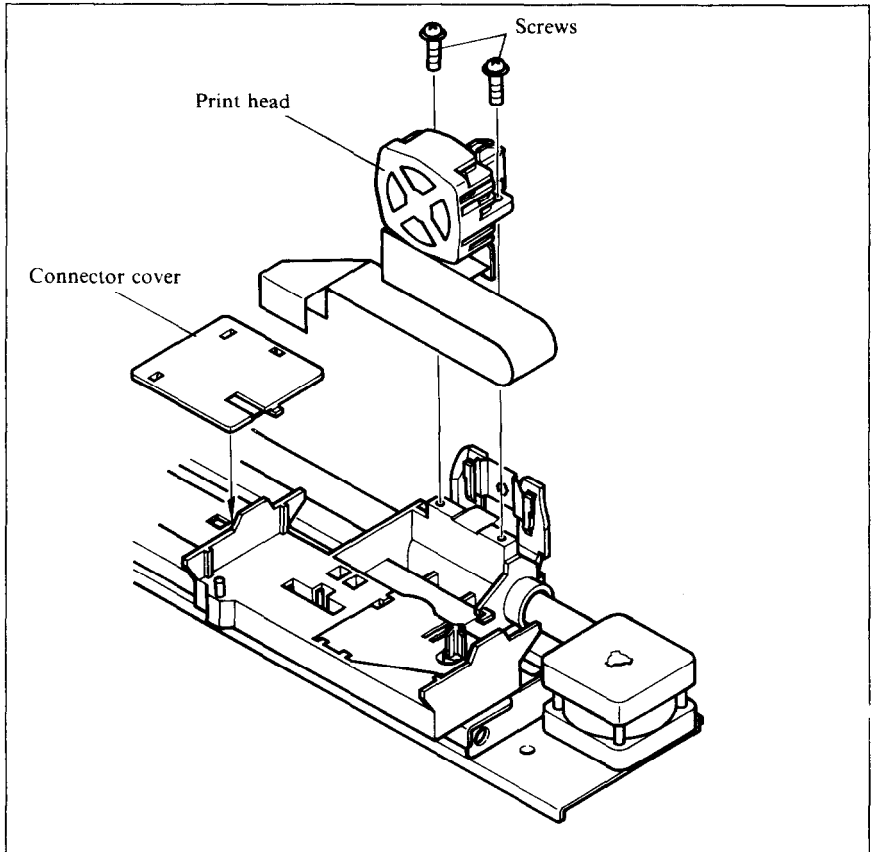
The dot matrix print head has a life of about 200 million dots, or years of normal use. When printing is too light even after replacing the ribbon, you'll know that the print head has reached the end of its service life. To replace the print head, follow the procedure below.

As you remove the old print head, note carefully how the cable is threaded, so that you can thread the new cable in the same way.

**Warning:** The print head becomes hot during operation. If you have been using the printer, wait awhile so that the print head can cool off.

1. Turn power OFF and unplug the power cord.
2. Remove the top cover and ribbon cartridge.
3. Move the print head carriage toward the right until you can see the connector cover. Remove the connector cover and pull the cable free from the connector.
4. Unscrew the two screws that hold the print head in place and set them aside.
5. Disengage the cable from the tabs holding it down, then remove the print head.
6. For easy installation of the new print head, move the carriage toward the left end of the rail.

7. Place the new print head on its support, seating it on the two pins.
8. Thread the new cable the same way as the old, securing it under the tabs on the print head carriage.
9. Plug the cable into the connector, inserting it as far as it will go.



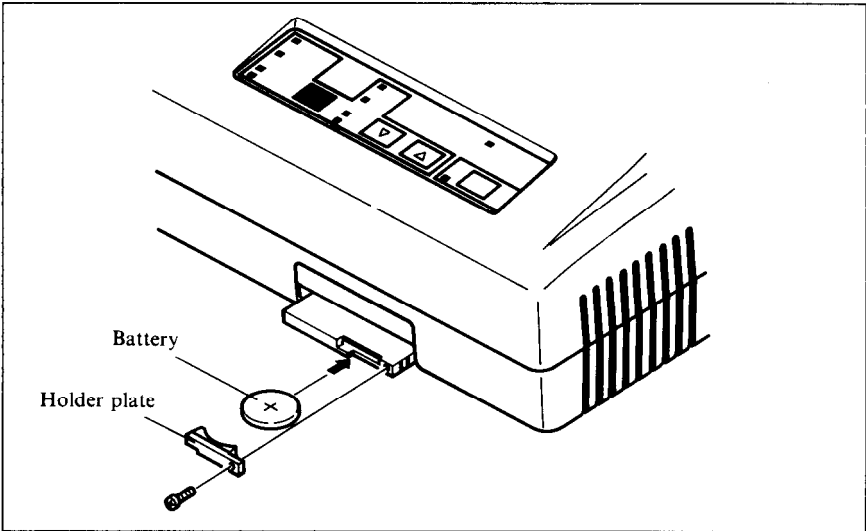
**Figure 5-2.** Replacing the print head

10. Fasten the print head down with the two screws.
11. Move the carriage back toward the right and replace the connector cover. Slide the connector cover to the left until it locks into place.
12. Replace the ribbon cartridge and top cover, and plug the power cord back in.

## REPLACING THE BATTERY IN THE RAM CARD

The optional RAM card has an internal battery that backs up the stored data even when the card is removed from the printer. This battery can be used for more than four years. To avoid losing data from the RAM card, you should replace the battery before the end of its service life. Follow the procedure below.

1. Insert the RAM card in the printer as described in Chapter 1.
2. Turn the power switch on to supply power to the RAM card.
3. Unscrew the screw that holds the battery in place and set it aside.
4. Remove the old battery, and install the new battery the same way as the old.
5. Fasten the battery holder plate with the screw.
6. Turn off the power switch and remove the RAM card.



**Figure 5-3.** Replacing the battery



## TROUBLESHOOTING

### ■ *If the printer doesn't print:*

- Check the Power and On Line indicators. Both must be on.
- Check that the interface cable is securely plugged in at the computer and printer ends.
- Make a test print. (Turn power OFF, hold the On Line or Paper Feed switch down, then turn power ON.) If the test print succeeds, the problem is not with the printer; try a different printing command, or try using a different cable. If the test print fails, have the printer checked by a qualified serviceman.

### ■ *If fanfold paper becomes stuck:*

- Turn power off, take off the rear cover, remove the paper, and reload the paper as described in Chapter 1.
- Make sure the paper is placed so that it feeds into the printer straight.

### ■ *If label paper becomes stuck:*

- Have a qualified serviceman remove any label paper that adheres inside the printer. Do not attempt to remove it yourself.
- Avoid using label paper with any exposed adhesive areas.

### ■ *If printing is faint, incomplete, or unclear:*

- Check that the ribbon cartridge is installed correctly. If the ribbon cartridge is old, replace it.
- Adjust the printing gap. See Chapter 1.
- If ribbon replacement or gap adjustment does not solve the problem, replace the print head.

### ■ *If all text is printed on the same line:*

- Set DIP switch 1-8 to the OFF (front) position.

### ■ *If line spacing is twice as wide as expected:*

- Set DIP switch 1-8 to the ON (back) position.

### ■ *If you can't print to the end of the page:*

- This is normal. The printer's paper-out detector detects the end of the paper and stops printing about an inch above the end.
- You can make the printer ignore the paper-out detector by setting DIP switch 1-5 to the OFF (front) position, or by using the <ESC> "8" printer command.

■ ***If the printed characters don't match the characters on the screen:***

- Check DIP switches 2-2 to 2-4. When these switches are not all ON (back), an international character set is selected and some ASCII symbols are changed to other characters. See Appendix D.
- Some software is not able to display international characters on the screen. If you use an international character set you may want to paste labels on the keyboard.
- If you are using the IBM mode, check DIP switch 1-7. Some international characters and symbols do not print when this switch is OFF (front).

■ ***If some printer commands are ignored or executed incorrectly:***

- Check that the setting of DIP switch 1-6 matches the type of printer your software supports: ON (back) for Star or Epson; OFF (front) for IBM.
- A few commands are mutually exclusive. For example, you cannot get emphasized condensed printing.

■ ***If you have problems with horizontal tabulation:***

- Don't change the margins after setting tabs.
- Don't change the print pitch after setting tabs. The physical positions of the tab stops do not adjust to the new print pitch.

■ ***If you have problems with graphics:***

- If you are using commercial software, check that it supports this printer, or a Star, Epson or IBM printer, and that DIP switch 1-6 is set correctly: ON (back) for Star or Epson; OFF (front) for IBM.
- Use a hex dump to verify the codes the printer is receiving. See the graphics command descriptions in Appendix B. Some computers insert unwanted commands (such as carriage returns and line feeds) in graphics data, or change the values of certain codes.
- BASIC programs may require a WIDTH statement. Check your BASIC manual.

■ ***If you have problems with download characters:***

- Check that DIP switch 2-1 is OFF (front).
- Make the same checks as for graphics problems.

---

# Appendix A

## TECHNICAL SPECIFICATIONS

---

### ■ **Printing Mechanism**

|                    |  |
|--------------------|--|
| Printing method    | Serial impact dot matrix   |
| Printing speed     | 142 characters per second (draft pica)<br>47 characters per second (LQ pica) |
| Printing direction |  |
| Text:              | Bidirectional or unidirectional (selectable), logic seeking                  |
| Dot graphics:      | Unidirectional, logic seeking  |
| Print head         | 24 Pins<br>Life: 200 million dots  |
| Ribbon             | Black fabric ribbon cartridge<br>Life: 2 million draft characters            |
| Paper feed         | Friction and push-tractor feed<br>Semiautomatic sheet loading                |
| Paper feed speed   | 3.4 inches/second (during page feed)   |

### ■ **Interface and Emulation**

|                 |   |
|-----------------|---|
| Interface       | Centronics-compatible, 7 or 8 bit, TTL-level  |
| Data buffer     | 7K bytes when not used for download characters<br>1-Line buffer when using download |
| Emulation modes | Epson LQ-800 and IBM Proprinter X24   |

### ■ **Switches and Indicators**

|               |  |
|---------------|--|
| Power switch  | Rocker switch                          |
| Control panel | 4 Membrane switches, 10 LED indicators |
| DIP switches  | 16 pins                                |

Special features

Panel pitch/style lock-in  
Forward and reverse micro-feed  
Paper parking  
Hexadecimal dump

## ■ **Dot Matrix Size**

Draft character:

24 x 9 dots (Pica)  
24 x 9 dots (Elite)  
16 x 7 dots (Semi-condensed)  
24 x 9 dots (Condensed pica)  
24 x 9 dots (Condensed elite)  
16 x 7 dots (Super/Subscript)

LQ characters:

24 x 35 dots (Pica)  
24 x 29 dots (Elite)  
16 x 23 dots (Semi-condensed)  
24 x 18 dots (Condensed pica)  
24 x 15 dots (Condensed elite)  
16 x 23 dots (Super/Subscript)

Dot graphics:

8 x 480 dots at 60 dpi (Single density)  
8 x 640 dots at 80 dpi (CRT I)  
8 x 720 dots at 90 dpi (CRT II)  
8 x 960 dots at 120 dpi (Double density)  
8 x 960 dots at 120 dpi (High speed)  
8 x 1920 dots at 240 dpi (Quadruple density)  
24 x 480 dots at 60 dpi (Single density)  
24 x 720 dots at 90 dpi (CRT II)  
24 x 960 dots at 120 dpi (Double density)  
24 x 1440 dots at 180 dpi (Triple density)  
24 x 2880 dots at 360 dpi (Hex density)

## ■ **Character Sets**

Standard character set

96 ASCII characters

IBM character set

244 characters (ASCII, international characters, symbols, block graphics)

Download characters

Max. 50 (Expandable to 221 with optional RAM card)

International character sets

14 sets (USA, France, Germany, England, Denmark I, Denmark II, Sweden, Italy, Spain I, Spain II, Japan, Norway, Latin America, Denmark/Norway)

## ■ **Type Styles and Pitches**

|                        |  |
|------------------------|--|
| Type styles            | Draft 12, Draft 15, Courier 10, Courier 12, Courier 15, Courier proportional, Prestige 10, Prestige 12, Prestige 15 Prestige proportional, Orator 12, Orator 15, Script 10, Script 12, Script 15                           |
| Extra-large characters | Double width, triple width, double height, double width and height, quadruple width and height   |
| Print pitches          | Pica (10 cpi)<br>Elite (12 cpi)<br>Semi-condensed (15 cpi) [Standard mode only]<br>Condensed pica (17 cpi)<br>Condensed elite (20 cpi) [Standard mode only]<br>Proportional spacing [Courier and Prestige characters only] |
| Line spacing           | 1/6 inch (standard)<br>1/8, <i>n</i> /60, <i>n</i> /72, <i>n</i> /180, <i>n</i> /216, or <i>n</i> /360 inch (programmable)   |
| Column width           | 8 inches   |
| Pica:                  | 80 characters  |
| Elite:                 | 96 characters  |
| Semi-condensed:        | 120 characters   |
| Condensed pica:        | 137 characters   |
| Condensed elite:       | 160 characters   |

## ■ **Paper Specifications**

|                  |   |
|------------------|---|
| Single sheets    | 140 to 216 mm (5.5 to 8.5 inches) wide,<br>0.07 to 0.10 mm thick  |
| Fanfold paper    | 102 to 254 mm (4 to 10 inches) wide<br>0.07 to 0.10 mm thick (single-ply)<br>Max. 0.28 mm thick (3-ply) |
| Number of copies | Max. 3 (original + 2 copies)  |

## ■ **Dimensions and Weight**

|            |   |
|------------|---|
| Dimensions | Width 410 mm (16.1 inches)<br>Depth 328 mm (12.9 inches)<br>Height 120 mm ( 4.7 inches) |
| Weight     | 6.4 kg (14.1 pounds)  |

## ■ **Electrical Specifications**

|                       |  |
|-----------------------|--|
| Line voltage          | 120 VAC $\pm$ 10%<br>220 VAC $\pm$ 10%<br>240 VAC $\pm$ 10%<br>(varies according to the country of purchase) |
| Line frequency        | 50 or 60 Hz  |
| Power consumption     | Typ. 39W, Max. 135W  |
| Insulation resistance | 10 megohms between AC power line and chassis   |
| Dielectric strength   | Withstands 1 kVAC rms at 50 or 60 Hz between AC power line and chassis for at least 1 minute                 |

## ■ **Environmental Requirements**

|                       |  |
|-----------------------|--|
| Operating temperature | 5 to 40°C (41 to 104°F)                |
| Operating humidity    | 10% to 80% (no condensation)           |
| Storage temperature   | -30 to 65°C (-22 to 149°F)             |
| Storage humidity      | 10% to 95% (at 40°C) (no condensation) |

## ■ **Option**

Automatic sheet feeder

## ■ **Interface Signals**

| Pin No. | Signal Name | Direction | Function   |
|---------|-------------|-----------|--|
| 1       | STROBE      | IN        | Goes from High to Low (for at least 0.5 microseconds) when data are valid.   |
| 2       | DATA1       | IN        | Eight-bit character data. DATA8 is the most significant bit. DATA1 is the least significant bit. High is logic 1 and Low is logic 0. |
| 3       | DATA2       | IN        |  |
| 4       | DATA3       | IN        |  |
| 5       | DATA4       | IN        |  |
| 6       | DATA5       | IN        |  |
| 7       | DATA6       | IN        |  |
| 8       | DATA7       | IN        |  |
| 9       | DATA8       | IN        |  |

| Pin No. | Signal Name    | Direction | Function   |
|---------|----------------|-----------|--|
| 10      | ACK            | OUT       | 5-Microsecond<br>Low pulse acknowledges receipt of data.   |
| 11      | BUSY           | OUT       | Low when the printer is ready to accept data.  |
| 12      | PAPER<br>OUT   | OUT       | Goes High if the printer runs out of paper.<br>Can be held Low permanently by turning<br>DIP switch 1-5 off. |
| 13      | SELECTED       | OUT       | High when the printer is on-line.  |
| 14-15   | N/C            |           | Unused   |
| 16      | SIGNAL<br>GND  |           | Signal ground.   |
| 17      | CHASSIS<br>GND |           | Printer's chassis ground, isolated from<br>signal ground.  |
| 18      | + 5VDC         | OUT       | External supply of + 5VDC.   |
| 19-30   | GND            |           | Twisted pair return signal ground level.   |
| 31      | RESET          | IN        | Low input resets the printer to its power-up<br>condition.   |
| 32      | ERROR          | OUT       | Goes Low to signal that the printer cannot<br>print due to an error condition.                               |
| 33      | EXT GND        |           | External ground.   |
| 34, 35  | N/C            |           | Unused.  |
| 36      | SELECT IN      | IN        | Always High.   |

# MEMO



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# Appendix B

## PRINTER CONTROL COMMANDS

---

This appendix describes the printer's control commands. The commands are arranged by function. The name of each command is followed by a table like the one below:

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "x" "1" | 27 120 49 | 1B 78 31    |
|      | <ESC> "x" <1> | 27 120 1  | 1B 78 01    |

**Mode:** Indicates the mode in which the command is recognized.  
Std. Standard mode (DIP switch 1-6 on)  
IBM IBM mode (DIP switch 1-6 off)  
Both Both Standard and IBM modes

**ASCII:** Indicates the ASCII coding of the command. Control characters are enclosed in pointed brackets: For example, <1> means character code 1.

