

MULTI-FONT
NX-2415

USERS MANUAL

NOT INTENDED FOR SALE

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful 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:

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- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

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HOW TO USE THIS MANUAL

This manual is organized into nine chapters. To learn how to make the best use of your printer you are urged to read through chapters 1 through 3. The remaining chapters may be treated as a reference guide for programming operations, etc. It assumes a degree of acknowledge off the operation of computers (for instance, it assumes you know about hexadecimal numbers). The chapters are as follows:

Chapter 1 — Setting up the printer

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

Chapter 2 — Control panel operations

There are a number of controls on the front panel which perform various functions related to paper handling, print modes and font selection.

After getting set up, read this chapter and try out the procedures in it to find out how the printer works.

Chapter 3 — DIP switch settings

This chapter explains how to set the DIP switches to make system settings on the printer.

Chapter 4 — Printer control commands

This chapter explains the different emulations provided by your printer, and the software commands used to drive it. This section is of use if you are writing or modifying programs to take advantage of the printer's features.

Chapter 5 — Download characters

This chapter explains the procedures to create your own characters.

Chapter 6 — MS-DOS and your printer

Since the PC or PC-AT family of computers running under MS-DOS is currently the most popular configuration of microcomputer, we have included a few hints and tips to help you use your printer with such systems. Since virtually all PCs are sold with a Microsoft BASIC interpreter, we have also included some hints, and a sample program in this language to demonstrate the capabilities of the printer.

Chapter 7 — Troubleshooting and maintenance

This section gives a checklist of points to check if your printer is not working in the expected way. It also includes details of some routine maintenance operations you can carry out yourself. It is not, however, a complete service manual. Call a qualified service engineer if you are unsure of your ability to carry out any maintenance or servicing operations.

Chapter 8 — Specifications

This section gives the specifications of your printer.

Chapter 9 — Character sets

These charts give the different character sets available, and the differences between national character sets (as set up with the DIP switches).

FEATURES OF THE PRINTER

This printer is a convenient, monochrome printer without frills but 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, spread-sheets, and integrated software packages.

- Easy operation

Clearly understandable indicator displays and beep tones provide immediate feedback when you press the buttons on the control panel. The five buttons 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.

- Large variety of font styles and sizes

The printer has one draft style and four LQ styles (Courier, Sanserif, Orator and Script), plus italics for all styles, plus condensed print, bold print, double-sized print, quadruple-sized print.

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Chapter 1

SETTING UP THE PRINTER

Subjects covered in Chapter 1 include —

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

LOCATING THE PRINTER

Before you start unpacking and setting up your printer, make sure that you have a suitable place on which to locate it. By “a suitable place”, we mean:

- A firm, level surface which is fairly vibration-free
- Away from excessive heat (such as direct sunlight, heaters, etc)
- Away from excessive humidity
- Away from excessive dust
- 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.
- A location with sufficient space to locate the printer and any paper to be fed into it, as well as the printed paper coming out.
- If you are using a parallel connection to your computer, make sure that it is within 2m (6ft) of the printer (an RS-232 connection using the optional RS-232 interface can be made over longer distances).

UNPACKING AND INSPECTION

Check the carton contents

Now unpack the contents of the printer shipping carton, and check each item in the box against Figure 1-1 to make sure that you have everything (there should be five items).

If any of these items are missing, contact your supplier.

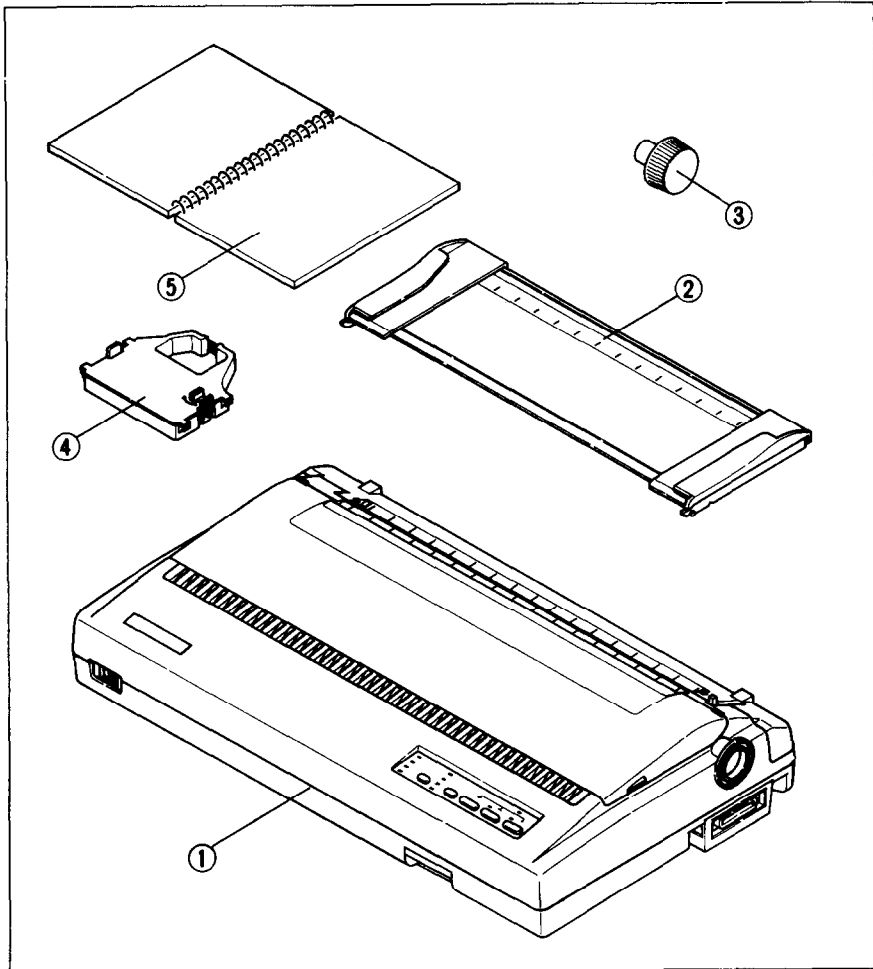


Figure 1-1. Check to make sure you have all five items: 1) Printer, 2) Paper guide, 3) Platen knob, 4) Ribbon cartridge, and 5) User's manual.

The optional accessories which you may have ordered with your printer are:

- Serial (RS-232) interface board
- Automatic sheet feeder
- Pull tractor unit
- Font card
- RAM card

Parts name of the printer

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

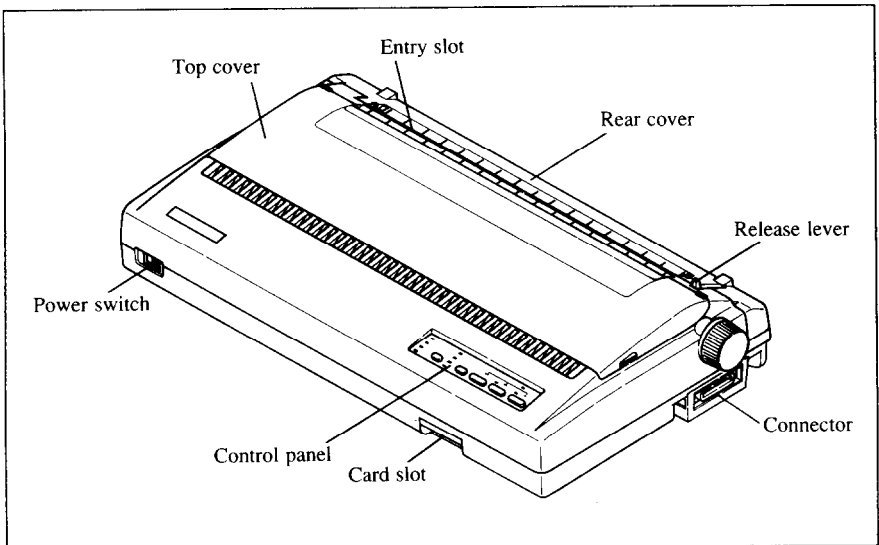


Figure 1-2. The printer's external parts

- Bail lever:** opens and closes the paper bail which holds the paper against the platen.
- 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.
- Card slot:** for inserting optional Font card or RAM card.
- Connector:** for connecting the computer to the printer.

SETTING UP

Place the printer in the position where it is going to be permanently sited, and remove all packing material from inside the top cover. This packing material is intended to prevent damage to the printer in transit. You may like to keep this packing with the printer carton if you intend transporting the printer for use at a different location.

Mount the platen knob

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

Mount the platen knob on the shaft on the right-hand side of the printer. Turn the knob on the shaft before pushing the knob fully into position.

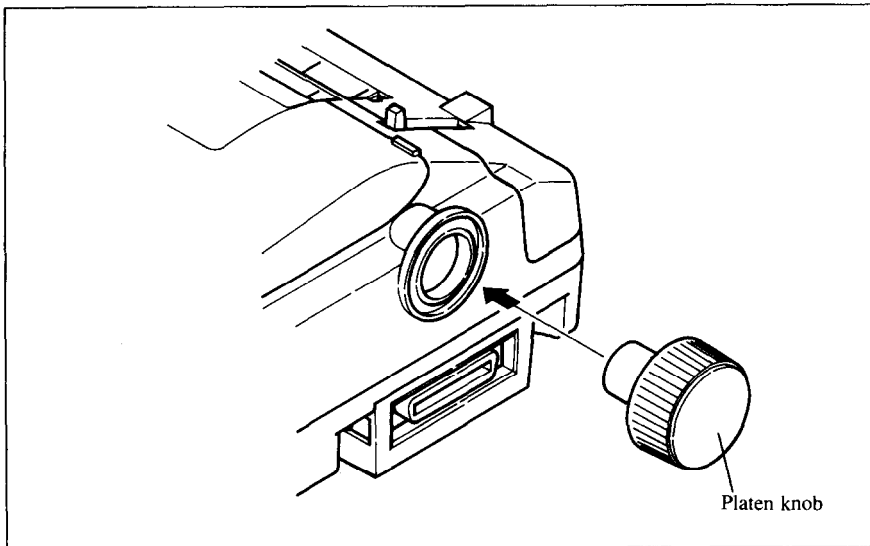


Figure 1-3. Mounting the platen knob

Install the ribbon cartridge

Remove the top cover by lifting the front (using the two grips at the side), and pulling towards you. Now install the ribbon.

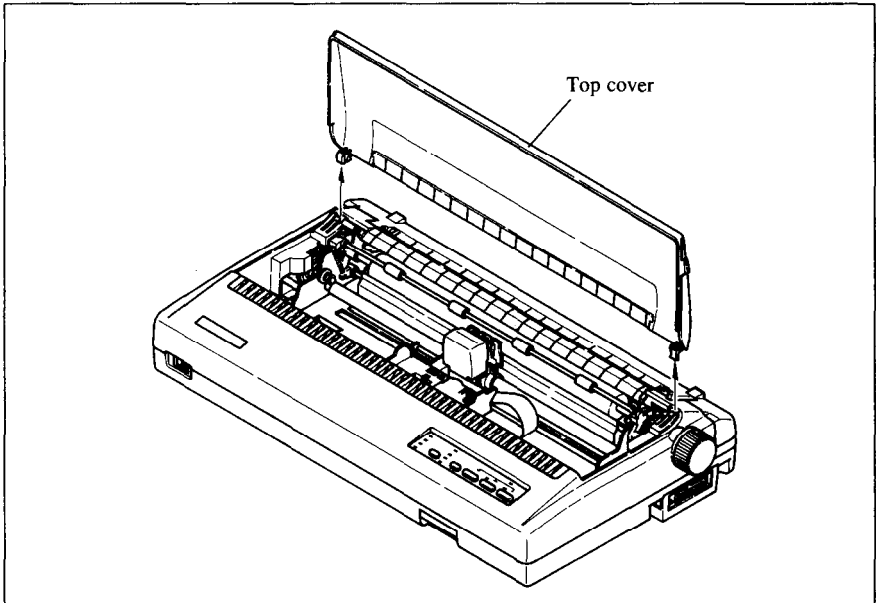


Figure 1-4. Removing the top cover

1. Use the tensioning knob on the ribbon cartridge to tighten the ribbon if it is slack (turn clockwise).
2. Use the grips on the side of the ribbon cartridge to help locate the cartridge (squeeze them inwards gently), and make sure that the spindles on the cartridge holder fit into the sockets on the cartridge itself.

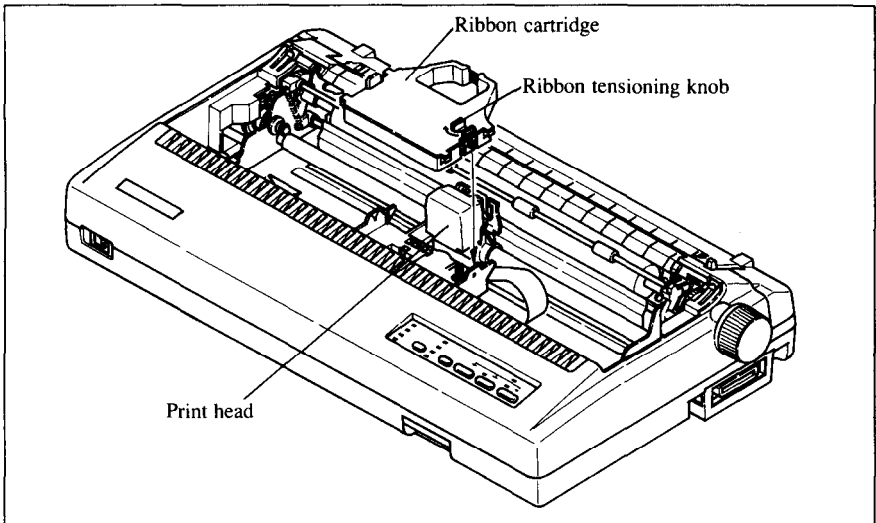


Figure 1-5. Installing the ribbon cartridge

3. The ribbon should pass between the print head and the print head shield (see Figure 1-6).

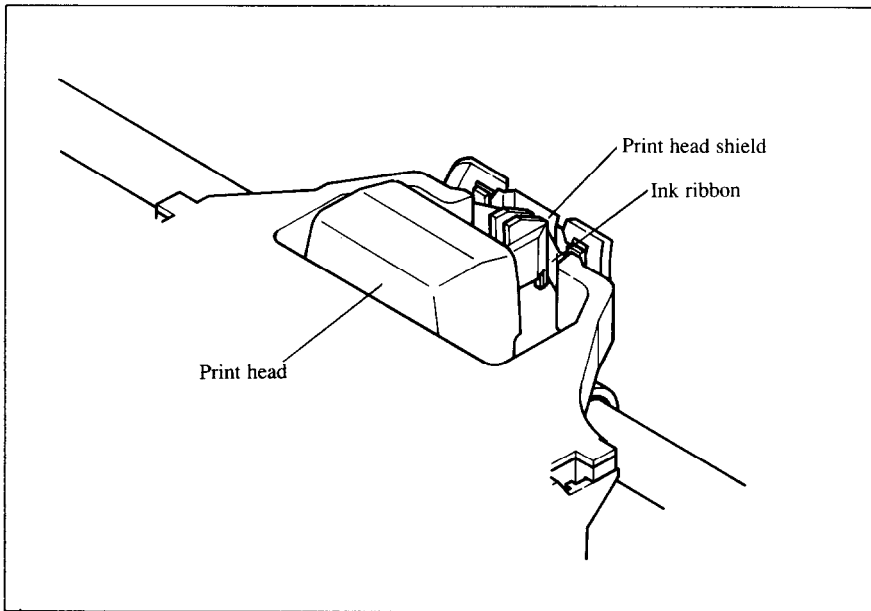


Figure 1-6. Pass the ribbon between the print head and print head shield

Now, hold the top cover upright and engage the tabs at the back. Then swing the front edge down until the cover is closed.

Leave the top 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 an 1 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.

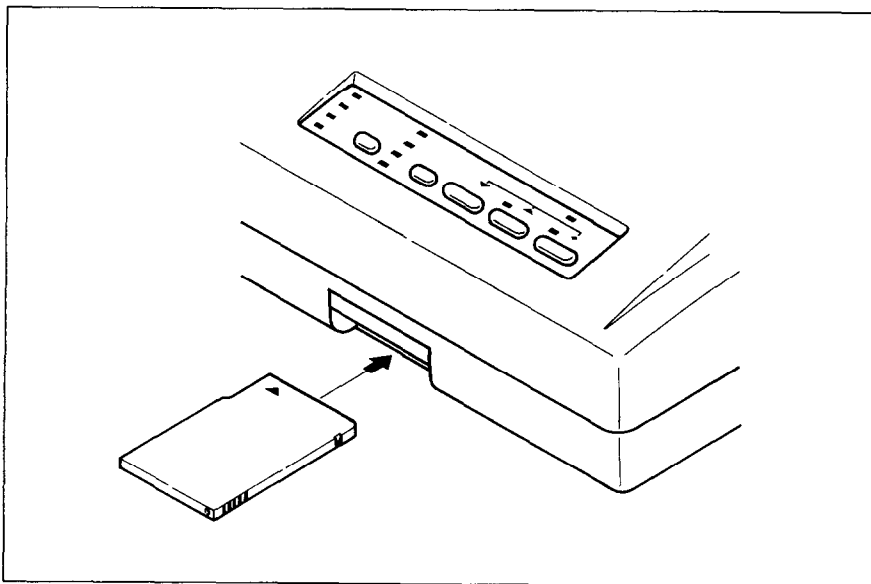


Figure 1-7. Slide the IC card into the front slot with the power switch off.

