

LC24-15 II

MULTI-FONT

USERS MANUAL

VDE Statement

This device carries the VDE RFI protection mark to certify that it meets the radio interference requirements of the Postal Ordinance No. 243/1991. The additional marking "Vfg. 243/P" expresses in short form that this is a peripheral device (not operable alone) which only individually meets the Class B RFI requirements in accordance with the DIN VDE 0878 part 3/11.89 and the Postal Ordinance 243/1991.

If this device is operated in conjunction with other devices within a set-up, in order to take advantage of a "General (Operating) Authorization" in accordance with the Postal Ordinance 243/1991, the complete set-up must comply with the Class B limits in accordance with the DIN VDE 0878 part 3/11.89, as well as satisfy the preconditions in accordance with § 2 and the prerequisites in accordance with § 3 of the Postal Ordinance 243/1991.

As a rule, this is only fulfilled when the device is operated in a set-up which has been type-tested and provided with a VDE RFI protection mark with the additional marking "Vfg 243".

Machine Noise Information Ordinance 3, GSGV, January 18, 1991: The sound pressure level at the operator position is equal or less than 70 dB(A) according to ISO 7779.

The above statement applies only to printers marketed in Germany.

Trademark Acknowledgements

LC24-15 II, LC24-15, NB24-15, IS-8XL, SF-15DJ, PT-15XJ: Star Micronics Co., Ltd.
IBM-PC, PS/2, PC-AT, Proprinter XL24E/XL24, PC-DOS: International Business Machines Corp.
Microsoft BASIC, MS-DOS: Microsoft Corporation
LQ-1050, LQ-1060: Seiko Epson Corp.

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HOW TO USE THIS MANUAL

This manual is organized into eleven chapters. To learn how to make the best use of your printer you are urged to read through chapters 1 through 6. Chapters 7 through 11 may be treated as a reference guide for programming operations, etc. It assumes a degree of knowledge of the operation of computers. The chapters are as follows:

Chapter 1 — Introduction

This chapter indicates the primary features of your printer, the names and functions of the printer components, and an actual example of the many font styles that your printer can produce.

Chapter 2 — 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 3 — Paper Installation and Use

This chapter describes the instructions for printing such as selecting paper types, adjusting the printing gap, and installing paper.

Chapter 4 — 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 performing the setup of the printer, read this chapter and try out the procedures to find out how the printer works.

Chapter 5 — Default Settings – EDS mode

This chapter explains how to set the Electronic DIP Switch (EDS) mode to make your printer match your system and software needs.

Chapter 6 — Troubleshooting

This section shows a list of check points to follow if your printer is not working properly. It also includes details of some routine maintenance operations you can perform yourself. It is not, however, a complete service manual. Call your authorized service center if you are unsure of your ability to carry out any maintenance or servicing operations on the printer.

Chapter 7 — Optional Accessories

This chapter explains the optional accessories that are available for your printer, and how to install and use them.

Chapter 8 — Printer Control Commands

This chapter explains the software commands that are used to drive your printer. This section is of use if you are writing or modifying programs to take advantage of the printer's features.

Chapter 9 — Download Characters

This chapter explains the procedures to create your own characters.

Chapter 10 — MS-DOS and Your Printer

Since the PS/2 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 11 — Reference

This section provides references for your printer, such as specifications, the pinout of interface connector, and the character tables.

The character table charts give the different character sets available.

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Chapter 1

INTRODUCTION

This printer has a full complement of features, making it an excellent partner for a personal computer. It supports the Epson/IBM printer commands and character sets, enabling it to print just about anything your computer can generate, both text and graphics.

The selection of paper you can use is as varied as the types of document you can produce. This printer accepts any of the following kinds of paper:

- Single sheets (cut forms) and stationery
- Fanfold forms (continuous forms)
- Multi-part forms (up to 3-ply)
- Preprinted forms

This Multi-font printer has the following resident (internal) fonts:

- Draft
- Roman
- Sanserif
- Courier
- Prestige
- Script

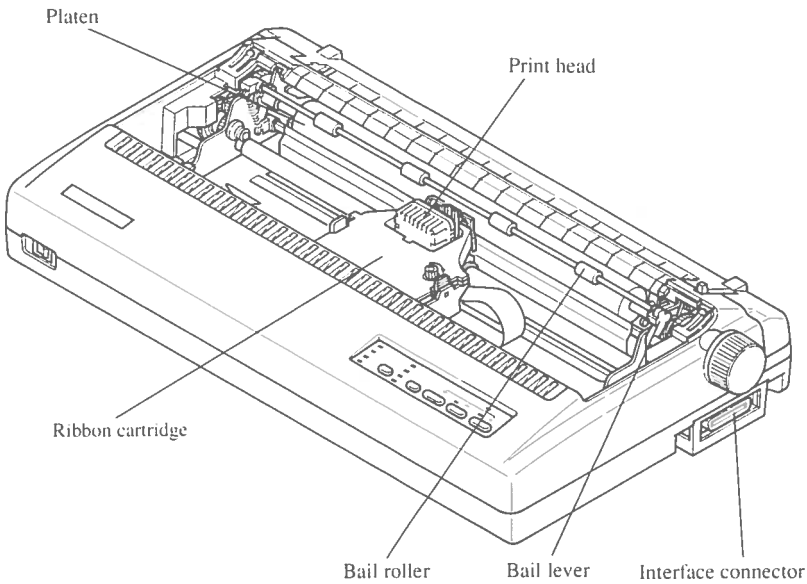
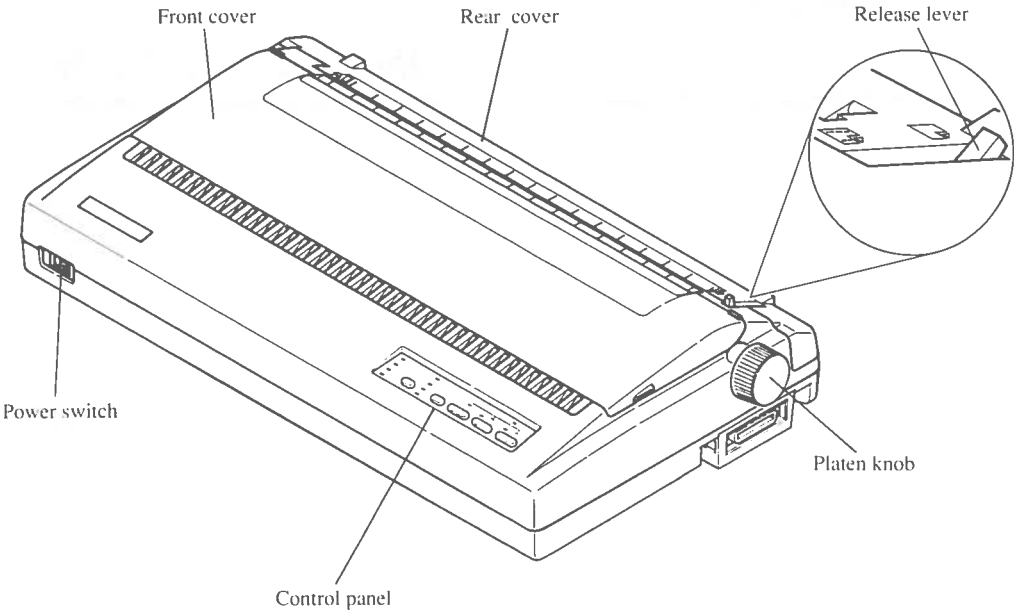
The control panel has five buttons and eleven indicators. The indicator display and beep tones provide immediate, easy-to-understand feedback when you press the buttons on the control panel.



The five buttons can operate in combinations to perform a surprising variety of functions, including saving a micro.

An additional useful feature is the ability to switch easily between printing on fanfold paper and printing on single sheets. A simple control panel operation lets you “park” the fanfold paper, so that you do not have to remove the fanfold paper from the printer. When you want to resume printing on the fanfold paper, you can simply “unpark” it.

To get acquainted with the printer’s components and capabilities, refer to the information on the pages that follow.

PRINTER COMPONENTS



| Component | Description |
|---------------------|---|
| Paper guide | Aligns single sheets (cut forms) to help the printer detect when paper is inserted. |
| Release lever | Releases pressure on the paper. This lever must be back for cut forms (), and forward for fanfold forms (). |
| Front cover | Protects the print head and other internal components of your printer. |
| Rear cover | Protects the tractor feed unit and separates incoming and outgoing fanfold forms. |
| Entry slot | For inserting single sheets of paper. |
| Control panel | Indicates printer status and makes control of printer functions simple and convenient. |
| Power switch | Switches power on or off. |
| Platen knob | For advancing the paper manually. |
| Interface connector | Connects the computer to the printer. |
| Print head | Has a high resolution dot matrix (24-wire) composition for outstanding print quality. |
| Ribbon cartridge | Contains the printer ribbon. |
| Adjustment lever | Controls print darkness by adjusting for the thickness of forms being printed. |
| Tractors | Control the movement of fanfold forms. |
| Clamp lever | Clamps the tractor in place. |
| Bail lever | Opens and closes the paper bail which holds the paper against the platen. |

SUMMARY OF PRINTER FEATURES

| Feature | Function |
|--------------------------------------|---|
| Dot matrix (24-wire) impact printing | Draft and Letter-Quality printing. |
| Extensive software support | The printer is compatible with the Epson and IBM standards, and works with any software that supports those printers. |
| Multi-font support | This printer includes Draft, Roman, Sanserif, Courier, Prestige, and Script fonts. |
| Carriage size | A wide carriage that prints on cut forms up to 420 mm (16.5 inches) wide and fanfold forms up to 406 mm (16 inches) wide. |
| Multi-speed printing | <p>In Draft mode, prints at speeds up to:</p> <ul style="list-style-type: none">• 300 CPS in 15 pitch• 240 CPS in 12 pitch• 200 CPS in 10 pitch <p>In Letter-Quality mode, prints at speeds up to:</p> <ul style="list-style-type: none">• 100 CPS in 15 pitch• 80 CPS in 12 pitch• 67 CPS in 10 pitch. |
| Character spacing | Prints in 10, 12, 15, 17, and 20 CPI, as well as proportional spacing. |
| Control panel | Button control for fonts, pitches, paper movement, and paper park functions. |
| Font/Pitch Lock | Ignores font and pitch selections sent from your computer, and stays on the font and pitch selected from the control panel. |
| Quiet mode | Reduces printing noise by approximately 50%. However, printing speed is also reduced. |
| Graphics printing | Standard graphics printing with resolution of up to 360 × 360 dots per square inch. It also supports the NEC graphics commands. |

| Feature | Function |
|-------------------|---|
| Paper parking | Parks fanfold paper. You can print on cut sheet paper without unloading the fanfold forms. |
| Print styles | <p>Highlighting capability with the following emphasis styles:</p> <ul style="list-style-type: none"> • Double-high • Double-strike • Double-wide • Emphasized • Italics • Outline • Overlining • Shadow • Subscript • Superscript • Underlining. |
| Tear off function | Fanfold forms can be removed without advancing blank forms. |
| Multi-part forms | Prints up to three-part forms. |
| Ribbon cartridge | Contains the printer ribbon. |
| EDS mode | Electronic DIP Switch (EDS) mode allows you to easily change the default settings of your printer to match your system and software needs. |

FONT STYLE EXAMPLE

The following example shows the many font styles your printer can print.

Resident fonts are:

Draft characters,
Roman characters,
Sanserif characters,
Courier characters,
Prestige characters,
Script characters.

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,
Condensed proportional.

Double-height,
Double width,
Triple width,

Various line and character spacings:

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Other features:

OUTLINED, SHADOWED,
OUTLINED WITH SHADOWED,
Emphasized, Double-strike, *Italics*,
Underlining, ~~Strike through~~, Overlining,
SUPERSCRIFT and SUBSCRIPT,
Download characters: *****
Dot graphics:

MGW

Chapter 2

SETTING UP THE PRINTER

This chapter describes the following procedures for setting up your new printer. If you have optional accessories, refer to Chapter 7 after setting up the printer.

- Printer placement
- Unpacking the printer
- Installing the platen knob
- Installing the ribbon cartridge
- Connecting the printer to your computer
- Configuring your software for the printer

PRINTER PLACEMENT

Before you start 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
- A steady power supply that is not subject to power surges should be connected to the printer.
For example, do not connect the printer to the same circuit as a large, noise-producing appliance such as a refrigerator or an air conditioner.
- Make sure the line voltage is the voltage specified on the printer's identification plate.
- If you are connecting your printer with a parallel interface, make sure that the cable is within 2m (6ft) of the printer. An RS-232 connection using the optional IS-8XL interface cartridge can be made over longer distances.

UNPACKING AND INSPECTION

Now check each item in the box against Figure 2-1 to make sure that you have everything (there should be five items).

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

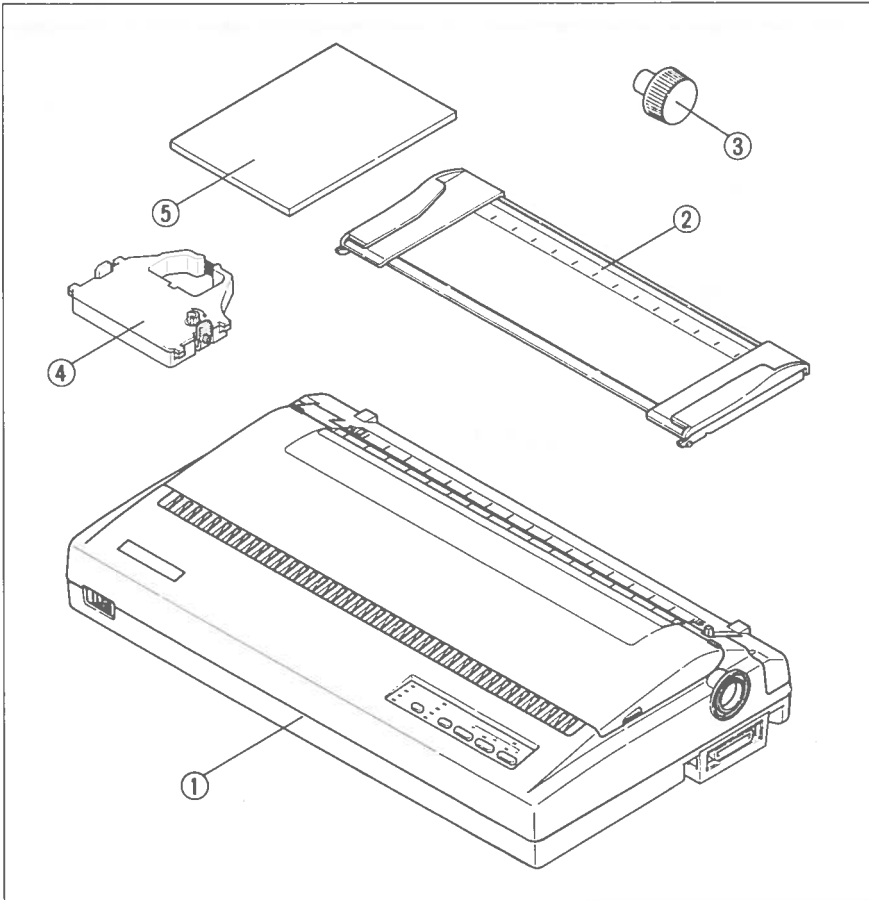


Figure 2-1. Check to make sure you have all five items: 1) Printer, 2) Paper guide, 3) Platen knob, 4) Ribbon cartridge, and 5) User's manual.