**Decimal:** Gives the command in decimal character codes.

**Hexadecimal:** Gives the command in hexadecimal character codes.

Parameters for which values must be supplied are indicated by italic letters such as *n*.

Many commands have alternative forms. Some commands use <ESC> (character code 27) in Standard mode and <FS> (character code 28) in IBM mode. Other commands have parameters that can be specified as either character codes or digit characters, like the parameter 1 in the sample command above.

### FONT CONTROL COMMANDS

#### Select draft quality characters

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "x" "0" | 27 120 48 | 1B 78 30    |
|      | <ESC> "x" <0> | 27 120 0  | 1B 78 00    |

Changes from letter quality to draft quality. Ignored if the printer was set to stay in panel style at power-on.

## Select LQ characters

| Mode | ASCII             | Decimal   | Hexadecimal |
|------|-------------------|-----------|-------------|
| Both | < ESC > "x" "1"   | 27 120 49 | 1B 78 31    |
|      | < ESC > "x" < 1 > | 27 120 1  | 1B 78 01    |

Changes from draft quality to letter quality. Ignored if the printer was set to stay in panel style at power-on.

## Select LQ type style

| Mode | ASCII                | Decimal         | Hexadecimal    |
|------|----------------------|-----------------|----------------|
| Both | < ESC > "k" <i>n</i> | 27 107 <i>n</i> | 1B 6B <i>n</i> |
| Std. | < FS > "C" <i>n</i>  | 28 67 <i>n</i>  | 1C 43 <i>n</i> |

Selects an LQ type style according to the value of *n*. In draft mode, this command remains dormant and takes effect later when LQ is selected by < ESC > "x" 1. Ignored if the printer was set to stay in panel style at power-on.

*n* Type style

- 0 Courier
- 1 Optional font
- 2 Prestige
- 3 Orator
- 4 Script

## Select ornament character

| Mode | ASCII                | Decimal         | Hexadecimal    |
|------|----------------------|-----------------|----------------|
| Std. | < ESC > "q" <i>n</i> | 27 113 <i>n</i> | 1B 71 <i>n</i> |

Selects an ornament character according to the value of *n*.

*n* Character

- 0 Normal
- 1 Outlined
- 2 Shadow
- 3 Outlined with shadow

## Select italic characters

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Std. | < ESC > "4" | 27 52   | 1B 34       |
| IBM  | < FS > "4"  | 28 52   | 1C 34       |

Causes subsequent characters to be printed in italics. Ignored if the printer was set to stay in panel style at power-on.

## Select upright characters

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Std. | <ESC> "5" | 27 53   | 1B 35       |
| IBM  | <FS> "5"  | 28 53   | 1C 35       |

Stops italic printing and causes subsequent characters to be printed upright. Ignored if the printer was set to stay in panel style at power-on.

## Emphasized printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "E" | 27 69   | 1B 45       |

Causes subsequent characters to be emphasized by adding extra thickness to vertical strokes.

## Cancel emphasized printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "F" | 27 70   | 1B 46       |

Cancels emphasized printing.

## Double-strike printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "G" | 27 71   | 1B 47       |

Causes subsequent characters to be printed in double-strike mode with a slight vertical paper motion in between, causing a thickening of horizontal strokes. For bold print, use of double-strike is recommended in LQ mode, and combined use of emphasized and double-strike is recommended in draft mode. Double-strike cannot be used with superscripts or subscripts.

## Cancel double-strike printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "H" | 27 72   | 1B 48       |

Cancels double-strike printing.

## Start underlining

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "-" "1" | 27 45 49 | 1B 2D 31    |
|      | <ESC> "-" <1> | 27 45 1  | 1B 2D 01    |

Causes subsequent characters to be underlined. IBM block graphics characters and spaces skipped by horizontal tabulation are not underlined.

## Stop underlining

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> “_” “0” | 27 45 48 | 1B 2D 30    |
|      | <ESC> “_” <0> | 27 45 0  | 1B 2D 00    |

Stops underlining.

## Start overlining

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> “_” “1” | 27 95 49 | 1B 5F 31    |
|      | <ESC> “_” <1> | 27 95 1  | 1B 5F 01    |

Causes subsequent characters to be overlined. Spaces skipped by horizontal tabulation are not overlined.

## Stop overlining

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> “_” “0” | 27 95 48 | 1B 5F 30    |
|      | <ESC> “_” <0> | 27 95 0  | 1B 5F 00    |

Stops overlining.

## Superscript

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> “S” “0” | 27 83 48 | 1B 53 30    |
|      | <ESC> “S” <0> | 27 83 0  | 1B 53 00    |

Causes subsequent characters to be printed as superscripts. Does not change the character pitch.

## Subscript

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> “S” “1” | 27 83 49 | 1B 53 31    |
|      | <ESC> “S” <1> | 27 83 1  | 1B 53 01    |

Causes subsequent characters to be printed as subscripts. Does not change the character pitch.

## Cancel superscript or subscript

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> “T” | 27 84   | 1B 54       |

Stops printing superscripts or subscripts and returns to normal printing.

## CHARACTER SET COMMANDS

### Select standard character set

| Mode | ASCII           | Decimal   | Hexadecimal |
|------|-----------------|-----------|-------------|
| Both | < ESC > "t" "0" | 27 116 48 | 1B 74 30    |
|      | < ESC > "t" <0> | 27 116 0  | 1B 74 00    |
| Std. | < FS > "I" <0>  | 28 73 48  | 1C 49 30    |
|      | < FS > "I" <0>  | 28 73 0   | 1C 49 00    |

Selects the standard character set. This is the power-up default in Standard mode if DIP switch 1-7 is ON.

### Select IBM character set

| Mode | ASCII           | Decimal   | Hexadecimal |
|------|-----------------|-----------|-------------|
| Both | < ESC > "t" "1" | 27 116 49 | 1B 74 31    |
|      | < ESC > "t" <1> | 27 116 1  | 1B 74 01    |
| Std. | < FS > "I" <1>  | 28 73 49  | 1C 49 31    |
|      | < FS > "I" <1>  | 28 73 1   | 1C 49 01    |

Selects an IBM character set. This is the power-up default in IBM mode if DIP switch 1-7 is OFF.

### Select character set #1

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Both | < ESC > "7" | 27 55   | 1B 37       |

Selects character set #1.

### Select character set #2

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Both | < ESC > "6" | 27 54   | 1B 36       |

Selects character set #2.

### Select international character set

| Mode | ASCII                | Decimal        | Hexadecimal    |
|------|----------------------|----------------|----------------|
| Std. | < ESC > "R" <i>n</i> | 27 82 <i>n</i> | 1B 52 <i>n</i> |
| IBM  | < FS > "R" <i>n</i>  | 28 82 <i>n</i> | 1C 52 <i>n</i> |

Selects an international character set according to the value of *n* as shown next.

| <i>n</i> | Character set | <i>n</i> | Character set  |
|----------|---------------|----------|----------------|
| 0        | U.S.A         | 7        | Spain I        |
| 1        | France        | 8        | Japan          |
| 2        | Germany       | 9        | Norway         |
| 3        | England       | 10       | Denmark II     |
| 4        | Denmark I     | 11       | Spain II       |
| 5        | Sweden        | 12       | Latin America  |
| 6        | Italy         | 13       | Denmark/Norway |

The first eight of these character sets (from U.S.A. to Spain I) can be selected as power-up defaults by DIP switches 2-2 to 2-4.

### **Enable printing of all character codes**

| Mode | ASCII                            | Decimal                   | Hexadecimal               |
|------|----------------------------------|---------------------------|---------------------------|
| IBM  | <ESC>    “\” <i>n1</i> <i>n2</i> | 27 92 <i>n1</i> <i>n2</i> | 1B 5C <i>n1</i> <i>n2</i> |

Enables printing of all characters in the IBM character set, including those assigned to character codes which are normally considered control codes. This command remains in effect for the next *n1* + *n2* x 256 characters, where *n1* and *n2* are numbers between 0 and 255. During this interval no control functions are executed. If a code with no assigned character is received, the printer prints a space.

### **Enable printing of all character codes on next character**

| Mode | ASCII        | Decimal | Hexadecimal |
|------|--------------|---------|-------------|
| IBM  | <ESC>    “^” | 27 94   | 1B 5E       |

This command operates like <ESC> “\” except that it remains in effect for only one character.

### **Select slash zero**

| Mode | ASCII               | Decimal   | Hexadecimal |
|------|---------------------|-----------|-------------|
| Both | <ESC>    “~”    “1” | 27 126 49 | 1B 7E 31    |
|      | <ESC>    “~”    <1> | 27 126 1  | 1B 7E 01    |

Causes subsequent zero characters to be overprinted with a slash.

### **Select normal zero**

| Mode | ASCII               | Decimal   | Hexadecimal |
|------|---------------------|-----------|-------------|
| Both | <ESC>    “~”    “0” | 27 126 48 | 1B 7E 30    |
|      | <ESC>    “~”    <0> | 27 126 0  | 1B 7E 00    |

Causes subsequent zero characters to be printed normally (0), without a slash.

## CHARACTER SIZE AND PITCH COMMANDS

### *Pica pitch*

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Std. | < ESC > "P" | 27 80   | 1B 50       |
| IBM  | < DC2 >     | 18      | 12          |

In Standard mode, changes from either elite or semi-condensed to pica pitch (10 cpi) or from condensed elite to condensed pica (17 cpi). In IBM mode, changes from either elite or condensed to pica (10 cpi). Ignored if the printer was set to stay in panel pitch at power-up.

### *Elite pitch*

| Mode | ASCII        | Decimal | Hexadecimal |
|------|--------------|---------|-------------|
| Both | < ESC > "M"  | 27 77   | 1B 4D       |
| IBM  | < ESC > ":", | 27 58   | 1B 3A       |

In Standard mode, changes from either pica or semi-condensed to elite pitch (12 cpi) or from condensed pica to condensed elite (20 cpi). In IBM mode, changes from either pica or condensed to elite (12 cpi). Ignored if the printer was set to stay in panel pitch at power-up.

### *High-speed elite pitch*

| Mode | ASCII            | Decimal  | Hexadecimal |
|------|------------------|----------|-------------|
| Std. | < FS > "S" "I"   | 28 83 49 | 1C 53 31    |
|      | < FS > "S" < I > | 28 83 1  | 1C 53 01    |

Selects high-speed draft quality with elite pitch. This command becomes effective only after the draft quality and elite pitch have been selected.

### *High-density elite pitch*

| Mode | ASCII            | Decimal  | Hexadecimal |
|------|------------------|----------|-------------|
| Std. | < FS > "S" "0"   | 28 83 48 | 1C 53 30    |
|      | < FS > "S" < 0 > | 28 83 0  | 1C 53 00    |

Selects high-density draft quality with elite pitch. This command becomes effective only after the draft quality and elite pitch have been selected.

### *Semi-condensed pitch*

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Std. | < ESC > "g" | 27 103  | 1B 67       |

Changes from either pica or elite to semi-condensed pitch (15 cpi). Ignored if the printer was set to stay in panel pitch at power-up.

## Condensed printing

| Mode | ASCII      | Decimal | Hexadecimal |
|------|------------|---------|-------------|
| Both | <SI>       | 15      | 0F          |
|      | <ESC> <SI> | 27 15   | 1B 0F       |

In Standard mode, changes from pica to condensed pica (17 cpi) or from elite to condensed elite (20 cpi). In IBM mode, changes from pica to condensed (17 cpi). Ignored if the printer was set to stay in panel pitch at power-up.

## Cancel condensed printing

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <DC2> | 18      | 12          |

In Standard mode, changes from condensed pica to normal pica or from condensed elite to normal elite. In IBM mode, always changes to normal pica. Ignored if the printer was set to stay in panel pitch at power-up.

## Expanded printing

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "W" "1" | 27 87 49 | 1B 57 31    |
|      | <ESC> "W" <1> | 27 87 1  | 1B 57 01    |

Causes subsequent characters to be expanded to double width.

## Cancel expanded printing

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "W" "0" | 27 87 48 | 1B 57 30    |
|      | <ESC> "W" <0> | 27 87 0  | 1B 57 00    |

Stops expanded printing and returns to normal width.

## Expanded printing for one line

| Mode | ASCII      | Decimal | Hexadecimal |
|------|------------|---------|-------------|
| Both | <SO>       | 14      | 0E          |
|      | <ESC> <SO> | 27 14   | 1B 0E       |

Causes subsequent characters in the current line to be expanded to double width. Characters return to normal width after the next line feed (<LF>). The <DC4>, <VT>, <FF>, and <ESC> "W" 0 commands also cancel expanded printing.



## Cancel one-line expanded printing

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <DC4> | 20      | 14          |

Stops one-line expanded printing set with <SO> or <ESC> <SO> .  
Does not cancel <ESC> "W" 1.

## Select proportional spacing

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "p" "1" | 27 112 49 | 1B 70 31    |
|      | <ESC> "p" <1> | 27 112 1  | 1B 70 01    |
| IBM  | <ESC> "P" <1> | 27 80 1   | 1B 50 01    |

Causes subsequent Courier or Prestige characters to be proportionally spaced. Ignored if the printer was set to stay in panel pitch at power-up.

## Select fixed spacing

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "p" "0" | 27 112 48 | 1B 70 30    |
|      | <ESC> "p" <0> | 27 112 0  | 1B 70 00    |
| IBM  | <ESC> "P" <0> | 27 80 0   | 1B 50 00    |

Causes subsequent characters to be printed with fixed character spacing. Ignored if the printer was set to stay in panel pitch at power-up.

## Select master print mode

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| Both | <ESC> "!" <i>n</i> | 27 33 <i>n</i> | 1B 21 <i>n</i> |

Selects a combined print mode according to the value of *n*. The value of *n* is the sum of the values given below for the desired characteristics. Examples: *n* = 1 gives elite; *n* = 9 (1 + 8) gives emphasized elite; *n* = 137 (1 + 8 + 128) gives underlined emphasized elite.

| Function          | <i>n</i> value |
|-------------------|----------------|
| Underline         | 128            |
| Italic [*1]       | 64             |
| Expanded          | 32             |
| Double strike     | 16             |
| Emphasized        | 8              |
| Condensed [*2]    | 4              |
| Proportional [*2] | 2              |
| Elite [*2]        | 1              |

[\*1] Ignored if the printer was set to stay in panel style at power-up.

[\*2] Ignored if the printer was set to stay in panel pitch at power-up.

## Increase character spacing

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| Std. | <ESC> " " <i>n</i> | 27 32 <i>n</i> | 1B 20 <i>n</i> |

Increases the space between characters by *n* dots, where *n* is a number from 0 to 127. Used in microjustification.

## Select double or quadruple size

| Mode | ASCII              | Decimal         | Hexadecimal    |
|------|--------------------|-----------------|----------------|
| Both | <ESC> "h" <i>n</i> | 27 104 <i>n</i> | 1B 68 <i>n</i> |

Selects the size of subsequent characters as shown below. Extra-high characters align along the cap-line of normal characters, with the base line temporarily moving down. Line spacing is temporarily doubled when *n* = 1 and quadrupled when *n* = 2.

| <i>n</i> | Effect                         |
|----------|--------------------------------|
| 0        | Normal size                    |
| 1        | Double-high, double-wide       |
| 2        | Quadruple-high, quadruple-wide |

## Print double-height characters

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "w" "1" | 27 119 49 | 1B 77 31    |
|      | <ESC> "w" <1> | 27 119 1  | 1B 77 01    |
| Std. | <FS> "V" "1"  | 28 86 49  | 1C 56 31    |
|      | <FS> "V" <1>  | 28 86 1   | 1C 56 01    |

Prints subsequent characters at double height without moving the base line, and without changing the line spacing.

## Return to normal height

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "w" "0" | 27 119 48 | 1B 77 30    |
|      | <ESC> "w" <0> | 27 119 0  | 1B 77 00    |
| Std. | <FS> "V" "0"  | 28 86 48  | 1C 56 30    |
|      | <FS> "V" <0>  | 28 86 0   | 1C 56 00    |

Terminates double-height printing and prints subsequent characters at normal height.

## Select character width

| Mode | ASCII               | Decimal        | Hexadecimal    |
|------|---------------------|----------------|----------------|
| Std. | < FS > "E" <i>n</i> | 28 69 <i>n</i> | 1C 45 <i>n</i> |

Selects a character width according to the value of *n* as shown below.