Connection

Connect the printer to your computer, using a standard parallel-type cable. On a PC or PC/AT-type computer, this means that you use the 25-way D-type connector at the computer end, and the Amphenol-type 36-way connector at the printer end. The pinouts of the printer's connector are given in Chapter 8 if you need a cable for connection to another computer.

Plug the printer into a suitable mains outlet. However, **DO NOT** turn on the power switch at the front of the printer yet.

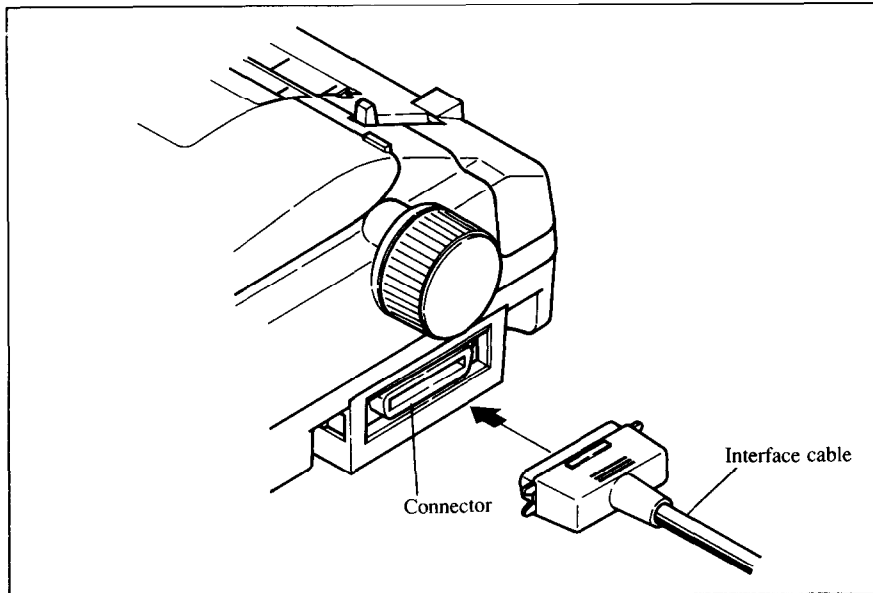


Figure 1-8. Connecting the interface cable

If you want to use the optional serial interface, slide out the parallel interface board by gripping the flips on both sides. Then insert the optional serial interface board all the way, as shown in Figure 1-9.

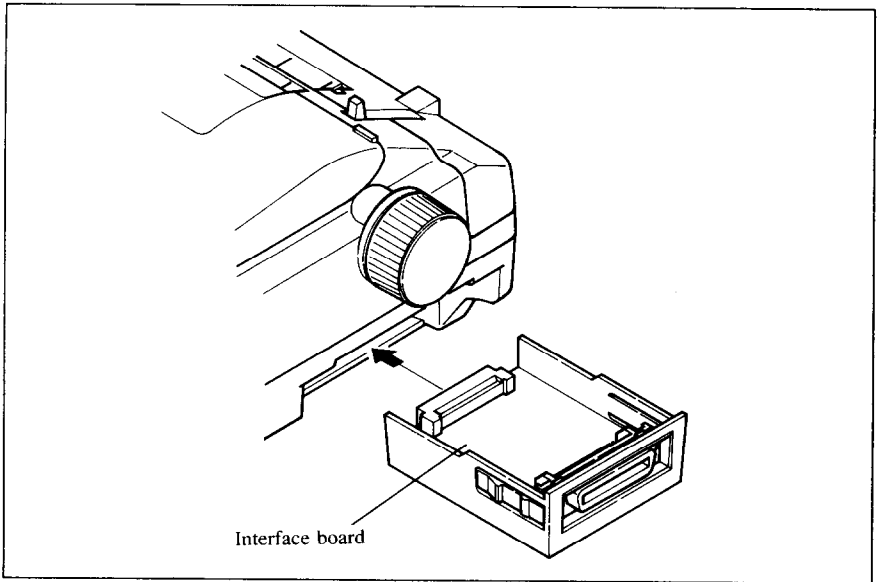


Figure 1-9. Replacing the interface board

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.

Automatic loading

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

1. Place the paper guide in position, locating the lugs on the bottom of the assembly into the slots on the rear cover of the printer.

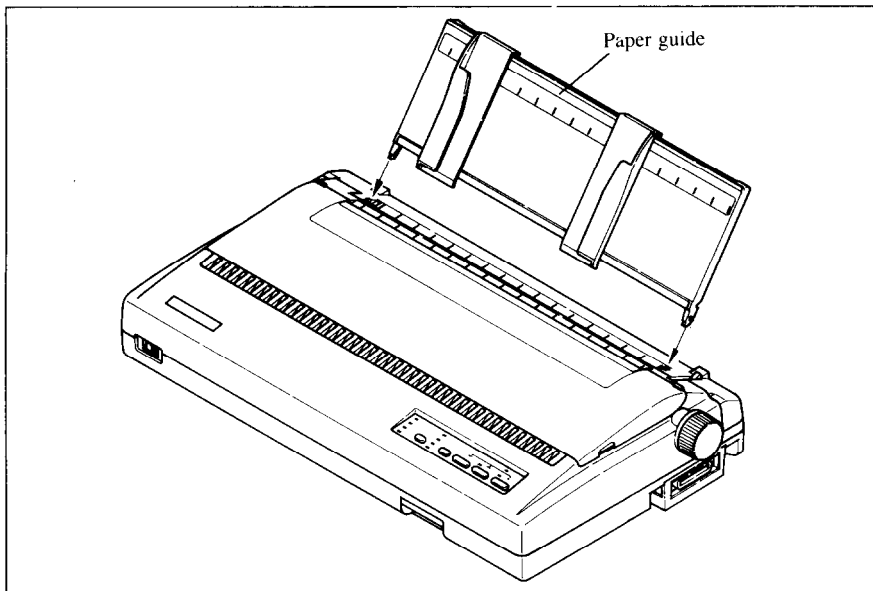
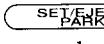


Figure 1-10. Mounting the paper guide for single sheets

2. Make sure that the release lever is down.

If the fanfold paper is mounted on the printer, press the  button to park the paper, then move the release lever downwards.

3. Adjust the paper guides to match the size of paper you will be using (remembering that printing will start some distance from the left-hand edge of the carriage).
4. Place a single sheet between the guides, placing the side on which you want to print towards the back of the printer. Gently push the paper down in the guides until you feel it stop.

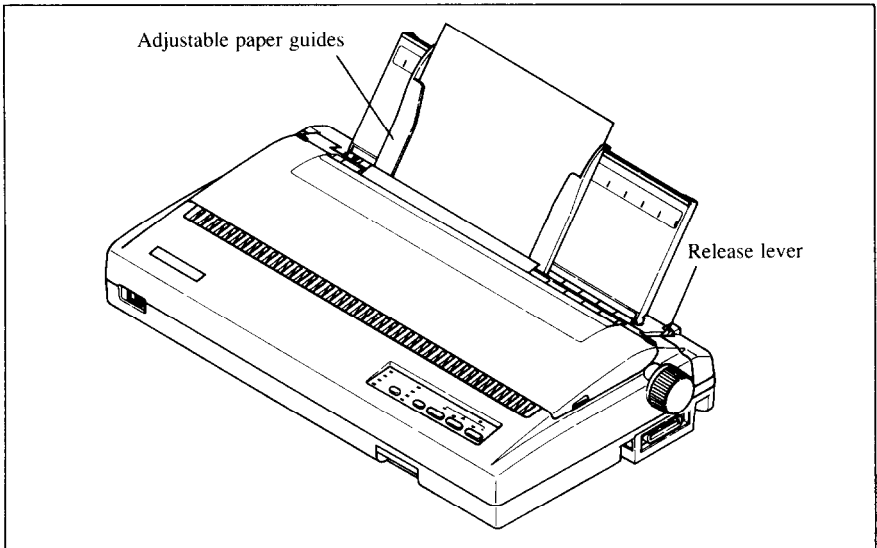


Figure 1-11. Loading a single sheet

5. Turn on the power using the switch at the front of the printer. The printer will beep, indicating that no paper is in position for printing. The orange POWER indicator also flashes to show this.
6. Now press the button. The paper bail will move clear of the paper, and the paper will be fed and adjusted past the print head to a position ready for printing. The paper bail will be moved back to grip the paper against the platen, and the print head will move to the start position.

Manual loading

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

1. Place the paper guide in position, locating the lugs on the bottom of the assembly into the slots on the rear cover of the printer.
2. Check that printer power is off and the release lever at the back of the printer is down.
3. Open the top cover, then move the bail lever on top of the printer forward to open the paper bail.
4. Adjust the paper guides to match the size of paper you will be using (remembering that printing will start some distance from the left-hand edge of the carriage).
5. Place a single sheet between the guides, placing the side on which you want to print towards the back of the printer. Gently push the paper down in the guides until you feel it stop.
6. Turn the platen knob clockwise until the front edge of the paper comes out from under the top cover.
7. 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.
8. 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 16" wide. Fanfold forms are loaded, parked, and unparked as explained next.

Loading the fanfold forms

You can load the fanfold paper from the rear of the printer.

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. Push the release lever to the upward position. This has the effect of releasing the paper from the platen roller, and engaging the tractor feed.
4. Remove the paper guide and put it aside for the moment.
5. Remove the rear cover. Grip it by its rear edge and lift upwards and backwards as in Figure 1-12.

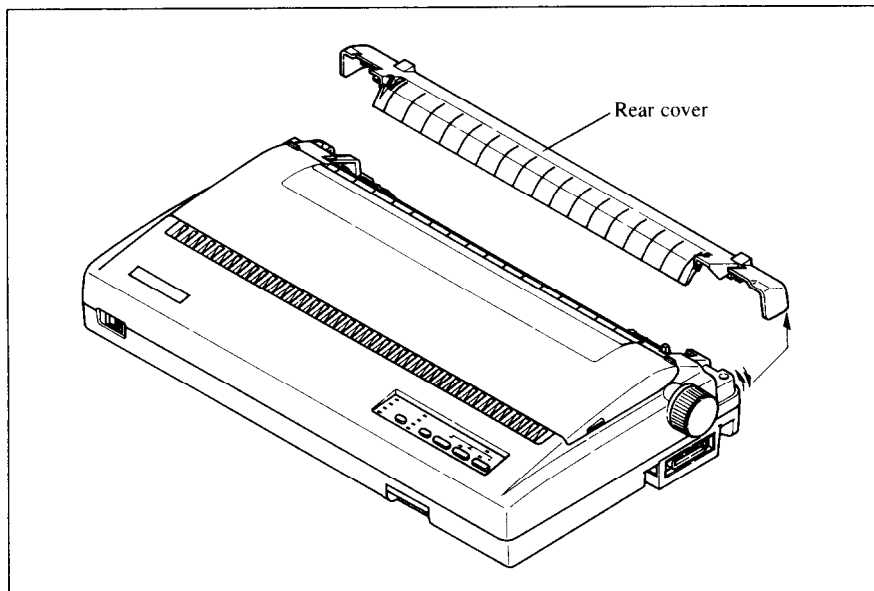


Figure 1-12. Opening the rear cover

6. With the sprocket covers open, thread the paper over the sprockets, aligning holes with the pins on the sprockets.
7. Adjust the spacing of the sprockets by sliding them along the bar, using the clamp lever at the back of each sprocket to release and lock the sprocket in position (when the lever is down, the sprocket may be moved, and when it is up, the sprocket is locked).

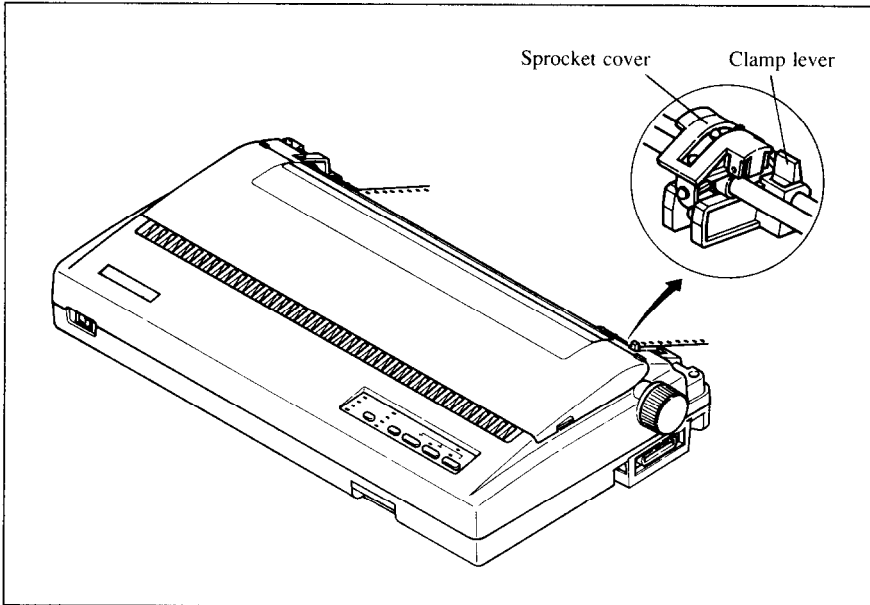


Figure 1-13. Thread the fanfold paper over the sprockets.

8. Now close the sprocket covers, again making sure that the paper sprocket holes are aligned with the pins on the sprockets. If they are not aligned properly, you will have problems with paper feeding, possibly resulting in tearing and jamming of the paper.
9. Turn on the printer using the switch at the front of the printer. The printer will beep (indicating that the paper is not yet fully loaded). This is also confirmed by the orange POWER indicator flashing.
10. Now press the **SET/EJECT PAHR** button. The paper bail will move clear of the paper, and the paper will be fed and adjusted past the print head to a position ready for printing. The paper bail will be moved back to grip the paper against the platen, and the print head will move to the start position.
11. Remount the rear cover. Hold it tilted upward and insert the four tabs at the front into their slots. Then rotate the cover downwards, pressing down on the thumb pads on the left and right to snap it into place.

12. Mount the paper guide in the horizontal position shown in Figure 1-14, so that it will separate the printed from the unprinted paper.

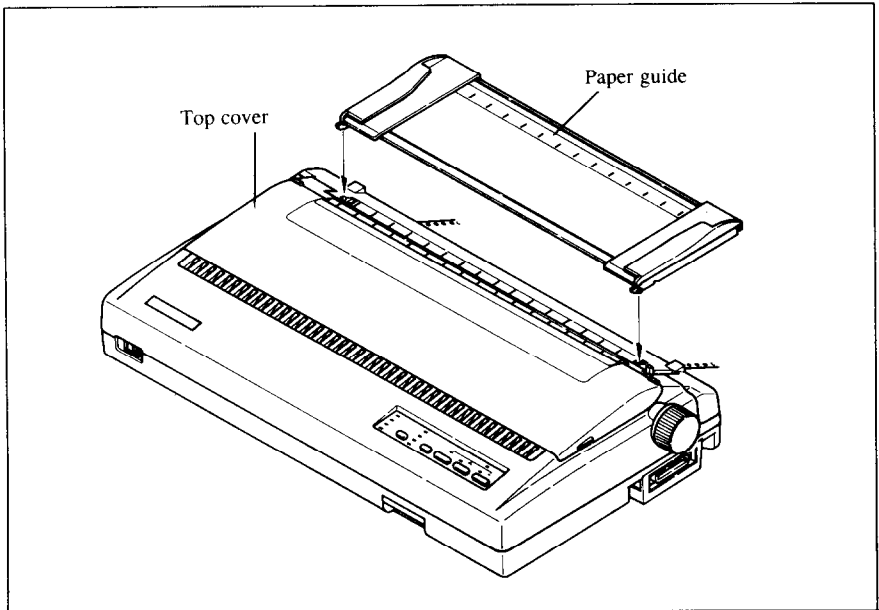


Figure 1-14. Mounting the paper guide for fanfold forms

Loading the paper with pull tractor unit

You can load the fanfold paper by using the optional pull tractor unit.

1. Remove the top cover, then move the bail lever on top of the printer forward to open the paper bail.
2. Set the DIP switch 1-4 to the OFF position. (See Chapter 3 for details.)
3. Mount the optional pull tractor unit onto the printer. Grip the lock levers on both side and push the unit downwards onto the platen roller shaft to fit the tractor grips, as shown in Figure 1-15.
4. Place a stack of fanfold paper behind and at least one page-length below the printer.
5. With the sprocket covers open, thread the paper over the sprockets from the entry slot of the printer, aligning holes with the pins on the sprockets.
6. Adjust the spacing of the sprockets by sliding them along the bar, using the clamp lever at the back of each sprocket to release and lock the sprocket in position (when the lever is up, the sprocket may be moved, and when it is down, the sprocket is locked).