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

- Serial interface cartridge (IS-8XL)
- Automatic sheet feeder (SF-15DJ)
- Pull tractor unit (PT-15XJ)

For details of the optional accessories, refer to Chapter 7.

SETTING UP

Place the printer in the desired location, and remove all packing material from the printer. This packing material is intended to prevent damage to the printer while in transit.

You will want to keep all the packing material, along with the printer carton, in case you have to move the printer to a new location.

Installing the platen knob

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

Mount the knob on the platen shaft, which is located on the right-hand side of the printer. Rotate the knob on the shaft before pushing the knob fully into position.

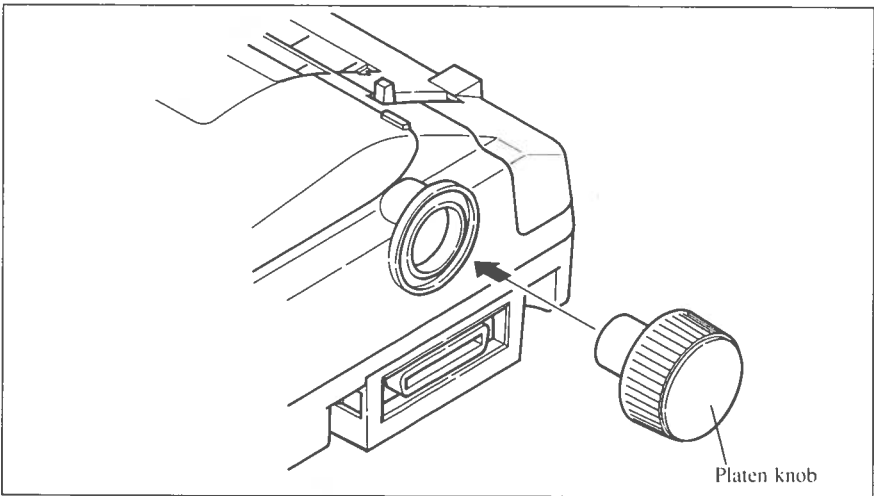


Figure 2-2. Installing the platen knob.

Installing the ribbon cartridge

Now install the ribbon by the following procedure.

1. Remove the front cover by lifting the front (using the two grips at the sides), and pulling towards you.

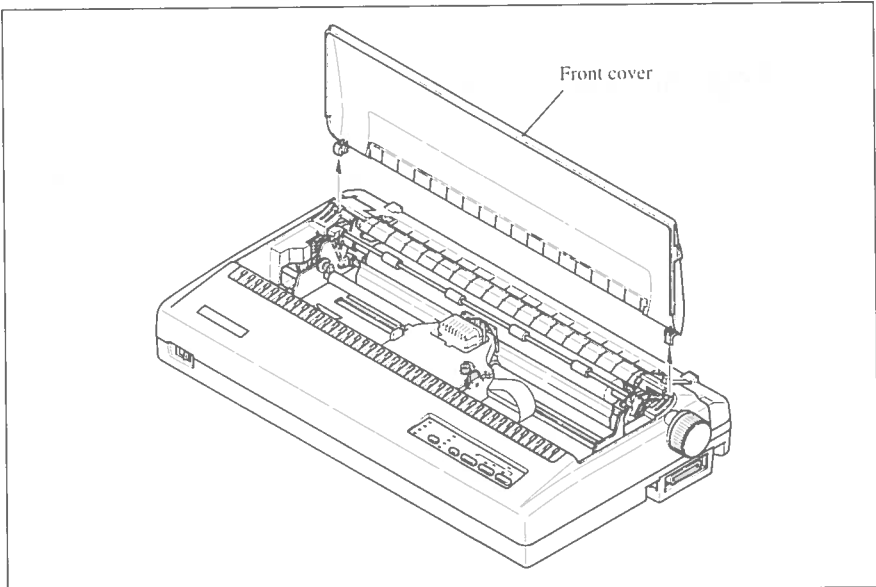


Figure 2-3. Remove the front cover to install the ribbon cartridge.

2. Take up the slack in the ribbon by turning the tension knob on the ribbon cartridge clockwise as shown by the arrow.

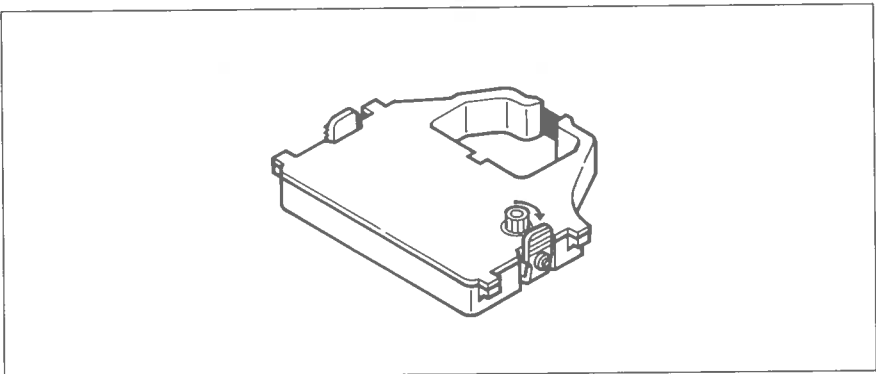


Figure 2-4. Take up the slack in the ribbon by turning the tension knob on the ribbon cartridge.

3. Guide the ribbon between the print head and the silver print head shield, making certain that the spindles on the cartridge holder fit into the sockets on the cartridge itself.

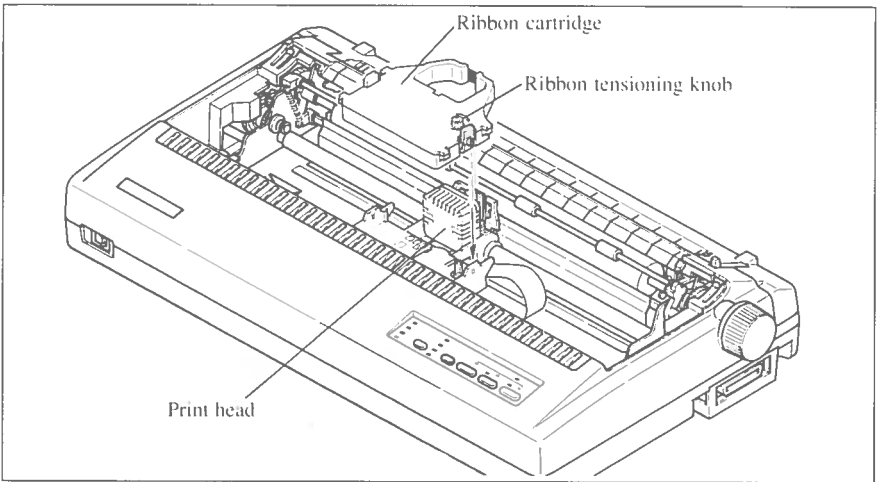


Figure 2-5. Install the ribbon cartridge.

4. Make sure that the ribbon is positioned between the print head and the print head shield as shown in Figure 2-5.
5. Take up the slack in the ribbon again by turning the tension knob.

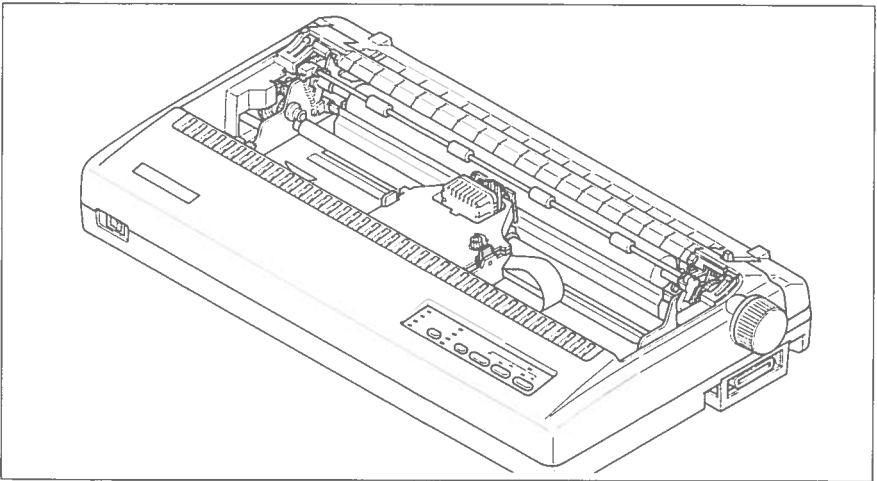


Figure 2-6. Make sure that the ribbon is positioned correctly.

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

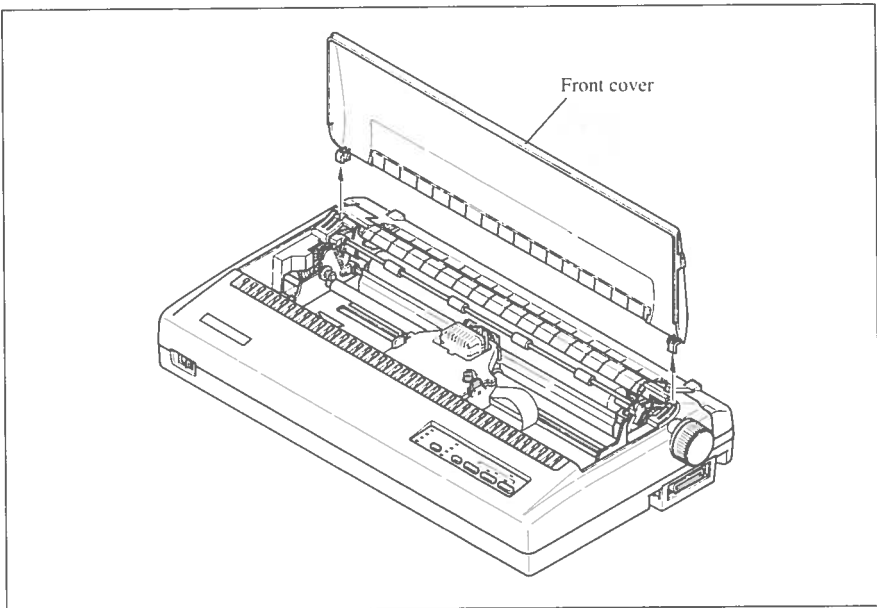


Figure 2-7. Swing down the front of the front cover after inserting the tabs into the slots of the printer case.

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

Installing the paper guide

Follow the procedure below to install the paper guide:

1. Insert the two slots on either side of the paper guide into the two tabs on the rear cover, as shown in Figure 2-8.

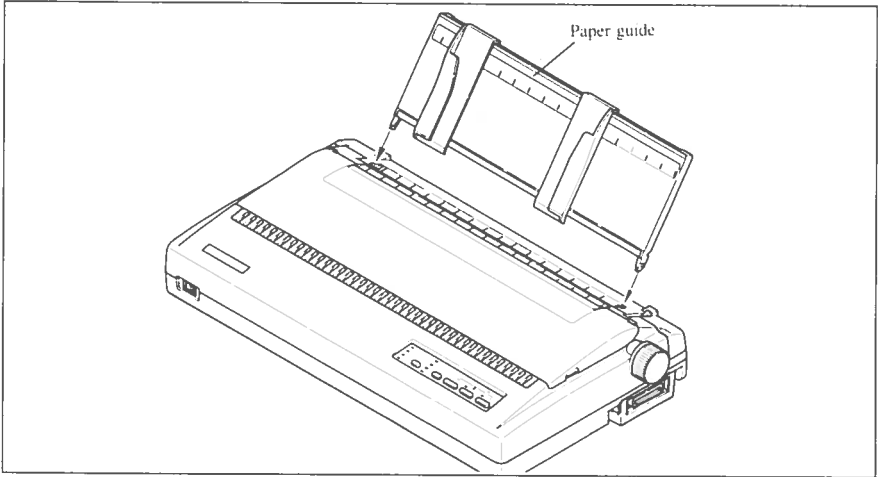


Figure 2-8. Install the paper guide.

2. Place the paper guide horizontally when using fanfold paper, or vertically when using single sheets.

Connecting the interface cable

The printer and computer are connected by a cable along which the computer transmits the documents that you want to print. A cable is not supplied as standard equipment with this printer. There are two sorts of cable that you can use: a standard 36-pin Centronics parallel cable or the serial cable that you can purchase as an option with the printer.

Connecting the printer to a computer using a parallel cable is generally simpler; however, the length of the parallel cable should not be more than 6 feet, otherwise the transfer of information between your computer and the printer may be impaired. A serial connection can, for all practical purposes, be as long as you like, but is a little more complicated to set up. Buy the type of cable which will best suit your needs.

If you need to connect to a serial port, use the optional Serial interface cartridge, IS-8XL.

The parallel cable which you can use has a 25-pin D-type plug at one end, and a 36-pin Centronics connector at the other.

Follow the procedure below to connect the interface cable:

1. Turn off the power switch on both the printer and the computer.
2. Plug the cable's Centronics connector into the socket on the side of the printer as shown in Figure 2-9.

Make sure that you press the plug into the interface connector.