*n* Character width

0 Normal-wide

1 Double-wide

2 Triple-wide

## Select character height, width, and line spacing

| Mode | ASCII   | Decimal                                  | Hexadecimal                                  |
|------|---|--|--|
| Both | < ESC > "[ " @" < 4 ><br>< 0 > < 0 > < 0 > <i>n</i><br><i>m</i> | 27 91 64 4<br>0 0 0 <i>n</i><br><i>m</i> | 1B 5B 40 04<br>00 00 00 <i>n</i><br><i>m</i> |

Selects a combination of character height, width, and line spacing according to the value of *n* and *m*, as below. Does not move the base line.

| <i>n</i> | Line spacing                         | Character height |
|----------|--------------------------------------|------------------|
| 0        | Unchanged                            | Unchanged        |
| 1        | Unchanged                            | Single height    |
| 2        | Unchanged                            | Double height    |
| 16       | Single                               | Unchanged        |
| 17       | Single                               | Single height    |
| 18       | Single                               | Double height    |
| 32       | Double                               | Unchanged        |
| 33       | Double                               | Single height    |
| 34       | Double                               | Double height    |
| <i>m</i> | Character width                      |                  |
| 1        | Single width (same as < ESC > "W" 0) |                  |
| 2        | Double width (same as < ESC > "W" 1) |                  |

Double-height printing temporarily cancels the super/subscript and condensed printing modes, but these modes resume when the printer returns to normal height.

## Select character type and print pitch

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| IBM  | <ESC> "1" <i>n</i> | 27 73 <i>n</i> | 1B 49 <i>n</i> |

Selects a combination of character type and print pitch according to the value of *n* as shown below.

| <i>n</i> | Character type | Print pitch  |
|----------|----------------|--------------|
| 0        | Resident Draft | Pica         |
| 8        | Resident Draft | Elite        |
| 16       | Resident Draft | Condensed    |
| 2        | Resident LQ    | Pica         |
| 10       | Resident LQ    | Elite        |
| 18       | Resident LQ    | Condensed    |
| 3        | Resident LQ    | Proportional |
| 4        | Download Draft | Pica         |
| 12       | Download Draft | Elite        |
| 20       | Download Draft | Condensed    |
| 6        | Download LQ    | Pica         |
| 14       | Download LQ    | Elite        |
| 22       | Download LQ    | Condensed    |
| 7        | Download LQ    | Proportional |

Ignored if the printer was set to stay in panel pitch and/or panel style at power-up.

## VERTICAL POSITION COMMANDS

### Set line spacing to 1/8 inch

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "0" | 27 48   | 1B 30       |

Sets the distance the paper advances or reverses in subsequent line feeds to 1/8 inch.

### Set line spacing to 7/60 or 7/72 inch

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "1" | 27 49   | 1B 31       |

Sets the distance the paper advances or reverses in subsequent line feeds to 7/60 inch (Standard mode) or 7/72 inch (IBM mode).

### Set line spacing to 1/6 inch

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| Std. | < ESC > "2" | 27 50   | 1B 32       |
| IBM  | < FS > "2"  | 28 50   | 1C 32       |

Sets the distance the paper advances or reverses in subsequent line feeds to 1/6 inch.

### Set base unit for line spacing

| Mode | ASCII   | Decimal                           | Hexadecimal                            |
|------|---|-----------------------------------|--|
| IBM  | < ESC > "[ " \ " < 4 ><br>< 0 > < 0 > < 0 > < 0 ><br><i>n</i> | 27 91 92 4<br>0 0 0 0<br><i>n</i> | 1B 5B 5C 04<br>00 00 00 00<br><i>n</i> |

Sets the base unit for the line spacing commands, < ESC > "3" and < ESC > "J". If the value of *n* is 180, the base unit is set to 1/180". If the value of *n* is 216, the base unit is set to 1/216". If otherwise specified, this command is ignored. This command becomes effective only after < ESC > "3" or < ESC > "J" is received. The default base unit is set to 1/216".

### Set line spacing to *n*/180 or *n*/216 inch

| Mode | ASCII                | Decimal        | Hexadecimal    |
|------|----------------------|----------------|----------------|
| Both | < ESC > "3" <i>n</i> | 27 51 <i>n</i> | 1B 33 <i>n</i> |

Sets the distance the paper advances or reverses in subsequent line feeds to *n*/180 inch (Standard mode) or *n*/216 inch (IBM mode), where *n* is between 0 and 255. If *n* = 0, in Standard mode the line-feed distance is set to 0, but in IBM mode this command is ignored.

### Set line spacing to *n*/360 inch

| Mode | ASCII               | Decimal        | Hexadecimal    |
|------|---------------------|----------------|----------------|
| Both | < FS > "3" <i>n</i> | 28 51 <i>n</i> | 1C 33 <i>n</i> |

Sets the distance the paper advances or reverses in subsequent line feeds to *n*/360 inch, where *n* is between 0 and 255. If *n* = 0, the line-feed distance is set to 0.

### Set line spacing to *n*/60 or *n*/72 inch

| Mode | ASCII                | Decimal        | Hexadecimal    |
|------|----------------------|----------------|----------------|
| Std. | < ESC > "A" <i>n</i> | 27 65 <i>n</i> | 1B 41 <i>n</i> |
| IBM  | < FS > "A" <i>n</i>  | 28 65 <i>n</i> | 1C 41 <i>n</i> |

Sets the distance the paper advances or reverses in subsequent line feeds to *n*/60 inch (Standard mode) or *n*/72 inch (IBM mode), where *n* is between 0 and 255. If *n* = 0, the line spacing is set to 0.

## Define line spacing to $n/72$ inch

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| IBM  | <ESC> "A" $n$ | 27 65 $n$ | 1B 41 $n$   |

Defines the distance the paper advances or reverses in subsequent lines feeds to  $n/72$  inch, where  $n$  is between 1 and 85. If  $n = 0$ , this command is ignored. The new line spacing does not take effect until the next <ESC> "2" command.

## Execute <ESC> "A"

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| IBM  | <ESC> "2" | 27 50   | 1B 32       |

Sets the line spacing to the value defined by the last preceding <ESC> "A" command. Sets the line spacing to 1/6 inch if there is no preceding <ESC> "A" command.

## Line feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <LF>  | 10      | 0A          |

Prints the current line and feeds the paper to the next line. If DIP switch 1-2 is ON, also moves the next print position to the left margin. See the preceding commands for the line spacing.

## Reverse line feed

| Mode | ASCII      | Decimal | Hexadecimal |
|------|------------|---------|-------------|
| Both | <ESC> <LF> | 27 10   | 1B 0A       |

Prints the current line and feeds the paper in the reverse direction to the preceding line. If DIP switch 1-2 is ON, also moves the next print position to the left margin. See the preceding commands for the line spacing. Ignored when friction feed is used.

## Select forward feed mode

| Mode | ASCII    | Decimal | Hexadecimal |
|------|----------|---------|-------------|
| Std. | <FS> "F" | 28 70   | 1C 46       |

Cancels the reverse feed mode and selects forward feed mode. This is the default setting at power-up.

## Select reverse feed mode

| Mode | ASCII    | Decimal | Hexadecimal |
|------|----------|---------|-------------|
| Std. | <FS> "R" | 28 82   | 1C 52       |

Selects reverse feed mode. Reverses the direction of all vertical movements. Ignored when friction feed is used.

### **Perform one $n/180$ -inch or $n/216$ -inch line feed**

| Mode | ASCII           | Decimal   | Hexadecimal |
|------|-----------------|-----------|-------------|
| Both | < ESC > "J" $n$ | 27 74 $n$ | 1B 4A $n$   |

Feeds the paper once by  $n/180$  inches (Standard mode) or  $n/216$  inches (IBM mode), where  $n$  is between 0 and 255. Does not move the print position right or left when DIP switch 1-2 is OFF; returns the carriage to the left margin if DIP switch 1-2 is ON. Does not change the line-spacing setting.

### **Perform one $n/180$ -inch reverse line feed**

| Mode | ASCII           | Decimal    | Hexadecimal |
|------|-----------------|------------|-------------|
| Std. | < ESC > "j" $n$ | 27 106 $n$ | 1B 6A $n$   |

Feeds the paper once by  $n/180$  inches in the reverse direction, where  $n$  is between 0 and 255. Does not move the print position right or left when DIP switch 1-2 is OFF; returns the carriage to the left margin if DIP switch 1-2 is ON. Does not change the line-spacing setting. Ignored when friction feed is used.

### **Feed paper $n$ lines**

| Mode | ASCII                 | Decimal       | Hexadecimal  |
|------|-----------------------|---------------|--------------|
| Both | < ESC > "f" "1" $n$   | 27 102 49 $n$ | 1B 66 31 $n$ |
|      | < ESC > "f" < 1 > $n$ | 27 102 1 $n$  | 1B 66 01 $n$ |

Feeds the paper  $n$  lines from the current line, where  $n$  is between 0 and 127.

### **Set top of page at current position**

| Mode | ASCII       | Decimal | Hexadecimal |
|------|-------------|---------|-------------|
| IBM  | < ESC > "4" | 27 52   | 1B 34       |

Sets the current position as the top-of-page position. Note that this can also be done from the control panel.

### **Set page length to $n$ lines**

| Mode | ASCII           | Decimal   | Hexadecimal |
|------|-----------------|-----------|-------------|
| Both | < ESC > "C" $n$ | 27 67 $n$ | 1B 43 $n$   |

Sets the page length to  $n$  lines in the current line spacing, where  $n$  is between 1 and 127 in Standard mode or between 1 and 255 in IBM mode. Changing the line spacing later does not alter the physical page length. The current line becomes the top of the page.

## Set page length to *n* inches

| Mode | ASCII                  | Decimal          | Hexadecimal       |
|------|------------------------|------------------|-------------------|
| Both | <ESC> "C" <0> <i>n</i> | 27 67 0 <i>n</i> | 1B 43 00 <i>n</i> |

Sets the page length to *n* inches, where *n* is between 1 and 22 in Standard mode or between 1 and 127 in IBM mode. The current line becomes the top of the page.

## Set top margin

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| Both | <ESC> "c" <i>n</i> | 27 99 <i>n</i> | 1B 63 <i>n</i> |

Sets the top margin to *n* lines, where *n* is between 1 and 255. Printing begins on the (*n* + 1)th line on the page.

## Set bottom margin

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| Both | <ESC> "N" <i>n</i> | 27 78 <i>n</i> | 1B 4E <i>n</i> |

Sets the bottom margin to *n* lines, where *n* is between 1 and 127 in Standard mode or between 1 and 255 in IBM mode. The bottom margin is reset when you change the page length.

## Cancel top and bottom margins

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "O" | 27 79   | 1B 4F       |

Cancels both the top margin and the bottom margin.

## Form feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <FF>  | 12      | 0C          |

Feeds the paper to the top of the next page according to the current page length, and moves the print position to the left margin. When the automatic sheet feeder (ASF) is selected (DIP switch 1-4 is OFF), this command ejects the current page.

## Return to top of current page

| Mode | ASCII      | Decimal | Hexadecimal |
|------|------------|---------|-------------|
| Both | <ESC> <FF> | 27 12   | 1B 0C       |

Feeds the paper backward to the top of the current page. Ignored when friction feed is used.



## Disable paper-out detector

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "8" | 27 56   | 1B 38       |

Causes the printer to disregard the signal sent by the paper-out detector, enabling printing to the bottom of the paper. Overrides the setting of DIP switch 1-5.

## Enable paper-out detector

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "9" | 27 57   | 1B 39       |

Causes the printer to stop printing about an inch before the end of the paper. Overrides the setting of DIP switch 1-5.

## Set vertical tab stops

| Mode | ASCII                       | Decimal               | Hexadecimal           |
|------|-----------------------------|-----------------------|-----------------------|
| Both | <ESC> "B" $n1$ $n2$ ... <0> | 27 66 $n1$ $n2$ ... 0 | 1B 42 $n1$ $n2$ ...00 |

Cancels all current vertical tab stops and sets new vertical tab stops at lines  $n1$ ,  $n2$ , etc., where  $n1$ ,  $n2$ , etc. are numbers between 1 and 255. A maximum of 16 vertical tab stops can be set. The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code. The vertical tab stops are set in terms of the current line spacing and do not move if the line spacing is changed later.

## Set vertical tab stops every $n$ lines

| Mode | ASCII             | Decimal       | Hexadecimal  |
|------|-------------------|---------------|--------------|
| Both | <ESC> "e" "1" $n$ | 27 101 49 $n$ | 1B 65 31 $n$ |
|      | <ESC> "e" <1> $n$ | 27 101 1 $n$  | 1B 65 01 $n$ |

Cancels all current vertical tab stops and sets new tab stops every  $n$  lines, where  $n$  is between 1 and 127.

## Set vertical tab stops in channel

| Mode | ASCII               | Decimal         | Hexadecimal     |
|------|---------------------|-----------------|-----------------|
| Both | <ESC> "b" $n0$ $n1$ | 27 98 $n0$ $n1$ | 1B 62 $n0$ $n1$ |
|      | $n2$ ... <0>        | $n2$ ... 0      | $n2$ ... 00     |

Cancels all current vertical tab stops in channel  $n0$ , (where  $n0$  is between 0 and 7) and sets new vertical tab stops in this channel. (A channel is a set of vertical tab stops selected by the <ESC> "/" command.) See <ESC> "B" for parameters  $n1$ ,  $n2$ , ... <0>.

## Select vertical tab channel

| Mode | ASCII               | Decimal         | Hexadecimal     |
|------|---------------------|-----------------|-----------------|
| Both | <ESC> "b" <i>n0</i> | 27 47 <i>n0</i> | 1B 2F <i>n0</i> |

Selects a set of vertical tab stops designated by a channel number (*n0*) from 0 to 7. The tab stops in each channel are set by <ESC> "b".

## Vertical tab

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <VT>  | 11      | 0B          |

Feeds the paper to the next vertical tab stop and moves the print position to the left margin. Performs a line feed if no vertical tabs are set, as at power-up. Feeds to the top of the next page if vertical tabs are set but the current line is at or below the last vertical tab stop.

## HORIZONTAL POSITION COMMANDS

### Set left margin

| Mode | ASCII              | Decimal         | Hexadecimal    |
|------|--------------------|-----------------|----------------|
| Both | <ESC> "l" <i>n</i> | 27 108 <i>n</i> | 1B 6C <i>n</i> |

Sets the left margin at column *n* (where *n* is between 0 and 255) in the current character pitch (pica pitch if proportional spacing is selected). The left margin does not move if the character pitch is changed later. The left margin must be at least two columns to the left of the right margin and within the limits below:

|                          |                    |
|--------------------------|--------------------|
| Pica                     | 0 ≤ <i>n</i> ≤ 76  |
| Elite                    | 0 ≤ <i>n</i> ≤ 91  |
| Semi-condensed           | 0 ≤ <i>n</i> ≤ 114 |
| Condensed pica           | 0 ≤ <i>n</i> ≤ 130 |
| Condensed elite          | 0 ≤ <i>n</i> ≤ 152 |
| Expanded pica            | 0 ≤ <i>n</i> ≤ 38  |
| Expanded elite           | 0 ≤ <i>n</i> ≤ 45  |
| Expanded semi-condensed  | 0 ≤ <i>n</i> ≤ 57  |
| Expanded condensed pica  | 0 ≤ <i>n</i> ≤ 64  |
| Expanded condensed elite | 0 ≤ <i>n</i> ≤ 76  |

### Set right margin

| Mode | ASCII              | Decimal        | Hexadecimal    |
|------|--------------------|----------------|----------------|
| Std. | <ESC> "Q" <i>n</i> | 27 81 <i>n</i> | 1B 51 <i>n</i> |
| IBM  | <FS> "Q" <i>n</i>  | 28 81 <i>n</i> | 1C 51 <i>n</i> |

Sets the right margin at column  $n$  in the current character pitch (pica pitch if proportional spacing is currently selected). Column  $n$  becomes the last character position in the line. The right margin does not move if the character pitch is changed later. The right margin must be within the limits below:

|                          |               |
|--------------------------|---------------|
| Pica                     | 4 ≤ $n$ ≤ 80  |
| Elite                    | 5 ≤ $n$ ≤ 96  |
| Semi-condensed           | 6 ≤ $n$ ≤ 120 |
| Condensed pica           | 7 ≤ $n$ ≤ 137 |
| Condensed elite          | 8 ≤ $n$ ≤ 160 |
| Expanded pica            | 2 ≤ $n$ ≤ 40  |
| Expanded elite           | 3 ≤ $n$ ≤ 48  |
| Expanded semi-condensed  | 3 ≤ $n$ ≤ 60  |
| Expanded condensed pica  | 4 ≤ $n$ ≤ 68  |
| Expanded condensed elite | 4 ≤ $n$ ≤ 80  |

### Set left and right margins

| Mode | ASCII               | Decimal         | Hexadecimal     |
|------|---------------------|-----------------|-----------------|
| Both | <ESC> "X" $n1$ $n2$ | 27 88 $n1$ $n2$ | 1B 58 $n1$ $n2$ |

Sets the left margin at column  $n1$  and the right margin at column  $n2$ . See the preceding commands for margin restrictions and other notes.

### Carriage return

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <CR>  | 13      | 0D          |

Prints the current line and returns the next print position to the left margin. If DIP switch 1-8 is ON, also performs a line feed.

### Set automatic line feed

| Mode | ASCII         | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| IBM  | <ESC> "5" <1> | 27 53 1 | 1B 35 01    |

Causes the printer to perform both a carriage return and line feed each time it receives a <CR> code. This command takes priority over DIP switch 1-8.