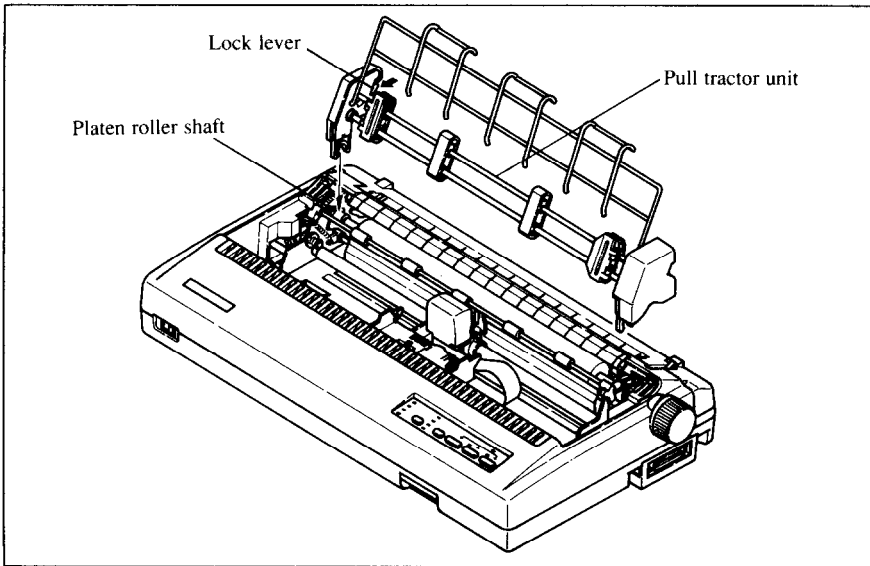


Figure 1-15. Mounting the optional pull tractor unit

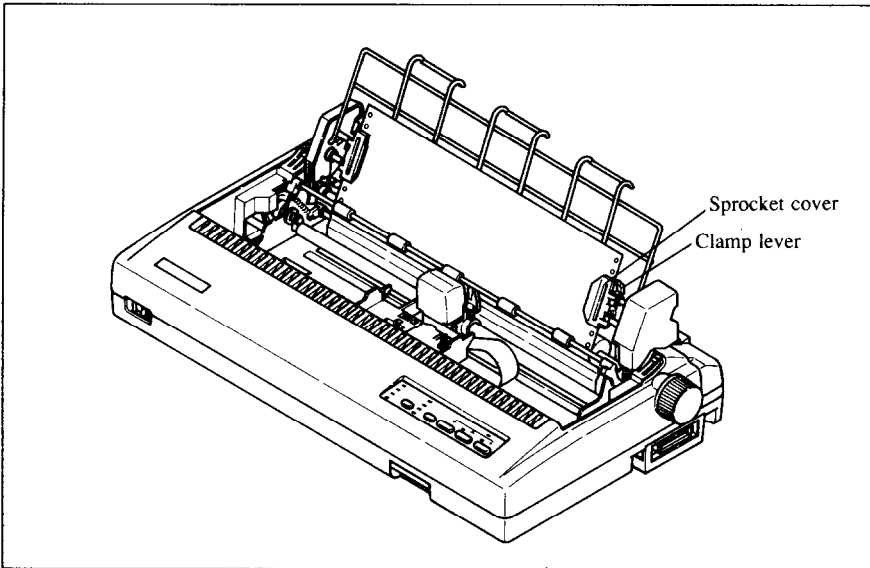


Figure 1-16. Thread the fanfold paper over the sprockets from the entry slot of the printer.

7. Now close the sprocket covers, again making sure that the paper sprocket holes are aligned with the pins on the sprockets. If they are not aligned properly, you will have problems with paper feeding, possibly resulting in tearing and jamming of the paper.
8. Mount the new top cover.

Paper parking

After loading fanfold paper with the internal tractor unit, 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.
2. Press the **ON LINE** button 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** button to feed paper forward until a perforation is located just above the top cover, and tear there.
4. Press the **SET/EJECT PARK** button on the control panel.
The printer will automatically feed the fanfold form backward until the paper is completely free of the platen.
5. Move the release lever to the down position.
6. Mount the paper guide in the upright position.

Now you can load single sheets either automatically 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.
2. Mount the paper guide in the horizontal position.
3. Move the release lever to the up position.
4. Press the **SET/EJECT PARK** button. The printer will automatically feed the parked fanfold paper into position for printing.

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, remove the top cover. The adjustment lever is located near the right end of the paper bail. Pulling the adjustment lever upwards narrows the gap; pushing it downwards widens the gap.

There are five positions; you can feel the lever clicking into each position. The second position from the top is the one most commonly used for single sheets of paper. Try different positions until you get the best printing results.

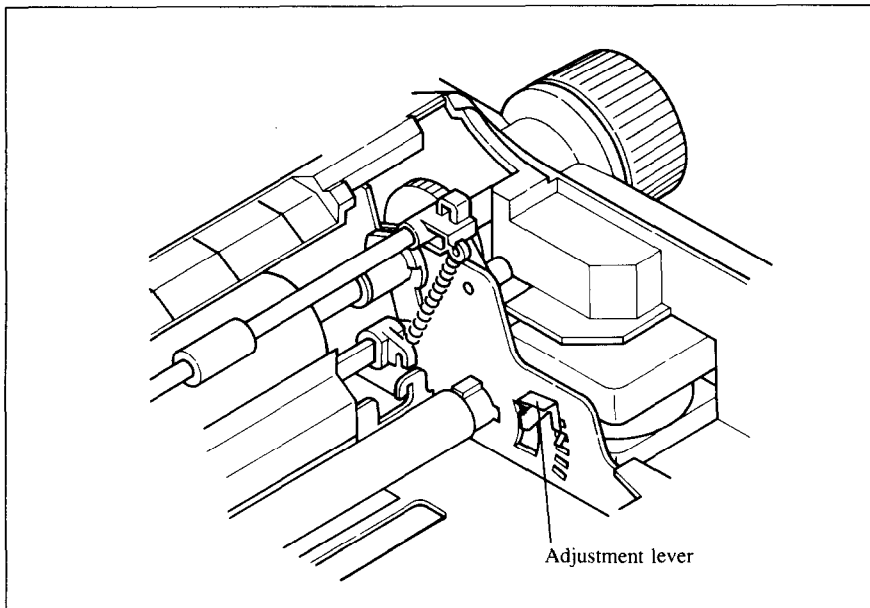


Figure 1-16. Adjusting for different thicknesses of paper

Chapter 2

CONTROL PANEL OPERATIONS

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

This chapter explains all the button and indicator functions.

- Pause printing
- Feed paper (fast and slow, forward and reverse)
- Park fanfold forms
- Set the top-of-form position
- Select the print pitch
- Select a font style
- Print test patterns
- Prevent software from changing the panel pitch and font selections
- Print a hexadecimal dump
- Clear the printer's buffer

BUTTONS AND INDICATORS

The printer is equipped with five buttons on the control panel: from right to left they are, **ON LINE**, **PAPER FEED**, and **SELECT** (larger buttons), and **PITCH** and **STYLE** (smaller buttons).

The following is a brief guide to the buttons and indicators on the control panel.

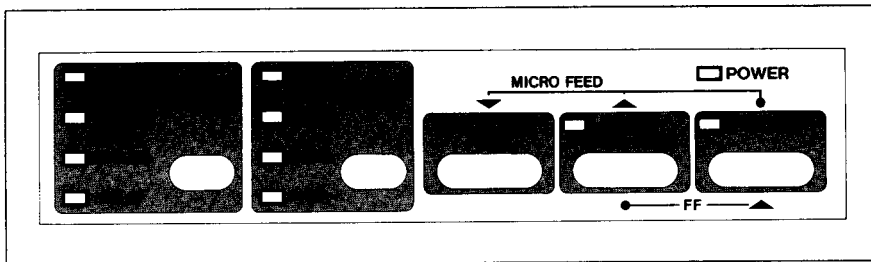


Figure 2-1. Control panel

ON LINE button

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

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 button go on-line.

The three main times when you will want to press the button are:

- Before and after any other panel operation

The other panel buttons operate only in the off-line state. First press the button to go off-line, then perform the panel operation, then press the button again to go back on-line.

- To pause during printing

If you press the button 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 button again to go back on-line.

- To cut fanfold forms at the end of printing

When using fanfold forms, if you hold the button down for one second, in addition to go 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 button again to go back on-line, the paper feeds backward about one inch, stopping in the right place to resume printing.

PAPER FEED button

If you press this button in off-line, the paper feeds forward. If you hold this button down, the printer performs consecutive line feeds.

While you are feeding lines, if you also press the **ON LINE** button, the paper will feed to the top of the next page. This is explained later.

If you press this button in on-line, this will alternately illuminate and extinguish the QUIET indicator. When in Quiet mode with the QUIET indicator illuminating, the printer will print slightly slower, but at a reduced noise level.

SET/EJECT PARK button

Pressing this button causes the printer to execute paper loading if the paper has not loaded while in the off-line state.

If the paper has been loaded, this button causes the printer in different functions depending on the release lever position.

If the release lever is set to the upward position for the fanfold forms, this button operates to park the fanfold forms to the backward position.

If the release lever is set to the downward position for the single sheets, pressing this button ejects the paper.

This button has no effect if the optional pull tractor unit is mounted.

PITCH button

This button selects the print pitch that will be printed. Remember that the printer must be off-line for you to do this. Successive presses of this button will illuminate (and select) the following options in this order:

Pitch	Indicator(s)
Pica	10 CPI
Elite	10 CPI, 15 CPI
Semi-condensed	15 CPI
Condensed pica	10 CPI, COND
Condensed elite	10 CPI, 15 CPI, COND
Proportional	PROP
Condensed proportional	COND, PROP

Holding down this button will cycle continuously between these options.

STYLE button

This button selects the font style to be printed. Courier style is always selected at power-up. To change to one of the other styles, set the printer off-line, then press the **(STYLE)** button repeatedly until the indicators beside the desired selection illuminate. The selections cycle in the following order:

Font style	Indicator(s)
Courier	COURIER
Courier italic	COURIER, ITALIC
Prestige	COURIER, ORATOR
Prestige italic	COURIER, ORATOR, ITALIC
Orator	ORATOR
Orator italic	ORATOR, ITALIC
Script	ORATOR, OPTION
Script italic	ORATOR, OPTION, ITALIC
Option	OPTION
Option italic	OPTION, ITALIC
Draft	(all indicators off)
Draft italic	ITALIC

Holding down this button will cycle continuously between these options.

The font style can also be selected by printer commands given in Chapter 4.

POWER-UP FUNCTIONS

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

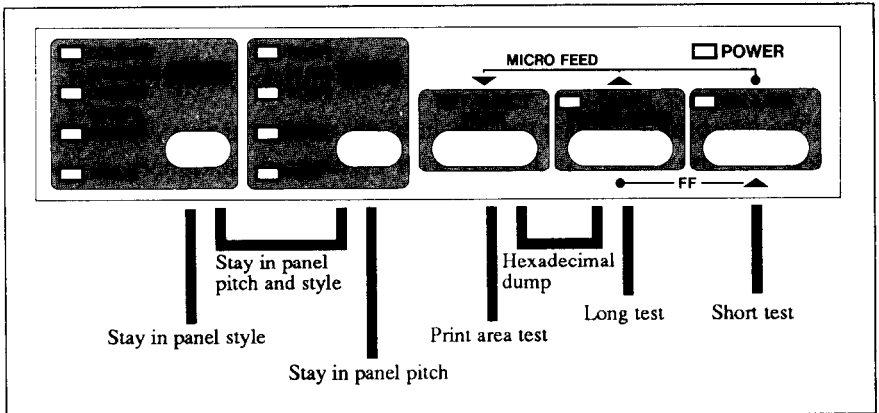


Figure 2-2. Power-up functions of control panel

Short test mode

If the printer is turned on while the **ON LINE** button is pressed, the printer will enter the short self-test mode. The printer will start printing as soon as the **ON LINE** button is released, and will print the version number of the printer's ROM, followed by six lines of the character set.

Each line will be offset by one character from the one before it. The final result will be something like the following.

```

:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHIJ
:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHI
:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHIJ
:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHIJ
:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHIJ
:0286'()*+-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUWXYZ[\]^_`abcdefgijklmnopqrstuvwxy{|}~"0286'()*+-./0123456789:;<=>?@ABCDEFGHIJ

```

Figure 2-3. Short self-test

Since the test print occupies the whole width of the carriage, it is recommended that the printer is loaded with continuous stationery to avoid possible damage to the print head and/or platen.

Long test mode

If the printer is turned on while the **(PAPER FEED)** button is pressed, the printer will enter the long self-test mode. The printer will start printing as soon as the **(PAPER FEED)** button is released, and will print the version number of the printer's ROM, followed by the whole character set printed in each font styles and pitch available.

The test cycles endlessly. To stop the test you must switch power off.

Since the test print occupies the whole width of the carriage, it is recommended that the printer is loaded with continuous stationery to avoid possible damage to the print head and/or platen. In addition, the total number of lines printed is considerable, more than can be accommodated on a single sheet, so fanfold paper is certainly suggested for this test.

Print area test mode

If you want to know how many lines on your paper can be printed, try to run this print area test. By holding the **(SELECT/PARK)** button down during power-up, the printer will enter the print area test mode. The printer will print the first line message, then prints the last line message on your single sheet after feeding the paper to the bottom of the paper.

If you have loaded the fanfold paper, the printer shows only the first line.

Stay in panel pitch

By holding the **(PITCH)** button 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

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

Stay in panel pitch and style

If you want to protect both the pitch and font style settings from software changes, press the (PITCH) and (STYLE) buttons during power-up. There will be a little long acknowledging beep.

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

Hexadecimal dump

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.)

In this mode, all received data will be printed in a hexadecimal dump format, rather than the control codes being acted on as command codes.

This mode is accessed with the following procedure:

1. Holding both the (PAPER FEED) and (SET/EJECT PAPER) buttons 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) button. 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 2-4.

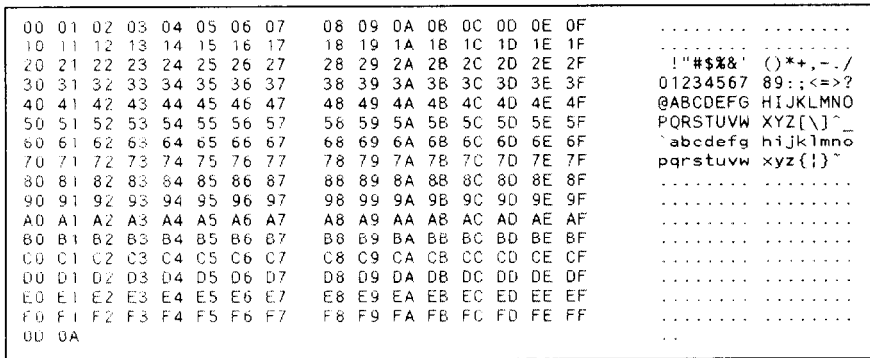


Figure 2-4. Sample hexadecimal dump

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

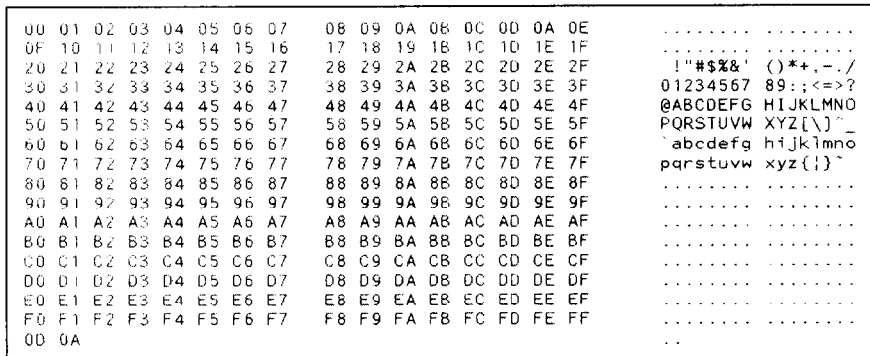


Figure 2-5. Sample hexadecimal dump with IBM-PC

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

Coding for IBM-PC with color adapter:

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

SWITCH COMBINATION FUNCTIONS

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

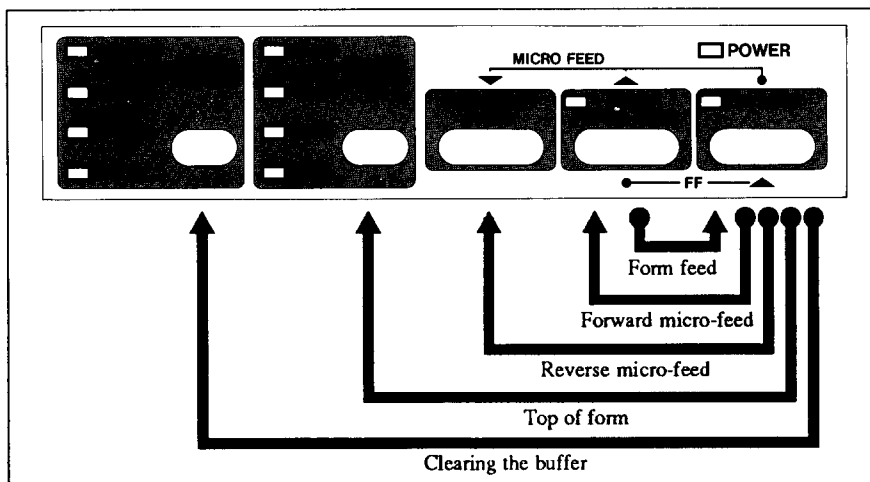


Figure 2-6. Switch combination functions of control panel

Form feed

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** button to set the printer off-line.
2. Press the **PAPER FEED** button and hold it down. The printer will start performing successive line feeds.
3. Still holding the **PAPER FEED** button down, press the **ON LINE** button, then release both buttons. The printer will smoothly eject the current page.

Top of form

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** button to set the printer off-line.
2. Move the paper to the desired top-of-form position by pressing the **PAPER FEED** button, or by performing a forward or reverse micro-feed.
3. Press and hold the **ON LINE** button.
4. Press and hold the **PITCH** button.
5. Release both buttons at the same time. The printer will beep to indicate that the top-of-form position has been set.

Forward micro-feed

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

1. Press the **ON LINE** button to set the printer off-line.
2. Press the **ON LINE** button again and hold it down.
3. Press the **PAPER FEED** button. The paper will start advancing in a series of small steps. When you want to stop, release both buttons.