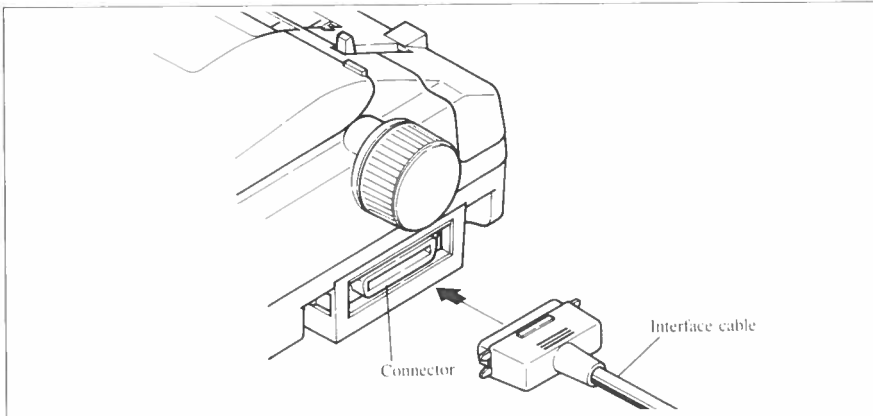


Figure 2-9. Connect the interface cable.

3. Move both clips inside the extended prongs on the sides of the plug until you hear a click.

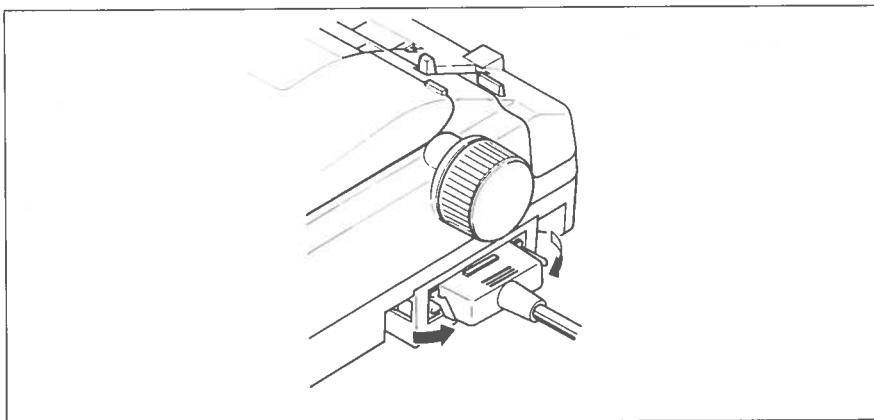


Figure 2-10. Move the clips until you hear a click.

4. Plug the 25-way plug into the parallel socket on your computer. This will probably be labelled "Printer", "Parallel", "PRN", "LPT1" or something similar.

Configuring your software for the printer

Most application software programs let you specify the type of printer you are using so that the software can take full advantage of the printer's features.

Many of these software packages provide an installation or setup program that presents a list of printers.

This printer is preset to emulate the Epson printer commands. If you want to emulate the IBM printer commands, you can select IBM with the Electronic DIP Switch (EDS) mode.

Choose one of the following (in the order of preference) according to your selected Emulation mode:

| # | Standard (Epson) mode | IBM mode |
|---|-----------------------|------------------|
| 1 | Star LC24-15II | Proprinter XL24E |
| 2 | Star LC24-15 | Proprinter XL24 |
| 3 | Star NB24-15 | |
| 4 | Epson LQ-1060 | |
| 5 | Epson LQ-1050 | |

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.

Make sure that the Electronic DIP Switch (EDS) is set for the correct printer emulation, and that you have also selected the appropriate character set. (Refer to Chapter 5 for detailed information on the EDS mode.)

NOTE: If you are in doubt about the configuration of your application software, seek expert advice. Your software supplier will probably be your most qualified reference.

MEMO

Chapter 3

PAPER INSTALLATION AND USE

This chapter describes instructions for printing such as selecting paper types, adjusting the printing gap, and installing paper.

SELECTION OF PAPER

You can use any of the following types of paper with your printer: single sheets, fanfold paper and multi-part forms.

- **Single sheets (cut forms) and stationery**
Single sheets are simply individual, unconnected pieces of paper, and are also sometimes referred to as cut sheets.
Up to fifty single sheets can be stacked and automatically fed into the printer by using the optional Automatic Sheet Feeder (SF-15DJ).

- **Fanfold forms**
Fanfold forms are sheets of paper joined with perforations. Fanfold forms usually have a column of holes punched into each edge which enables the printer to grip the paper as it feeds it through. Fanfold paper is also sometimes referred to as computer paper, continuous forms or sprocket forms.

You can feed the fanfold forms from the rear of the printer as standard. You can also use the optional Pull tractor unit (PT-15XJ) to feed fanfold paper. Printing on or near the perforations of continuous fanfold forms may reduce printing quality, misalign the fanfold forms, or cause a paper jam.

- **Multi-part forms**
Multi-part forms consist of several sheets, one on top of another, enabling several copies to be made simultaneously. Multi-part forms may be joined together, as fanfold stationery. If you want to use multi-part forms, use the type that has both side edges glued together. Do not use forms that have more than three parts.

It is recommended that you load multi-part forms using the optional Pull tractor unit.

Figure 3-1 shows the recommended print area for each type of paper.

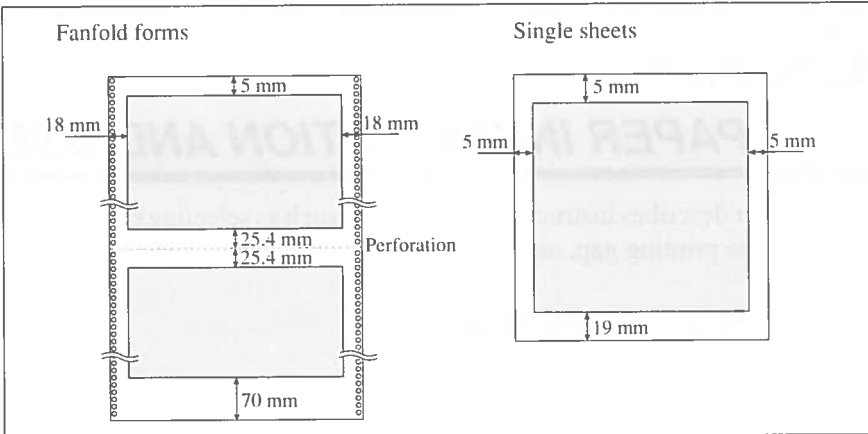


Figure 3-1. Recommended print area for acceptable types of paper.

ADJUSTING THE PRINTING GAP

Paper comes in different weights, normally quoted in gsm (grams per square meter). Typical figures are 80 gsm and 100 gsm. Heavier paper is thicker. Also, multi-part forms are generally thicker than single sheets or ordinary fanfold paper.

The distance between the print head and the platen can be adjusted to suit the paper thickness. The adjustment lever is located inside the printer's main body, at the right-hand end of the platen. There are five settings. Push the lever up to narrow the gap between the print head and the platen, and down to widen the gap. The top position is referred to as position 1, and the lowest position as position 5. Position 2 is the one most suited to single sheets.

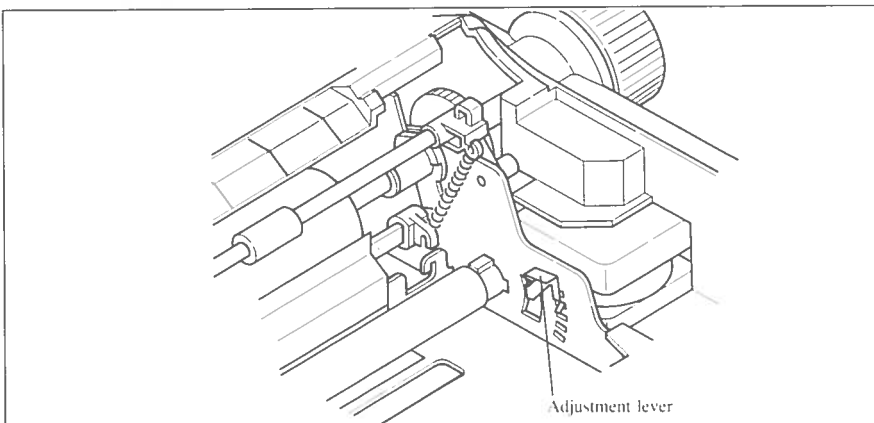


Figure 3-2. Location of the adjustment lever.

It is a good idea to try out different settings in order to ascertain which setting gives the best results in terms of print quality.

NOTE: Printing with an inappropriate gap may drastically shorten the life of the print head.

The table below gives recommended settings:

| Paper Type | Weight(g/m ²) (Each sheet) | Thickness (mm) (Total) | Recommended Lever position |
|------------|---|---------------------------|-------------------------------|
| Single | 52 to 90 | 0.07 to 0.12 | 2 or 3 |
| 2-ply | 40 to 52 | 0.12 to 0.14 | 2 or 3 |
| 3-ply | 40 to 52 | 0.18 to 0.21 | 3 or 4 |

LOADING SINGLE SHEETS

This section will take you through the procedure for loading single sheets of paper. If you are using the optional Automatic Sheet Feeder (SF-15DJ), refer to Chapter 7.

The paper path for cut forms is shown in Figure 3-3.

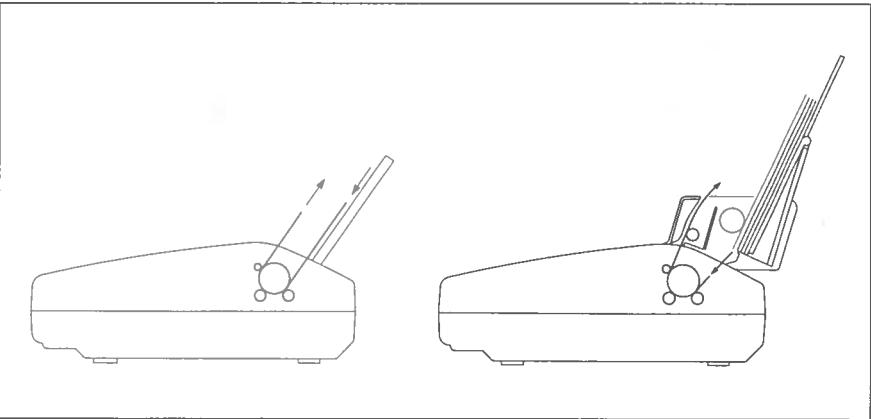


Figure 3-3. Paper path for cut forms.

1. Raise the paper guide vertically on the rear cover..

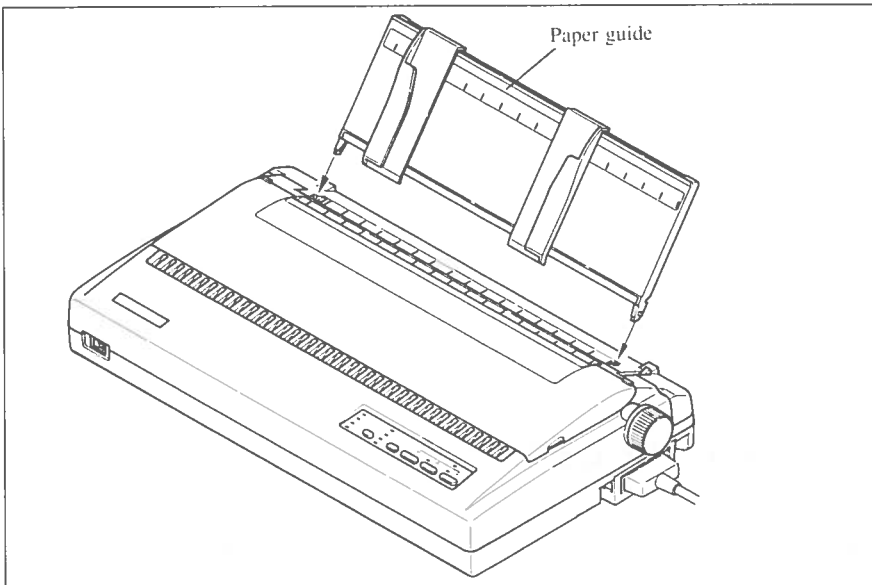


Figure 3-4. Raise the paper guide vertically.

2. Turn ON the power at the switch located at the front of the printer. The printer will beep, indicating that there is no paper in position for printing. The POWER indicator will also flash to confirm this.
3. Make sure that the release lever is at rear position (🔒). If fanfold paper is already mounted in the printer, press the **SET/EJECT** button to park the paper in the off-line state, then move the release lever toward the rear of the printer.
4. Adjust the left paper guide to the desired left position by moving it horizontally in either direction.
5. Adjust the right paper guide to accommodate the width of the paper. The guides should be adjusted to restrict the amount of horizontal play while allowing the paper to slide up and down freely between the two paper guides. The ideal distance between paper ream and paper guides is 0.25 mm (0.01") on both sides at the narrowest part of the paper guides.
6. Place a single sheet between the guides, facing 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.

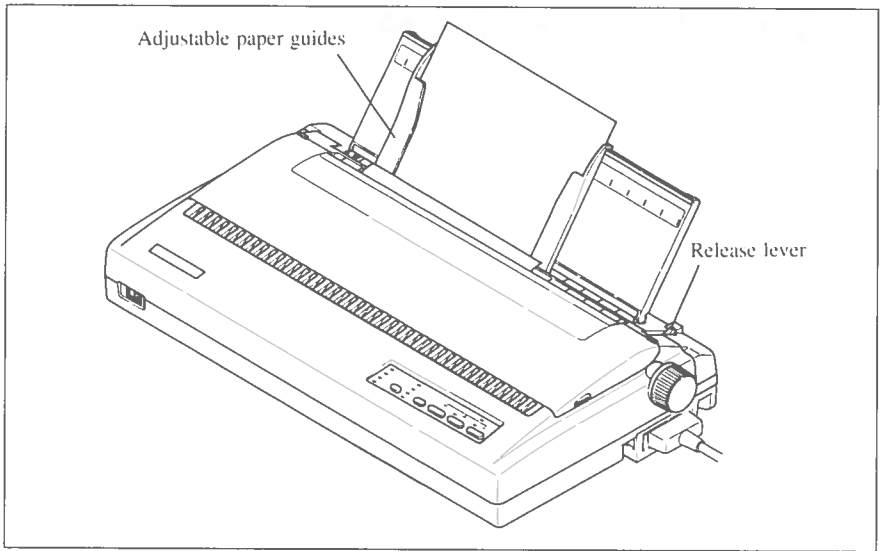


Figure 3-5. Place a single sheet between the guides.

7. Now press the **(SET/EJECT)** button. The paper will be fed into the printer and adjusted past the print head to a position ready for printing.
8. If you want to set the paper to a different position, set the printer off-line by pressing the **(ONLINE)** button, then set the paper by using the micro-feed function. (For details, refer to Chapter 4.)

Now you are ready to start printing.

LOADING AND PARKING FANFOLD FORMS

This printer accepts forms up to 16" wide.