### Cancel automatic line feed

| Mode | ASCII         | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| IBM  | <ESC> "5" <0> | 27 53 0 | 1B 35 00    |

Causes the printer to perform only a carriage return when it receives a <CR> code. This command takes priority over DIP switch 1-8.

## Backspace

| Mode | ASCII  | Decimal | Hexadecimal |
|------|--------|---------|-------------|
| Both | < BS > | 8       | 08          |

Moves the print position one column to the left. Ignored if the print position is at the left margin. This command can be used to overstrike or combine characters.

## Left justify

| Mode | ASCII             | Decimal  | Hexadecimal |
|------|-------------------|----------|-------------|
| Both | < ESC > "a" "0"   | 27 97 48 | 1B 61 30    |
|      | < ESC > "a" < 0 > | 27 97 0  | 1B 61 00    |

Aligns subsequent text with the left margin, leaving the right margin ragged.

## Center text

| Mode | ASCII             | Decimal  | Hexadecimal |
|------|-------------------|----------|-------------|
| Both | < ESC > "a" "1"   | 27 97 49 | 1B 61 31    |
|      | < ESC > "a" < 1 > | 27 97 1  | 1B 61 01    |

Centers subsequent text between the left and right margins.

## Right justify

| Mode | ASCII             | Decimal  | Hexadecimal |
|------|-------------------|----------|-------------|
| Both | < ESC > "a" "2"   | 27 97 50 | 1B 61 32    |
|      | < ESC > "a" < 2 > | 27 97 2  | 1B 61 02    |

Aligns subsequent text with the right margin, leaving the left margin ragged.

## Full justify

| Mode | ASCII             | Decimal  | Hexadecimal |
|------|-------------------|----------|-------------|
| Both | < ESC > "a" "3"   | 27 97 51 | 1B 61 33    |
|      | < ESC > "a" < 3 > | 27 97 3  | 1B 61 03    |

Aligns subsequent text between the left and right margins.

## Set horizontal tab stops

| Mode | ASCII                                 | Decimal                         | Hexadecimal                      |
|------|---------------------------------------|---------------------------------|----------------------------------|
| Both | <ESC> "D" <i>n1</i> <i>n2</i> ... <0> | 27 68 <i>n1</i> <i>n2</i> ... 0 | 1B 44 <i>n1</i> <i>n2</i> ... 00 |

Cancels all current horizontal tab stops and sets new tab stops at columns *n1*, *n2*, etc. in the current character pitch (pica pitch if proportional spacing is currently selected), where *n1*, *n2*, etc. are numbers between 1 and 255. The maximum number of horizontal tab stops allowed is 32 in Standard mode and 28 in IBM mode. The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code. To clear all tab stops, specify <ESC> "D" <0>.

## Set horizontal tab stop every *n* columns

| Mode | ASCII                  | Decimal            | Hexadecimal       |
|------|------------------------|--------------------|-------------------|
| Both | <ESC> "e" "0" <i>n</i> | 27 101 48 <i>n</i> | 1B 65 30 <i>n</i> |
|      | <ESC> "e" <0> <i>n</i> | 27 101 0 <i>n</i>  | 1B 65 00 <i>n</i> |

Cancels all current horizontal tab stops and sets new tab stops every *n* columns, where *n* is between 1 and 127.

## Reset all tab stops

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| IBM  | <ESC> "R" | 27 82   | 1B 52       |

Resets the horizontal tab stops to their power-up values in which a tab stop is set every 8 columns starting at column 9. Also clears all vertical tab stops.

## Horizontal tab

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <HT>  | 9       | 09          |

Moves the print position to the next horizontal tab stop. Ignored if there is no next horizontal tab stop in the current line. Note that when underlining is selected, spaces skipped by horizontal tabulation are not underlined.

## Relative horizontal tab

| Mode | ASCII                  | Decimal         | Hexadecimal     |
|------|------------------------|-----------------|-----------------|
| Std. | <ESC>    “\” $n1$ $n2$ | 27 92 $n1$ $n2$ | 1B 5C $n1$ $n2$ |
| IBM  | <FS>    “\” $n1$ $n2$  | 28 92 $n1$ $n2$ | 1C 5C $n1$ $n2$ |

Moves the print position right or left a specified distance (maximum 6 inches). Ignored if the resulting position is beyond the right or left margin.

The formulas for the distance and direction are as follows:

If  $n2$  is between 0 and 63, the print head moves right by  $(n1 + n2 \times 256)$  dots

If  $n2$  is between 64 and 127, the print head moves left by  $(n1 + [n2 - 64] \times 256)$  dots

## Relative horizontal tab in inches

| Mode | ASCII                  | Decimal          | Hexadecimal     |
|------|------------------------|------------------|-----------------|
| IBM  | <ESC>    “d” $n1$ $n2$ | 27 100 $n1$ $n2$ | 1B 64 $n1$ $n2$ |

Sets the next print position to  $(n1 + n2 \times 256)/120$  inches from the current position. Ignored if this position is beyond the right margin. The maximum position is 8 inches.

## Absolute horizontal tab in inches

| Mode | ASCII                   | Decimal         | Hexadecimal     |
|------|-------------------------|-----------------|-----------------|
| Both | <ESC>    “\$” $n1$ $n2$ | 27 36 $n1$ $n2$ | 1B 24 $n1$ $n2$ |

Sets the next print position to  $(n1 + n2 \times 256)/60$  inches from the left margin on the current line. Ignored if this position is beyond the right margin. The maximum position is 8 inches.

## Absolute horizontal tab in columns

| Mode | ASCII                   | Decimal       | Hexadecimal  |
|------|-------------------------|---------------|--------------|
| Both | <ESC>    “f”    “0” $n$ | 27 102 48 $n$ | 1B 66 30 $n$ |
|      | <ESC>    “f”    <0> $n$ | 27 102 0 $n$  | 1B 66 00 $n$ |

Moves the next print position to column  $n$  from the left margin, where  $n$  is between 0 and 127.

## GRAPHICS COMMANDS

### Print 8-bit single-density graphics

| Mode | ASCII                                      | Decimal                                | Hexadecimal                            |
|------|--|--|--|
| Both | <ESC> "K" <i>n1 n2</i><br><i>m1 m2 ...</i> | 27 75 <i>n1 n2</i><br><i>m1 m2 ...</i> | 1B 4B <i>n1 n2</i><br><i>m1 m2 ...</i> |

Prints 8-bit dot graphics at 60 dots per inch horizontally. The graphic image is 8 dots high and  $n1 + n2 \times 256$  dots wide. Maximum width is 8 inches (480 dots). *m1, m2, ...* are the dot data, each a 1-byte value from 0 to 255 representing 8 vertical dots, with the most significant bit at the top and the least significant bit at the bottom. The number of data bytes must be  $n1 + n2 \times 256$ . Dots beyond the right margin are ignored. At the end of dot graphics printing the printer returns automatically to character mode.

### Print 8-bit double-density graphics

| Mode | ASCII                                      | Decimal                                | Hexadecimal                            |
|------|--|--|--|
| Both | <ESC> "L" <i>n1 n2</i><br><i>m1 m2 ...</i> | 27 76 <i>n1 n2</i><br><i>m1 m2 ...</i> | 1B 4C <i>n1 n2</i><br><i>m1 m2 ...</i> |

Prints 8-bit dot graphics at 120 dots per inch horizontally (maximum 960 dots wide). See <ESC> "K" for other information.

### Print 8-bit double-density, double-speed graphics

| Mode | ASCII                                      | Decimal                                | Hexadecimal                            |
|------|--|--|--|
| Both | <ESC> "Y" <i>n1 n2</i><br><i>m1 m2 ...</i> | 27 89 <i>n1 n2</i><br><i>m1 m2 ...</i> | 1B 59 <i>n1 n2</i><br><i>m1 m2 ...</i> |

Prints 8-bit dot graphics at 120 dots per inch horizontally (maximum 960 dots wide), skipping every second dot in the horizontal direction. See <ESC> "K" for other information.

### Print 8-bit quadruple-density graphics

| Mode | ASCII                                      | Decimal                                | Hexadecimal                            |
|------|--|--|--|
| Both | <ESC> "Z" <i>n1 n2</i><br><i>m1 m2 ...</i> | 27 90 <i>n1 n2</i><br><i>m1 m2 ...</i> | 1B 5A <i>n1 n2</i><br><i>m1 m2 ...</i> |

Prints 8-bit dot graphics at 240 dots per inch horizontally (maximum 1920 dots wide), skipping every second dot in the horizontal direction. See <ESC> "K" for other information.

## Print 24-bit hex-density graphics

| Mode | ASCII                                      | Decimal                               | Hexadecimal                           |
|------|--|---------------------------------------|---------------------------------------|
| Both | < FS > "Z" $n1$ $n2$<br>$m1$ $m2$ $m3$ ... | 28 90 $n1$ $n2$<br>$m1$ $m2$ $m3$ ... | 1C 5A $n1$ $n2$<br>$m1$ $m2$ $m3$ ... |

Prints 24-bit dot graphics at 360 dots per inch horizontally. The graphic image is 24 dots high and  $n1 + n2 \times 256$  dots wide. Maximum width is 8 inches (2880 dots). In the data  $m1, m2, m3 \dots$  each three bytes represent 24 vertical dots. In the leftmost position, the most significant bit of  $m1$  is the top dot; the least significant bit of  $m1$  is the eighth dot from the top; the most significant bit of  $m2$  is the ninth dot; the least significant bit of  $m2$  is the sixteenth dot from the top; the most significant bit of  $m3$  is the seventeenth dot from the top; the least significant bit of  $m3$  is the bottom dot. The rest of the data is similar. The number of data bytes must be  $3 \times (n1 + n2 \times 256)$ . Dots beyond the right margin are ignored. At the end of dot graphics printing the printer returns automatically to character mode.

## Select graphics mode

| Mode | ASCII                                       | Decimal                               | Hexadecimal                           |
|------|---|---------------------------------------|---------------------------------------|
| Both | < ESC > "*" $n0$ $n1$<br>$n2$ $m1$ $m2$ ... | 27 42 $n0$ $n1$<br>$n2$ $m1$ $m2$ ... | 1B 2A $n0$ $n1$<br>$n2$ $m1$ $m2$ ... |

Selects one of eleven graphics modes depending on the value of  $n0$  and prints dot graphics in this mode. See < ESC > "K" (for 8-bit graphics) or < FS > "Z" (for 24-bit graphics) for information on  $n1, n2, m1, m2,$

...

| $n0$ | Graphics mode                      |                     |
|------|------------------------------------|---------------------|
| 0    | 8-bit Single-density               | ( 60 dots per inch) |
| 1    | 8-bit Double-density               | (120 dots per inch) |
| 2    | 8-bit Double-density, double-speed |                     |
| 3    | 8-bit Quadruple-density            | (240 dots per inch) |
| 4    | 8-bit CRT graphics, mode I         | ( 80 dots per inch) |
| 6    | 8-bit CRT graphics, mode II        | ( 90 dots per inch) |
| 32   | 24-bit Single-density              | ( 60 dots per inch) |
| 33   | 24-bit Double-density              | (120 dots per inch) |
| 38   | 24-bit CRT graphics                | ( 90 dots per inch) |
| 39   | 24-bit Tripple-density             | (180 dots per inch) |
| 40   | 24-bit Hex-density                 | (360 dots per inch) |



## Select graphics mode

| Mode | ASCII   | Decimal                                       | Hexadecimal                                  |
|------|---|---|--|
| IBM  | <ESC> “[” “g” <i>n1</i><br><i>n2 m0 m1 m2 ...</i> | 27 91 103 <i>n1</i><br><i>n2 m0 m1 m2 ...</i> | 1B 5B 67 <i>n1</i><br><i>n2 m0 m1 m2 ...</i> |

Selects one of eight graphics modes depending on the value of *m0* and prints dot graphics in this mode. The graphic image is (*n1* + *n2* x 256) - 1 dots wide. See <ESC> “K” (for 8-bit graphics) or <FS> “Z” (for 24-bit graphics) for information on *m1*, *m2*, ...

| <i>m0</i> | Graphics mode                      |                     |
|-----------|------------------------------------|---------------------|
| 0         | 8-bit Single-density               | ( 60 dots per inch) |
| 1         | 8-bit Double-density               | (120 dots per inch) |
| 2         | 8-bit Double-density, double-speed |                     |
| 3         | 8-bit Quadruple-density            | (240 dots per inch) |
| 8         | 24-bit Single-density              | ( 60 dots per inch) |
| 9         | 24-bit Double-density              | (120 dots per inch) |
| 11        | 24-bit Triple-density              | (180 dots per inch) |
| 12        | 24-bit Hex-density                 | (360 dots per inch) |

## Convert graphics density

| Mode | ASCII                | Decimal          | Hexadecimal      |
|------|----------------------|------------------|------------------|
| Both | <ESC> “?” <i>n m</i> | 27 63 <i>n m</i> | 1B 3F <i>n m</i> |

Converts graphics defined by subsequent <ESC> “K”, <ESC> “L”, <ESC> “Y” or <ESC> “Z” commands to a density mode defined by <ESC> “\*”. *n* is “K”, “L”, “Y” or “Z”, indicating the mode to be converted. *m* is a code from <0> to <4> or <6> indicating one of the modes of <ESC> “\*.”

## DOWNLOAD CHARACTER COMMANDS

### Copy standard characters from ROM into RAM

| Mode | ASCII                 | Decimal     | Hexadecimal    |
|------|-----------------------|-------------|----------------|
| Std. | <ESC> “.” <0> <0> <0> | 27 58 0 0 0 | 1B 3A 00 00 00 |
| IBM  | <FS> “.” <0> <0> <0>  | 28 58 0 0 0 | 1C 3A 00 00 00 |

Copies all the standard characters to the corresponding download character RAM area, overwriting any download data already present. Ignored when DIP switch 2-1 is ON.

## Define download characters

| Mode | ASCII   | Decimal   | Hexadecimal  |
|------|---|---|--|
| Std. | <ESC> "&" <0> <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> | 27 38 0 <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> | 1B 26 00 <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> |
| IBM  | <ESC> "=" <0> <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> | 27 61 0 <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> | 1B 3D 00 <i>n1</i><br><i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i><br><i>d1</i> <i>d2</i> ... <i>dx</i> |

Defines one or more new characters and stores them in RAM for later use. DIP switch 2-1 must be OFF; otherwise RAM is used as an input buffer, not for downloading characters, and this command is ignored.

*n1* is the character code of the first character defined and *n2* is the character code of the last character defined. *n1* and *n2* must both be between 33 and 254. *n1* must be equal to or less than *n2*. Use of character codes 32 (space) and 127 (delete code) should be avoided if possible. The data for each character start with three bytes specifying proportional spacing attributes: the first byte, *m0*, specifies the left of the character; the second byte, *m1*, specifies the character width; the third byte, *m2*, specifies the right of the character. These values must not exceed the following maximum limits:

| Character mode            | <i>m1</i> | <i>m0</i> + <i>m1</i> + <i>m2</i> |
|---------------------------|-----------|-----------------------------------|
| Draft characters          | 9         | 12                                |
| LQ pica characters        | 29        | 36                                |
| LQ elite characters       | 23        | 30                                |
| LQ semi-condensed         | 15        | 24                                |
| LQ proportional           | 37        | 42                                |
| Draft super/subscripts    | 7         | 12                                |
| LQ super/subscripts       | 23        | 36                                |
| LQ prop. super/subscripts | 23        | 42                                |

Next comes the dot data. Normal character height is 24 dots, so there must be  $3 \times m1$  bytes of dot data. If the printer is in super/subscript mode, however, the character height is 16 dots, so there must be  $2 \times m1$  bytes of dot data.

Each data byte indicates eight vertical dots, with the MSB being the top dot and the LSB the bottom dot.

For further details, please refer to the Appendix C.

## Select download character set

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "%" "1" | 27 37 49 | 1B 25 31    |
|      | <ESC> "%" <1> | 27 37 1  | 1B 25 01    |

Selects the download character set. Ignored when DIP switch 2-1 is ON.

## Select ROM character set

| Mode | ASCII             | Decimal  | Hexadecimal |
|------|-------------------|----------|-------------|
| Both | < ESC > “%” “0”   | 27 37 48 | 1B 25 30    |
|      | < ESC > “%” < 0 > | 27 37 0  | 1B 25 00    |

Stops using the download character set and returns to the built-in ROM character set. Ignored when DIP switch 2-1 is ON.

## OTHER PRINTER CONTROL COMMANDS

### Set MSB to 1

| Mode | ASCII         | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Both | < ESC > “ > ” | 27 62   | 1B 3E       |

Sets the most significant bit of each subsequent byte received to 1, allowing users with a 7-bit interface to access characters with ASCII codes greater than 127.

### Set MSB to 0

| Mode | ASCII         | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Std. | < ESC > “ = ” | 27 61   | 1B 3D       |
| IBM  | < FS > “ = ”  | 28 61   | 1C 3D       |

Sets the most significant bit of each subsequent byte received to 0.