Reverse micro-feed

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** button to set the printer off-line.
2. Press the **ON LINE** button again and hold it down.
3. Press the **SET/EJECT PAPER** button. The paper will start moving backwards in a series of small steps. When you want to stop, release both buttons.

Clearing the buffer

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** button to set the printer off-line. Printing will now stop, but there may be data remaining in the buffer.
3. Press and hold the **ON LINE** button.
4. Press and hold the **STYLE** button. Continue holding these two buttons down. In about three seconds you will hear a beep tone signaling that the buffer has been cleared.
5. Release these buttons, 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.

Chapter 3

DIP SWITCH SETTINGS

The bank of DIP (Dual In-line Package) switches inside the printer is used for various functions.

This chapter explains where the DIP switches are located, and how to use them.

LOCATION OF THE DIP SWITCHES

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 white switches marked DSW1 and DSW2. These are the printer's DIP 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.

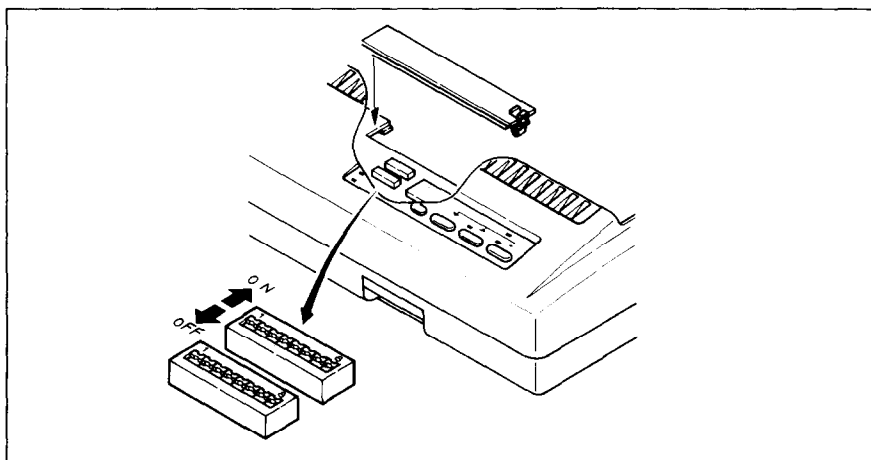


Figure 3-1. DIP switches

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.

FUNCTIONS OF THE DIP SWITCHES

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	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 (Standard 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	Font style and pitch selection		
2-6			
2-7			
2-8	Printing area	A type	B type

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?

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. Very few programs require this switch to be OFF.

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 at the end of the paper, or to keep printing?

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-1050. In IBM mode it operates like the IBM Proprinter XL24. 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 Chapter 9, 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 at the back of this manual. 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 switch 1-6 is OFF and switch 1-7 is ON.

Switches 2-5 to 2-7: What font style and print pitch do you want?

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

Font Style	Pitch	2-5	2-6	2-7
Courier	10 CPI	ON	ON	ON
Prestige	12 CPI	ON	ON	OFF
Orator	10 CPI	ON	OFF	ON
Script	12 CPI	ON	OFF	OFF
Option	10 CPI	OFF	ON	ON
Draft	17 CPI	OFF	ON	OFF
Draft	12 CPI	OFF	OFF	ON
Draft	10 CPI	OFF	OFF	OFF

Switch 2-8: Which type of printing area format do you want to use for single sheets?

This printer can use two types of printing area format for single sheets. By putting the switch ON ("A type"), the top of the first line of printing will start to one inch from the top of the paper, and the printed area will end to print 6 mm from the bottom of the paper.

By putting the switch OFF ("B type"), the top of the first line of printing will start 1/6 inch from the top of the paper, and the printed area will end 1/3 inch from the bottom of the paper.

MEMO

Chapter 4

PRINTER CONTROL COMMANDS

The printer has two emulation modes: Standard mode and IBM mode. In standard mode, the printer emulates the functions of the Epson LQ-1050. In IBM mode, the printer emulates the IBM Proprinter XL24. Additional command codes are included as a superset of these emulations.

The emulation is changed by means of DIP switch 1-6. When ON, the printer will be in standard mode, and when OFF, the printer will be in IBM emulation mode (see Chapter 3). It is not possible to change the emulation mode by means of software control or the front control panel.

This chapter describes the printer's control commands. Some commands are common to both the standard and IBM modes. In the descriptions of the commands, all commands will be given 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, <0> means character code 0.

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	"(" "(" "F" ")" ")" "9"	40 40 70 41 41 57	28 28 46 29 29 39
	<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 **(STYLE)** button was pressed during power-up.

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. The initial font style is Courier unless a different style has been selected by a preceding command. Ignored if the **(STYLE)** button was pressed during power-up.

Select LQ font 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 font 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 **(STYLE)** button was pressed during power-up.

n Font style

- 0 Courier (initial value)
- 1 Optional font
- 2 Prestige
- 3 Orator
- 4 Script

Select Courier characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "0"	40 40 70 41 41 48	28 28 46 29 29 30

Changes to the Courier font. Ignored if the **(STYLE)** button was pressed during power-up.

Select Optional characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "1"	40 40 70 41 41 49	28 28 46 29 29 31

Changes to the Optional font. Ignored if the **(STYLE)** button was pressed during power-up.

Select Prestige characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "2"	40 40 70 41 41 50	28 28 46 29 29 32

Changes to the Prestige font. Ignored if the **(STYLE)** button was pressed during power-up.

Select Orator characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "3"	40 40 70 41 41 51	28 28 46 29 29 33

Changes to the Orator font. Ignored if the **(STYLE)** button was pressed during power-up.

Select Script characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "((" "F" ")" ")" "4"	40 40 70 41 41 52	28 28 46 29 29 34

Changes to the Script font. Ignored if the (STYLE) button was pressed during power-up.

Select italic characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "((" "I" ")" ")" "1"	40 40 73 41 41 49	28 28 49 29 29 31
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 (STYLE) button was pressed during power-up.

Select upright characters

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "((" "I" ")" ")" "0"	40 40 73 41 41 48	28 28 49 29 29 30
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 (STYLE) button was pressed during power-up.

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*.

- | | |
|----------|----------------------|
| <i>n</i> | Character |
| 0 | Normal |
| 1 | Outlined |
| 2 | Shadow |
| 3 | Outlined with shadow |

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	"(" "("B" ")" ")" "1"	40 40 66 41 41 49	28 28 42 29 29 31
	<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.

Cancel double-strike printing

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "("B" ")" ")" "0"	40 40 66 41 41 48	28 28 42 29 29 30
	<ESC> "H"	27 72	1B 48

Cancels double-strike printing.

Start underlining

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "("-" ")" ")" "1"	40 40 45 41 41 49	28 28 2D 29 29 31
	<ESC> "-" "1"	27 45 49	1B 2D 31
	<ESC> "-" <I>	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	"(" "(" _" ")" ")" "0"	40 40 45 41 41 48	28 28 2D 29 29 30
	<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> "r" "0"	27 116 48	1B 74 30
	<ESC> "r" <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> "r" "1"	27 116 49	1B 74 31
	<ESC> "r" <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.

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*.

<u><i>n</i></u>	<u>Character set</u>	<u><i>n</i></u>	<u>Character set</u>
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 $n1 + n2 \times 256$ 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> “~” <L>	27 126 1	1B 7E 01

Causes subsequent zero characters to be overprinted with a slash (Ø).

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 (PITCH) button was pressed during 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 **(PITCH)** button was pressed during power-up.

High-speed elite pitch

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

Seim-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 **(PITCH)** button was pressed during 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 either pica or elite to condensed (17 cpi). Ignored if the **PITCH** button was pressed during 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 **PITCH** button was pressed during 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 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 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 characters to be proportionally spaced. Ignored if the (PITCH) button was pressed during 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 (PITCH) button was pressed during 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 (STYLE) button was pressed during power-up.

[*2] Ignored if the (PITCH) button was pressed during power-up.

Increase character spacing

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> <SP> <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

Select character size

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "((" "S" "y)" "y)" <i>n</i>	40 40 83 41 41 <i>n</i>	28 28 53 29 29 <i>n</i>

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

<i>n</i>	Character width	Character height
0	Single width	Single height
1	Double width	Single height
2	Single width	Double height
3	Double width	Double height

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 height, width, and line spacing

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

Select character type and print pitch

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <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 **(STYLE)** and/or **(PITCH)** button was pressed during 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 line spacing to $n/360$ inch

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "+" n	27 43 n	1B 2B n
	<FS> "3" n	28 51 n	1C 33 n

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-feeds distance is set to 0.

Set base unit for line spacing

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

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, 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 $n/60$ 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” <i>n</i>	27 65 <i>n</i>	1B 41 <i>n</i>

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" <i>n</i>	27 74 <i>n</i>	1B 4A <i>n</i>

Feeds the paper once by $n/180$ inches (standard mode) or $n/216$ inches, where n is between 1 and 255. Does not move the print position right or left when DIP switch 1-2 is OFF. Does not change the line-spacing setting.

Perform one n/216-inch reverse line feed

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "j" <i>n</i>	27 106 <i>n</i>	1B 6A <i>n</i>

Feeds the paper once by $n/216$ inches in the reverse direction, where n is between 1 and 255. Does not move the print position right or left when DIP switch 1-2 is OFF. Does not change the line-spacing setting.

Feed paper n lines

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "f" "1" <i>n</i>	27 102 49 <i>n</i>	1B 66 31 <i>n</i>
	<ESC> "f" <1> <i>n</i>	27 102 1 <i>n</i>	1B 66 01 <i>n</i>

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> n	27 67 0 n	1B 43 00 n

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" n	27 99 n	1B 63 n

Sets the top margin to n lines, where n is between 1 and 255. Printing begins on the n th line on the page. The power-up default is $n = 1$, giving no top margin.

Set bottom margin

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

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 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" <i>n1 n2 ...</i> <0>	27 66 <i>n1 n2 ...</i> 0	1B 42 <i>n1 n2 ...</i> 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" <i>n</i>	27 101 49 <i>n</i>	1B 65 31 <i>n</i>
	<ESC> "e" <1> <i>n</i>	27 101 1 <i>n</i>	1B 65 01 <i>n</i>

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" <i>n0 n1 n2 ...</i> <0>	27 98 <i>n0 n1 n2 ...</i> 0	1B 62 <i>n0 n1 n2 ...</i> 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> "f" command.) See <ESC> "B" for parameters *n1*, *n2*, ... <0>.

Select vertical tab channel

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "f" <i>n0</i>	27 47 <i>n</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> "I" <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	$0 \leq n \leq 132$
Elite	$0 \leq n \leq 158$
Semi-condensed	$0 \leq n \leq 198$
Condensed pica	$0 \leq n \leq 226$
Condensed elite	$0 \leq n \leq 255$
Expanded pica	$0 \leq n \leq 66$
Expanded elite	$0 \leq n \leq 79$
Expanded semi-condensed	$0 \leq n \leq 99$
Expanded condensed pica	$0 \leq n \leq 112$
Expanded condensed elite	$0 \leq n \leq 132$

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	$4 \leq n \leq 136$
Elite	$5 \leq n \leq 163$
Semi-condensed	$6 \leq n \leq 204$
Condensed pica	$7 \leq n \leq 233$
Condensed elite	$8 \leq n \leq 255$
Expanded pica	$2 \leq n \leq 68$
Expanded elite	$3 \leq n \leq 81$
Expanded semi-condensed	$3 \leq n \leq 102$
Expanded condensed pica	$4 \leq n \leq 116$
Expanded condensed elite	$4 \leq n \leq 136$

Set left and right margins

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "X" <i>n1 n2</i>	27 88 <i>n1 n2</i>	1B 58 <i>n1 n2</i>

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 n2 ...</i> <0>	27 68 <i>n1 n2 ...</i> 0	1B 44 <i>n1 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 column 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> "\ " <i>n1 n2</i>	27 92 <i>n1 n2</i>	1B 5C <i>n1 n2</i>
IBM	<FS> "\ " <i>n1 n2</i>	28 92 <i>n1 n2</i>	1C 5C <i>n1 n2</i>

Moves the print position right or left a specified distance (maximum 1440 dots). 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
Both	<ESC> "d" <i>n1 n2</i>	27 100 <i>n1 n2</i>	1B 64 <i>n1 n2</i>

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 13.6 inches.

Absolute horizontal tab in inches

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "\$" n_1 n_2	27 36 n_1 n_2	1B 24 n_1 n_2

Sets the next print position to $(n_1 + n_2 \times 256)/60$ inches from the left margin on the current line. Ignored if this position is beyond the right margin. The maximum position is 13.6 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 normal-density graphics

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "K" n_1 n_2 m_1 m_2 ...	27 75 n_1 n_2 m_1 m_2 ...	1B 4B n_1 n_2 m_1 m_2 ...

Prints bit-image graphics at 60 dots per inch horizontally. The graphic image is 8 dots high and $n_1 + n_2 \times 256$ dots wide. Maximum width is 13.6 inches (816 dots). m_1, m_2, \dots 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 $n_1 + n_2 \times 256$. Dots beyond the right margin are ignored. At the end of bit-image printing the printer returns automatically to character mode.

Print 8-bit double-density graphics

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "L" n_1 n_2 m_1 m_2 ...	27 76 n_1 n_2 m_1 m_2 ...	1B 4C n_1 n_2 m_1 m_2 ...

Prints bit-image graphics at 120 dots per inch horizontally (maximum 1632 dots wide). See <ESC> "K" for other information.

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

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "Y" $n1$ $n2$ $m1$ $m2$...	27 89 $n1$ $n2$ $m1$ $m2$...	1B 59 $n1$ $n2$ $m1$ $m2$...

Prints bit-image graphics at 120 dots per inch horizontally (maximum 1632 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" $n1$ $n2$ $m1$ $m2$...	27 90 $n1$ $n2$ $m1$ $m2$...	1B 5A $n1$ $n2$ $m1$ $m2$...

Prints bit-image graphics at 240 dots per inch horizontally (maximum 3264 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" $n1$ $n2$ $m1$ $m2$ $m3$...	27 90 $n1$ $n2$ $m1$ $m2$ $m3$...	1C 5A $n1$ $n2$ $m1$ $m2$ $m3$...

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 13.6 inches (4896 dots). In the data $m1$, $m2$, $m3$... 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> "*" <i>n0 n1</i> <i>n2 m1 m2 ...</i>	27 42 <i>n0 n1</i> <i>n2 m1 m2 ...</i>	1B 2A <i>n0 n1</i> <i>n2 m1 m2 ...</i>

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 Normal-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 Normal-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 Triple-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> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> ...	27 91 103 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> ...	1B 5B 67 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>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 $(n1 + n2 \times 256) - 1$ dots wide. See <ESC> “K” (for 8-bit graphics) or <FS> “Z” (for 24-bit graphics) for information on *m1*, *m2*, ...

m0 Graphics mode

0	8-bit Normal-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 Normal-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</i> <i>m</i>	27 63 <i>n</i> <i>m</i>	1B 3F <i>n</i> <i>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

Define download characters

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "&" <0> <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <i>d1</i> <i>d2</i> ... <i>dx</i>	27 38 0 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <i>d1</i> <i>d2</i> ... <i>dx</i>	1B 26 00 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <i>d1</i> <i>d2</i> ... <i>dx</i>
IBM	<ESC> "=" <0> <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <i>d1</i> <i>d2</i> ... <i>dx</i>	27 61 0 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <i>d1</i> <i>d2</i> ... <i>dx</i>	1B 3D 00 <i>n1</i> <i>n2</i> <i>m0</i> <i>m1</i> <i>m2</i> <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 chapter 5.

Copy character set from ROM into RAM card

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> “:” <0> <i>n</i> <0>	27 58 0 <i>n</i> 0	1B 3A 00 <i>n</i> 00
IBM	<FS> “:” <0> <i>n</i> <0>	28 58 0 <i>n</i> 0	1C 3A 00 <i>n</i> 00

Copies the selected character set with *n*, as shown below, to the corresponding download character RAM card, overwriting any download data already present. Ignored when DIP switch 2-1 is ON.

n Character set

- 0 Courier
- 2 Prestige
- 3 Orator
- 4 Script

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.		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" <i>n</i> <i>d1</i> <i>d2</i> ... <i>dx</i> <ESC> "V" <0>	27 86 <i>n</i> <i>d1</i> <i>d2</i> ... <i>dx</i> 27 86 0	1B 56 <i>n</i> <i>d1</i> <i>d2</i> ... <i>dx</i> 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 button.

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 button.

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 35	1B 51 23

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 button 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 ONLINE 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> <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> <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> "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> "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

Chapter 5

DOWNLOAD CHARACTERS

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.

Regular characters are permanently stored in the printer's ROM, but characters you design are downloaded and stored in RAM for use.

DEFINING YOUR OWN CHARACTERS

Designing and printing your own characters has two requirements: firstly, designing the shape of the character, calculating the data necessary to make the shape, and sending that data to the printer, and secondly, sending the command to print the downloaded characters instead of the regular characters. There are a number of design constraints for download characters:

- The matrix or grid on which you design the characters is depending on the print mode as shown below:

Character mode	Horizontal	Vertical
Draft characters	9	24
LQ pica characters	29	24
LQ elite characters	23	24
LQ semi-condensed	15	24
LQ proportional	37	24
Draft super/subscript	7	16
LQ super/subscript	23	16
LQ prop. super/subscript	23	16

- The minimum width of a character is five dots.
- Dots cannot overlap.
- You may define any position in the ASCII table, except the block graphics area when you are downloading in the IBM mode.

We will use a tiny representation of a telephone symbol for our example.