The printer can feed fanfold forms using either the standard tractor unit or the optional Pull tractor unit (PT-15XJ), as shown in Figure 3-6.

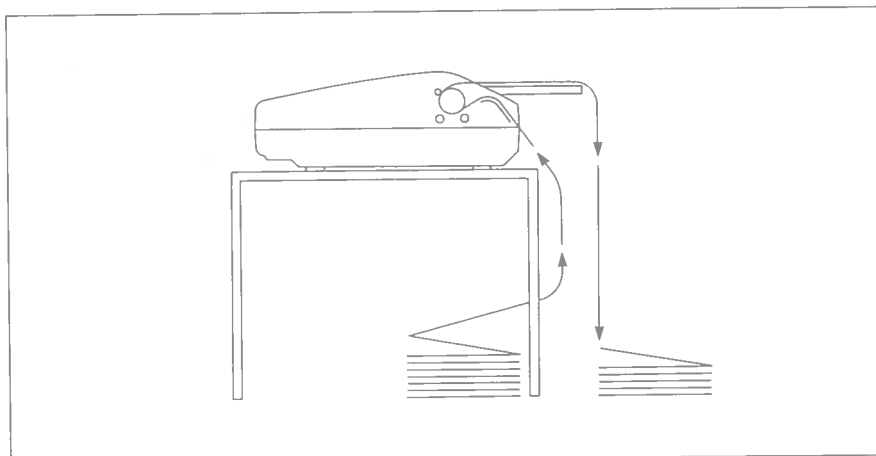


Figure 3-6. Paper path for fanfold forms.

This section will take you through the procedures for loading, parking and unparking fanfold forms.

Loading the paper

If you are going to load the paper with the optional Pull tractor unit, refer to Chapter 7.

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 forward. This has the effect of releasing the paper from the platen roller, and engaging the tractor feed.
4. Remove the rear cover. Grip it by its rear edge and lift upwards and backwards as in Figure 3-7.

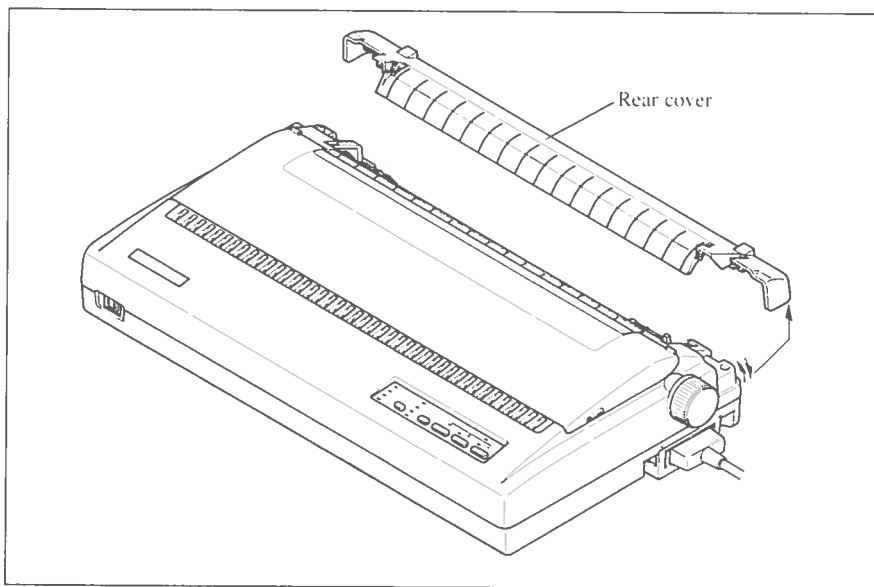


Figure 3-7. Remove the rear cover.

5. With the tractor covers open, mount the paper by aligning holes with the pins on the tractor unit.
6. Adjust the spacing of the tractor units by sliding them along the bar, using the clamp lever at the back of each unit to release them and lock them in position. The unit is released when the clamp lever is down and locked when the clamp lever is up.

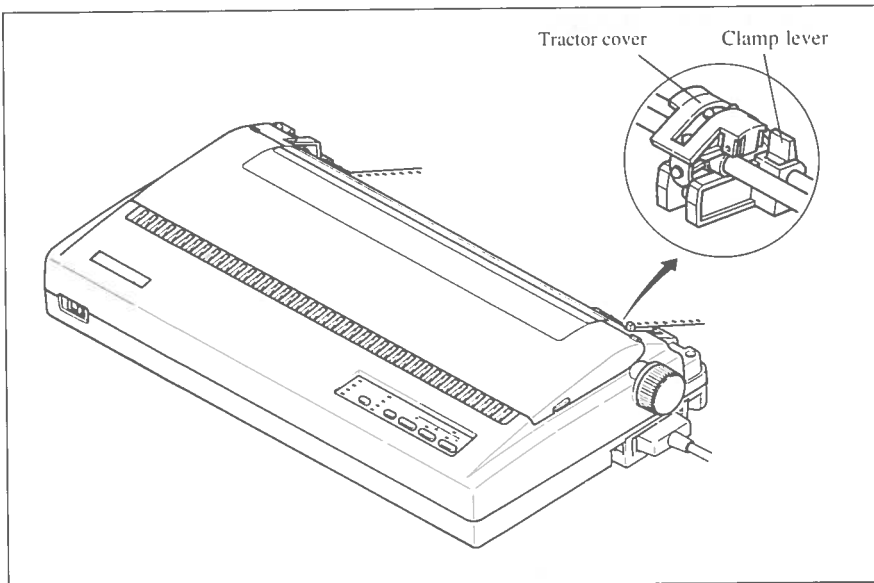


Figure 3-8. Mount the fanfold paper over the tractor units.

7. Now close the tractor covers, again making sure that the paper holes are aligned with the pins on the tractor units. If they are not aligned properly, you will have problems with paper feeding, possibly resulting in tearing and jamming of the paper.
8. 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.
9. Mount the paper guide in the horizontal position, as shown in Figure 3-9. This will separate the printed from the unprinted paper.
10. Turn ON the power at the switch located at the front of the printer. The printer will beep, indicating that the paper is not yet fully loaded. The POWER indicator will also flash to confirm this.
11. Now press the **(SET/EJECT)** button. The paper will be fed and adjusted past the print head to a position ready for printing.
12. If you want to set the paper to a different position, set the printer off-line by pressing the **(ONLINE)** button, then set the paper by using the micro-feed function. (For details, refer to Chapter 4.)

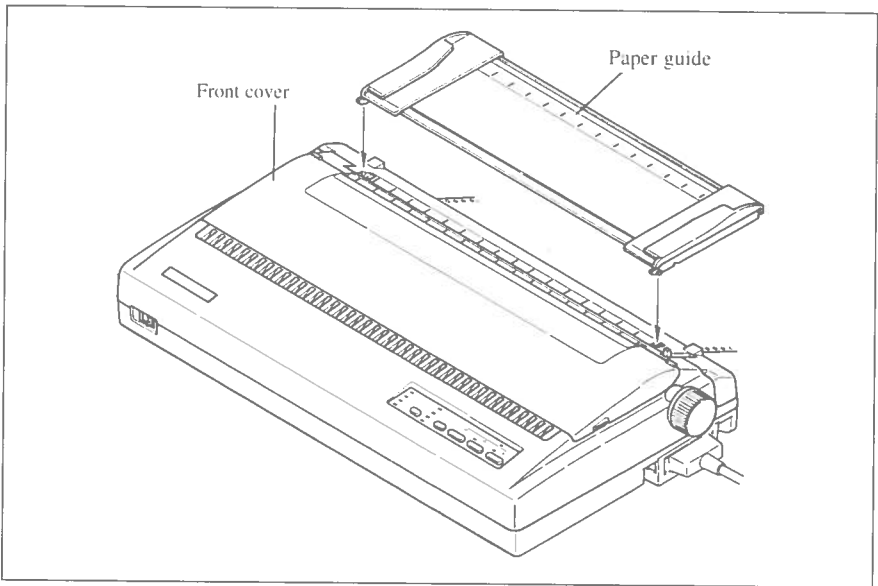


Figure 3-9. Close the rear cover, then set the paper guide horizontally.

Paper parking

After loading fanfold paper from the rear of the printer, 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. To begin paper parking, start with power ON, fanfold paper loaded in printing position, and the release lever forward.
2. Press the **(ON LINE)** button on the control panel to set the printer off-line. The ON LINE indicator will turn 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 front cover, and tear there.
4. Press the **(SET/EJECT)** 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 back.
6. Mount the paper guide in the upright position.

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

NOTE: You cannot park the fanfold paper if you have loaded it with the optional pull tractor unit.

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 front.
4. Press the (SET/EJECT) button. The printer will automatically feed the parked fanfold paper back into position for printing.

NOTE: The printer beeps intermittently if you move the release lever while the paper is loaded.

Chapter 4

CONTROL PANEL OPERATIONS

The control panel buttons can be pressed individually to perform the operations indicated by their names. Other functions can be achieved by pressing the control panel buttons in combination, or by holding these buttons down when you turn the printer's power on.

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
- Save macro definition
- Clear the printer's buffer
- Print test patterns
- Prevent software from changing the panel pitch and font selections
- Adjust the print alignment for bi-directional printing
- Print a hexadecimal dump

BUTTON AND INDICATOR FUNCTIONS

The printer is equipped with five buttons on the control panel. From left to right they are **(FONT)**, **(PITCH)**, **(SET/EJECT)**, **(PAPER FEED)** and **(ON LINE)**.

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

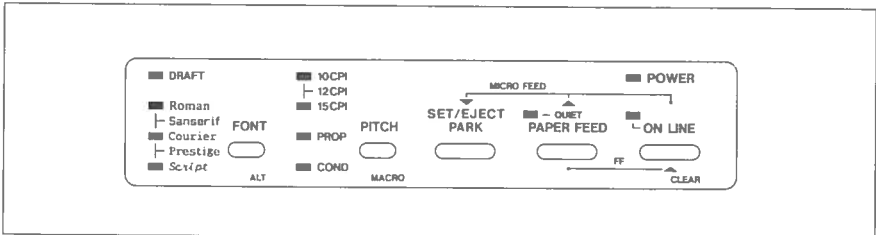


Figure 4-1. Control panel.

ON LINE

The **ON LINE** button sets the printer on-line and off-line. The status changes each time you press the button.

When the printer is on-line, it can receive and print data from the computer. This status is indicated by the ON LINE indicator being lit. When the printer is off-line, it stops printing and sends the computer a signal indicating that it cannot accept data.

The printer powers up in the on-line status when paper is loaded. If paper is not loaded, the printer powers up off-line with the POWER indicator blinking. When you load paper, the printer goes on-line.

You will want to press the **ON LINE** button:

- Before and after any other panel operation

The other panel buttons operate in the off-line state. Press the **ON LINE** button to go off-line. After performing the panel operation(s), press the **ON LINE** button again to go back on-line.

- To pause during printing

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

- To cut fanfold forms at the end of printing

When you hold down the **ON LINE** button and press the **PAPER FEED** button down for one second with the fanfold forms fed through by the standard tractor unit, the printer goes off-line, then the printer feeds the paper forward approximately two inches. This allows you to cut it off just below the last line printed.

When you press the **ON LINE** button again to go back on-line, the paper feeds backward stopping where you left off.

NOTE: This function is available only when the buffer is empty.

PAPER FEED

If you press and release this button while off-line, the paper will feed forward one line. If you hold the button down, the printer will perform consecutive line feeds.

If you also press the **ON LINE** button while you are line-feeding, the paper will feed automatically to the top of the next page. This is explained later.


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


SET/EJECT

NOTE: This button has no effect if the Pull tractor unit is used.

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

If the paper has been loaded, pressing this button results in different functions depending on the position of the release lever.

If the release lever is facing toward the rear of the printer for cut forms () , pressing this button ejects the paper.

If the release lever is facing toward the front of the printer for fanfold forms () , pressing this button parks the forms.

PITCH

This button allows you to select the printing pitch. 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 order:

| Pitch | Indicator(s) |
|--------------------------|-------------------------|
| Pica (10 CPI) | 10 CPI |
| Elite (12 CPI) | 10 CPI, 15 CPI |
| Semi-condensed (15 CPI) | 15 CPI |
| Condensed pica (17 CPI) | 10 CPI, COND |
| Condensed elite (20 CPI) | 10 CPI, 15 CPI, COND |
| Super-condensed (24 CPI) | 15 CPI, COND (IBM only) |
| Proportional | PROP |
| Condensed proportional | PROP, COND |

FONT

This button selects the font to be printed. Roman font is selected at power-up unless the default settings are changed. To change the font, set the printer off-line, then press the **(FONT)** button repeatedly until the indicators beside the desired selection illuminate. The selections cycle in the following order:

| Font | Indicators |
|----------|-----------------|
| Roman | ROMAN |
| Sanserif | ROMAN, COURIER |
| Courier | COURIER |
| Prestige | COURIER, SCRIPT |
| Script | SCRIPT |
| Draft | DRAFT |

SWITCH COMBINATION FUNCTIONS

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

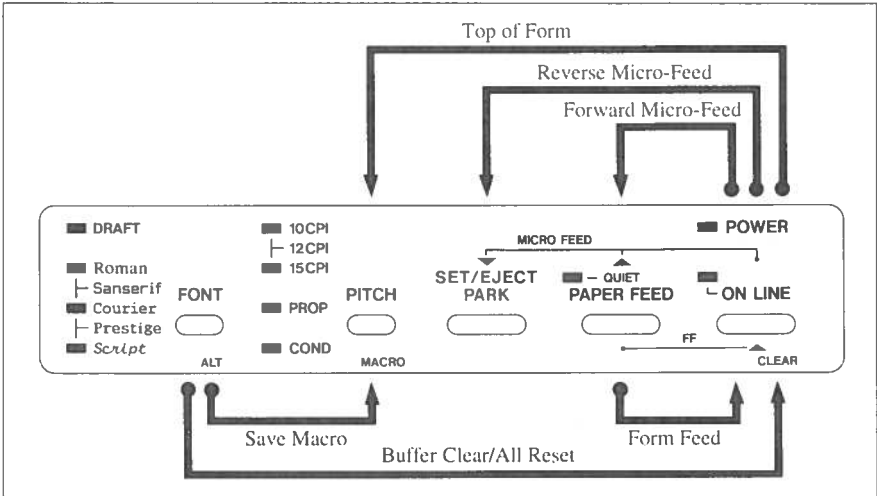


Figure 4-2. Switch combination functions of control panel.

Form feed

If you are using cut forms, 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. While holding the **(PAPER FEED)** button down, press the **(ON LINE)** button, then release both buttons at the same time. The printer will smoothly eject the current page.