### Accept MSB as is

| Mode | ASCII         | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Both | < ESC > “ # ” | 27 35   | 1B 23       |

Cancels the preceding commands and accepts the most significant bit as it is sent to the printer.

### Delete last character sent

| Mode | ASCII   | Decimal | Hexadecimal |
|------|---------|---------|-------------|
| Std. | < DEL > | 127     | 7F          |

Deletes the last character received. Ignored if the last character received has already been printed, or if the last character received was all or part of a command.

## Cancel last line

| Mode | ASCII   | Decimal | Hexadecimal |
|------|---------|---------|-------------|
| Both | < CAN > | 24      | 18          |

Deletes the last line currently present in the print buffer.

## Repeat data

| Mode | ASCII  | Decimal                              | Hexadecimal                           |
|------|--|--------------------------------------|---------------------------------------|
| Both | < ESC > "V" n d1<br>d2 ..... dx<br>< ESC > "V" < 0 > | 27 86 n d1<br>d2 ..... dx<br>27 86 0 | 1B 56 n d1<br>d2 ..... dx<br>1B 56 00 |

Repeats data, defined by  $d1$ ,  $d2$ , ...  $dx$ , for  $n$  times.

## Quiet print

| Mode | ASCII             | Decimal   | Hexadecimal |
|------|-------------------|-----------|-------------|
| Both | < ESC > "s" "1"   | 27 115 49 | 1B 73 31    |
|      | < ESC > "s" < 1 > | 27 115 1  | 1B 73 01    |

Selects the quiet print mode, in which the printer prints each line in two passes to reduce the sound of printing. You can also set the quiet mode with the control panel switch.

## Cancel quiet print

| Mode | ASCII             | Decimal   | Hexadecimal |
|------|-------------------|-----------|-------------|
| Both | < ESC > "s" "0"   | 27 115 48 | 1B 73 30    |
|      | < ESC > "s" < 0 > | 27 115 0  | 1B 73 00    |

Cancels the quiet print mode, and resumes normal printing.  
You can also cancel the quiet mode with the control panel switch.

## Immediate print

| Mode | ASCII             | Decimal   | Hexadecimal |
|------|-------------------|-----------|-------------|
| Both | < ESC > "i" "1"   | 27 105 49 | 1B 69 31    |
|      | < ESC > "i" < 1 > | 27 105 1  | 1B 69 01    |

Selects the immediate print mode, in which the printer prints each character as soon as received. At every pause in the incoming data stream the printer scrolls the paper up about 2 inches so that the current line can be seen. When the next character is received the paper is scrolled back down and printing continues. This command is ignored when friction feed is used.

## Cancel immediate print

| Mode | ASCII         | Decimal   | Hexadecimal |
|------|---------------|-----------|-------------|
| Both | <ESC> "i" "0" | 27 105 48 | 1B 69 30    |
|      | <ESC> "i" <0> | 27 105 0  | 1B 69 00    |

Cancels the immediate print mode. The printer waits for each line to be completed before printing it, and does not scroll the paper up and down. This command is ignored when friction feed is used.

## Set printer off-line

| Mode | ASCII          | Decimal  | Hexadecimal |
|------|----------------|----------|-------------|
| Std. | <DC3>          | 19       | 13          |
| IBM  | <ESC> "Q" "\$" | 27 81 36 | 1B 51 24    |

Sets the printer off-line. The printer disregards all subsequent characters and commands except <DC1>, which returns it to the on-line state. The printer's On Line indicator does not go off.

## Set printer on-line

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <DC1> | 17      | 11          |

Returns the printer to the on-line state, allowing it to receive and process all subsequent characters and commands. This command is ignored if the printer was set off-line by pressing the On Line switch on the control panel.

## Stop printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| IBM  | <ESC> "j" | 27 106  | 1B 6A       |

Prints the entire contents of the input buffer, then sets the printer off-line. The printer's On Line indicator goes off.

## Bell

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------|---------|-------------|
| Both | <BEL> | 7       | 07          |

Sounds a brief beep tone from the printer's beeper.

## Bidirectional printing

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "U" "0" | 27 85 48 | 1B 55 30    |
|      | <ESC> "U" <0> | 27 85 0  | 1B 55 00    |

Causes subsequent printing to be done in the normal bidirectional mode, which is faster than unidirectional printing.

## Unidirectional printing

| Mode | ASCII         | Decimal  | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "U" "1" | 27 85 49 | 1B 55 31    |
|      | <ESC> "U" <1> | 27 85 1  | 1B 55 01    |

Causes subsequent printing to be done unidirectionally, ensuring maximum vertical alignment precision.

## One-line unidirectional printing

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "<" | 27 60   | 1B 3C       |

Immediately returns the print head to the left margin, then prints the remainder of the line from left to right. Normal bidirectional printing resumes on the next line.

## Manual feed

| Mode | ASCII               | Decimal        | Hexadecimal    |
|------|---------------------|----------------|----------------|
| Both | <ESC> <EM> <0>      | 27 25 0        | 1B 19 00       |
|      | "(" "(" "0" ")" ")" | 40 40 48 41 41 | 28 28 30 29 29 |

Selects manual sheet feeding even when the optional automatic sheet feeder is mounted. Ignored if DIP switch 1-4 is ON (ASF inactive).

## Auto feed

| Mode | ASCII               | Decimal        | Hexadecimal    |
|------|---------------------|----------------|----------------|
| Both | <ESC> <EM> <4>      | 27 25 4        | 1B 19 04       |
|      | "(" "(" "4" ")" ")" | 40 40 52 41 41 | 28 28 34 29 29 |

Selects the automatic sheet feeder. Ignored if DIP switch 1-4 is ON (ASF inactive).

## Eject paper from ASF

| Mode | ASCII               | Decimal        | Hexadecimal    |
|------|---------------------|----------------|----------------|
| Both | <ESC> <EM> "R"      | 27 25 82       | 1B 19 52       |
|      | "(" "(" "R" ")" ")" | 40 40 82 41 41 | 28 28 52 29 29 |

Ejects the current page. Ignored if DIP switch 1-4 is ON (ASF inactive).

## Set print start position on ASF

| Mode | ASCII                        | Decimal                 | Hexadecimal             |
|------|------------------------------|-------------------------|-------------------------|
| Both | <ESC> <EM> "T" <i>n</i>      | 27 25 84 <i>n</i>       | 1B 19 54 <i>n</i>       |
|      | "(" "(" "T" ")" ")" <i>n</i> | 40 40 84 41 41 <i>n</i> | 28 28 54 29 29 <i>n</i> |

Skips  $n/6$  inches at the top of the page, where  $n$  is equal to or greater than 1. Ignored if DIP switch 1-4 is ON (ASF inactive).

## Reset printer

| Mode | ASCII     | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Both | <ESC> "@" | 27 64   | 1B 40       |
| Std. | <FS> "@"  | 28 64   | 1C 40       |

Reinitializes the printer. Clears the print buffer and returns settings to their power-up values. Does not clear the input buffer or change ASF selections.

# MEMO



# Appendix C

# DOWNLOAD CHARACTER GENERATOR

With this printer you can create new characters and symbols, download their dot data, and have them printed in place of selected characters in the regular character set. Characters that can be generated in this way range from simple but useful symbols like the check mark through complex Chinese or Japanese characters.

The process of designing new characters with paper and pencil is time consuming. The program listed in this appendix enables you to do everything on the computer screen. It also enables you to maintain disk files of character data for downloading when required.

The creation of a telephone symbol as a normal character ( ☎ ) and super/subscript character ( ⓞ ) is explained below.

## Normal character

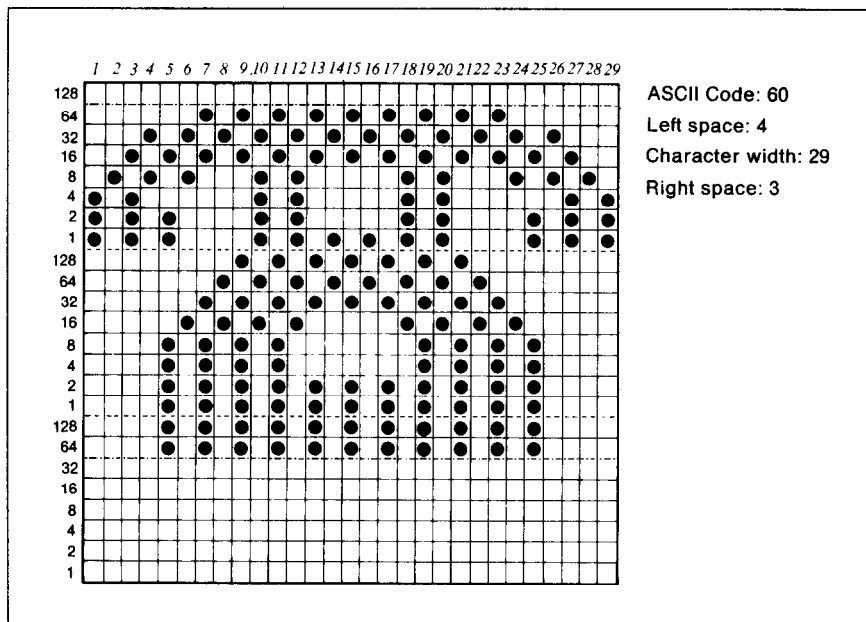


Figure C-1. Telephone symbol, Normal LQ pica

The normal character height is 24 cells, and the width is varied by the character mode as shown below.

| Character mode      | Character width |
|---------------------|-----------------|
| Draft characters    | 9               |
| LQ pica characters  | 29              |
| LQ elite characters | 23              |
| LQ semi-condensed   | 15              |
| LQ proportional     | 37              |

Figure C-1 shows the matrix with the telephone symbol filled in. Note that there are no pairs of horizontally adjacent dots. The pins in the print head cannot fire fast enough to print adjacent dots in the horizontal direction.

To the printer, a normal character is represented three bytes for each column. If you are working by hand, you can calculate the data as shown in Figure C-1 and enter them via the <ESC> "&" <0> printer command. If you use the program in this appendix, proceed as follows.

The program starts by asking whether you want to read characters from an existing file. If you are going to add the telephone symbol to a file of download characters you have already generated, answer yes; if you are going to create a new file, answer no. The arrow on the screen toggles between Yes and No when any key except Return is pressed. The Return key enters your choice.

In the same way the program asks you to select Standard or IBM mode; normal or super/subscript, and character mode, then to confirm whether to continue or start over. Continuing, on the next screen the program asks what character you want to redefine, offering the exclamation mark(!) as a suggestion. If you want to print the telephone symbol in place of the exclamation mark, press Return. If you want to assign the telephone symbol to another character, press the key of that character.

Next you must choose the spaces between characters. After you have defined the character width and left space, the cursor enters the character box. You can move the cursor with the numeric keypad. For example, pressing the "6" key moves to the right; pressing the "3" key moves diagonally down to the right. The function keys control the setting and clearing of dots. After F1 is pressed the cursor clears the dot in each position it is moved to. F3 causes the cursor to set dots. F2 allows the cursor to pass over dots without either setting or clearing them.

Each dot is represented by two adjacent solid blocks, occupying its own position and the position to the right. This reflects the fact that the printer cannot print horizontally adjacent dots. The program automatically censors adjacent dots.

By moving the cursor and pressing the F1, F2, and F3 keys you can quickly build up the dot pattern. If necessary you can clear all dots by pressing F4 and start over. When the character is complete, press Return to store the dot data in the computer's memory. The program will clear the character box and ask you to select the next character to design.

When you have finished designing characters, press the F6 key. The program will ask you whether you want to save, download, and print the characters you have designed. If you answer Yes to all three questions, your characters will be saved on a disk file and downloaded to the printer, and the entire character set from character 33 (!) to character 126(~) will be printed out.

At any point while you are selecting or designing characters you can press F5 to skip the current character and proceed to the next character.

The program does not allow you to redefine the space character, or to define any other character as an all-blank character. Nor can you assign character codes less than 33 or greater than 126 to the characters you define.

### Super/subscript character

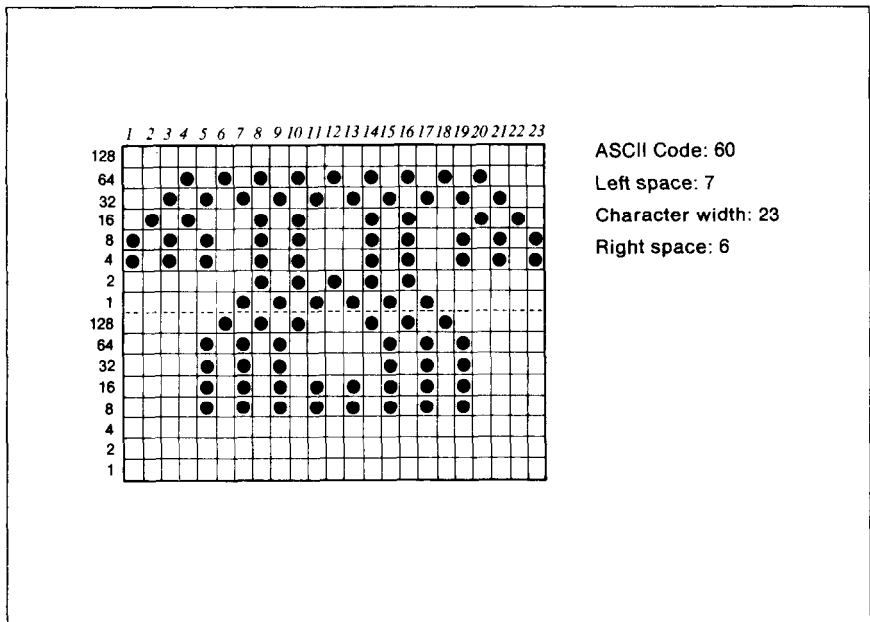


Figure C-2. Telephone symbol, super/subscript

If you select super/subscript, the character box now has 16 (high) x 7 (wide) dot positions for draft characters, or 16 x 23 dot positions for LQ characters. Each dot is represented by two adjacent solid blocks, occupying its own position and the position to the right. This reflects the fact that the printer still cannot print horizontally adjacent dots, but that even skipping every other dot, the dots appear joined when printed.

The file created by this program contains the following printer commands:

1. <ESC> “.” <0> <0> <0> (standard mode) or <FS> “.” <0> <0> <0> (IBM mode) to copy the printer’s regular characters into download memory. If you leave a download character undefined, the regular character will be printed.
2. <ESC> “x” <0> or <ESC> “x” <1> to select draft or letter quality.
3. One <ESC> “&” <0> <cc> <cc> <m0> <m1> <m2> <d1> ... command for each character defined. <cc> is the character code, <m0> is the left hand space byte, <m1> is the character width byte, and <m2> is the right hand space byte. <p1> ... are the <m1> x 3 bytes of dot data.
4. <ESC> “%1” to enable the printer to print the downloaded characters.

This program is coded in Microsoft BASIC for the IBM-PC.

The WIDTH 255 command in line 1050 means infinite line width and prevents the computer from inserting unwanted line feeds in the character data. Some versions of BASIC do not need the WIDTH command.