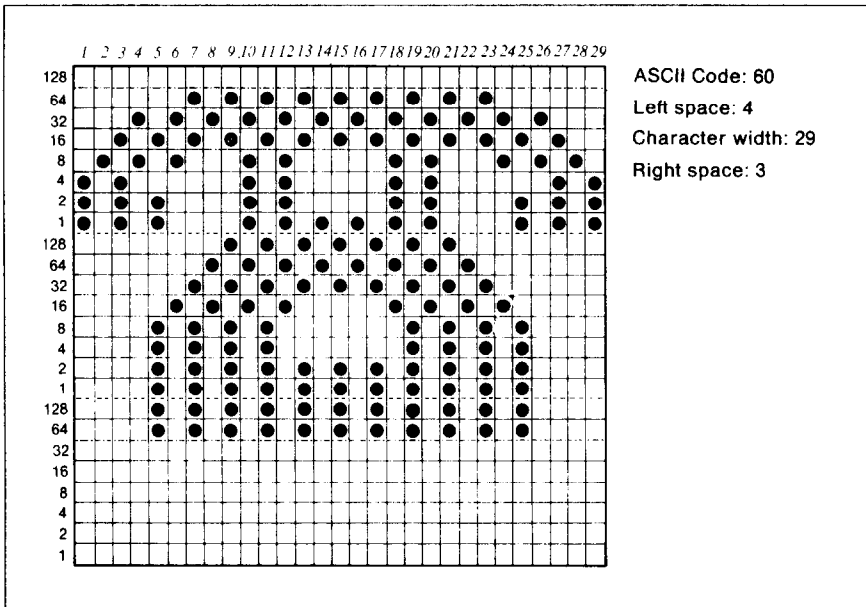


Figure 5-1. Telephone symbol, Normal LQ pica

Assigning the character data

Now, we calculate the vertical numerical values of the columns of dots, and enter them underneath the grid. Each vertical column (which has a maximum of 24 dots) is first divided into three groups (or two groups for super/subscripts) of eight dots. Each group of eight dots is represented by one byte, which consists of eight bits.

That's where the numbers down the left side of the grid come in. Notice that there is a number for each row of dots and that each number is twice the number below it. By making these numbers of two we can take any combination of dots in a vertical column and assign them a unique value.

Assigning a value of character space

Besides being able to specify the actual width of the character, this printer allows you to specify the position in the standard grid where the character will print. You must specify the dot column in which the printed character starts and the dot column in which the character ends. Why, you may ask, would you want to define a character this way instead of merely defining the overall width of the character? Because this printer's proportional character definitions can also be used to print normal width characters. And by centering even the narrow characters in the complete grid they will look good even you aren't printing them proportionally.

The three bytes are used to specify the width of the character and the space to be allowed on either side of it. The left space (in dot columns) is specified by $m0$ and the right space is specified by $m2$. The second byte ($m1$) specifies the number of columns of dots that will be printed by the character. By varying the width of the character itself and the spaces around it, you can actually create proportional width characters.

When defining characters, the number of printed columns ($m1$), and the sum of side spaces and the character width ($m0+m1+m2$) cannot exceed the value shown below.

Character mode	$m1$	$m0+m1+m2$
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/subscript	7	12
LQ super/subscript	23	36
LQ prop. super/subscript	23	42

Sample program

To demonstrate how to use the download characters, let's use the "telephone" character and the other user-defined characters to print a small graph. This program will do just that:

```

1000 LPRINT CHR$(27);"x1";
1010 LPRINT CHR$(27);"&";CHR$(0);CHR$(60);CHR$(61);
1020 RESTORE 1540
1030 FOR N=60 TO 61
1040 READ LS :LPRINT CHR$(LS);
1050 READ CW :LPRINT CHR$(CW);
1060 READ RS :LPRINT CHR$(RS);
1070 FOR M=1 TO CW*3
1080 READ MM
1090 LPRINT CHR$(MM);
1100 NEXT M
1110 NEXT N
1120 LPRINT CHR$(27);"D";CHR$(11);CHR$(0)
1130 LPRINT CHR$(27);"k";CHR$(4);
1140 LPRINT CHR$(27);"h";CHR$(1);
1150 LPRINT " DIFFUSION RANGES OF"
1160 LPRINT " CARS & TELEPHONES"
1170 LPRINT CHR$(27);"h";CHR$(0)
1180 LPRINT CHR$(27);"k";CHR$(0);
1190 LPRINT CHR$(27);"%1";
1200 LPRINT "USA";CHR$(9);
1210 FOR I=0 TO 681 STEP 25 :LPRINT CHR$(60); :NEXT I
1220 LPRINT
1230 LPRINT CHR$(9);
1240 FOR I=0 TO 781 STEP 25 :LPRINT CHR$(61); :NEXT I
1250 LPRINT
1260 LPRINT "GERMANY";CHR$(9);
1270 FOR I=0 TO 412 STEP 25 :LPRINT CHR$(60); :NEXT I
1280 LPRINT
1290 LPRINT CHR$(9);
1300 FOR I=0 TO 488 STEP 25 :LPRINT CHR$(61); :NEXT I
1310 LPRINT
1320 LPRINT "JAPAN";CHR$(9);
1330 FOR I=0 TO 347 STEP 25 :LPRINT CHR$(60); :NEXT I
1340 LPRINT
1350 LPRINT CHR$(9);
1360 FOR I=0 TO 493 STEP 25 :LPRINT CHR$(61); :NEXT I
1370 LPRINT
1380 LPRINT CHR$(9);"+-";
1390 SCALE$="+-+-"
1400 FOR I=2 TO 8 :LPRINT SCALE$; :NEXT I
1410 LPRINT "+-+"
1420 LPRINT CHR$(9);"0 ";
1430 FOR I=1 TO 8
1440 LPRINT " ";I;
1450 NEXT I
1460 LPRINT CHR$(27);"%0"
1470 LPRINT CHR$(27);"M";
1480 LPRINT CHR$(27);"80";
1490 LPRINT CHR$(9);"(100 UNITS/1000 PERSONS)"
1500 LPRINT CHR$(27);"T";
1510 LPRINT CHR$(27);"@"
1520 END
1530 ' DATA
1540 ' Telephone Symbol
1550 DATA 4, 29, 3
1560 DATA 7, 0, 0, 8, 0, 0, 23, 0, 0, 40, 0, 0, 19, 15,192
1570 DATA 40, 16, 0, 80, 47,192, 32, 80, 0, 80,175,192, 47, 80, 0
1580 DATA 80,175,192, 47, 80, 0, 80,163,192, 33, 64, 0, 80,163,192
1590 DATA 33, 64, 0, 80,163,192, 47, 80, 0, 80,175,192, 47, 80, 0

```


1600 DATA	80,175,192, 32, 80, 0, 80, 47,192, 40, 16, 0, 19, 15,192
1610 DATA	40, 0, 0, 23, 0, 0, 8, 0, 0, 7, 0, 0
1620 ' Car	Symbol
1630 DATA	4, 29, 3
1640 DATA	0, 30, 0, 0, 0, 0, 0, 60, 0, 0, 3, 0, 0, 252,128
1650 DATA	0, 3, 64, 1,252,128, 2, 3, 64, 5,124,128, 10, 3, 0
1660 DATA	20,124, 0, 40, 0, 0, 80,126, 0, 32, 0, 0, 64,126, 0
1670 DATA	63,128, 0, 64,126, 0, 63,128, 0, 64,124, 0, 32, 3, 0
1680 DATA	64,124,128, 32, 3, 64, 64,124,128, 48, 3, 64, 76,124,128
1690 DATA	51, 3, 0, 12,252, 0, 3, 0, 0, 0,254, 0

DIFFUSION RANGES OF CARS & TELEPHONES

USA

#####

#####

GERMANY

#####

#####

JAPAN

#####

#####

+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

0 1 2 3 4 5 6 7 8

(100 UNITS/1000 PERSONS)

MEMO

Chapter 6

MS-DOS AND YOUR PRINTER

When using your printer with an IBM PC, PC-XT, or PC-AT or compatible, you will probably be using PC-DOS or MS-DOS as an operating system. A number of software tricks may be useful here. This chapter is not, however, a substitute for the operating system manuals supplied with your computer. To learn how to print files, etc. it is best to read the relevant parts of these manuals.

INSTALLING APPLICATION SOFTWARE WITH YOUR PRINTER

When installing application software, you may find that your printer is not specifically mentioned in the lists of printers given for installation. However, this should pose no problem. Read this section, and guidelines provided with your software on printer installation.

If you have your printer set up in standard mode, then choose an Epson LQ-1050 or LQ-850 as your printer to be selected.

If neither of these are mentioned, choose one of the following (in order of preference): Star NB-15, Star NB24-15, Epson LQ-1000, Epson LQ-1500.

If you have your printer set up with the DIP switches to emulate an IBM Proprinter XL24, simply choose this from the list of printers available in the application software list.

If the IBM Proprinter XL24 is not mentioned, use Proprinter X24 or Proprinter II.

If your software package does not mention printers by name, but asks instead what features your printer is capable of, the most common questions are: "Can your printer perform a backspace?" and "Can it do a hardware form feed?". You should answer "Yes" to both these questions.

Other software packages may well allow you to install specific features. Spreadsheet programs will often ask for the maximum number of columns to be printed. This is given below.

Number of columns	CPI	
Pica	10	136
Elite	12	163
Condensed pica	17.1	233
Condensed elite	20	272
Proportional	Variable	

Sometimes the software installation will ask you for an initialization sequence to return to the default settings. The command for your printer is <ESC> @.

Make sure that the DIP switches are set for the right printer emulation, and that you have selected the appropriate character set using the DIP switches. If you are in doubt about the configuration of your application software, seek expert advice. Your software supplier will probably be your most convenient reference.

EMBEDDING PRINTER COMMANDS

Many word-processors and other software lack commands for changing font style, or printing double-size characters, and some do not even support bold printing or italics. Your printer therefore has commands that can be embedded in documents to control these functions without software help. The commands consist of a capital letter enclosed in double parentheses, followed by a digit:

Font style:	((F))0	Courier
	((F))1	Option
	((F))2	Prestige
	((F))3	Orator
	((F))4	Script
Size:	((F))9	Draft
	((S))0	Standard size
	((S))1	Double width
	((S))2	Double height
	((S))3	Double width and height
Bold:	((B))0	Non-bold
	((B))1	Bold
Italic:	((I))0	Non-italic
	((I))1	Italic

If you want to print a title in double-size Script, then change to regular-size Courier for some text that includes italics, you can use these commands as follows:

File as seen on computer screen:

```
((F))4 ((S))3
Printer Commands
((F))0 ((S))0
Font style, size, bold print, and
((I))1Italic ((I))0commands can be embedded
((I))1anywhere ((I))0in a document.
```

Printout:

Printer Commands

Font style, size, bold print, and
Italic commands can be embedded
anywhere in a document.

When you use these commands there are several points to note:

- The font style ((F)) and italic ((I)) commands are ignored if the **STYLE** button was held down when power was switched on.
- A line consisting of commands alone prints as a blank line.
- Software does not know that these commands are commands, so you cannot trust your software to give you the correct line width. The printed line may be considerably shorter than the line on the screen; the missing space is the space that was occupied by the commands.

One way to handle the last problem is to prepare your document without the commands, then insert them as a final step, with the margins released. The find, replace, and copy functions of word-processing software can be helpful here.

If you do not use these commands or the panel controls, the printer will print standard-size, draft, non-bold, non-italic characters.

The printer supports various commands in addition to the above, such as quadruple-size printing.

Most of these other commands consist of the escape code followed by one or more letters or numbers.

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 can also embed these escape sequences.

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 font 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 font style 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 select letter quality, and select elite pitch. You can find the commands in Chapter 4. We suggest the following:

- Letter quality <ESC> “x” “1”
- Elite pitch <ESC> “!” <1>

<ESC> “!” <1> 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 <1> indicate character code 1, which is a control code, not the printable digit “1”.

You may want to place additional commands in this file, such as left and right margins, 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
*1
      1: *^V[x1^V[!^VA
      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>. 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>LQELITE 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 WITH BASIC

As an example of programming the printer on Microsoft BASIC, we have listed the program for the IBM-PC. This program runs in the printer's Standard mode, and the downloadable condition (DIP switch 1-6 ON and DIP switch 2-1 OFF).

```
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 PI$=E$+"P" 'Pica pitch
```



```

1100 ' Start printing
1110 WIDTH "LPT1:",255
1120 LPRINT ES;"D";CHR$(3);CHR$(24);CHR$(0)      'Set HT
1130 LPRINT C$;"Font 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 ES;"4";                                'Select italics
1200 LPRINT H$;D$;"and ";C$;"italics ";P$;"for ";
1210 LPRINT O$;"all ";S$;"styles."
1220 LPRINT ES;"5"                                'Cancel italics
1230 LPRINT C$;"Print pitches are:"
1240 LPRINT H$;PI$;"Pica pitch (10 CPI),";
1250 LPRINT H$;E$;"M";"Elite pitch (12 CPI),"
1260 LPRINT H$;E$;"g";"Semi-condensed pitch (15 CPI),";
1270 LPRINT H$;PI$;
1280 LPRINT CHR$(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$;"p1";                            'Select proportional spacing
1330 LPRINT PI$;"Normal proportional,";
1340 LPRINT H$;CHR$(15);"And condensed proportional.";
1350 LPRINT CHR$(18);
1360 LPRINT ES;"p0"                                'Cancel proportional spacing
1370 LPRINT
1380 LPRINT H$;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 ES;"h";CHR$(0)
1450 LPRINT :LPRINT
1460 LPRINT ES;"Q";CHR$(47)                        'Set right margin
1470 LPRINT C$;"Various line and character spacings:"
1480 LPRINT ES;"a1"                                'Center text
1490 FOR I=1 TO 7
1500 LPRINT ES;"A";CHR$(I);                        'Line spacing set
1510 LPRINT ES;" ";CHR$(I);                        'Increase character space
1520 LPRINT "THE SPACINGS ARE CHANGED"
1530 NEXT I
1540 FOR I=6 TO 1 STEP -1
1550 LPRINT ES;"A";CHR$(I);                        'Line spacing set
1560 LPRINT ES;" ";CHR$(I);                        'Increase character space
1570 LPRINT "THE SPACINGS ARE CHANGED"
1580 NEXT I
1590 LPRINT ES;"a0"                                'Left justify
1600 LPRINT ES;"3";CHR$(30);                       'Set 1/6" line spacing
1610 LPRINT ES;" ";CHR$(0);                        'Normal character space
1620 LPRINT :LPRINT
1630 LPRINT C$;"Other features:"
1640 LPRINT H$;E$;"q";CHR$(1);"OUTLINED";E$;"q";CHR$(0);", ";
1650 LPRINT ES;"q";CHR$(2);"SHADOWED";E$;"q";CHR$(0);", ";
1660 LPRINT ES;"q";CHR$(3);"OUTLINED WITH SHADOWED";
1670 LPRINT ES;"q";CHR$(0);", "
1680 LPRINT H$;E$;"E";"Emphasized";E$;"F";", ";
1690 LPRINT ES;"G";"Double-strike";E$;"H";", ";
1700 LPRINT ES;"-1";"Underlining";E$;"-0";", "
1710 LPRINT H$;E$;"_1";"Overlining";E$;"_0";", ";
1720 LPRINT ES;"SO";"SUPERSCRIP";E$;"T";" and ";

```

```

1730 LPRINT E$;"S1";"SUBSCRIPT";E$;"T";";"
1740 LPRINT H$;C$;"Download characters:";
1750 LPRINT E$;"S0"; 'Select superscript
1760 GOSUB 2130
1770 LPRINT E$;"%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$;"T"; 'Cancel superscript
1830 GOSUB 2260
1840 LPRINT E$;"%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 LPRINT E$;"S1"; 'Select subscript
1900 GOSUB 2130
1910 LPRINT E$;"%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$;"T" 'Cancel superscript
1970 LPRINT H$;C$;"Dot graphics:"
1980 RESTORE 2560
1990 LPRINT E$;"A";CHR$(8); 'Set 8/60" line spacing
2000 FOR I=1 TO 3
2010 LPRINT E$;"f0";CHR$(8);
2020 LPRINT E$;"^";CHR$(33);CHR$(240);CHR$(0);
2030 FOR J=1 TO 240*3
2040 READ DAT
2050 LPRINT CHR$(DAT);
2060 NEXT J
2070 LPRINT
2080 NEXT I
2090 LPRINT E$;"@" 'Initialize printer
2100 END
2110 '
2120 ' SUBROUTINES
2130 ' Define super/subscript download character
2140 LPRINT E$;"S1";
2150 LPRINT E$;"&";CHR$(0);CHR$(60);CHR$(60);
2160 RESTORE 2400
2170 READ LS :LPRINT CHR$(LS);
2180 READ CW :LPRINT CHR$(CW);
2190 READ RS :LPRINT CHR$(RS);
2200 FOR M=1 TO CW*2
2210 READ MM
2220 LPRINT CHR$(MM);
2230 NEXT M
2240 RETURN
2250 '
2260 ' Define LQ pica download character
2270 LPRINT C$;
2280 LPRINT E$;"&";CHR$(0);CHR$(60);CHR$(60);
2290 RESTORE 2470
2300 READ LS :LPRINT CHR$(LS);
2310 READ CW :LPRINT CHR$(CW);
2320 READ RS :LPRINT CHR$(RS);
2330 FOR M=1 TO CW*3
2340 READ MM
2350 LPRINT CHR$(MM);