Top of form

When you power on the printer, 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. Press and hold down the **(ON LINE)** button.
3. While holding the **(ON LINE)** button down, press the **(PITCH)** button, then 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. While holding the **(ON LINE)** button down, 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.

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

Changing the auto loading position

Normally, the printer automatically loads the paper one line from the top edge. If you want to change this value, follow this procedure:

1. Load the paper by pressing the **(SET/EJECT)** button.
2. Change the print position using the micro feed function.
3. After you set up the desired position, press the **(ON LINE)** button to save the value.

This position remains valid until you power off the printer. If you want to retain this position even after you turn off the power, store it using the Macro Definition function, which is described later.

Note that you can only change this value immediately after loading paper. If you feed paper, you cannot change the auto loading value.

Clearing the buffer/All reset

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 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 **(ONLINE)** button to set the printer off-line. Printing will now stop, but there may be data remaining in the buffer.
3. Press and hold down the **(FONT)** button.
4. While pressing the **(FONT)** button down, press and hold down the **(ONLINE)** button. Continue holding these two buttons down and you will hear a beep tone signaling that the buffer has been cleared. If you hold these buttons down longer, you will hear three beep tones and the printer has been initialized to the power-on default settings.
5. Release these buttons, make any necessary control panel settings, then set the printer back on-line.

It is essential to stop 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 data missing from when the buffer was cleared.

Save Macro Definition

You can save the current settings to the printer for later use by the following procedure:

1. Press the **(ON LINE)** button to set the printer off-line.
2. Press the **(FONT)** button and hold it down.
3. While holding the **(FONT)** button down, press the **(PITCH)** button and hold them down until you hear a beep tone.
4. Release both buttons at the same time after this beep tone to save the current setting.

If you release these buttons after three beep tones, the macro has been cleared.

NOTE: You can store the following settings by this procedure.

- Current Font
- Current Pitch
- Current auto-loading amount for cut forms
- Current auto-loading amount for fanfold forms
- Current auto-loading amount in ASF mode

POWER-UP FUNCTIONS

In addition to their normal functions, all of the control panel buttons perform “special” functions if you hold them down while switching the power button on.

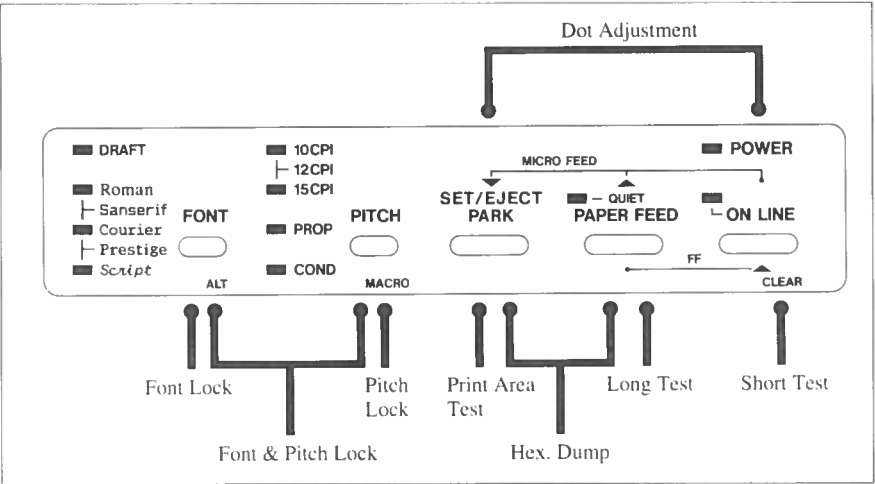


Figure 4-3. Power-up functions of control panel.

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 print the version number of the printer’s ROM, followed by seven 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 Figure 4-4.

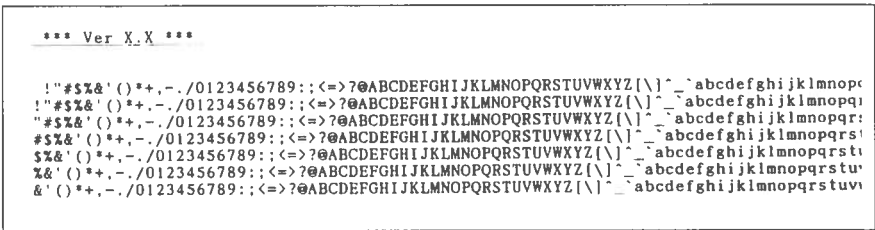


Figure 4-4. Short self-test.

Since the self-test prints across the full width of the carriage, it is recommended that the printer is loaded with the widest paper possible to avoid 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 print the version number of the printer's ROM, the current Electronic DIP Switch (EDS) settings and the current Dot Adjustment settings, followed by the entire character set printed in each font and pitch available.

The test repeats endlessly, so you must turn the power off to stop it.

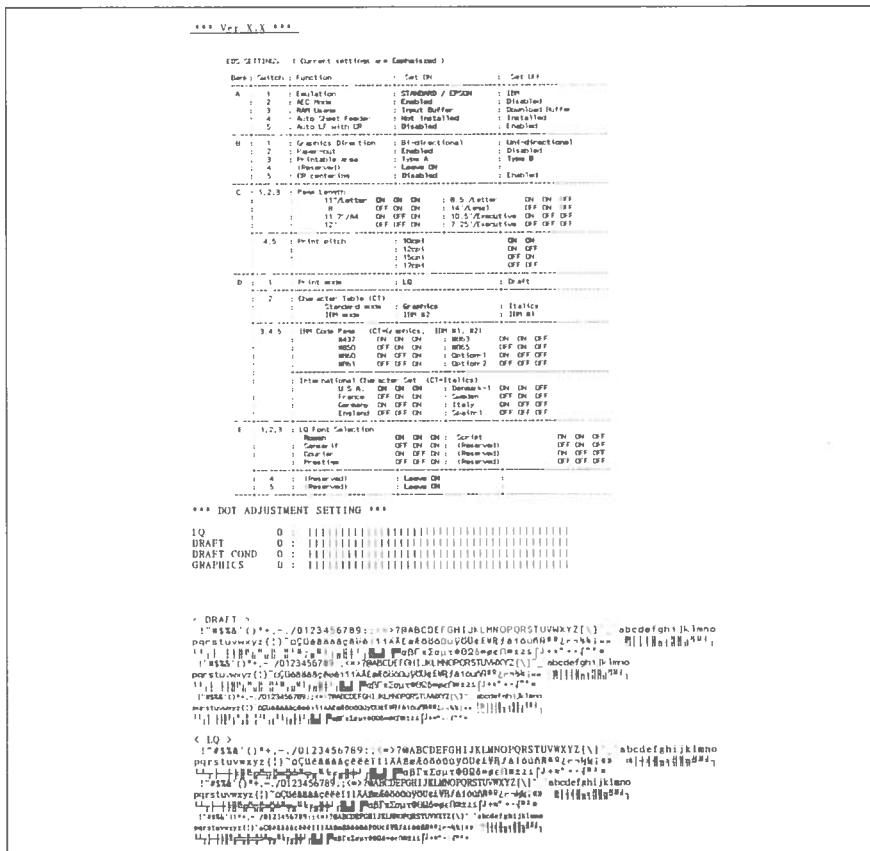


Figure 4-5. Long self-test.

Since the self-test prints across the full width of the carriage, it is recommended that the printer is loaded with the widest paper possible to avoid 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 recommended for this test.

Print area test mode

By holding the (SET/EJECT) button down during power-up, the printer will enter the print area test mode. You can find how many lines on your paper are available for printing with 1/6-inch line feeding. The printer will print the first line message on the paper, then print the last line message after feeding to the bottom of the page.

If you have loaded fanfold paper, only the first line message is printed.

Pitch lock mode

By holding the (PITCH) button down during power-up, the print pitch can only be selected from the control panel. This prevents software interference. 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 the on-line state and start printing. The pitch you selected will not be reset or otherwise changed by any commands your software may issue.

Font lock mode

By holding the (FONT) button down during power-up, fonts can only be selected from the control panel. This prevents software interference. There will be an acknowledging beep tone. After this you can set the printer off-line, select a font, then return to the on-line state and begin printing. The selected font will not be changed by any commands your software may issue.

Font and Pitch lock mode

If you want to protect both the font and pitch settings from software changes, press both the (FONT) and (PITCH) buttons during power-up. There will be two acknowledging beep tones.

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

Dot adjustment mode

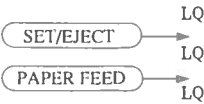
This mode is used to adjust the vertical alignment of text and graphics on successive bi-directional passes.

After a period of time, your printer may work itself out of alignment on left and right printing passes. This malalignment appears most visibly during graphics printing. This mode will probably be used very rarely.

1. Turn the printer off and then turn it on again while holding down the **SET/EJECT** and **ON LINE** buttons. The printer will print something like the following:

*** DOT ADJUSTMENT SETTING ***
LQ 0 : |||

2. The printer will feed the paper forwards and backwards during this operation, allowing you to view the paper for optimum alignment.
3. To adjust the printing, use the **SET/EJECT** and **PAPER FEED** buttons. The **SET/EJECT** button will move the second pass to the left. The **PAPER FEED** button will move the second pass to the right.

*** DOT ADJUSTMENT SETTING ***
LQ 0 : |||
LQ -1 : |||
LQ 0 : |||

4. When the two passes are aligned with each other to form one continuous line, the bi-directional alignment test is completed.
5. To change the mode for which the bi-directional adjustment is performed, press the **ON LINE** button. This will cycle through “LQ”, “DRAFT”, “DRAFT COND”, and “GRAPHICS”. Repeat the process for all print modes.
6. To exit from this mode, press the **PITCH** button.

CONDITIONS INDICATED BY BEEP TONES

This section helps you identify the meanings of beep tones.

| Beep tone | Meaning |
|-------------------------------------|--|
| Two-second tone | Printer detects an error condition. Turn off the power switch and turn it on again. |
| Four short tones sequence, twice | Printer is out of paper. |
| Short tone, once | <ul style="list-style-type: none">• Buffer is cleared.• Top of form is set.• Quiet mode is selected. |
| Short tone, twice | <ul style="list-style-type: none">• Macro definition is selected.• Quiet mode is cancelled. |
| Short tone, three times | <ul style="list-style-type: none">• Macro definition is cancelled.• Printer is reset. |
| One-quarter tone | <ul style="list-style-type: none">• Hexadecimal mode is selected.• Pitch lock mode is selected.• Font lock mode is selected. |
| One-quarter tone, twice | Pitch and Font lock modes are selected at a time. |

Chapter 5

DEFAULT SETTINGS-EDS MODE

From the control panel you can change the parameters that define how your printer works. These parameters become your power-on settings. This function is called the Electronic DIP Switch (EDS) mode.

HOW TO SET THE EDS MODE

The EDS mode in this printer has 16 functions that you can set as the power-on default settings.

Turn the printer on while simultaneously holding down the **(SET/EJECT)**, **(PAPER FEED)**, and **(ON LINE)** buttons. You will hear an acknowledging beep as power comes on. This indicates that you have entered the EDS mode.

In EDS mode, the buttons on the control panel are used as shown below in Figure 5-1.

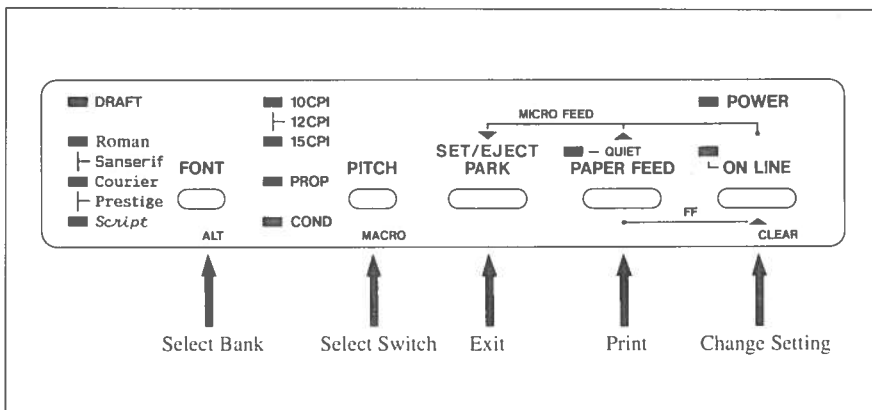


Figure 5-1. Button functions in the EDS mode.

- Use the **(FONT)** button to select the Bank Letter.
- Use the **(PITCH)** button to select the Switch Number.
- The ON LINE indicator shows the current setting, ON or OFF. Use the **(ON LINE)** button to change the settings.
- Press the **(PAPER FEED)** button to print the current settings.
- Press the **(SET/EJECT)** button to save and exit the EDS mode.

FUNCTIONS OF THE EDS SETTINGS

The printer stores the parameters that you select from the control panel while in the EDS mode.

A default is the setting that the printer will use if none is specifically selected by a program. When you first turn on or later reset your printer, these default settings will take effect.

By changing the settings, you can alter various printer functions to match your specific requirements. The following table will help you choose the proper settings.

| Bank-Switch | Function | ON | OFF |
|-------------|--|--------------------|-------------------|
| A-1 | Emulation | Standard/Epson | IBM |
| A-2 | AEC Mode | Enabled | Disabled |
| A-3 | RAM Usage | Input Buffer | Download buffer |
| A-4 | Automatic Sheet Feeder | Not installed | Installed |
| A-5 | Auto LF with CR | Disabled | Enabled |
| B-1 | Graphics Direction | Bi-directional | Uni-directional |
| B-2 | Paper-out | Enabled | Disabled |
| B-3 | Printable Area | Type A | Type B |
| B-4 | (Reserved) | Leave ON | |
| B-5 | CR Centering | Disabled | Enabled |
| C-1 | Page Length | (See below) | |
| C-2 | | | |
| C-3 | Print Pitch | (See below) | |
| C-4 | | | |
| C-5 | | | |
| D-1 | Print Mode | Letter Quality | Draft |
| D-2 | Character Table Standard mode IBM mode | Graphics IBM #2 | Italics IBM #1 |
| D-3 | Code page or | (See below) | |
| D-4 | International | | |
| D-5 | Character Set | | |
| E-1 | LQ Font Selection | (See below) | |
| E-2 | | | |
| E-3 | | | |
| E-4 | (Reserved) | Leave ON | |
| E-5 | (Reserved) | Leave ON | |

NOTE: The default is **ON** for all functions at purchase except B-1 and B-3 which are set to the **OFF** position.