Check your BASIC manual and make any changes necessary.

```

1000 '*****
1010 '
1020 '           DOWNLOAD CHARACTER GENERATOR FOR 24-WIRE PRINTER
1030 '
1040 '*****
1050 WIDTH "LPT1:",255 :KEY OFF :CLS
1060 DIM A(126), A$(126), P$(126), DT(24,42) :E$=CHR$(27) :F$=CHR$(28)
1070 SC$(0)="-----+-----+-----+-----+-----"
1080 SC$(1)=".....+.....+.....+.....+....."
1090 KEY 1,CHR$(7) :KEY 2,CHR$(8) :KEY 3,CHR$(9)
1100 KEY 4,CHR$(10) :KEY 5,CHR$(11) :KEY 6,CHR$(12)
1110 FOR I=33 TO 126 :A(I)=-1 :NEXT I
1120 '----- PRINT HEADING -----
1130 LOCATE 1,1 :PRINT STRING$(25,62);
1140 PRINT " DOWNLOAD CHARACTER GENERATOR ";STRING$(25,60)
1150 '-----
1160 LOCATE 3,1 :PRINT "READ CHARACTERS FROM EXISTING FILE?"
1170 S0$="Yes" :S1$="No" :S=-1 :PX=4 :PY=1 :GOSUB 2820 :IF S THEN 1470
1180 '----- Open existing file -----
1190 LOCATE 3,1 :PRINT STRING$(40,32) :LOCATE 3,1
1200 INPUT "File name";FI$
1210 OPEN FI$ FOR INPUT AS #1
1220 '----- Read initial commands-----
1230 I$=INPUT$(3,#1)
1240 IF RIGHT$(I$,1)="0" THEN QUA=1 :GOTO 1260

```

```

1250 IF MID$(I$,2,1)="p" THEN QUA=2 ELSE QUA=0
1260 '
1270 I$=INPUT$(2,#1)
1280 IF RIGHT$(I$,1)="T" THEN SCR=0 :GOTO 1300
1290 I$=INPUT$(1,#1) :SCR=-1
1300 '
1310 I$=INPUT$(5,#1)
1320 IF LEFT$(I$,1)=E$ THEN IBM=0 ELSE IBM=-1
1330 '----- Read data for 1 character -----
1340 I$=INPUT$(3,#1)
1350 IF I$=E$+"%1" THEN 1440
1360 I$=INPUT$(1,#1) :J$=INPUT$(1,#1)
1370 CC=ASC(I$) :IF CC>126 THEN 1440
1380 A$(CC)=INPUT$(3,#1) :A(CC)=ASC(MID$(A$(CC),2,1))
1390 '
1400 IF NOT SCR THEN 1420
1410 P$(CC)=INPUT$(A(CC)*2,#1) :GOTO 1430
1420 P$(CC)=INPUT$(A(CC)*3,#1)
1430 IF NOT EOF(1) THEN 1330
1440 CLOSE #1
1450 '
1460 '==== START DEFINITION =====
1470 '----- Select Std./IBM -----
1480 LOCATE 6,1 :PRINT "SELECT MODE"
1490 S0$="Standard mode (DIP SW. 1-6 ON )"
1500 S1$="IBM mode (DIP SW. 1-6 OFF)"
1510 S=0 :PX=7 :PY=1 :GOSUB 2820 :IBM=S
1520 IF IBM THEN HD$=F$+" :"+STRING$(3,0) ELSE HD$=E$+" :"+STRING$(3,0)
1530 '----- Select character mode -----
1540 LOCATE 9,1 :PRINT "SELECT STYLE"
1550 S0$="Normal (24dot) " :S1$="Super/subscript (16dot)"
1560 S=0 :PX=10 :PY=1 :GOSUB 2820 :SCR=S
1570 IF SCR THEN 1580 ELSE 1590
1580 HD$=CHR$(27)+"SO"+HD$ :HI=16 :GOTO 1600
1590 HD$=CHR$(27)+"T"+HD$ :HI=24
1600 '----- Select Quality -----
1610 LOCATE 12,1 :PRINT "SELECT QUALITY" :S=0
1620 LOCATE 13,1 :PRINT " Letter quality"
1630 LOCATE 14,1 :PRINT " Draft quality"
1640 LOCATE 15,1 :PRINT " Proportional"
1650 LOCATE 13+S,1 :PRINT "==" :S$=INPUT$(1) :QUA=ASC(S$)
1660 IF QUA=13 THEN QUA=S :GOTO 1680 ELSE LOCATE 13+S,1 :PRINT " "
1670 S=((S+1) MOD 3) :GOTO 1650
1680 IF QUA=0 THEN HD$=E$+"x1"+HD$ :W=36 :A=23 ELSE 1700
1690 IF NOT SCR THEN 1740 ELSE 1860
1700 IF QUA=2 THEN 1720 ELSE HD$=E$+"x0"+HD$ :W=12
1710 IF SCR THEN A=7 :GOTO 1860 ELSE A=9 :GOTO 1860
1720 HD$=E$+"p1"+HD$ :W=42
1730 IF SCR THEN A=23 :GOTO 1860 ELSE A=37 :GOTO 1860
1740 '
1750 '----- Select Character pitch -----
1760 LOCATE 12,1 :PRINT "Print pitch " :S=0
1770 LOCATE 13,1 :PRINT " LQ-10cpi. "
1780 LOCATE 14,1 :PRINT " LQ-12cpi. "
1790 LOCATE 15,1 :PRINT " LQ-17cpi. "
1800 LOCATE 13+S,1 :PRINT "==" :S$=INPUT$(1) :PT=ASC(S$)
1810 IF PT=13 THEN PT=S :GOTO 1830 ELSE LOCATE 13+S,1 :PRINT " "
1820 S=((S+1) MOD 3) :GOTO 1800
1830 HD$=E$+"x1"+HD$ :W=36 :A=29
1840 IF PT=1 THEN W=30 :A=23 ELSE IF PT=2 THEN W=24 :A=15
1850 '
1860 CC=33 :CH$=""
1870 '----- Select Continue/Start over -----
1880 LOCATE 16,1 :PRINT "CONTINUE?"

```

```

1890 S0$="Continue" :S1$="Start over"
1900 S=0 :PX=17 :PY=1 :GOSUB 2820 :IF S THEN CLS :GOTO 1120
1910 '
1920 '-----
1930 CLS
1940 '----- Select character position -----
1950 CH$=CHR$(CC)
1960 LOCATE 1,50 :PRINT "CHARACTER [";CH$;"]";
1970 I$=INPUT$(1)
1980 IF "<I$ AND I$<CHR$(127) THEN CH$=I$ ELSE GOTO 2000
1990 CC=ASC(CH$)
2000 LOCATE 1,50 :PRINT "CHARACTER : ";CH$; " "
2010 IF A(CC)<0 THEN AO=0 :A1=A :A2=W-A :GOTO 2030
2020 AO=ASC(LEFT$(A$(CC),1)) :A1=A(CC) :A2=ASC(RIGHT$(A$(CC),1))
2030 LOCATE 3,50 :PRINT "Body-Width = ";A1
2040 LOCATE 4,50 :PRINT "Left Space = ";AO
2050 LOCATE 5,50 :PRINT "Right Space = ";A2
2060 LOCATE 7,50 :PRINT "( Are you sure ? )"
2070 LOCATE 8,50 :PRINT "*** Yes or No ***"
2080 A$=INPUT$(1)
2090 LOCATE 7,50 :PRINT SPC(25) :LOCATE 8,50 :PRINT SPC(25)
2100 IF A$="N" OR A$="n" THEN 2110 ELSE GOTO 2240
2110 '----- Select Character width/Left space -----
2120 FOR I=3 TO 5 :LOCATE I,50 :PRINT SPC(25) :NEXT I
2130 LOCATE 3,50 :INPUT "Body-Width = ";A1
2140 IF A1=0 OR A1>W THEN BEEP :LOCATE 3,50 :PRINT SPC(20) :GOTO 2130
2150 LOCATE 3,63 :PRINT STR$(A1);". "
2160 LOCATE 4,50 :INPUT "Left Space = ";AO
2170 IF AO+A1>W THEN BEEP :LOCATE 4,50 :PRINT SPC(20) :GOTO 2160
2180 LOCATE 4,63 :PRINT STR$(AO);". "
2190 IF QUA=2 THEN 2210
2200 A2=W-AO-A1 :LOCATE 5,50 :PRINT "Right Space = ";:GOTO 2230
2210 LOCATE 5,50 :INPUT "Right Space = ";A2
2220 IF AO+A1+A2>W THEN LOCATE 3,50 :PRINT SPC(20) :GOTO 2210
2230 LOCATE 5,63 :PRINT STR$(A2);". " :GOTO 2060
2240 '----- Key explanations -----
2250 LOCATE 10,50 :PRINT "F1: Clear dot"
2260 LOCATE 11,50 :PRINT "F2: Pass over"
2270 LOCATE 12,50 :PRINT "F3: Set dot"
2280 LOCATE 13,50 :PRINT "F4: Clear all dots"
2290 LOCATE 14,50 :PRINT "F5: Skip character"
2300 LOCATE 15,50 :PRINT "F6: End"
2310 LOCATE 16,50 :PRINT "RET Record character"
2320 '----- Get character -----
2330 IF A(CC)<0 THEN GOSUB 3040 :GOTO 2460
2340 '
2350 FOR N=1 TO HI-7 STEP 8 :FOR O=N TO N+7 :LOCATE O,1
2360 IF O=N THEN PRINT LEFT$(SC$(O),A1); ELSE PRINT LEFT$(SC$(1),A1);
2370 NEXT O,N
2380 H=0 :FOR Y=1 TO A1 :FOR N=1 TO HI-7 STEP 8 :H=H+1 :WT=128
2390 P=ASC(MID$(P$(CC),H,1)) :FOR O=N TO N+7
2400 IF (P AND WT)=0 THEN 2430
2410 DT(O,Y)=1 :CS$="█" :BX=0 :BY=Y
2420 IF Y<A1 THEN DT(O,Y+1)=2 :CS$="█" :GOSUB 3680 ELSE GOSUB 3680
2430 WT=.5*WT :NEXT O :NEXT N :NEXT Y
2440 '----- Modify & plot character -----
2450 X=1 :Y=1
2460 FOR Z=10 TO 12 :LOCATE Z,48 :PRINT " " :NEXT Z
2470 ST=2 :LOCATE 11,48 :PRINT "+" :GOTO 2480
2480 '
2490 IF DT(X,Y)=2 THEN CS$=CHR$(2) :GOTO 2610
2500 '
2510 IF DT(X,Y)=0 THEN 2570
2520 IF ST>1 THEN 2540 ELSE DT(X,Y)=0 :CS$=CHR$(1)

```

```

2530 IF Y<A1 THEN DT(X,Y+1)=0 :CS$=STRING$(2,1) :GOTO 2610 ELSE GOTO 2610
2540 IF Y=A1 THEN CS$=CHR$(2) ELSE CS$=STRING$(2,2)
2550 GOTO 2610
2560 '
2570 IF ST<3 THEN CS$=CHR$(1) :GOTO 2610
2580 IF DT(X,Y+1)=1 THEN CS$=CHR$(1) :GOTO 2610
2590 DT(X,Y)=1 :CS$=CHR$(2)
2600 IF Y<A1 THEN DT(X,Y+1)=2 :CS$=STRING$(2,2)
2610 GOSUB 3670
2620 SS=ST :BX=X :BY=Y :GOSUB 2930 :IF SS=ST THEN 2710
2630 '
2640 IF ST>3 THEN 2670
2650 FOR Z=10 TO 12 :LOCATE Z,48 :PRINT " " :NEXT Z
2660 LOCATE 9+ST,48 :PRINT "+" :GOTO 2480
2670 IF ST=4 THEN GOSUB 3040 :GOTO 2460
2680 IF ST=5 THEN CLS :GOTO 1940
2690 IF ST=6 THEN 3210
2700 IF ST=7 THEN 3100
2710 '
2720 IF DT(BX,BY)=0 THEN 2750 :ELSE CS$="█"
2730 IF DT(BX,BY)=1 AND BY<A1 THEN CS$="█"
2740 GOTO 2810
2750 '
2760 CS$="." :IF (BX MOD 8)=1 THEN CS$="-"
2770 IF (BY MOD 10)=0 THEN CS$="+"
2780 IF BY=A1 OR DT(BX,BY+1)<>0 THEN 2810
2790 IF ((BY+1) MOD 10)=0 THEN CS$=CS$+"+" :GOTO 2810
2800 IF (BX MOD 8)=1 THEN CS$=CS$+"-" ELSE CS$=CS$+"."
2810 GOSUB 3680 :GOTO 2480
2820 '----- Yes or No -----
2830 LOCATE PX,PY :PRINT " " ;S0$
2840 LOCATE PX+1,PY :PRINT " " ;S1$
2850 IF NOT S THEN 2860 ELSE 2880
2860 LOCATE PX,PY :PRINT "=="
2870 LOCATE PX+1,PY :PRINT " " :LOCATE PX,PY
2880 IF S THEN 2890 ELSE 2910
2890 LOCATE PX,PY :PRINT " "
2900 LOCATE PX+1,PY :PRINT "==" :LOCATE PX,PY
2910 I$=INPUT$(1) :IF I$<>CHR$(13) THEN S=NOT S :GOTO 2850
2920 RETURN
2930 '----- Function key check -----
2940 I$=INPUT$(1) :SK=ASC(I$) :FK=VAL(I$)
2950 IF SK>6 AND SK<14 THEN ST=SK-6 :GOTO 3030
2960 IF FK=0 OR FK=5 THEN 2940
2970 IF FK MOD 3 = 0 THEN Y=Y+1
2980 IF FK MOD 3 = 1 THEN Y=Y-1
2990 IF FK >6 THEN X=X-1
3000 IF FK <4 THEN X=X+1
3010 IF Y>A1 THEN Y=A1 ELSE IF Y<1 THEN Y=1
3020 IF X>HI THEN X=HI ELSE IF X<1 THEN X=1
3030 RETURN
3040 '----- Clear all dots -----
3050 FOR N=1 TO HI-7 STEP 8 :FOR O=N TO N+7 :LOCATE O,1
3060 IF O=N THEN PRINT LEFT$(SC$(O),A1); ELSE PRINT LEFT$(SC$(1),A1);
3070 NEXT O,N
3080 FOR X=1 TO HI :FOR Y=1 TO A1 :DT(X,Y)=0 :NEXT Y,X
3090 ST=2 :X=1 :Y=1 :RETURN
3100 '----- Store character data -----
3110 CLS :LOCATE 20,20 :PRINT "***** WAIT *****"
3120 FL=0 :A$(CC)=CHR$(A0)+CHR$(A1)+CHR$(A2) :A(CC)=A1 :P$(CC)="
3130 FOR Y=1 TO A1 :FOR N=1 TO HI-7 STEP 8 :WT=128 :P=0
3140 FOR X=N TO N+7 :P=P+WT*(DT(X,Y) AND 1) :FL=FL+P
3150 WT=.5*WT :NEXT X
3160 P$(CC)=P$(CC)+CHR$(P) :NEXT N,Y

```

```

3170 IF FL=0 THEN A(CC)=-1
3180 BEEP
3190 CC=CC+1 :IF CC=127 THEN CC=33
3200 GOTO 1920
3210 '----- Wrap-up -----
3220 CLS :LOCATE 1,1 :PRINT "SAVE TO FILE?"
3230 S=0 :PX=2 :PY=1 :SO$="Yes" :S1$="No" :GOSUB 2820
3240 IF S THEN 3310
3250 LOCATE 5,10 :PRINT "Output file name [";FI$;"] ";
3260 INPUT FO$
3270 IF FO$="" AND FI$="" THEN 3250
3280 IF FO$="" THEN FO$=FI$
3290 OPEN FO$ FOR OUTPUT AS #1
3300 GOSUB 3410 :CLOSE #1
3310 '
3320 LOCATE 7,1
3330 PRINT "DOWNLOAD TO PRINTER? (DIP SWITCH 2-1 MUST BE OFF)"
3340 S=0 :PX=6 :PY=1 :SO$="Yes" :S1$="No" :GOSUB 2820
3350 IF S THEN END
3360 LOCATE 11,1 :PRINT "Select I/F board "
3370 S=PB :SO$="COLOR" :S1$="MONOCRO" :PX=12 :PY=1 :GOSUB 2820 :PB=S
3380 GOSUB 3480 :LPRINT E$;"3";CHR$(50);
3390 FOR CC=33 TO 126 :LPRINT CHR$(CC);" ";:NEXT CC
3400 LPRINT STRING$(10,10) :END
3410 '----- Output to Diskette -----
3420 PRINT#1,HD$;
3430 FOR CC=33 TO 126
3440 IF A(CC)<0 THEN 3460
3450 PRINT#1,E$;"&";CHR$(0);STRING$(2,CC);A$(CC);P$(CC);
3460 NEXT CC
3470 PRINT#1,E$;"%1";:RETURN
3480 '----- Output to Printer -----
3490 IF QUA>0 OR SCR THEN 3510
3500 IF PT=1 THEN LPRINT E$;"M"; ELSE IF PT=2 THEN LPRINT CHR$(15);
3510 LPRINT HD$;
3520 FOR CC=33 TO 126
3530 IF A(CC)<0 THEN 3570
3540 LPRINT E$;"&";CHR$(0);STRING$(2,CC);
3550 FOR Y=1 TO 3 :Z=ASC(MID$(A$(CC),Y,1)) :GOSUB 3590 :NEXT Y
3560 FOR Y=1 TO LEN(P$(CC)) :Z=ASC(MID$(P$(CC),Y,1)) :GOSUB 3590 :NEXT Y
3570 NEXT CC
3580 LPRINT E$;"%1";:RETURN
3590 '
3600 IF NOT PB THEN 3630
3610 PP=INP(&H3BD) :IF PP<128 THEN 3610
3620 OUT &H3BC,Z :OUT &H3BE,5 :OUT &H3BE,4 :GOTO 3650
3630 PP=INP(&H379) :IF PP<128 THEN 3630
3640 OUT &H378,Z :OUT &H37A,5 :OUT &H37A,4
3650 RETURN
3660 '----- Plot character -----
3670 LOCATE X,Y :PRINT CS$;:RETURN
3680 LOCATE BX,BY :PRINT CS$;:RETURN

```



# Appendix D

## CHARACTER SETS

This appendix gives tables of the printer's standard and IBM character sets.

The decimal character code of each character is shown in an inset to the lower right of the character.

The hexadecimal code can be found by reading the entries at the top and left edges of the table. For example, the character "A" is in column 4 and row 1, so its hexadecimal character code is 41. This is equivalent ( $4 \times 16 + 1 = 65$ ) to decimal 65, the number in the inset.

Control codes recognized by this printer are indicated by abbreviations inside pointed brackets  $\langle \rangle$ .