```

```

2360 NEXT M
2370 RETURN
2380 '
2390 ' DATA
2400 ' Super/subscript download character data
2410 DATA 7, 23, 6
2420 DATA 12, 0, 16, 0, 44, 0, 80, 0, 44,120, 64,128, 33,120
2430 DATA 94,128, 33,120, 94,128, 33, 24, 66, 0, 33, 24, 94,128
2440 DATA 33,120, 94,128, 33,120, 64,128, 44,120, 80, 0, 44, 0
2450 DATA 16, 0, 12, 0
2460 '
2470 ' LQ pica download characer data
2480 DATA 4, 29, 3
2490 DATA 7, 0, 0, 8, 0, 0, 23, 0, 0, 40, 0, 0, 19, 15,192
2500 DATA 40, 16, 0, 80, 47,192, 32, 80, 0, 80,175,192, 47, 80, 0
2510 DATA 80,175,192, 47, 80, 0, 80,163,192, 33, 64, 0, 80,163,192
2520 DATA 33, 64, 0, 80,163,192, 47, 80, 0, 80,175,192, 47, 80, 0
2530 DATA 175,192, 48, 32, 80, 0, 80, 47,192, 40, 16, 0, 19, 15,192
2540 DATA 40, 0, 0, 23, 0, 0, 8, 0, 0, 7, 0, 0
2550 '
2560 ' Dot graphics data
2570 ' 1ST LINE
2580 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2590 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2600 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2610 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2620 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 127,255, 0,255,255
2630 DATA 1,255,255, 3, 0, 0, 7, 0, 0, 7, 0, 0, 15, 0, 0
2640 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2650 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2660 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2670 DATA 31, 0, 0, 31,128, 0, 31,224, 0, 31,248, 0, 31,255, 0
2680 DATA 31,255,224, 15,255,248, 7,255,255, 1,255,255, 0,127,255
2690 DATA 0, 7,255, 0, 0,255, 0, 0,63, 0, 0,63, 0, 0,248
2700 DATA 0, 3,192, 0, 63, 0, 0,248, 0, 1,128, 0, 3, 0, 0
2710 DATA 7, 0, 0, 15, 0, 0, 15, 0, 0, 31, 0, 0, 31, 0, 0
2720 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2730 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2740 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2750 DATA 31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,255
2760 DATA 31,255,255, 15,255,255, 0, 0, 0, 0, 0, 0, 0, 0, 0
2770 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2780 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2790 DATA 0, 0, 0, 0, 0, 60, 0, 3,255, 0, 11,195, 0, 28, 0
2800 DATA 0, 12, 0, 0, 96, 0, 0,192, 0, 0,192, 0, 1,128, 0
2810 DATA 3, 0, 0, 3, 0, 0, 7, 0, 0, 7, 0, 0, 15, 0, 0
2820 DATA 15, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 15
2830 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
2840 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
2850 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
2860 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 63
2870 DATA 31,255,255, 31,255,255, 31,255,247, 31,255,231, 31,255,199
2880 DATA 15,255,135, 7,255, 7, 0, 0, 3, 0, 0, 1, 0, 0, 0
2890 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2900 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,254, 0
2910 DATA 1,255,240, 3,135,255, 7, 0, 63, 15, 0, 0, 15, 0, 0
2920 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2930 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31,128, 0, 31,128, 0
2940 DATA 31,192, 0, 31,255, 0, 31,255,255, 31,255,255, 31,255,255
2950 DATA 31,255,255, 15,255,255, 7,255,255, 0,255,240, 1,254, 0
2960 DATA 1,240, 0, 3,128, 0, 7, 0, 0, 15, 0, 0, 31, 0, 0
2970 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
2980 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31,128, 0, 31,128, 0

```

2990 DATA	31,192,0	31,240,0	31,255,0	31,255,240	31,255,255
3000 DATA	31,255,255	7,255,255	0,255,255	0,255,255	1,255,240
3010 DATA	3,192,0	7,128,0	15,0,0	31,0,0	31,0,0
3020 DATA	31,0,0	31,0,0	31,0,0	31,0,0	31,0,0
3030 DATA	31,0,0	31,0,0	31,0,0	31,0,15	31,135,255
3040 DATA	31,255,255	31,255,255	31,255,255	31,255,255	31,255,240
3050 DATA	15,252,0	47,128,0	0,0,0	0,0,0	0,0,0
3060	2ND LINE				
3070 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3080 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3090 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3100 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3110 DATA	0,0,0	0,0,0	0,0,0	0,255,255	255,255,255
3120 DATA	255,255,255	0,0,0	0,0,0	0,0,0	0,0,0
3130 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3140 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3150 DATA	255,255,255	31,255,255	7,255,255	0,255,255	0,31,255
3160 DATA	0,3,255	0,0,255	0,0,31	0,0,7	0,0,0
3170 DATA	0,0,0	0,0,0	0,0,0	0,224,0	0,0,252
3180 DATA	254,0	0,0,248	0,0,192	0,0,0	0,0,0
3190 DATA	0,0,0	0,0,0	0,0,0	0,0,7	0,0,63
3200 DATA	0,1,255	0,15,255	0,127,255	1,255,255	15,255,255
3210 DATA	255,255,255	0,0,0	0,0,0	0,0,0	0,0,0
3220 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3230 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3240 DATA	255,255,255	255,255,255	255,255,255	255,255,255	255,255,255
3250 DATA	255,255,255	255,255,255	0,0,0	0,0,0	0,0,0
3260 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3270 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3280 DATA	0,7,224	0,63,252	128,120	31,192,224	3,97,128
3290 DATA	59,0	0,30	0,0,14	0,0,12	0,0,12
3300 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3310 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,63
3320 DATA	128,127,128	128,127,128	128,127,128	128,127,128	128,128,255,128
3330 DATA	223,255,128	255,255,128	255,255,0	224,0	0,224,0
3340 DATA	224,0	0,224	0,0,224	0,0,224	0,0,224
3350 DATA	224,0	0,224	0,0,224	0,0,224	0,0,224
3360 DATA	224,0	1,224	0,3,240	0,15,255	255,255,255,254
3370 DATA	255,255,254	255,255,252	255,255,248	255,255,224	255,255,128
3380 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3390 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3400 DATA	0,0,0	0,0,0	0,240	0,0,255	0,0,15,248
3410 DATA	0,63,0	0,3,248	0,0,31	0,0,3	0,0,0
3420 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3430 DATA	0,0,0	0,0,0	0,0,0	0,0,255	0,0,255,224
3440 DATA	255,128	0,240	0,0,0	0,0,0	0,0,0
3450 DATA	0,0,0	0,0,0	0,0,0	0,0,7	0,0,127
3460 DATA	0,7,255	0,63,255	1,255,255	31,255,255	3,255,255
3470 DATA	0,127,254	0,7,252	0,0,127	0,0,7	0,0,0
3480 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,128,0
3490 DATA	248,0	0,255	0,0,255,192	0,128	0,0,0
3500 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3510 DATA	0,0,0	0,0,0	0,0,0	0,0,0	1,0,0,63
3520 DATA	0,31,255	7,255,255	255,255,255	255,255,255	255,255,254
3530 DATA	255,255,192	255,248	0,255	0,0,0	0,0,0
3540 DATA	0,0,0	0,0,0	0,0,0	0,0,0	0,0,0
3550	3RD LINE				
3560 DATA	0,0,0	0,0,0	0,0,0	0,0,24	0,0,56
3570 DATA	0,0,56	0,0,120	0,0,248	0,1,248	0,1,248
3580 DATA	0,3,248	0,7,248	0,7,248	0,15,248	0,15,248
3590 DATA	0,31,248	0,63,248	0,127,248	0,127,248	0,255,248
3600 DATA	0,255,248	1,255,248	3,255,248	199,255,248	247,255,248
3610 DATA	255,255,248	31,255,240	15,255,240	15,255,224	15,255,224

3620 DATA 15,255,192, 15,255,192, 15,255,192, 15,255,128, 15,255,128
 3630 DATA 15,255, 0, 15,255, 0, 15,255, 0, 15,254, 0, 15,254, 0
 3640 DATA 252,252, 24,252,252, 56,249,252,248,249,252,248,243,255,248
 3650 DATA 227,255,248,231,255,248,199,255,248,231,255,248,255,255,248
 3660 DATA 31,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
 3670 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,207,248
 3680 DATA 31, 15,248, 30, 31,248,252, 63,248,248,127,248,240,127,240
 3690 DATA 224,255,240,225,255,240,195,255,224,199,255,192,247,255,128
 3700 DATA 255,255,128, 63,255, 0, 31,254, 0, 15,254, 0, 15,252, 0
 3710 DATA 15,248, 0, 15,240, 0, 15,240, 0, 15,224, 0, 15,192, 0
 3720 DATA 15,192, 0, 15,128, 0, 15, 0, 0, 31, 0, 0, 62, 0, 0
 3730 DATA 252, 0, 0,252, 0, 0,248, 0, 0,240, 0,224,240, 0,240
 3740 DATA 224, 1,240,192, 1,248, 0, 3,248, 0, 3,248, 0, 3,248
 3750 DATA 0, 7,248, 0, 7,248, 0, 63,248, 0,127,248, 0,127,248
 3760 DATA 0,255,248, 0,255,248, 1,255,248, 1,255,248, 1,255,248
 3770 DATA 3,255,248, 3,255,248, 3,255,248,131,255,248,199,255,248
 3780 DATA 103,255,248,119,255,248, 55,255,248, 63,255,248, 31,255,248
 3790 DATA 31,255,248, 31,255,248, 15,255,248, 15,255,248, 15,255,248
 3800 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
 3810 DATA 15,255,240, 15,255,224, 15,255,192, 15,255,192, 15,254, 0
 3820 DATA 15,254, 0, 15,254, 0, 15,254, 0, 15,254, 0, 15,254, 0
 3830 DATA 15,252, 0, 15,252, 0, 15,248, 0, 15,240, 0, 31,240, 0
 3840 DATA 31,224, 0, 31,192, 0, 55,128, 0, 48, 0, 8, 96, 0, 24
 3850 DATA 192, 0, 24,128, 0, 56, 0, 0, 56, 0, 0,120, 0, 0,120
 3860 DATA 0, 0,248, 0, 0,248, 0, 1,248, 0, 1,248, 0, 3,248
 3870 DATA 0, 3,248, 0, 7,248, 0, 7,248, 0, 15,248, 0, 15,248
 3880 DATA 0, 31,248, 0, 31,240, 0, 63,240, 0, 63,224, 0,127,224
 3890 DATA 0,127,192, 0,255,192, 0,255,128, 1,255,128, 1,255, 24
 3900 DATA 3,255, 56, 3,255,248,231,255,248,255,255,248, 31,255,248
 3910 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
 3920 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
 3930 DATA 15,255,240, 15,255,240, 15,255,224, 15,255,224, 15,255,192
 3940 DATA 15,255,192, 31,255,128,254,127,128,252,127, 24,248,255, 56
 3950 DATA 248,255,248,240,255,248,225,255,248,193,255,248,131,255,248
 3960 DATA 3,255,248, 7,255,248,135,255,248,231,255,248,255,255,248
 3970 DATA 63,255,248, 31,255,248, 15,255,248, 15,255,248, 15,255,240
 3980 DATA 15,255,240, 15,255,224, 15,255,192, 15,255,128, 15,255, 0
 3990 DATA 15,254, 0, 15,252, 0, 15,248, 0, 15,240, 0, 15,224, 0
 4000 DATA 15,192, 0, 15, 0, 0, 62, 0, 0,252, 0, 0,248, 0, 0, 0
 4010 DATA 240, 0, 0,224, 0, 0,192, 0, 0,128, 0, 0, 0, 0, 0, 0
 4020 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 4030 DATA 0, 0, 0, 0, 0, 0, 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 chapter 4.

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 font 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: 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 Chapter 5.

The final part of the program uses dot graphics to print an "M&W" logo. The dot pattern of the logo was originally laid out on graph paper, then converted to the data in lines 2570 to 4030 with the help of a calculator. Each number represents eight vertical dots. (See "Graphics commands" in Chapter 4 for details.)

The pattern is printed in three rows, each twenty-four dots high and 240 dots wide. Line 1990 sets the line spacing to 8/60 inch so that the rows will connect vertically. The loop in lines 2000 to 2080 does the printing in three passes of the print head.

Font 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:

THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED
THE SPACING ARE CHANGED

Other features:

OUTLINED, SHADOWED, OUTLINED WITH SHADOWED,

Emphasized, Double-strike, Underlining,

Overlining, SUPERSCRIP^T and SUBSCRIP_T,

Download characters: *******⁸*******

Dot graphics:

M & W

Modifications for IBM mode

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 difference 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.

```
1010 E$=CHR$(27) :F$=CHR$(28)           'Escape & FS codes
1090 PI$=CHR$(18)                       'Pica pitch
1190 LPRINT F$;"4";                     'Select italics
1220 LPRINT F$;"5"                       'Cancel italics
1260 ' LPRINT H$;E$;"q";"Semi-condensed pitch (15 CPI),";
1300 ' LPRINT H$;E$;"M";"Condensed elite pitch (20 CPI),";
1400 ' LPRINT H$;CHR$(28);"E";CHR$(2);"Triple width,";
1410 ' LPRINT CHR$(28);"E";CHR$(0)
1460 LPRINT F$;"Q";CHR$(47)             'Set right margin
1500 LPRINT E$;"A";CHR$(1);E$;"2";      'Line spacing set
1510 ' LPRINT E$;" ";CHR$(1);           'Increase character space
1550 LPRINT E$;"A";CHR$(1);E$;"2";      'Line spacing set
1560 ' LPRINT E$;" ";CHR$(1);           'Increase character space
1610 ' LPRINT E$;" ";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);", "
1990 LPRINT E$;"A";CHR$(8);E$;"2";      'Set 8/60" line spacing
2150 LPRINT E$;"=";CHR$(0);CHR$(60);CHR$(60);
2280 LPRINT E$;"=";CHR$(0);CHR$(60);CHR$(60);
```

Chapter 7 **TROUBLESHOOTING AND MAINTENANCE**

The following section on troubleshooting and maintenance is intended only as a brief guide to these functions. Remember that your printer is a highly sophisticated electronic device, which also contains high voltage inside. For that reason, only carry out those operations described in this chapter.

CAUTION: Any attempt to carry out operations other than those described here may result in electric shock and/or damage to the printer. When carrying out any repairs or maintenance, always follow the instructions carefully.

TROUBLESHOOTING

Your printer is a reliable piece of precision machinery, which should not cause you any trouble, provided it is used and treated sensibly. However, the few elementary tips below should avoid you having to make unnecessary service calls. The following table gives you ideas on where to look in this section if you experience faults:

Region of fault	Description
Power supply	Power is not being supplied to the printer
Printing	The printer does not print, or stops printing
	The print is faint or uneven
	Dots are missing in characters or graphics
	While using application software, fonts or characters cannot be printed
	The printout is not what is expected when running a program
Paper feeding	Single sheets do not feed properly (without ASF)
	Continuous paper does not feed properly with the tractor feed
	The ASF is not operating or is not feeding paper properly
	Paper park (switching between continuous paper and cut sheets) is not working properly
	Text is being printed all on one line, or with extra blank lines
	Page length and margin settings are not what is expected.

Remember - it is better not to attempt operations or repairs above your level of competence. Otherwise, you run the risk of damaging the printer.

Power supply

If the POWER indicator does not illuminate, check the following:

Check	Possible remedy
Is the power cable properly plugged into the electrical outlet?	Turn off the printer, ensure the power cable is securely connected, and then turn the printer back on.
Is power being supplied to the outlet?	Turn off the printer, unplug it, and try with another appliance to determine if electricity is being supplied to that outlet.
Is the printer voltage correct?	Check the bottom panel of your printer to ensure that the outlet voltage corresponds to the voltage required by the printer. If they do not match, DO NOT try to operate the printer. Contact your supplier.

Printing

If your printer does not print, or suddenly stops printing, check the following:

Check	Possible remedy
Is the interface cable connected securely?	Check both ends of the cable - printer and computer to make sure that the connector is firmly in position.
Is the ON LINE indicator illuminated?	If it is not, press the ON LINE button to set the printer on-line.
Is the POWER indicator flashing?	If it is, the paper has run out. Load more paper.
Is the paper caught up internally?	Turn off the power, remove the jammed paper, replace, turn on the printer, and continue printing. Make sure that the leading edge of the paper is smooth and uncreased.
Is the ribbon caught up around the print head?	Turn off the power, remove the ribbon, retension it, and replace it. This problem occurs most frequently with a worn ribbon, so you may need to replace the ribbon.
Is the software you are using properly installed for your printer?	Check the installation settings in your software, and re-install if necessary.
Can the printer perform self-test operations?	Turn the printer off, and turn it on again, holding down one of the buttons to perform a self-test. If these do not work, contact your dealer.

If the print is faint, or uneven, check the following:

Check	Possible remedy
Is the ribbon properly installed?	Check and reinstall if necessary.
Is the ribbon worn out?	The ribbon has a long life, but eventually will need replacing. Fit a new ribbon cartridge if necessary.

If dots are missing in the printing, check the following:

Check	Possible remedy
Are dots missing at random in the printing?	The ribbon has become slack, causing it to get caught up. Stop printing, remove the ribbon cartridge, retention and replace it.
Is a line of dots missing consistently throughout the printing?	The print head is damaged. Stop printing, and contact your supplier for a new print head.

If your application software cannot print the fonts or characters selected, check the following:



Check	Possible remedy
Is your application software properly installed?	Check the software installation, and re-install the software if necessary.
Are fonts not being selected properly?	Check the software installation, and insert the commands necessary for font changes into the software.
Are characters other than those expected being printed?	Either you are using the wrong International Character Set (reset with DIP switches or software commands), or you have the wrong character set selected (for example if characters other than IBM block graphic characters are being printed). Correct this with DIP switches or the appropriate software sequences.