Switches A-1: Emulation

Select the mode compatible with your computer and software. In standard mode the printer operates like the Epson LQ-1060. In IBM mode it operates like the IBM Proprinter XL24E. The ON position selects standard mode. The OFF position selects IBM mode.

Switch A-2: Auto Emulation Change (AEC) Mode

This switch selects the Auto Emulation Change (AEC) mode.

When the AEC mode is enabled, the printer automatically judges the Emulation which your application program uses.

Switch A-3: RAM usage

In order to download characters this switch must be in the OFF position. 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 faster than the printer prints.

Switch A-4: Automatic Sheet Feeder

When using the optional automatic sheet feeder (SF-15DJ), move this switch to the OFF position.

Otherwise leave it ON.

Switch A-5: Auto LF with CR

If you leave this switch at the ON position, a separate line-feed code is required from your computer 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 B-1: Graphics Direction

When printing in graphics mode, the printer may either print bi-directionally (in alternate directions) for speed or in one direction only (uni-directional) for increased accuracy. For practically all purposes, however, bi-directional printing is sufficiently accurate.

Switch B-2: Paper-out

When this switch is OFF the printer ignores the paper-out detector and prints down to (and beyond) the bottom edge.

Switch B-3: Printable area

This printer can use two types of printing area format.

By putting the switch ON (Type A), the first line of printing will start 1/6 inch from the top of the paper, and the printed area will end 1/6 inch from the bottom of the paper.

By putting the switch OFF (Type B), the first line of printing will start one inch from the top of the paper, and the printed area will end 6 mm from the bottom of the paper.

Switch B-4: This switch is used for technical purposes only. Leave this switch ON.

Switch B-5: CR Centering

If you set this switch OFF, the carriage moves to the center each time to feed paper nears the perforations. This way, you can get better quality of printing around the perforations. It is recommended to match the page length setting to your fanfold paper; otherwise, this function does not work properly at the perforations.

If you leave this switch ON, the carriage does not move when feeding paper.

Switches C-1 to C-3: Page Length

Leave these switches ON if you will be using 11-inch forms. You will need to change the switches as shown below if you will be using a different page length:

| Page Length | C-1 | C-2 | C-3 |
|-----------------------|-----|-----|-----|
| 11 inches/Letter | ON | ON | ON |
| 8 inches | OFF | ON | ON |
| 11.7 inches/A4 | ON | OFF | ON |
| 12 inches | OFF | OFF | ON |
| 8.5 inches | ON | ON | OFF |
| 14 inches/Legal | OFF | ON | OFF |
| 10.5 inches/Executive | ON | OFF | OFF |
| 7.25 inches | OFF | OFF | OFF |

Switches C-4 and C-5: Print Pitch

These switches select the default print pitch as shown below.

| Print Pitch | C-4 | C-5 |
|-------------|-----|-----|
| 10 CPI | ON | ON |
| 12 CPI | ON | OFF |
| 15 CPI | OFF | ON |
| 17 CPI | OFF | OFF |

NOTE: If you change these switches after you have saved a macro, these new settings will override the macro setting.

Switch D-1: Print Mode

This switch selects either Letter Quality (LQ) or Draft for the power-on setting.

When the LQ mode is selected, the LQ Font selection by the EDS switches E-1 to E-3 takes effect.

Switch D-2: Character Table

The action of this switch depends on the mode chosen with switch A-1.

Move this switch OFF to select Italic character table with the Standard/Epson emulation mode. If you leave this switch in the ON position, in place of italics you will get the graphic characters, international characters, and mathematical symbols of IBM character set #2.

In the IBM emulation mode, ON selects character set #2, which has international characters and fewer control words. OFF selects character set #1, for computers with a 7-bit interface.

Switches D-3 to D-5: Code Page or International Character Set

Except in the Standard Italic character set, these switches select the default character code page as shown below:

| Code Page | D-3 | D-4 | D-5 |
|----------------------|-----|-----|-----|
| #437 U.S.A. | ON | ON | ON |
| #850 Multi-lingual | OFF | ON | ON |
| #860 Portuguese | ON | OFF | ON |
| #861 Icelandic | OFF | OFF | ON |
| #863 Canadian French | ON | ON | OFF |
| #865 Nordic | OFF | ON | OFF |

International character sets differ in their assignment of 12 character codes in the Standard Italic character set. See the character tables in Chapter 11. With these switches you can select one of eight character sets as follows:

| Country | D-3 | D-4 | D-5 |
|-----------|-----|-----|-----|
| U.S.A. | ON | ON | ON |
| France | OFF | ON | ON |
| Germany | ON | OFF | ON |
| England | OFF | OFF | ON |
| Denmark I | ON | ON | OFF |
| Sweden | OFF | ON | OFF |
| Italy | ON | OFF | OFF |
| Spain I | OFF | OFF | OFF |

Switches E-1 to E-3: LQ Font Selection

These switches allow you to choose the default font selected when LQ mode is selected, as shown below.

| Font Name | E-1 | E-2 | E-3 |
|-----------|-----|-----|-----|
| Roman | ON | ON | ON |
| Sanserif | OFF | ON | ON |
| Courier | ON | OFF | ON |
| Prestige | OFF | OFF | ON |
| Script | ON | ON | OFF |

Chapter 6

TROUBLESHOOTING

This chapter helps you identify printer conditions and problems that you can often correct yourself.

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 help you avoid having to make unnecessary service calls.

Remember that your printer is a highly sophisticated electronic device, which also contains high voltage. 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.

- Power switch is on, but power indicator is off

| Probable Cause | Action |
|---------------------------------|--|
| Printer is not receiving power. | Make sure that the power cord is correctly connected. Verify that the power source works. |

- Printer sounds as if it is printing but does not; Printing is weak

| Probable Cause | Action |
|--|---|
| Ribbon is jamming, twisted, or not between the print head and the print head shield. | Make sure that the ribbon cartridge is correctly installed. Make sure that the ribbon is between the shield on the print head and the end of the print head. Replace the ribbon. |
| Adjustment lever is set incorrectly. | Check the setting of the adjustment lever. Move the lever to a darker setting. |

- Printer test works, but printer does not print when attached to computer

| Probable Cause | Action |
|---------------------------------------|---|
| Printer cable has a problem. | Make sure that the printer cable is correctly connected at both ends, printer and computer. |
| Problem with the application program. | Refer to your application program manual. |



- Printer sounds the audible alarm

| Probable Cause | Action |
|---|---|
| This might indicate an error or normal operation. | Check the status of the control panel indicators and see “Conditions indicated by beep tones” in Chapter 4. |

- Selected pitch or font is being changed

| Probable Cause | Action |
|---|---|
| Your software is overriding your control panel selection. | Set your printer in Font/Pitch lock. See “Pitch lock mode” and “Font lock mode” in Chapter 4. |

- Printer does not feed paper

| Probable Cause | Action |
|--------------------------------------|--|
| Paper is jamming. | Remove all forms and pieces of paper. |
| Adjustment lever is set incorrectly. | Check the setting of the adjustment lever. See “Adjusting the printing gap” in Chapter 3. |
| Release lever is set incorrectly. | Check the setting of the release lever. This lever must be set to the back for cut-sheet forms (), and forward for fanfold forms (). |
| Fanfold form is parked. | Unpack the fanfold paper. |

- Line spacing is incorrect or overprinting occurs

| Probable Cause | Action |
|---|--|
| The tractor positions are incorrectly adjusted. | Adjust the tractor positions. See “Loading fanfold forms” in Chapter 3. |
| Problem with the application program. | Refer to your application program manual. |
| Platen knob was manually turned while the POWER indicator was on. | Set the top of form. See “Top of form” in Chapter 4. Do not manually turn the platen knob when the power is on. Use the PAPER FEED button. |
| Forms are jamming between printing surface and the print head. | Reset adjustment lever. See “Adjusting the printing gap” in Chapter 3. |

- Incorrect number of lines on a page

| Probable Cause | Action |
|--|--|
| Paper is adjusted incorrectly. | Set the top of form. See “Top of form” in Chapter 4. |
| Paper has shifted backwards after several forms printed correctly. | Readjust forms. |
| Problem with the application program. | Refer to your application program manual. |
| Distance printer must pull paper is too far. | Move paper closer to the printer. |
| Paper is getting stuck on cables. | Move the paper away from any wires or cables. |

- Line length is wrong; Graphics do not print; Lines are not starting at left margin

| Probable Cause | Action |
|---------------------------------------|---|
| Problem with the application program. | Refer to your application program manual. |

- Characters are wrong or missing; formatting control codes do not work

| Probable Cause | Action |
|---|--|
| Problem with the application program. | Refer to your application program manual. |
| Some wires are missing from the print head. | Printer needs repair. |
| Wrong default setting with EDS switches. | Check the current EDS setting. Modify the EDS setting. |

- Dots are missing or print quality is poor

| Probable Cause | Action |
|--------------------------------------|--|
| Adjustment lever is set incorrectly. | Check the position of the adjustment lever. See Chapter 3. |
| Print head is not working. | Printer needs repair. |

- Forms are smudged or printing is too dark

| Probable Cause | Action |
|---|---|
| Adjustment lever is set incorrectly. | Check the position of the adjustment lever. Move the lever to a lighter setting (front). See Chapter 3. |
| Ribbon is twisted or is not between the print head and the print head shield. | Install the ribbon correctly. See “Installing the ribbon cartridge” in Chapter 2. |
| Print head shield (or print head) is damaged or missing. | See “Installing the ribbon cartridge” in Chapter 2 to locate the print head shield and print head. Contact your dealer. |

- Printer is unstable; Wrong characters are printed; Left margin changes; Printing stops

| Probable Cause | Action |
|---|--|
| Static electricity is resulting from low humidity or interference from nearby electrical devices. | Increase the humidity. Move devices with electric motors away from the printer. |

- Left margin moves to the right during printing

| Probable Cause | Action |
|--|---|
| The print head is not moving correctly. | Check that the ribbon and paper are correctly installed. See “Installing ribbon cartridge” in Chapter 2 and “Loading paper” in Chapter 3. |
| Problem with the application program. | Refer to your application program manual. |
| The adjustment lever is in the wrong position. | Reset the adjustment lever. See “Adjusting the printing gap” in Chapter 3. |

- Printer is printing beyond side edge of forms

| Probable Cause | Action |
|---|---|
| Paper is adjusted incorrectly. | Adjust both paper guides and the paper. |
| Problem with the application program. | Refer to your application program manual. |
| A print head jam caused by the ribbon or a paper jam. | Make sure that the ribbon cartridge is correctly installed. See “Installing the ribbon cartridge” in Chapter 2. Clear the paper jam. |

- Printer case is hot to the touch

| Probable Cause | Action |
|------------------------------|---|
| Printer’s vents are blocked. | Move object away from the air vents, including the bottom of the printer. |

- Printer is noisy

| Probable Cause | Action |
|--------------------------|---|
| The printer vibrates. | Move any objects that touch the printer. Ensure that the printer is on a level, sturdy surface. |
| Printer covers are open. | Close covers. |

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 (see Chapter 2).
- 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 cloth barely dampened with either water containing 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.

Chapter 7

OPTIONAL ACCESSORIES

You can select the following accessories as optional equipment.

- Automatic sheet feeder (SF-15DJ)
- Pull tractor unit (PT-15XJ)
- Serial interface cartridge (IS-8XL)

This chapter describes how to install and use these optional accessories.

NOTE: Before you install or remove the optional accessories, turn off the power switch.

AUTOMATIC SHEET FEEDER (SF-15DJ)

You can use the Automatic Sheet Feeder (ASF) to print on cut forms.

Before installing the ASF, check each item in the box against Figure 7-1 to make sure that you have everything.

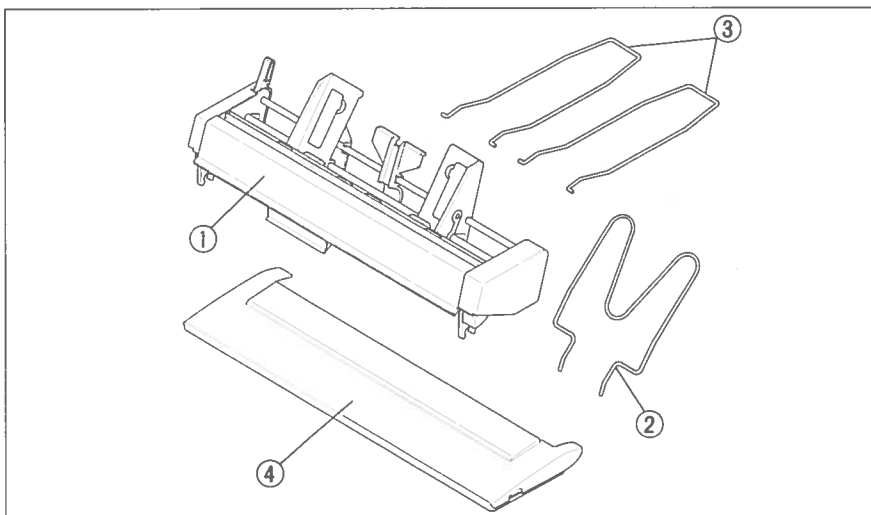


Figure 7-1. Check to make sure you have all five items: 1) Sheet Feeder, 2) Hopper attachment, 3) Stacker attachment, and 4) Printer cover, and 5) ASF User's manual.

NOTE: The Automatic Sheet Feeder is protected by packing and tape during shipping. Be sure to remove all of the protective material and tape before use.

Setting up

The procedure for installing the ASF is:

1. Use the printer's EDS mode to specify ASF as "installed". (For details, refer to Chapter 5.)
2. Open the front cover by lifting up the front using the two grips on either side, then remove the cover by pulling up.
3. Remove the paper guide, and move the release lever at the back of the printer to the rear position as shown in Figure 7-2.
4. Move the bail lever on top of the printer to open the paper bail.

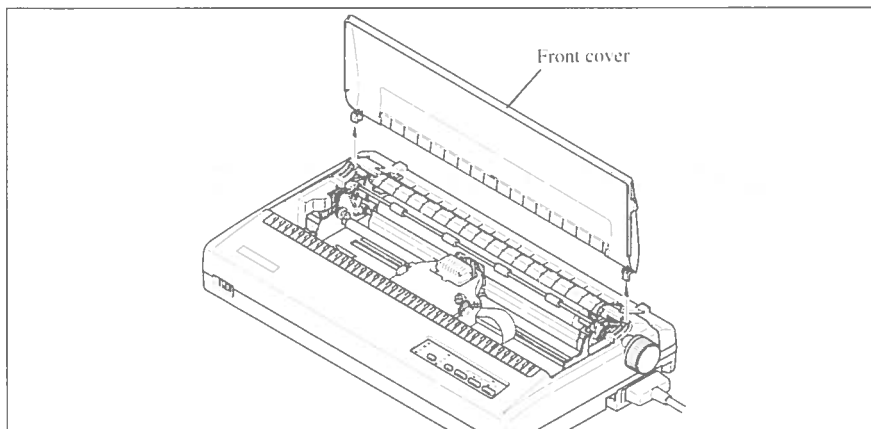


Figure 7-2. Remove the front cover from the printer.