**<Sample >**

| Hexa-<br>decimal | 0          | 1           | 2       | 3       | 4       | 5       | 6       | 7        |
|------------------|------------|-------------|---------|---------|---------|---------|---------|----------|
| 0                | <NUL><br>0 | 16          | 32      | 48      | 64<br>@ | 80<br>P | 96<br>' | 112<br>p |
| 1                | 1          | <DC1><br>17 | 33<br>! | 49<br>1 | 65<br>A | 81<br>Q | 97<br>a | 113<br>q |
| 2                | 2          | <DC2><br>18 | 34<br>" | 50<br>2 | 66<br>B | 82<br>R | 98<br>b | 114<br>r |
| 3                |            |             | 3       | 3       | 67<br>C | 83<br>S |         | s        |

Character

Hexadecimal value (high order)

Control code

Decimal value

Hexadecimal value (low order)

# STANDARD CHARACTER SET

| Hexa-<br>decimal | 0          | 1           | 2       | 3       | 4       | 5        | 6        | 7            |
|------------------|------------|-------------|---------|---------|---------|----------|----------|--------------|
| 0                | <NUL><br>0 | 16<br>32    | 0<br>48 | @<br>64 | P<br>80 | '<br>96  | p<br>112 |              |
| 1                | <DC1><br>1 | !<br>33     | 1<br>49 | A<br>65 | Q<br>81 | a<br>97  | q<br>113 |              |
| 2                | <DC2><br>2 | "<br>34     | 2<br>50 | B<br>66 | R<br>82 | b<br>98  | r<br>114 |              |
| 3                | <DC3><br>3 | #<br>35     | 3<br>51 | C<br>67 | S<br>83 | c<br>99  | s<br>115 |              |
| 4                | <DC4><br>4 | \$<br>36    | 4<br>52 | D<br>68 | T<br>84 | d<br>100 | t<br>116 |              |
| 5                | <br>5      | %<br>37     | 5<br>53 | E<br>69 | U<br>85 | e<br>101 | u<br>117 |              |
| 6                | <br>6      | &<br>38     | 6<br>54 | F<br>70 | V<br>86 | f<br>102 | v<br>118 |              |
| 7                | <BEL><br>7 | '<br>39     | 7<br>55 | G<br>71 | W<br>87 | g<br>103 | w<br>119 |              |
| 8                | <BS><br>8  | <CAN><br>24 | (<br>40 | 8<br>56 | H<br>72 | X<br>88  | h<br>104 | x<br>120     |
| 9                | <HT><br>9  | <EM><br>25  | )<br>41 | 9<br>57 | I<br>73 | Y<br>89  | i<br>105 | y<br>121     |
| A                | <LF><br>10 | <br>26      | *<br>42 | :<br>58 | J<br>74 | Z<br>90  | j<br>106 | z<br>122     |
| B                | <VT><br>11 | <ESC><br>27 | +<br>43 | ;<br>59 | K<br>75 | [<br>91  | k<br>107 | {<br>123     |
| C                | <FF><br>12 | <br>28      | ,<br>44 | <<br>60 | L<br>76 | \<br>92  | l<br>108 | !<br>124     |
| D                | <CR><br>13 | <br>29      | -<br>45 | =<br>61 | M<br>77 | ]<br>93  | m<br>109 | }<br>125     |
| E                | <SO><br>14 | <br>30      | .<br>46 | ><br>62 | N<br>78 | ^<br>94  | n<br>110 | ~<br>126     |
| F                | <SI><br>15 | <br>31      | /<br>47 | ?<br>63 | O<br>79 | _<br>95  | o<br>111 | <DEL><br>127 |

| Hexa-<br>decimal | 8            | 9            | A         | B        | C        | D        | E        | F            |
|------------------|--------------|--------------|-----------|----------|----------|----------|----------|--------------|
| 0                | <NUL><br>128 |              |           | 0<br>176 | @<br>192 | P<br>208 | '<br>224 | p<br>240     |
| 1                |              | <DC1><br>145 | !<br>161  | 1<br>177 | A<br>193 | Q<br>209 | a<br>225 | q<br>241     |
| 2                |              | <DC2><br>146 | "<br>162  | 2<br>178 | B<br>194 | R<br>210 | b<br>226 | r<br>242     |
| 3                |              | <DC3><br>147 | #<br>163  | 3<br>179 | C<br>195 | S<br>211 | c<br>227 | s<br>243     |
| 4                |              | <DC4><br>148 | \$<br>164 | 4<br>180 | D<br>196 | T<br>212 | d<br>228 | t<br>244     |
| 5                |              |              | &<br>165  | 5<br>181 | E<br>197 | U<br>213 | e<br>229 | u<br>245     |
| 6                |              |              | &<br>166  | 6<br>182 | F<br>198 | V<br>214 | f<br>230 | v<br>246     |
| 7                | <BEL><br>135 |              | '<br>167  | 7<br>183 | G<br>199 | W<br>215 | g<br>231 | w<br>247     |
| 8                | <BS><br>136  | <CAN><br>152 | (<br>168  | 8<br>184 | H<br>200 | X<br>216 | h<br>232 | x<br>248     |
| 9                | <HT><br>137  | <EM><br>153  | )<br>169  | 9<br>185 | I<br>201 | Y<br>217 | i<br>233 | y<br>249     |
| A                | <LF><br>138  |              | *<br>170  | :<br>186 | J<br>202 | Z<br>218 | j<br>234 | z<br>250     |
| B                | <VT><br>139  | <ESC><br>155 | +<br>171  | ;<br>187 | K<br>203 | [<br>219 | k<br>235 | {<br>251     |
| C                | <FF><br>140  |              | ,<br>172  | <<br>188 | L<br>204 | \<br>220 | l<br>236 | !<br>252     |
| D                | <CR><br>141  |              | -<br>173  | =<br>189 | M<br>205 | ]<br>221 | m<br>237 | }<br>253     |
| E                | <SO><br>142  |              | .<br>174  | ><br>190 | N<br>206 | ^<br>222 | n<br>238 | ~<br>254     |
| F                | <SI><br>143  |              | /<br>175  | ?<br>191 | O<br>207 | _<br>223 | o<br>239 | <DEL><br>255 |

# IBM CHARACTER SET #2

| Hexa-decimal | 0          | 1           | 2  | 3 | 4 | 5 | 6 | 7 |
|--------------|------------|-------------|----|---|---|---|---|---|
| 0            | <NUL><br>0 |             |    | 0 | @ | P | ' | p |
| 1            |            | <DC1><br>1  | !  | 1 | A | Q | a | q |
| 2            |            | <DC2><br>2  | "  | 2 | B | R | b | r |
| 3            | ♥          | <DC3><br>3  | #  | 3 | C | S | c | s |
| 4            | ♦          | <DC4><br>4  | \$ | 4 | D | T | d | t |
| 5            | ‡          | §           | %  | 5 | E | U | e | u |
| 6            | ↑          |             | &  | 6 | F | V | f | v |
| 7            | <BEL><br>7 |             | '  | 7 | G | W | g | w |
| 8            | <BS><br>8  | <CAN><br>24 | (  | 8 | H | X | h | x |
| 9            | <HT><br>9  | <EM><br>25  | )  | 9 | I | Y | i | y |
| A            | <LF><br>10 |             | *  | : | J | Z | j | z |
| B            | <VT><br>11 | <ESC><br>27 | +  | ; | K | [ | k | { |
| C            | <FF><br>12 | <FS><br>28  | ,  | < | L | \ | l | ; |
| D            | <CR><br>13 |             | -  | = | M | ] | m | } |
| E            | <SO><br>14 |             | .  | > | N | ^ | n | ~ |
| F            | <SI><br>15 |             | /  | ? | O | _ | o |   |

| Hexa-decimal | 8        | 9        | A        | B        | C        | D        | E        | F        |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0            | Ç<br>128 | Ĥ<br>144 | á<br>160 | ⋮<br>176 | ⊥<br>192 | ⊥<br>208 | α<br>224 | ≡<br>240 |
| 1            | ü<br>129 | æ<br>145 | í<br>161 | ⋮<br>177 | ⊥<br>193 | ⊥<br>209 | β<br>225 | ±<br>241 |
| 2            | é<br>130 | Æ<br>146 | ó<br>162 | ⋮<br>178 | ⊥<br>194 | ⊥<br>210 | Γ<br>226 | ≥<br>242 |
| 3            | â<br>131 | ô<br>147 | ú<br>163 | <br>179  | †<br>195 | ⊥<br>211 | π<br>227 | ≤<br>243 |
| 4            | ä<br>132 | ö<br>148 | ñ<br>164 | †<br>180 | -<br>196 | ⊥<br>212 | Σ<br>228 | ∫<br>244 |
| 5            | à<br>133 | ò<br>149 | ñ<br>165 | †<br>181 | †<br>197 | ⊥<br>213 | σ<br>229 | J<br>245 |
| 6            | â<br>134 | û<br>150 | ä<br>166 | †<br>182 | †<br>198 | ⊥<br>214 | μ<br>230 | ÷<br>246 |
| 7            | ç<br>135 | ù<br>151 | ó<br>167 | ⊥<br>183 | †<br>199 | †<br>215 | τ<br>231 | ≈<br>247 |
| 8            | ê<br>136 | ÿ<br>152 | ¿<br>168 | †<br>184 | ⊥<br>200 | †<br>216 | Φ<br>232 | °<br>248 |
| 9            | ë<br>137 | ö<br>153 | ˘<br>169 | †<br>185 | ⊥<br>201 | ⊥<br>217 | Θ<br>233 | ·<br>249 |
| A            | è<br>138 | Û<br>154 | ˘<br>170 | ⊥<br>186 | ⊥<br>202 | ⊥<br>218 | Ω<br>234 | -<br>250 |
| B            | ï<br>139 | ç<br>155 | ½<br>171 | ⊥<br>187 | ⊥<br>203 | ⊥<br>219 | δ<br>235 | √<br>251 |
| C            | î<br>140 | £<br>156 | ¼<br>172 | ⊥<br>188 | ⊥<br>204 | ⊥<br>220 | ∞<br>236 | ∞<br>252 |
| D            | ì<br>141 | ¥<br>157 | ı<br>173 | ⊥<br>189 | =<br>205 | ⊥<br>221 | ∅<br>237 | ²<br>253 |
| E            | ÿ<br>142 | Ŕ<br>158 | «<br>174 | ⊥<br>190 | †<br>206 | ⊥<br>222 | €<br>238 | ▪<br>254 |
| F            | À<br>143 | Œ<br>159 | »<br>175 | †<br>191 | ⊥<br>207 | ⊥<br>223 | ∩<br>239 | <br>255  |

# IBM CHARACTER SET #1

| Hexa-decimal | 0          | 1           |
|--------------|------------|-------------|
| 0            | <NUL><br>0 | 16          |
| 1            | 1          | <DC1><br>17 |
| 2            | 2          | <DC2><br>18 |
| 3            | 3          | <DC3><br>19 |
| 4            | 4          | <DC4><br>20 |
| 5            | 5          | 21          |
| 6            | 6          | 22          |
| 7            | <BEL><br>7 | 23          |
| 8            | <BS><br>8  | <CAN><br>24 |
| 9            | <HT><br>9  | <EM><br>25  |
| A            | <LF><br>10 | 26          |
| B            | <VT><br>11 | <ESC><br>27 |
| C            | <FF><br>12 | <FS><br>28  |
| D            | <CR><br>13 | 29          |
| E            | <SO><br>14 | 30          |
| F            | <SI><br>15 | 31          |

| Hexa-decimal | 8            | 9            |
|--------------|--------------|--------------|
| 0            | <NUL><br>128 | 144          |
| 1            | 129          | <DC1><br>145 |
| 2            | 130          | <DC2><br>146 |
| 3            | 131          | <DC3><br>147 |
| 4            | 132          | <DC4><br>148 |
| 5            | 133          | 149          |
| 6            | 134          | 150          |
| 7            | <BEL><br>135 | 151          |
| 8            | <BS><br>136  | <CAN><br>152 |
| 9            | <HT><br>137  | <EM><br>153  |
| A            | <LF><br>138  | 154          |
| B            | <VT><br>139  | <ESC><br>155 |
| C            | <FF><br>140  | <FS><br>156  |
| D            | <CR><br>141  | 157          |
| E            | <SO><br>142  | 158          |
| F            | <SI><br>143  | 159          |

Other characters are identical to IBM character set #2.

The duplication of control codes enables systems with a 7-bit interface to obtain control functions when the most significant bit is set to 1 by the <ESC> ">" command.

# ADDITIONAL CHARACTER SET

| Hexa-decimal | 0       | 1        |
|--------------|---------|----------|
| 0            | ∅<br>0  | ▶<br>16  |
| 1            | ☺<br>1  | ◀<br>17  |
| 2            | ☹<br>2  | ↕<br>18  |
| 3            | ♥<br>3  | !!<br>19 |
| 4            | ♦<br>4  | π<br>20  |
| 5            | ♣<br>5  | §<br>21  |
| 6            | ♠<br>6  | -<br>22  |
| 7            | ·<br>7  | ↕<br>23  |
| 8            | █<br>8  | ↑<br>24  |
| 9            | ◊<br>9  | ↓<br>25  |
| A            | Ⓢ<br>10 | →<br>26  |
| B            | ♂<br>11 | ←<br>27  |
| C            | ♀<br>12 | └<br>28  |
| D            | ♯<br>13 | ↔<br>29  |
| E            | ♪<br>14 | ▲<br>30  |
| F            | ✱<br>15 | ▼<br>31  |

In IBM mode, additional characters can be printed by special commands.

# INTERNATIONAL CHARACTER SETS

When an international character set is selected by DIP switches 2-2 to 2-4 or by a command from software, the following changes are made in the character set:

| Country        | 23 | 24 | 40 | 5B | 5C | 5D | 5E | 60 | 7B | 7C | 7D | 7E | 9B | 9D |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| U.S.A.         | #  | \$ | @  | [  | \  | ]  | ^  | '  | {  |    | }  | ~  | ç  | ¥  |
| FRANCE         | #  | \$ | à  | °  | ç  | §  | ^  | '  | é  | ù  | è  | ¨  | ç  | ¥  |
| GERMANY        | #  | \$ | §  | Ä  | Ö  | Ü  | ^  | '  | ä  | ö  | ü  | ß  | ç  | ¥  |
| ENGLAND        | £  | \$ | @  | [  | \  | ]  | ^  | '  | {  |    | }  | ~  | ç  | ¥  |
| DENMARK 1      | #  | \$ | @  | Æ  | Ø  | Å  | ^  | '  | æ  | ø  | å  | ~  | ç  | ¥  |
| SWEDEN         | #  | ¤  | É  | Ä  | Ö  | Å  | Û  | é  | ä  | ö  | å  | ü  | ç  | ¥  |
| ITALY          | #  | \$ | @  | °  | \  | é  | ^  | ù  | à  | ò  | è  | ì  | ç  | ¥  |
| SPAIN 1        | ₧  | \$ | @  | ı  | Ñ  | ¿  | ^  | '  | ¨  | ñ  | }  | ~  | ç  | ¥  |
| JAPAN          | #  | \$ | @  | [  | ¥  | ]  | ^  | '  | {  |    | }  | ~  | ç  | ¥  |
| NORWAY         | #  | ¤  | É  | Æ  | Ø  | Å  | Û  | é  | æ  | ø  | å  | ü  | ç  | ¥  |
| DENMARK 2      | #  | \$ | É  | Æ  | Ø  | Å  | Û  | é  | æ  | ø  | å  | ü  | ç  | ¥  |
| SPAIN 2        | #  | \$ | á  | ı  | Ñ  | ¿  | é  | '  | ı  | ñ  | ó  | ú  | ç  | ¥  |
| LATIN AMERICA  | #  | \$ | á  | ı  | Ñ  | ¿  | é  | ü  | ı  | ñ  | ó  | ú  | ç  | ¥  |
| DENMARK/NORWAY | #  | \$ | @  | [  | \  | ]  | ^  | '  | {  |    | }  | ~  | ø  | Ø  |

See page 17 for the DIP switch settings.