If the printout is not what is expected:



Check	Possible remedy
Is the printer installed correctly?	Your software may think that it is driving a different emulation to the one actually set. Check the DIP switch settings to make sure you have the right emulation.
Is the printer not printing anything that you are expecting?	Use the Hex Dump mode to analyze the output from the computer to the printer. This will enable you to determine that the right escape sequences, etc are being transmitted.

Paper feeding

If cut sheet paper (without the ASF) is not feeding smoothly, check the following:


Check	Possible remedy
Is the paper release lever pushed back (to the  position)?	Set the release lever to the  position.
Is the paper guide in place and vertical?	The paper guide should be in place vertically for cut sheets to feed smoothly.
Are the left and right guides too close together?	If the left and right guides are too close together, the paper will not feed smoothly. Move them a little further apart to allow the paper to feed freely.
Is the ASF selected with the DIP switch settings?	If it is, then deselect it.
Are you trying to feed paper using the front panel buttons while the ON LINE indicator is illuminated?	You can only feed paper in this way when the printer is off-line. Set the printer off-line and then feed paper.
Is the paper too thick?	There are limits to the thickness of paper that can be fed in this way. Try with thinner paper.

If fanfold (continuous) paper is not being fed correctly using the tractor feed, check the following:



Check	Possible remedy
Is the paper lever pushed to the  position?	Make sure the release lever is pushed to the  position.
Is the paper guide in the vertical position?	When using the tractor feed, the paper guide should be horizontal.
Are the holes on each side of the paper aligned with regard to each other in the sprockets?	If the two sides of the paper are out of alignment, realign them so that the sprocket holes match up.
Are the sprockets too close or too far apart?	Misalignment of the sprockets, making the paper too loose or too tight, will prevent a smooth paper feed.
Are the sprockets locked in position and the covers closed?	Correct this if necessary.
Is the paper feeding freely into the printer?	The paper should not be too far from the printer (less than 1 meter/ 3 feet), and there should be no cables or other obstacles obstructing its path. The paper should also be feeding straight into the printer, and an angled feed may cause jams and blockages.

Check	Possible remedy
Are you trying to feed paper using the front panel buttons while the ON LINE indicator is illuminated?	You can only feed paper in this way when the printer is off-line. Set the printer off-line and then feed paper.
Is the paper too thick?	There are limits to the thickness of paper that can be fed in this way (one top copy and two NCR copies). Try with thinner paper.

If the ASF is not operating or is not feeding paper correctly, check the following:

Check	Possible remedy
Has the ASF option been selected with the DIP switch?	Select this option
Is the release lever set to the  position?	The release lever should be set to the single-sheet position.
Is the ASF correctly mounted?	Make sure that the ASF is properly seated on the printer.
Is paper caught up near the print head?	Stop printing, remove the jammed sheet (you may have to remove the ASF for this), and continue.
Are the left and right guides too close together?	If the left and right guides are too close together, the paper will not feed smoothly. Move them a little further apart to allow the paper to feed freely.
Is there too much paper in the paper feed hopper or stacker?	The ASF's paper feed hopper and stacker can hold 120 sheets each. Make sure that there is no more paper than this in either the hopper or stacker.
Was the paper fanned before being fed into the ASF?	If this is not done, paper jams may occur. Remove the stack of paper from the ASF and fan it before reinserting.
Has the paper been used already or is it creased?	Only new, uncreased paper should be used with the ASF.
Are you trying to feed paper using the front panel buttons while the ON LINE indicator is illuminated?	You can only feed paper in this way when the printer is off-line. Set the printer off-line and then feed paper.
Is the paper too thick or too thin?	There are limits to the thickness of paper that can be fed in this way. Try with different paper.

If the paper park facility does not appear to be working correctly, check the following:

Check	Possible remedy
Is the paper release lever in the  position?	The paper release lever must be set to the  position after the fanfold paper has been parked.
Has the fanfold paper been properly parked?	Make sure that the POWER indicator comes on flashing after the fanfold paper has been parked.

If text is being printed all on one line, or with extra blank lines, check the following:

Check	Possible remedy
Is the text all on the same line?	Carriage returns are not being expanded to <CR> + <LF> pairs. Check the DIP switch setting and correct.
Is text being printed with extra blank lines?	Two line feeds are being printed. Either make your software print just a carriage return or (if this is not possible), set the AUTO LF to OFF with the DIP switch setting.

If the page length and margins are not what is expected, check the following:

Check	Possible remedy
Is the printing starting too high or too low on the page?	Use the Micro Feed facility to adjust the print position relative to the page.
Does the printer's page length not match the physical page length?	Use the DIP switch to set up the correct page length, or use software commands to do it.

MAINTENANCE

Essentially, your printer is a robust piece of equipment, but should be treated with a modicum of care in order to avoid malfunctions. For example:

- Keep your printer in a “comfortable” environment. Roughly speaking, if you are comfortable, then the environment is suitable for your printer, too (see Chapter 1).
- Do not subject the printer to physical shocks or excessive vibration.
- Avoid over-dusty environments. Dust is the enemy of all precision mechanical devices.
- To clean the exterior of the printer, use a barely damp cloth (use either water with a little detergent or a little alcohol), but do not allow any liquid to fall inside the printer.
- The interior of the printer may be cleaned with a small vacuum cleaner or a compressed-air aerosol (sold for this purpose). When performing this operation, be sure not to bend or damage any cable connections or electronic components.

REPLACING THE RIBBON

The ribbons used by your printer are endless-loop ribbons in which the ribbon is recycled. When the print quality becomes too faint, you will need to replace the ribbon.

To remove the old cartridge, take off the top cover, grasp the ribbon cartridge by the two arms at the 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.

REPLACING THE PRINT HEAD

This is not a job which you will need to do very often. The print head has been designed to give a life about 200 million dots. In normal everyday use, this will mean years of life. However, if the print quality is faint, even after you have changed the ribbon or you have adjusted the gap between the print head and the platen (see Chapter 1), the print head will need replacement.

Only use a replacement print head as recommended by your supplier.

1. Turn OFF the printer, and unplug the power cord.
2. Remove the top cover and ribbon cartridge.
3. If the printer has been in operation immediately before this operation, the print head will be hot. Allow time for the print head to cool before attempting to work on it.
4. 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.
5. Unscrew the two screws that hold the print head in place and set them aside.
6. Disengage the cable from the tabs holding it down, then remove the print head.
7. For easy installation of the new print head, move the carriage toward the left end of the rail.
8. Place the new print head on its support, seating it on the two pins.
9. Thread the new cable the same way as the old, securing it under the three tabs on the print head carriage.
10. Plug the cable into the connector, inserting it as far as it will go.
11. Fasten the print head down with the two screws.
12. Move the carriage back toward the right and replace the connector cover. Slide the connector cover to the left until it locks into place.
13. Replace the ribbon cartridge and top cover, and plug the power cord back in.

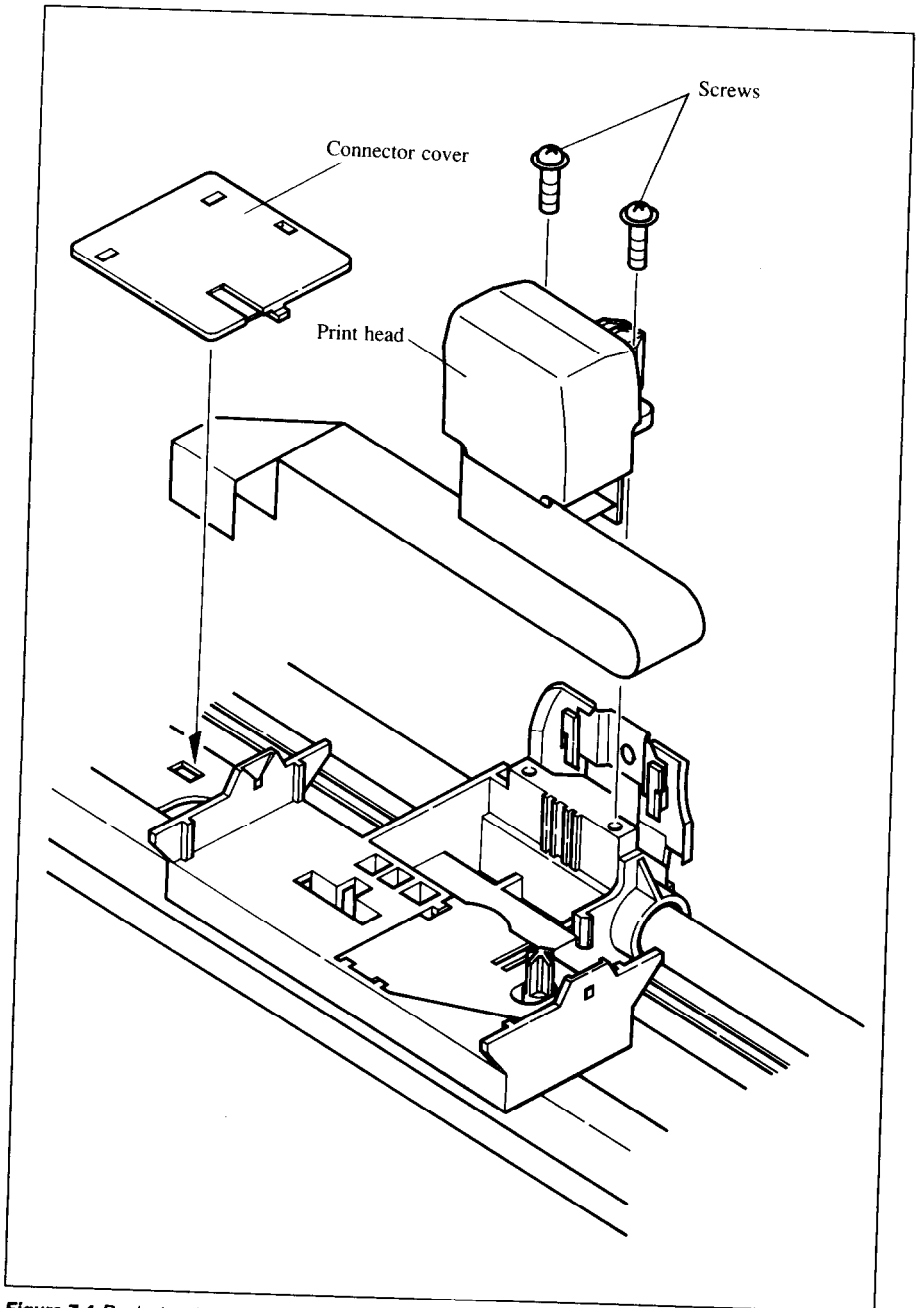


Figure 7-4. Replacing the print head

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.

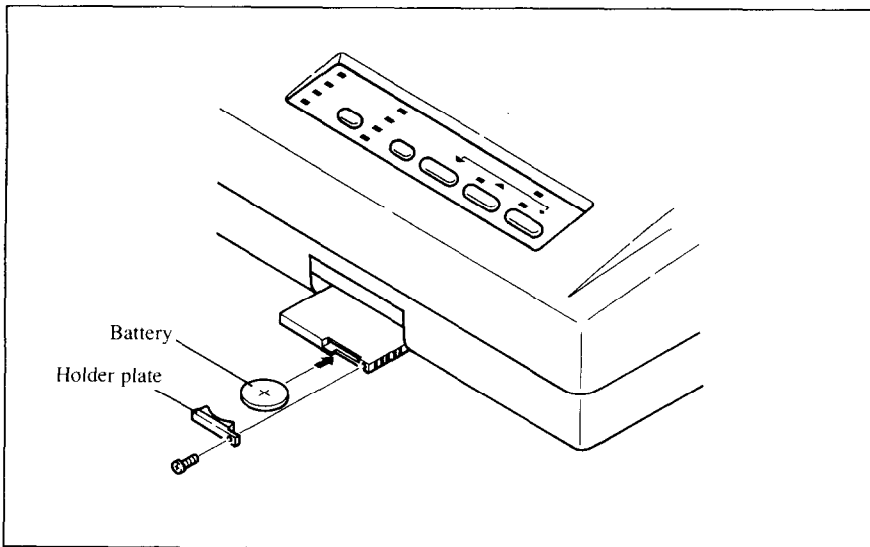


Figure 7-5. Replacing the battery.

Chapter 8

SPECIFICATIONS

Printing system	Serial Impact Dot-matrix	
Printing speed	200 cps (Draft elite)	
	66.7 cps (LQ elite)	
Print direction	Bidirectional, logic-seeking	
	Unidirectional, logic-seeking	
	(selectable)	
Number of print pins	24	
Line spacing	1/6, 1/8, <i>n</i> /180, <i>n</i> /360 inches	
Characters	ASCII	96
	International	14 sets (*)
	IBM special	111
	IBM block graphic	50
	Download	96 (**)

* USA, France, Germany, England, Denmark I, Sweden, Italy, Spain I, Japan, Norway, Denmark II, Spain II, Latin America, Denmark/Norway

** Expandable to 255 with optional RAM card

Number of columns	CPI	
Pica	10	136
Elite	12	163
Semi-condensed	15	204
Condensed pica	17.1	233
Condensed elite	20	272
Proportional		Variable

Character dot matrix	Draft	LQ
Pica	24 × 9	24 × 35
Elite	24 × 9	24 × 29
Semi-condensed	16 × 7	16 × 23
Condensed pica	24 × 9	24 × 18
Condensed elite	24 × 9	24 × 15
Super/subscript	16 × 7	16 × 23
Proportional	–	24 × <i>n</i>
Super/subscript proportional	–	16 × <i>n</i>

Bit image dot-matrix	DPI	
8-pin normal	60	8 × 816
8-pin double	120	8 × 1632
8-pin high-speed double*	120	8 × 1632
8-pin quadruple*	240	8 × 3264
8-pin CRT I	80	8 × 1088
8-pin CRT II	90	8 × 1224
24-pin normal	60	24 × 816
24-pin double	120	24 × 1632
24-pin CRT III	90	24 × 1224
24-pin Triple	180	24 × 2448
24-pin hex*	360	24 × 4896

* It is impossible to print adjacent dots in the mode marked with an asterisk (*).

Paper feed Friction and push tractor (standard)
Pull tractor (option)

Paper feed speed 3.3 inches/second max

Paper width Cut sheet 5.5"-16.5"
Fanfold (continuous) 4"-16"

Copies Original +2 copies

Maximum buffer size Without Download 11kB
With Download 1 line

Emulations	Epson mode IBM Proprinter mode
Interface	Centronics parallel (standard) RS-232C serial (option)
Ribbon type	On-carriage, dedicated Black
Ribbon life	3 million characters (draft pica)
Dimensions	590(w) × 332(d) × 127(h) mm 23.2(w) × 13.1(d) × 5(h) in
Weight.....	9.1kg (20.1lb)
Power supply	120VAC, 220VAC, 240VAC, 50/60Hz (varies according to the country of purchase)
Options	Automatic sheet feeder RS-232C interface Pull tractor feed Font card RAM card

The following describes the pinout of the parallel (Centronics-type) interface connector (signals which are low when active are overlined):

Pin	Name	Function
1	<u>STROBE</u>	Goes from high to low (for $\geq 0.5\mu\text{s}$) when active
2	DATA0	High when active
3	DATA1	High when active
4	DATA2	High when active
5	DATA3	High when active
6	DATA4	High when active
7	DATA5	High when active
8	DATA6	High when active
9	DATA7	High when active
10	<u>ACK</u>	5 μs low pulse acknowledges receipt of data
11	BUSY	Low when printer ready to receive data
12	PAPER	High when paper out. Can be disabled with DIP switch setting
13	SELECT	High when printer is on-line
14, 15	N/C	
16	SIGNAL GND	Signal ground
17	CHASSIS	Chassis ground (isolated from signal ground)
18	+5V	+5V DC output from printer
19~30	GND	Twisted pair ground return
31	<u>RESET</u>	When this input signal is low, printer is reset
32	<u>ERROR</u>	Outputs low when printer cannot continue, due to an error
33	EXT GND	External ground
34, 35	N/C	
36	SELECT IN	Always high

Chapter 9

CHARACTER SETS

This chapter 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. < >.