5. Secure the mounting brackets of the Automatic Sheet Feeder onto the shaft of the platen by lowering it into position as shown in Figure 7-3.

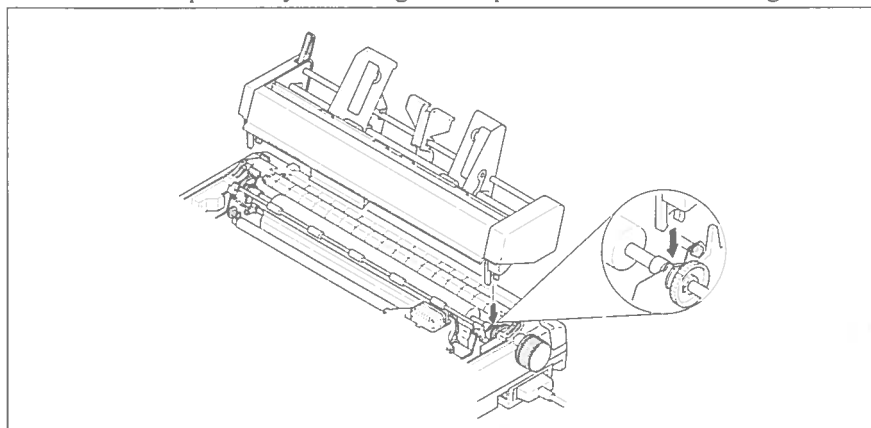


Figure 7-3. Mount the Automatic Sheet Feeder onto the printer.

6. Confirm that the mounting brackets on both sides of the Automatic Sheet Feeder are correctly engaged on the printer. When they are engaged correctly, the ejection roller can be rotated by turning the platen knob.
7. Install the printer cover provided with the Automatic Sheet Feeder.

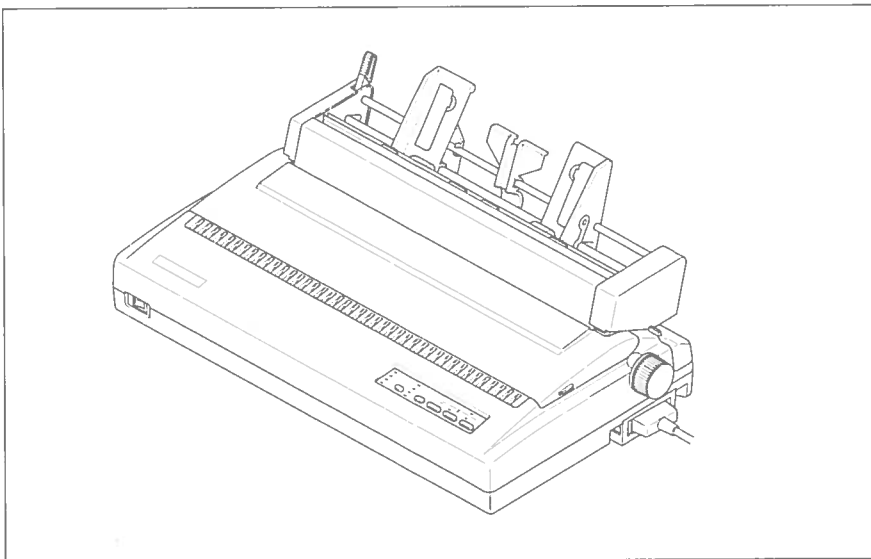


Figure 7-4. Install the printer cover.

8. Insert the hopper attachment on top of the hopper support section as shown in Figure 7-5.

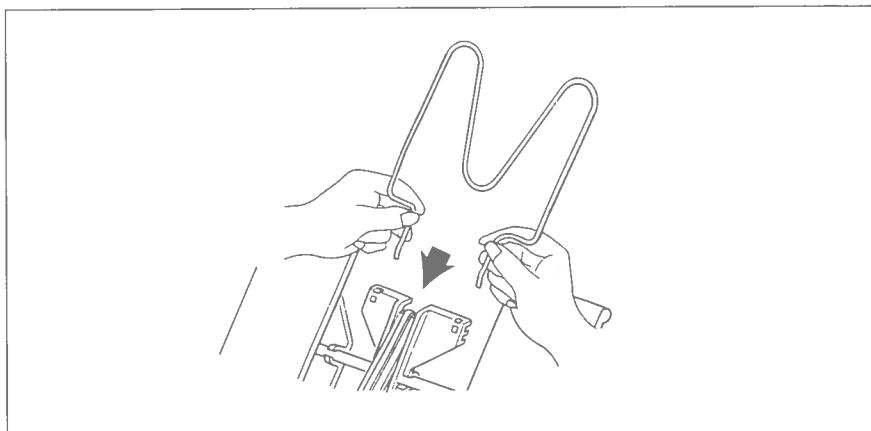


Figure 7-5. Insert the hopper attachment.

9. Insert the stacker attachment, squeezing it with your hand, into the fixing groove in the front part of the sheet feeder as shown in Figure 7-6.

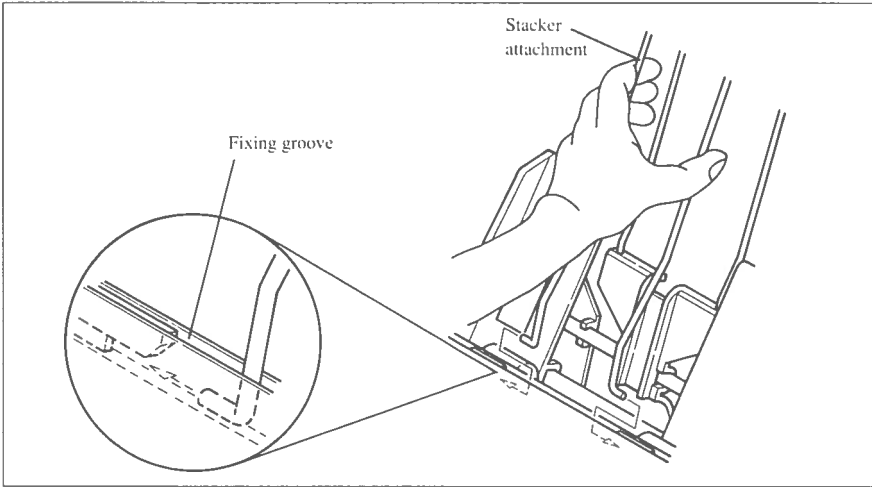



Figure 7-6. Insert the stacker attachment.

Now you can use the ASF by installing the paper stack into the hopper.

NOTE: Set the front cover and paper guide aside carefully after they have been removed from the printer. Reverse the procedure described above when removing the Automatic Sheet Feeder.

Loading paper

1. If fanfold paper has already been loaded into the printer, park the paper through the rear slot.
2. Push the printer release lever toward the rear of the printer () to load single sheets.
3. Pull the paper loading lever toward the front of the printer to draw the hopper out until it is in position.
4. Adjust the left paper guide to the desired left position by moving it horizontally in either direction.

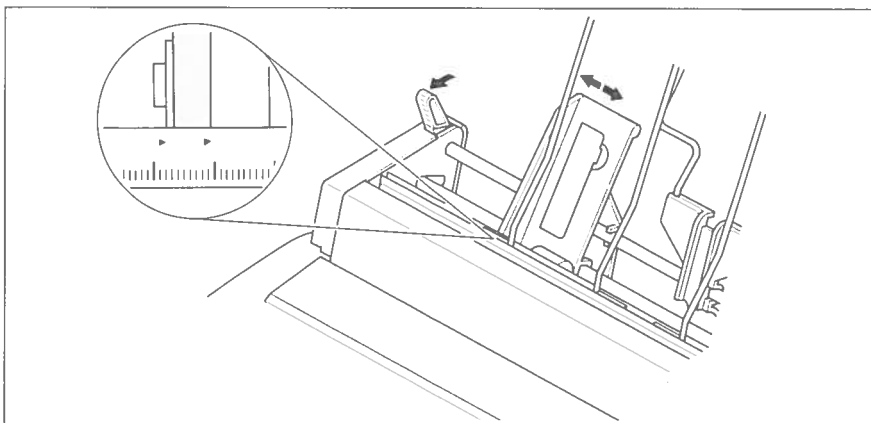


Figure 7-7. Adjust the paper guides to accommodate the width of the paper.

5. Fan the paper stack and square it off properly before inserting it into the Automatic Sheet Feeder.

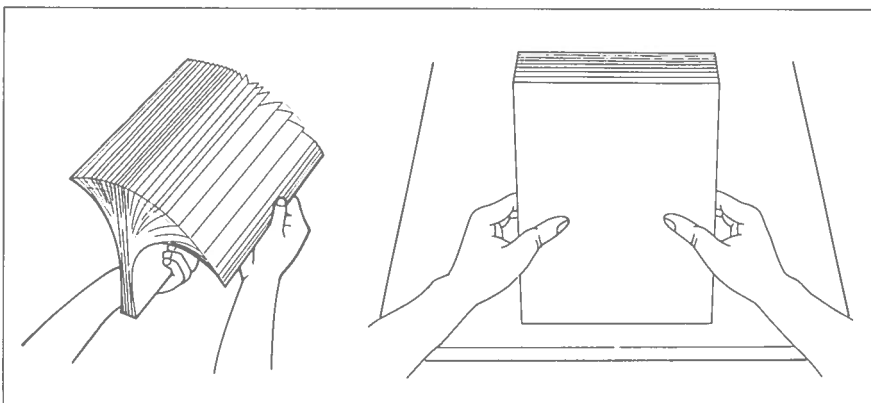


Figure 7-8. Fan the paper before inserting it into the ASF.

6. Insert the paper stack into the Automatic Sheet Feeder.
The stack should not be more than 50 sheets of 20 lb paper.
If necessary, remove some sheets. The ASF may not perform satisfactorily if it is overloaded.
7. Adjust the right paper guide to accommodate the width of the paper.
The guides should be adjusted to restrict the amount of horizontal play while allowing the paper to slide up and down freely between the two paper guides. The ideal distance between paper ream and paper guides is 0.25 mm (0.01") on both sides at the narrowest part of the paper guides.
8. Push the paper loading lever toward the rear of the printer.

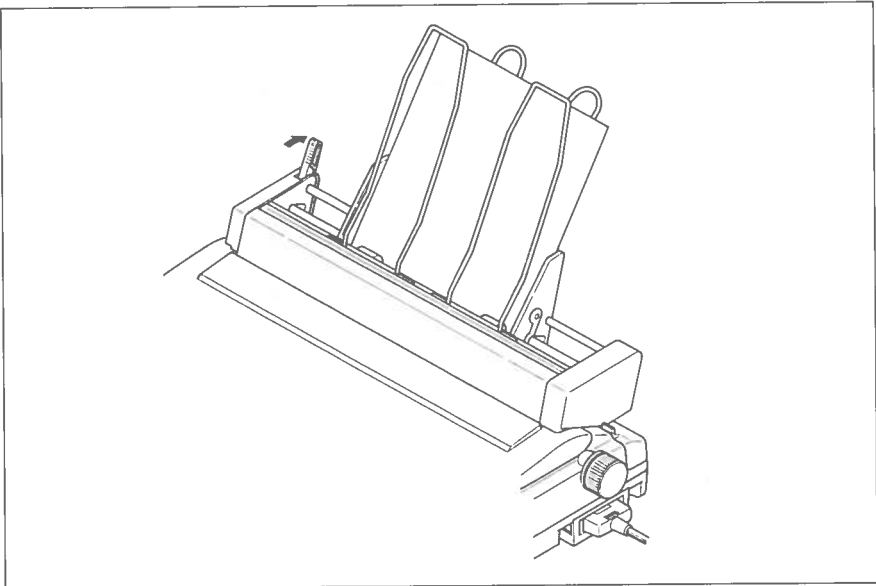


Figure 7-9. Push the paper loading lever to hold the paper stack.

Now you are ready to start printing with the Automatic Sheet Feeder.

PULL TRACTOR UNIT (PT-15XJ)

When printing on multi-part fanfold paper such as slips, use the PT-15XJ Pull tractor unit. Since printing is carried out while the paper is pulled, printouts on the original and duplicate paper are always aligned well.

Before installing the Pull tractor unit, check each item in the box against Figure 7-10 to make sure that you have everything.

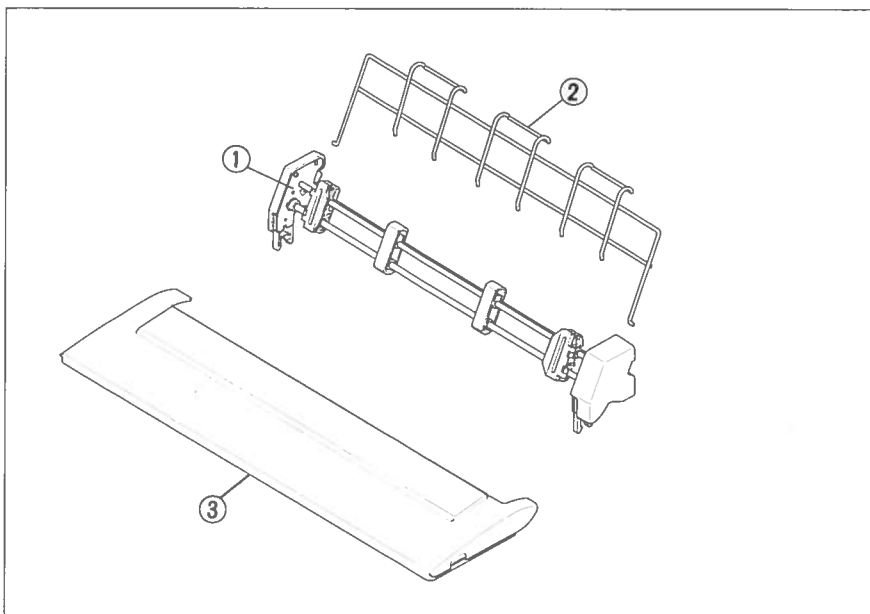


Figure 7-10 Check to make sure you have all three items: 1) Pull tractor, 2) Paper support, and 3) Printer cover.