The commands for selecting the international character sets are:

Standard mode: <ESC> "R" *n*    IBM mode: <FS> "R" *n*

Where *n* means character code *n*, i.e. CHR\$( *n*) in BASIC. The values of *n* are:

- |             |           |                   |
|-------------|-----------|-------------------|
| 0 U.S.A     | 5 Sweden  | 10 Denmark II     |
| 1 France    | 6 Italy   | 11 Spain II       |
| 2 Germany   | 7 Spain I | 12 Latin America  |
| 3 England   | 8 Japan   | 13 Denmark/Norway |
| 4 Denmark I | 9 Norway  |                   |



---

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# COMMAND SUMMARY

| MODE | CONTROL CODE                                       | FUNCTION  | PAGE |
|------|--|---|------|
|      | < BEL >  | Bell  | 85   |
|      | < BS >   | Backspace   | 76   |
|      | < HT >   | Horizontal tab  | 77   |
|      | < LF >   | Line feed   | 70   |
|      | < VT >   | Vertical tab  | 74   |
|      | < FF >   | Form feed   | 72   |
|      | < CR >   | Carriage return   | 75   |
|      | < SO >   | Expanded printing for one line                          | 64   |
|      | < SI >   | Condensed printing                                      | 64   |
|      | < DC1 >  | Set printer on-line                                     | 85   |
|      | < DC2 >  | Cancel condensed printing                               | 64   |
| IBM  | < DC2 >  | Pica pitch  | 63   |
| Std. | < DC3 >  | Set printer off-line                                    | 85   |
|      | < DC4 >  | Cancel one-line expanded printing                       | 65   |
|      | < CAN >  | Cancel last line  | 84   |
|      | < ESC > < LF >                                     | Reverse line feed                                       | 70   |
|      | < ESC > < FF >                                     | Return to top of current page                           | 72   |
|      | < ESC > < SO >                                     | Expanded print for one line                             | 64   |
|      | < ESC > < SI >                                     | Condensed printing                                      | 64   |
|      | < ESC > < EM > < 0 >                               | Manual feed   | 86   |
|      | < ESC > < EM > < 4 >                               | Auto feed   | 86   |
|      | < ESC > < EM > "R"                                 | Eject paper from ASF                                    | 87   |
|      | < ESC > < EM > "T" <i>n</i>                        | Set print start position on ASF                         | 87   |
| Std. | < ESC > " " <i>n</i>                               | Increase character spacing                              | 66   |
|      | < ESC > "!" <i>n</i>                               | Select master print mode                                | 65   |
|      | < ESC > "#"  | Accept MSB as is  | 83   |
|      | < ESC > "\$" <i>n1 n2</i>                          | Absolute horizontal tab in inches                       | 78   |
|      | < ESC > "%" < 0 >                                  | Select ROM character set                                | 83   |
|      | < ESC > "%" < 1 >                                  | Select download character set                           | 82   |
|      | < ESC > "%" "0"                                    | Select ROM character set                                | 83   |
|      | < ESC > "%" "1"                                    | Select download character set                           | 82   |
| IBM  | < ESC > "=" < 0 > <i>n1 n2 m0 m1 m2 d1 d2 ....</i> | Define download characters                              | 82   |
| Std. | < ESC > "&" < 0 > <i>n1 n2 m0 m1 m2 d1 d2 ....</i> | Define download characters                              | 82   |
|      | < ESC > "*" <i>n0 n1 n2 m1 m2 ....</i>             | Select graphics mode                                    | 80   |
|      | < ESC > "-" < 0 >                                  | Stop underlining  | 60   |
|      | < ESC > "-" < 1 >                                  | Start underlining                                       | 59   |
|      | < ESC > "-" "0"                                    | Stop underlining  | 60   |
|      | < ESC > "-" "1"                                    | Start underlining                                       | 59   |
|      | < ESC > "!" <i>n0</i>                              | Select vertical tab channel                             | 74   |
|      | < ESC > "0"  | Set line spacing to 1/8 inch                            | 68   |
|      | < ESC > "1"  | Set line spacing to 7/60 or 7/72 inch                   | 68   |
| IBM  | < ESC > "2"  | Execute < ESC > "A"                                     | 70   |
| Std. | < ESC > "2"  | Set line spacing to 1/6 inch                            | 69   |
|      | < ESC > "3" <i>n</i>                               | Set line spacing to <i>n</i> /180 or <i>n</i> /216 inch | 69   |
| IBM  | < ESC > "4"  | Set top of page at current position                     | 71   |
| Std. | < ESC > "4"  | Select italic characters                                | 58   |
| Std. | < ESC > "5"  | Select upright characters                               | 59   |
| IBM  | < ESC > "5" < 0 >                                  | Cancel automatic line feed                              | 75   |
| IBM  | < ESC > "5" < 1 >                                  | Set automatic line feed                                 | 75   |
|      | < ESC > "6"  | Select character set #2                                 | 61   |

| MODE | CONTROL CODE   | FUNCTION   | PAGE |
|------|--|--|------|
|      | < ESC > "7"  | Select character set #1  | 61   |
|      | < ESC > "8"  | Disable paper-out detector                                     | 73   |
|      | < ESC > "9"  | Enable paper-out detector                                      | 73   |
| IBM  | < ESC > ":", < 0 > < 0 > < 0 >                         | Elite pitch  | 63   |
| Std. | < ESC > "<"  | Copy standard characters from ROM into RAM                     | 81   |
|      | < ESC > "="  | One-line unidirectional printing                               | 86   |
| Std. | < ESC > ">"  | Set MSB to 0   | 83   |
|      | < ESC > "?" <i>n m</i>                                 | Set MSB to 1   | 83   |
|      | < ESC > "@"  | Convert graphics density                                       | 81   |
| IBM  | < ESC > "A" <i>n</i>                                   | Reset printer  | 87   |
| Std. | < ESC > "A" <i>n</i>                                   | Set line spacing to <i>n</i> /72 inch                          | 70   |
|      | < ESC > "A" <i>n</i>                                   | Set line spacing to <i>n</i> /60 inch                          | 69   |
|      | < ESC > "B" <i>n1 n2 ....</i> < 0 >                    | Set vertical tab stops   | 73   |
|      | < ESC > "C" <i>n</i>                                   | Set page length to <i>n</i> lines                              | 71   |
|      | < ESC > "C" < 0 > <i>n</i>                             | Set page length to <i>n</i> inches                             | 72   |
|      | < ESC > "D" <i>n1 n2 ....</i> < 0 >                    | Set horizontal tab stops                                       | 77   |
|      | < ESC > "E"  | Emphasized printing  | 59   |
|      | < ESC > "F"  | Cancel emphasized printing                                     | 59   |
|      | < ESC > "G"  | Double-strike printing   | 59   |
|      | < ESC > "H"  | Cancel double-strike printing                                  | 59   |
| IBM  | < ESC > "I" <i>n</i>                                   | Select character type and print pitch                          | 68   |
|      | < ESC > "J" <i>n</i>                                   | Perform one <i>n</i> /180-inch or <i>n</i> /216-inch line feed | 71   |
|      | < ESC > "K" <i>n1 n2 m1 m2 ....</i>                    | Print 8-bit single-density graphics                            | 79   |
|      | < ESC > "L" <i>n1 n2 m1 m2 ....</i>                    | Print 8-bit double-density graphics                            | 79   |
|      | < ESC > "M"  | Elite pitch  | 63   |
|      | < ESC > "N" <i>n</i>                                   | Set bottom margin  | 72   |
|      | < ESC > "O"  | Cancel top and bottom margins                                  | 72   |
| Std. | < ESC > "P"  | Pica pitch   | 63   |
| IBM  | < ESC > "P" < 0 >                                      | Select fixed spacing   | 65   |
| IBM  | < ESC > "P" < 1 >                                      | Select proportional spacing                                    | 65   |
| Std. | < ESC > "Q" <i>n</i>                                   | Set right margin   | 74   |
| IBM  | < ESC > "Q" < \$ >                                     | Set printer off-line   | 85   |
| IBM  | < ESC > "R"  | Reset all tab stops  | 77   |
| Std. | < ESC > "R" <i>n</i>                                   | Select international character set                             | 61   |
|      | < ESC > "S" < 0 >                                      | Superscript  | 60   |
|      | < ESC > "S" < 1 >                                      | Subscript  | 60   |
|      | < ESC > "S" "0"  | Superscript  | 60   |
|      | < ESC > "S" "1"  | Subscript  | 60   |
|      | < ESC > "T"  | Cancel superscript or subscript                                | 60   |
|      | < ESC > "U" < 0 >                                      | Bidirectional printing   | 86   |
|      | < ESC > "U" < 1 >                                      | Unidirectional printing  | 86   |
|      | < ESC > "U" "0"  | Bidirectional printing   | 86   |
|      | < ESC > "U" "1"  | Unidirectional printing  | 86   |
|      | < ESC > "V" <i>n d1 d2 .... dx</i> < ESC > "V" < 0 >   | Repeat data  | 84   |
|      | < ESC > "W" < 0 >                                      | Cancel expanded printing                                       | 64   |
|      | < ESC > "W" < 1 >                                      | Expanded printing  | 64   |
|      | < ESC > "W" "0"  | Cancel expanded printing                                       | 64   |
|      | < ESC > "W" "1"  | Expanded printing  | 64   |
|      | < ESC > "X" <i>n1 n2</i>                               | Set left and right margins                                     | 75   |
|      | < ESC > "Y" <i>n1 n2 m1 m2 ...</i>                     | Print 8-bit double-density, double-speed graphics              | 79   |
|      | < ESC > "Z" <i>n1 n2 m1 m2 ...</i>                     | Print 8-bit quadruple-density graphics                         | 79   |
|      | < ESC > "I" "@" < 4 > < 0 > < 0 > < 0 > <i>n m ...</i> | Select character height, width, and line spacing               | 67   |

| MODE | CONTROL CODE                              | FUNCTION   | PAGE |
|------|---|--|------|
| IBM  | <ESC> “[” “\” <4> <0> <0> <0> <0> <0> ... | Select base unit for line spacing                        | 69   |
| IBM  | <ESC> “[” “g” n1 n2 m0 m1 m2 ....         | Select graphics mode                                     | 81   |
| IBM  | <ESC> “[” “n1 n2                          | Enable printing of all character codes                   | 62   |
| Std. | <ESC> “[” “n1 n2                          | Relative horizontal tab                                  | 78   |
| IBM  | <ESC> “[” “^                              | Enable printing of all character codes on next character | 62   |
|      | <ESC> “[” “_” <0>                         | Stop overlining  | 60   |
|      | <ESC> “[” “_” <1>                         | Start overlining   | 60   |
|      | <ESC> “[” “_” “0”                         | Stop overlining  | 60   |
|      | <ESC> “[” “_” “1”                         | Start overlining   | 60   |
|      | <ESC> “[” “a” <0>                         | Left justify   | 76   |
|      | <ESC> “[” “a” <1>                         | Center text  | 76   |
|      | <ESC> “[” “a” <2>                         | Right justify  | 76   |
|      | <ESC> “[” “a” <3>                         | Full justify   | 76   |
|      | <ESC> “[” “a” “0”                         | Left justify   | 76   |
|      | <ESC> “[” “a” “1”                         | Center text  | 76   |
|      | <ESC> “[” “a” “2”                         | Right justify  | 76   |
|      | <ESC> “[” “a” “3”                         | Full justify   | 76   |
|      | <ESC> “[” “b” n1 n2 .... <0>              | Set vertical tab stops in channel                        | 73   |
|      | <ESC> “[” “c” n                           | Set top margin   | 72   |
| IBM  | <ESC> “[” “d” n1 n2                       | Relative horizontal tab in inches                        | 78   |
|      | <ESC> “[” “e” <0> n                       | Set horizontal tab stop every n columns                  | 77   |
|      | <ESC> “[” “e” <1> n                       | Set vertical tab stops every n lines                     | 73   |
|      | <ESC> “[” “e” “0” n                       | Set horizontal tab stop every n columns                  | 77   |
|      | <ESC> “[” “e” “1” n                       | Set vertical tab stops every n lines                     | 73   |
|      | <ESC> “[” “f” <0> n                       | Absolute horizontal tab in columns                       | 78   |
|      | <ESC> “[” “f” <1> n                       | Feed paper n lines                                       | 71   |
|      | <ESC> “[” “f” “0” n                       | Absolute horizontal tab in columns                       | 78   |
|      | <ESC> “[” “f” “1” n                       | Feed paper n lines                                       | 71   |
| Std. | <ESC> “[” “g”                             | Semi-condensed pitch                                     | 63   |
|      | <ESC> “[” “h” n                           | Select double or quadruple size                          | 66   |
|      | <ESC> “[” “i” <0>                         | Cancel immediate print                                   | 85   |
|      | <ESC> “[” “i” <1>                         | Immediate print  | 84   |
|      | <ESC> “[” “i” “0”                         | Cancel immediate print                                   | 85   |
|      | <ESC> “[” “i” “1”                         | Immediate print  | 84   |
| IBM  | <ESC> “[” “j”                             | Stop printing  | 85   |
| Std. | <ESC> “[” “j” n                           | Perform one n/180-inch reverse line feed                 | 71   |
|      | <ESC> “[” “k” n                           | Select LQ type style                                     | 58   |
|      | <ESC> “[” “l” n                           | Set left margin  | 74   |
|      | <ESC> “[” “p” <0>                         | Select fixed spacing                                     | 65   |
|      | <ESC> “[” “p” <1>                         | Select proportional spacing                              | 65   |
|      | <ESC> “[” “p” “0”                         | Select fixed spacing                                     | 65   |
|      | <ESC> “[” “p” “1”                         | Select proportional spacing                              | 65   |
| Std. | <ESC> “[” “q” n                           | Select ornament character                                | 58   |
|      | <ESC> “[” “s” <0>                         | Cancel quiet print                                       | 84   |
|      | <ESC> “[” “s” <1>                         | Quiet print  | 84   |
|      | <ESC> “[” “s” “0”                         | Cancel quiet print                                       | 84   |
|      | <ESC> “[” “s” “1”                         | Quiet print  | 84   |
|      | <ESC> “[” “t” <0>                         | Select standard character set                            | 61   |
|      | <ESC> “[” “t” <1>                         | Select IBM character set                                 | 61   |
|      | <ESC> “[” “t” “0”                         | Select standard character set                            | 61   |
|      | <ESC> “[” “t” “1”                         | Select IBM character set                                 | 61   |
|      | <ESC> “[” “w” <0>                         | Return to normal height                                  | 66   |
|      | <ESC> “[” “w” <1>                         | Print double-height characters                           | 66   |
|      | <ESC> “[” “w” “0”                         | Return to normal height                                  | 66   |
|      | <ESC> “[” “w” “1”                         | Print double-height characters                           | 66   |
|      | <ESC> “[” “x” <0>                         | Select draft quality characters                          | 57   |

| MODE | CONTROL CODE                        | FUNCTION                                   | PAGE |
|------|-------------------------------------|--|------|
|      | <ESC> "x" <1>                       | Select LQ characters                       | 58   |
|      | <ESC> "x" "0"                       | Select draft quality characters            | 57   |
|      | <ESC> "x" "1"                       | Select LQ characters                       | 58   |
|      | <ESC> "~" <0>                       | Select normal zero                         | 62   |
|      | <ESC> "~" <1>                       | Select slash zero                          | 62   |
|      | <ESC> "~" "0"                       | Select normal zero                         | 62   |
|      | <ESC> "~" "1"                       | Select slash zero                          | 62   |
| IBM  | <FS> "2"                            | Set line spacing to 1/6 inch               | 69   |
|      | <FS> "3" <i>n</i>                   | Set line spacing to <i>n</i> /360 inch     | 69   |
| IBM  | <FS> "4"                            | Select italic characters                   | 58   |
| IBM  | <FS> "5"                            | Select upright characters                  | 59   |
| IBM  | <FS> "·" <0> <0> <0>                | Copy standard characters from ROM into RAM | 81   |
| IBM  | <FS> "="                            | Set MSB to 0                               | 83   |
| Std. | <FS> "@"                            | Reset printer                              | 87   |
| IBM  | <FS> "A" <i>n</i>                   | Set line spacing to <i>n</i> /72 inch      | 69   |
| Std. | <FS> "C" <i>n</i>                   | Select LQ type style                       | 58   |
| Std. | <FS> "E" <i>n</i>                   | Select character width                     | 67   |
| Std. | <FS> "F"                            | Select forward feed mode                   | 70   |
| Std. | <FS> "I" <0>                        | Select standard character set              | 61   |
| Std. | <FS> "I" <1>                        | Select IBM character set                   | 61   |
| Std. | <FS> "I" "0"                        | Select standard character set              | 61   |
| Std. | <FS> "I" "1"                        | Select IBM character set                   | 61   |
| IBM  | <FS> "Q" <i>n</i>                   | Set right margin                           | 74   |
| Std. | <FS> "R"                            | Select reverse feed mode                   | 70   |
| IBM  | <FS> "R" <i>n</i>                   | Select international character set         | 61   |
| Std. | <FS> "S" <0>                        | High-density elite pitch                   | 63   |
| Std. | <FS> "S" <1>                        | High-speed elite pitch                     | 63   |
| Std. | <FS> "S" "0"                        | High-density elite pitch                   | 63   |
| Std. | <FS> "S" "1"                        | High-speed elite pitch                     | 63   |
| Std. | <FS> "V" <0>                        | Return to normal height                    | 66   |
| Std. | <FS> "V" <1>                        | Print double-height characters             | 66   |
| Std. | <FS> "V" "0"                        | Return to normal height                    | 66   |
| Std. | <FS> "V" "1"                        | Print double-height characters             | 66   |
|      | <FS> "Z" <i>n1 n2 m1 m2 m3 ....</i> | Print 24-bit hex-density graphics          | 80   |
| IBM  | <FS> "\ " <i>n1 n2</i>              | Relative horizontal tab                    | 78   |
|      | "(" "(" "0" ")" ")"                 | Manual feed                                | 86   |
|      | "(" "(" "4" ")" ")"                 | Auto feed                                  | 86   |
|      | "(" "(" "R" ")" ")"                 | Eject paper from ASF                       | 87   |
|      | "(" "(" "T" ")" ")" <i>n</i>        | Set print start position on ASF            | 87   |
| Std. | <DEL>                               | Delete last character sent                 | 83   |

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