<Sample>

	0	1	2	3	4	5	6	7
0	0	16	32	48	64	80	96	112
1	<DC1>	!	1	A	Q	a	q	
2	<DC2>	"	2	B	R	b	r	
3	<DC3>	#	3	C	S	c	s	
	<DC4>			D	T	d		

Character

Hexadecimal value (high order)

Control code

Decimal value

Hexadecimal value (low order)

STANDARD CHARACTER SET

	0	1	2	3	4	5	6	7
0	0	16	32	48	64	80	96	112
1	<DC1>	!	1	A	Q	a	q	
2	<DC2>	"	2	B	R	b	r	
3	<DC3>	#	3	C	S	c	s	
4	<DC4>	\$	4	D	T	d	t	
5		%	5	E	U	e	u	
6		&	6	F	V	f	v	
7	<BEL>	'	7	G	W	g	w	
8	<BS>	<CAN>	(	8	H	X	h	x
9	<HT>	<EH>	)	9	I	Y	i	y
A	<LF>		*	:	J	Z	j	z
B	<VT>	<ESC>	+	;	K	[	k	{
C	<FF>	<FS>	,	<	L	\	l	!
D	<CR>		-	=	M	]	m	}
E	<SO>		.	>	N	^	n	~
F	<SI>		/	?	O	--	o	<DEL>

	8	9	A	B	C	D	E	F
0	128	144	160	176	192	208	224	240
1	<DC1> 129	145	!	1	A	Q	a	q
2	<DC2> 130	146	"	2	B	R	b	r
3	<DC3> 131	147	#	3	C	S	c	s
4	<DC4> 132	148	\$	4	D	T	d	t
5	133	149	%	5	E	U	e	u
6	134	150	&	6	F	V	f	v
7	<BEL> 135	151	'	7	G	W	g	w
8	<BS> 136	<CAN> 152	(	8	H	X	h	x
9	<HT> 137	<EH> 153	)	9	I	Y	i	y
A	<LF> 138	154	*	:	J	Z	j	z
B	<VT> 139	<ESC> 155	+	;	K	[	k	{
C	<FF> 140	<ES> 156	,	<	L	\	l	,
D	<CR> 141	157	-	=	M	]	m	}
E	<SO> 142	158	.	>	N	^	n	~
F	<SI> 143	159	/	?	O	_	o	<DEL>
	191	175		191	207	223	239	255

IBM CHARACTER SET #2

	0	1	2	3	4	5	6	7
0	0	16	32	48	64	80	96	112
1	<DC1>	!	1	A	Q	a	q	
2	<DC2>	"	2	B	R	b	r	
3	♥	#	3	C	S	c	s	
4	♦	<DC4>	\$	4	D	T	d	t
5	‡	§	%	5	E	U	e	u
6	↑	&	6	F	V	f	v	
7	<BEL>	'	7	G	W	g	w	
8	<BS>	<CAN>	(	8	H	X	h	x
9	<HT>	<EH>	)	9	I	Y	i	y
A	<LF>	*	:	J	Z	j	z	
B	<VT>	<ESC>	+	;	K	[	k	{
C	<FF>	<FS>	,	<	L	\	l	;
D	<CR>	-	=	M	]	m	}	
E	<SO>	.	>	N	^	n	~	
F	<SI>	/	?	O	_	o		

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

IBM CHARACTER SET #1

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

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

Other characters are identical to 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.

IBM SPECIAL CHARACTER SET

Additional characters can be printed by special commands.

	0	1
0	∅ 0	▶ 16
1	⊕ 1	◀ 17
2	⊙ 2	↓ 18
3	♥ 3	!! 19
4	♦ 4	π 20
5	‡ 5	§ 21
6	♣ 6	- 22
7	· 7	± 23
8	■ 8	↑ 24
9	○ 9	↓ 25
A	□ 10	→ 26
B	σ [∧] 11	← 27
C	♀ 12	└ 28
D	♯ 13	↔ 29
E	♯ 14	▲ 30
F	* 15	▼ 31

INTERNATIONAL CHARACTER SETS

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

Country	35	36	64	91	92	93	94	96	123	124	125	126	155	157
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	#	¤	£	Ä	Ö	Å	Ü	é	ä	ö	å	ü	ç	¥
ITALY	#	\$	@	~	\	é	^	ù	à	ò	è	ì	ç	¥
SPAIN 1	₧	\$	@	;	Ñ	¿	^	'	¨	ñ	}	~	ç	¥
JAPAN	#	\$	@	[	¥	]	^	'	{	|	}	~	ç	¥
NORWAY	#	¤	£	Æ	Ø	Å	Ü	é	æ	ø	å	ü	ç	¥
DENMARK 2	#	\$	£	Æ	Ø	Å	Ü	é	æ	ø	å	ü	ç	¥
SPAIN 2	#	\$	á	;	Ñ	¿	é	'	í	ñ	ó	ú	ç	¥
LATIN AMERICA	#	\$	á	;	Ñ	¿	é	ü	í	ñ	ó	ú	ç	¥
DENMARK/NORWAY	#	\$	@	[	\	\]	^	'	{	|	}	~	ø	Ø

See Chapter 3 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	74
	<BS> Backspace	62
	<HT> Horizontal tab	64
	<LF> Line feed	55
	<VT> Vertical tab	60
	<FF> Form feed	58
	<CR> Carriage return	61
	<SO> Expanded printing for one line	48
	<SI> Condensed printing	47
	<DC1> Set printer on-line	73
Std.	<DC2> Cancel condensed printing	47
IBM	<DC2> Pica pitch	45
Std.	<DC3> Set printer off-line	73
	<DC4> Cancel one-line expanded printing	48
	<CAN> Cancel last line	71
Std.	 Delete last character sent	71
	<ESC> <LF> Reverse line feed	55
	<ESC> <FF> Return to top of current page	58
	<ESC> <SO> Expanded printing for one line	48
	<ESC> <SI> Condensed printing	47
	<ESC> <0> Manual feed	74
	<ESC> <4> Auto feed	75
	<ESC> "R" Eject paper from ASF	75
	<ESC> "T" n Set print start position on ASF	75
Std.	<ESC> <SP> n Increase character spacing	49
	<ESC> "!" n Select master print mode	49
	<ESC> "#" Accept MSB as is	71
	<ESC> "\$" n1 n2 Absolute horizontal tab in inches	65
	<ESC> "%" <0> Select ROM character set	70
	<ESC> "%" <1> Select download character set	70
	<ESC> "%" "0" Select ROM character set	70
	<ESC> "%" "1" Select download character set	70
	<ESC> "&" <0> n1 n2 m0 m1 m2 d1 d2 ...dx Define download characters	69
	<ESC> "*" n0 n1 n2 m1 m2 ... Select graphics mode	67
	<ESC> "+" n Set line spacing to n/360 inch	53
	<ESC> "-" <0> Stop underlining	42
	<ESC> "-" <1> Start underlining	41
	<ESC> "-" "0" Stop underlining	42
	<ESC> "-" "1" Start underlining	41
	<ESC> "f" n0 Select vertical tab channel	59
	<ESC> "0" Set line spacing to 1/8 inch	53
	<ESC> "1" Set line spacing to 7/60 or 7/72 inch	53
Std.	<ESC> "2" Set line spacing to 1/6 inch	53
IBM	<ESC> "2" Execute <ESC> "A"	55
	<ESC> "3" n Set line spacing to n/180 or n/216 inch	54
Std.	<ESC> "4" Select italic characters	40
IBM	<ESC> "4" Set top of page at current position	56
Std.	<ESC> "5" Select upright characters	40
IBM	<ESC> "5" <0> Cancel automatic line feed	62
IBM	<ESC> "5" <1> Set automatic line feed	62

MODE CONTROL CODE	FUNCTION	PAGE
	<ESC> "6"	Select character set #2 44
	<ESC> "7"	Select character set #1 43
	<ESC> "8"	Disable paper-out detector 58
	<ESC> "9"	Enable paper-out detector 58
IBM	<ESC> ":", <0> n <0>	Elite pitch 46
Std.	<ESC> "<"	Copy character set from ROM into RAM card 70
	<ESC> "<"	One-line unidirectional printing 74
Std.	<ESC> "="	Set MSB to 0 71
IBM	<ESC> "=" <0> n1 n2 m0 m1 m2 d1 d2 ... dx	Define download characters 69
	<ESC> ">"	Set MSB to 1 71
	<ESC> "?" n m	Convert graphics density 68
	<ESC> "@"	Reset printer 75
Std.	<ESC> "A" n	Set line spacing to n/72 inch 54
IBM	<ESC> "A" n	Define line spacing to n/72 inch 54
	<ESC> "B" n1 n2 ... <0>	Set vertical tab stops 59
	<ESC> "C" n	Set page length to n lines 57
	<ESC> "C" <0> n	Set page length to n inches 57
	<ESC> "D" n1 n2 ... <0>	Set horizontal tab stops 63
	<ESC> "E"	Emphasized printing 41
	<ESC> "F"	Cancel emphasized printing 41
	<ESC> "G"	Double-strike printing 41
	<ESC> "H"	Cancel double-strike printing 41
IBM	<ESC> "I" n	Select character type and print pitch 52
	<ESC> "J" n	Perform one n/180-inch or n/216-inch line feed 56
	<ESC> "K" n1 n2 m1 m2 ...	Print 8-bit normal-density graphics 65
	<ESC> "L" n1 n2 m1 m2 ...	Print 8-bit double-density graphics 65
	<ESC> "M"	Elite pitch 46
	<ESC> "N" n	Set bottom margin 57
	<ESC> "O"	Cancel top and bottom margins 58
Std.	<ESC> "P"	Pica pitch 45
IBM	<ESC> "P" <0>	Select fixed spacing 49
IBM	<ESC> "P" <1>	Select proportional spacing 48
Std.	<ESC> "Q" n	Set right margin 61
IBM	<ESC> "Q" "#"	Set printer off-line 73
IBM	<ESC> "R"	Reset all tab stops 64
Std.	<ESC> "R" n	Select international character set 44
	<ESC> "S" <0>	Superscript 42
	<ESC> "S" <1>	Subscript 42
	<ESC> "S" "0"	Superscript 42
	<ESC> "S" "1"	Subscript 42
	<ESC> "T"	Cancel superscript or subscript 43
	<ESC> "U" <0>	Bidirectional printing 74
	<ESC> "U" <1>	Unidirectional printing 74
	<ESC> "U" "0"	Bidirectional printing 74
	<ESC> "U" "1"	Unidirectional printing 74
	<ESC> "V" n d1 d2 ... dx <ESC> "V" <0>	Repeat data 72
	<ESC> "W" <0>	Cancel expanded printing 47
	<ESC> "W" <1>	Expanded printing 47
	<ESC> "W" "0"	Cancel expanded printing 47
	<ESC> "W" "1"	Expanded printing 47
	<ESC> "X" n1 n2	Set left and right margins 61
	<ESC> "Y" n1 n2 m1 m2 ...	Print 8-bit double-density, double-speed graphics 66
	<ESC> "Z" n1 n2 m1 m2 ...	Print 8-bit quadruple-density graphics 66
	<ESC> "[", "@", <4> <0> <0> <0> n m	Select character height, width, and line spacing 51
IBM	<ESC> "[", "\", <4> <0> <0> <0> n <0>	Set base unit for line spacing 54

MODE CONTROL CODE	FUNCTION	PAGE	
IBM	<ESC> "i" "g" <i>n1 n2 m0 m1 m2 ...</i>	Select graphics mode	68
Std.	<ESC> "i" "n1 n2"	Relative horizontal tab	64
IBM	<ESC> "i" "n1 n2"	Enable printing of all character codes	44
IBM	<ESC> "i" "A"	Enable printing of all character codes on next character	45
	<ESC> "i" "<0>"	Stop overlining	42
	<ESC> "i" "<1>"	Start overlining	42
	<ESC> "i" "1"	Stop overlining	42
	<ESC> "i" "1"	Start overlining	42
	<ESC> "i" "a" "<0>"	Left justify	62
	<ESC> "i" "a" "<1>"	Center text	62
	<ESC> "i" "a" "<2>"	Right justify	63
	<ESC> "i" "a" "<3>"	Full justify	63
	<ESC> "i" "a" "0"	Left justify	62
	<ESC> "i" "a" "1"	Center text	62
	<ESC> "i" "a" "2"	Right justify	63
	<ESC> "i" "a" "3"	Full justify	63
	<ESC> "i" "b" <i>n0 n1 n2 ... <0></i>	Set vertical tab stops in channel	59
	<ESC> "i" "c" <i>n</i>	Set top margin	57
	<ESC> "i" "d" <i>n1 n2</i>	Relative horizontal tab in inches	64
	<ESC> "i" "e" "<0> <i>n</i> "	Set horizontal tab stop every <i>n</i> columns	63
	<ESC> "i" "e" "<1> <i>n</i> "	Set vertical tab stops every <i>n</i> lines	59
	<ESC> "i" "e" "0" <i>n</i>	Set horizontal tab stop every <i>n</i> columns	63
	<ESC> "i" "e" "1" <i>n</i>	Set vertical tab stops every <i>n</i> lines	59
	<ESC> "i" "f" "<0> <i>n</i> "	Absolute horizontal tab in columns	65
	<ESC> "i" "f" "<1> <i>n</i> "	Feed paper <i>n</i> lines	56
	<ESC> "i" "f" "0" <i>n</i>	Absolute horizontal tab in columns	65
	<ESC> "i" "f" "1" <i>n</i>	Feed paper <i>n</i> lines	56
Std.	<ESC> "i" "g"	Semi-condensed pitch	46
	<ESC> "i" "h" <i>n</i>	Select double or quadruple size	50
	<ESC> "i" "i" "<0>"	Cancel immediate print	73
	<ESC> "i" "i" "<1>"	Immediate print	72
	<ESC> "i" "i" "0"	Cancel immediate print	73
	<ESC> "i" "i" "1"	Immediate print	72
IBM	<ESC> "i" "j"	Stop printing	73
Std.	<ESC> "i" "k" <i>n</i>	Perform one <i>n</i> /216-inch reverse line feed	56
	<ESC> "i" "k" <i>n</i>	Select LQ font style	38
	<ESC> "i" "l" <i>n</i>	Set left margin	60
	<ESC> "i" "p" "<0>"	Select fixed spacing	49
	<ESC> "i" "p" "<1>"	Select proportional spacing	48
	<ESC> "i" "p" "0"	Select fixed spacing	49
	<ESC> "i" "p" "1"	Select proportional spacing	48
Std.	<ESC> "i" "g" <i>n</i>	Select ornament character	40
	<ESC> "i" "s" "<0>"	Cancel quiet mode	72
	<ESC> "i" "s" "<1>"	Quiet mode	72
	<ESC> "i" "s" "0"	Cancel quiet mode	72
	<ESC> "i" "s" "1"	Quiet mode	72
	<ESC> "i" "t" "<0>"	Select standard character set	43
	<ESC> "i" "t" "<1>"	Select IBM character set	43
	<ESC> "i" "t" "0"	Select standard character set	43
	<ESC> "i" "t" "1"	Select IBM character set	43
	<ESC> "i" "w" "<0>"	Return to normal height	51
	<ESC> "i" "w" "<1>"	Print double-height characters	50
	<ESC> "i" "w" "0"	Return to normal height	51
	<ESC> "i" "w" "1"	Print double-height characters	50
	<ESC> "i" "x" "<0>"	Select draft quality characters	38
	<ESC> "i" "x" "<1>"	Select LQ characters	38
	<ESC> "i" "x" "0"	Select draft quality characters	38
	<ESC> "i" "x" "1"	Select LQ characters	38
	<ESC> "i" "z" "<0>"	Select normal zero	45

MODE CONTROL CODE

FUNCTION

PAGE

	<ESC> “-” <1>	Select slash zero	45
	<ESC> “-” “0”	Select normal zero	45
	<ESC> “-” “1”	Select slash zero	45
IBM	<FS> “2”	Set Line spacing to 1/6 inch	53
	<FS> “3” <i>n</i>	Set Line spacing to <i>n</i> /360 inch	53
IBM	<FS> “4”	Select italic characters	40
IBM	<FS> “5”	Select upright characters	40
IBM	<FS> “.” <0> <i>n</i> <0>	Copy character set from ROM into RAM card	70
IBM	<FS> “=”	Set MSB to 0	71
Std.	<FS> “@”	Reset printer	75
Std.	<FS> “C” <i>n</i>	Select LQ font style	38
Std.	<FS> “E” <i>n</i>	Select character width	48
Std.	<FS> “F”	Select forward feed mode	55
Std.	<FS> “I” <0>	Select standard character set	43
Std.	<FS> “I” <1>	Select IBM character set	43
Std.	<FS> “I” “0”	Select standard character set	43
Std.	<FS> “I” “1”	Select IBM character set	43
IBM	<FS> “Q” <i>n</i>	Set right margin	61
Std.	<FS> “R”	Select reverse feed mode	55
IBM	<FS> “R” <i>n</i>	Select international character set	44
Std.	<FS> “S” <0>	High-density elite pitch	46
Std.	<FS> “S” <1>	High-speed elite pitch	46
Std.	<FS> “S” “0”	High-density elite pitch	46
Std.	<FS> “S” “1”	High-speed elite pitch	46
Std.	<FS> “T” <0>	Return to normal height	51
Std.	<FS> “T” <1>	Print double-height characters	50
Std.	<FS> “T” “0”	Return to normal height	51
Std.	<FS> “T” “1”	Print double-height characters	50
	<FS> “Z” <i>n1 n2 m1 m2 m3 ...</i>	Print 24-bit hex-density graphics	66
IBM	<FS> “^” <i>n1 n2</i>	Relative horizontal tab	64
	“(” “(” “_” “)” “)” “0”	Stop underlining	42
	“(” “(” “_” “)” “)” “1”	Start underlining	41
	“(” “(” “0” “)” “)”	Manual feed	74
	“(” “(” “4” “)” “)”	Auto feed	75
	“(” “(” “B” “)” “)” “0”	Cancel double-strike printing	41
	“(” “(” “B” “)” “)” “1”	Double-strike printing	41
	“(” “(” “F” “)” “)” “0”	Select Courier characters	39
	“(” “(” “F” “)” “)” “1”	Select Optional characters	39
	“(” “(” “F” “)” “)” “2”	Select Prestige characters	39
	“(” “(” “F” “)” “)” “3”	Select Orator characters	39
	“(” “(” “F” “)” “)” “4”	Select Script characters	40
	“(” “(” “F” “)” “)” “9”	Select draft quality characters	38
	“(” “(” “I” “)” “)” “0”	Select upright characters	40
	“(” “(” “I” “)” “)” “1”	Select italic characters	40
	“(” “(” “R” “)” “)”	Eject paper from ASF	75
	“(” “(” “S” “)” “)” <i>n</i>	Select character size	50
	“(” “(” “T” “)” “)” <i>n</i>	Set print start position on ASF	75

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