Setting up

The procedure for installing the Pull tractor unit is:

1. Attach the paper support to the pull tractor.

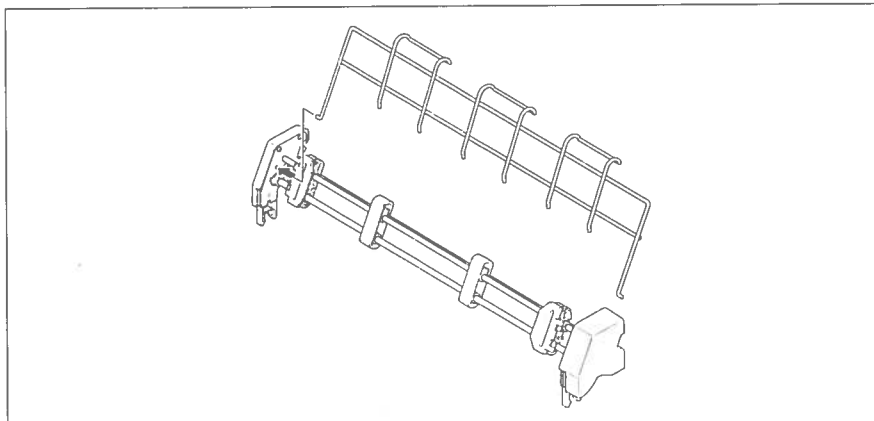



Figure 7-11. Attach the paper support to the pull tractor.

2. Remove the front cover and the paper guide from the printer.
3. Set the release lever to the front of the printer (), then pull the bail lever towards you to release the bail roller from the platen.
4. Pressing the right and left lock levers, align the fitting area of the pull tractor with that of the printer body, and push the pull tractor from the top gradually until it is set in place correctly.

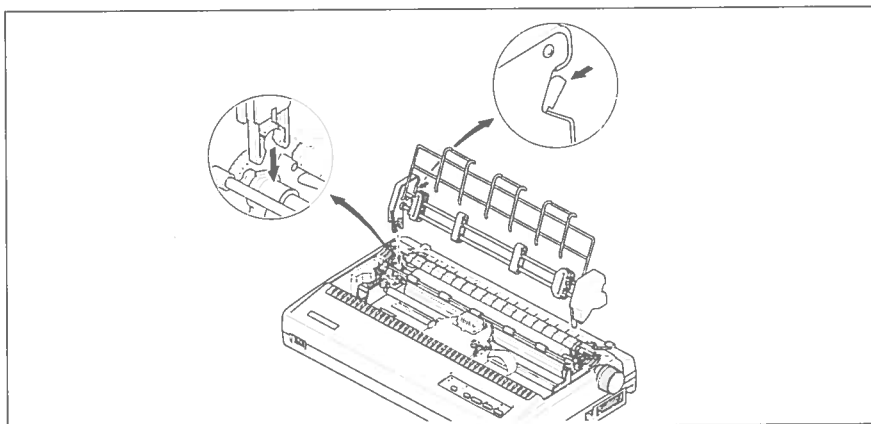


Figure 7-12. Place the pull tractor unit onto the printer.

5. Install the printer cover provided with the pull tractor unit.

Loading paper

1. Place a stack of fanfold paper behind and at least one page-length below the printer.
2. Turn the printer's power OFF, and remove the printer cover.
3. Hold the fanfold paper by hand so that the rear side of the paper is facing upwards, then set the end of the paper into the entry slot for cut-sheet forms and load the paper into the printer.

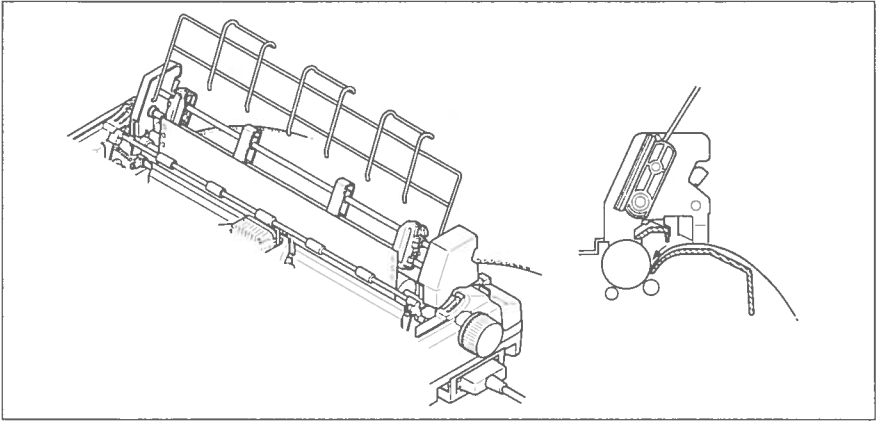


Figure 7-13. Insert the paper from the entry slot for cut-sheet forms.

4. Pull the paper about one page towards the sprocket guides.
5. Adjust the spacing of the tractor units by sliding them along the bar, using the clamp lever at the side of each unit to release them and lock them in position. The unit is released when the clamp lever is down and locked when the clamp lever is up.

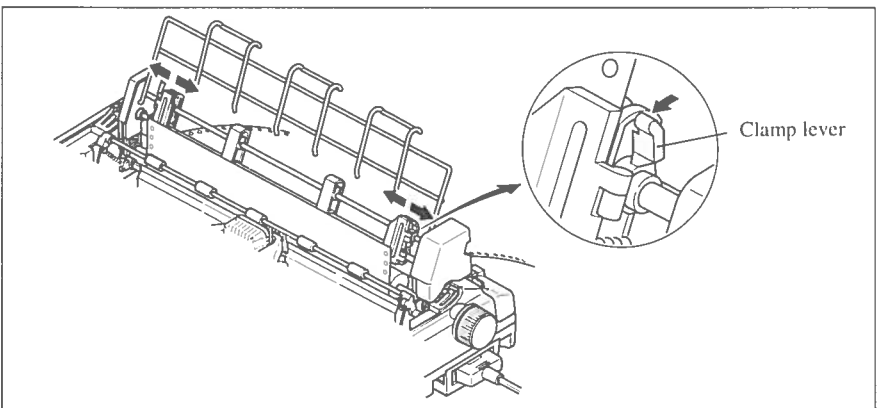


Figure 7-14. Adjust the sprocket guides.

6. With the tractor covers open, mount the paper by aligning holes with the pins on the tractor unit.

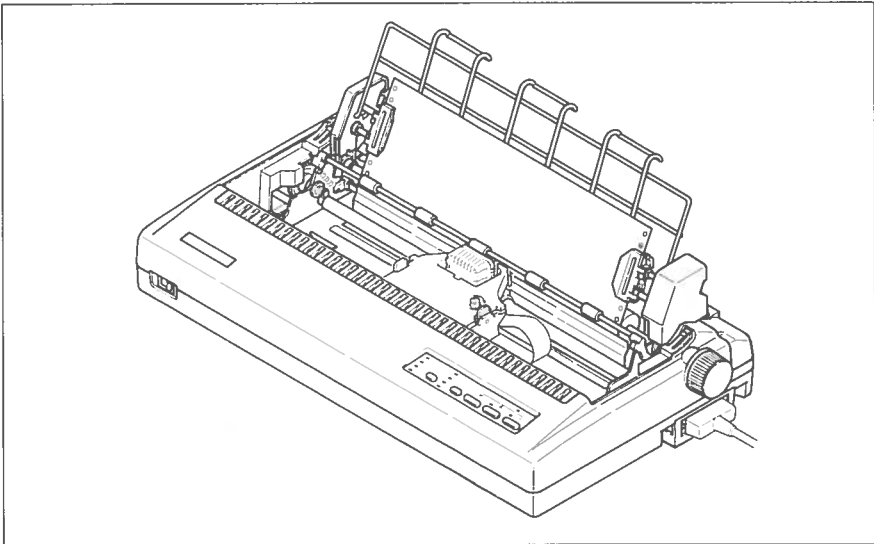


Figure 7-15. Mount the fanfold paper over the tractor units.

7. Now close the tractor covers, again making sure that the paper holes are aligned with the pins on the tractor units. If they are not aligned properly, you will have problems with paper feeding, possibly resulting in tearing and jamming of the paper.
8. Remount the printer cover.
9. Turn the platen knob to set the print starting position of the paper.

SERIAL INTERFACE CARTRIDGE

To run the printer in serial mode, you should use the optional Serial Interface Cartridge, IS-8XL.

The procedure for installing the interface cartridge is:

1. Set the DIP switches on the IS-8XL before attaching it to the printer. (See next page for detailed information.)
2. Turn off the power switch and disconnect the power cord from the power source.
3. Disconnect the interface cable if attached.
4. Slide out the parallel interface cartridge by gripping the flips on both sides.
5. Insert the Serial interface cartridge all the way, as shown in Figure 7-16.

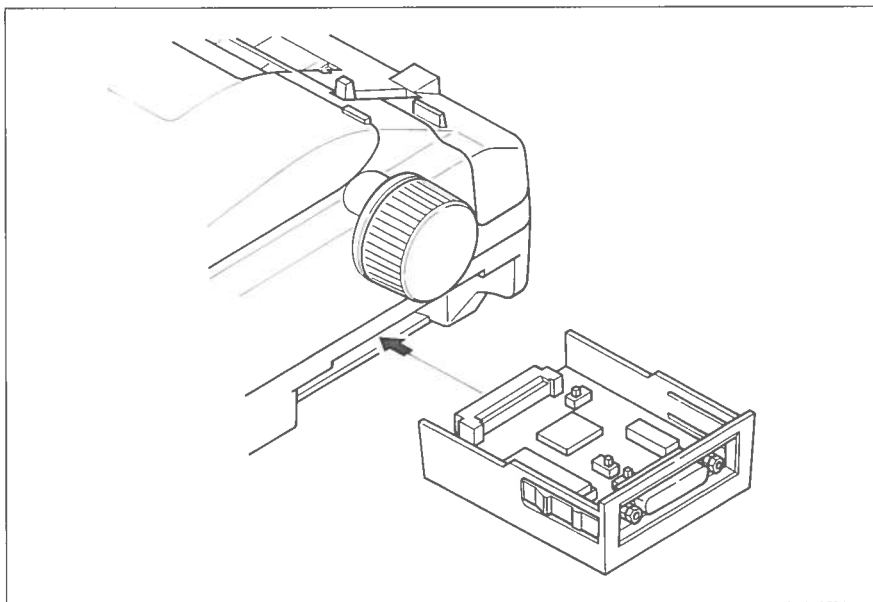


Figure 7-17. Replace the interface cartridge.

6. Connect the Serial interface cable both to the printer and to your computer.

DIP switch functions on the Serial interface cartridge

It is necessary to make compatible the data transfer conditions between the computer and the serial interface cartridge with the DIP switch settings on the cartridge.

The following table shows the functions of the DIP switches on the Serial Interface Cartridge.

| Switch | Function | ON | OFF |
|--------|------------------|---------------|-------|
| 1 | Data length | 8-bit | 7-bit |
| 2 | Parity condition | (Refer below) | |
| 3 | Data Protocol | (Refer below) | |
| 4 | | | |
| 5 | Parity condition | (Refer below) | |
| 6 | Transfer speed | (Refer below) | |
| 7 | | | |
| 8 | | | |

[Parity condition]

| Switch 2 | Switch 5 | Condition |
|----------|----------|-------------|
| ON | ON | No parity |
| ON | OFF | |
| OFF | ON | Odd parity |
| OFF | OFF | Even parity |

[Data protocol]

| Switch 3 | Switch 4 | Protocol |
|----------|----------|----------|
| ON | ON | DTR |
| ON | OFF | XON/XOFF |
| OFF | ON | ETX/ACK |

[Transfer speed]

| Switch 6 | Switch 7 | Switch 8 | Transfer speed |
|----------|----------|----------|----------------|
| OFF | OFF | OFF | 150 BPS |
| OFF | OFF | ON | 300 BPS |
| OFF | ON | OFF | 600 BPS |
| OFF | ON | ON | 1200 BPS |
| ON | OFF | OFF | 2400 BPS |
| ON | OFF | ON | 4800 BPS |
| ON | ON | OFF | 9600 BPS |
| ON | ON | ON | 19200 BPS |

Chapter 8

PRINTER CONTROL COMMANDS

This printer has two emulation modes: Standard/Epson mode and IBM mode.

In Standard/Epson mode, the printer emulates the functions of the Epson LQ-1060 and the graphics commands for NEC 24-wire printers. In IBM mode, the printer emulates the IBM Proprinter XL24E. Additional command codes are included as a superset of these emulations.

The emulation is changed by means of EDS switch A-1. When it is ON, the printer is in Standard/Epson mode, and when OFF, the printer is in IBM mode (see Chapter 5).

In addition, when EDS switch A-2 is ON, the printer automatically changes the emulation by means of software control.

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 functions. The name of each command is followed by a table like the one below:

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|----------|-------------|
| Std. | <ESC> "x" <1> | 27 120 1 | 1B 78 01 |

Mode: Indicates the mode in which the command is recognized.

Std. Standard/Epson mode
(EDS switch A-1 is ON)

IBM IBM mode (EDS switch A-1 is OFF)

Both Both Standard/Epson and IBM modes

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

Decimal: Gives the command in decimal character codes.

Hexadecimal: Gives the command in hexadecimal character codes.

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

FONT CONTROL COMMANDS

Select print quality

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------------|----------|-------------|
| Std. | <ESC> "x" n | 27 120 n | 1B 78 n |

Changes the print quality according to the value of *n*, as shown below:

| n | Print quality |
|---|----------------|
| 0 | Draft |
| 1 | Letter quality |

Ignored if the **FONT LOCK** mode was selected during power-up.

Select print quality

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------------------------|-----------------|------------------|
| IBM | <ESC> "[" "d" <1> <0> n | 27 91 100 1 0 n | 1B 5B 64 01 00 n |

Changes the print quality according to the value of *n*, as shown below:

| n | Print quality |
|-----------|-----------------------|
| 0 | Unchanged |
| 1 - 127 | Draft |
| 128 - 254 | Letter quality |
| 255 | Return to EDS setting |

Ignored if the **FONT LOCK** mode was selected during power-up.

Select LQ font

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------------|----------|-------------|
| Both | <ESC> "k" n | 27 107 n | 1B 6B n |

Selects an LQ font according to the value of *n*. In draft mode, this command remains dormant and takes effect later when LQ is selected. Ignored if the **FONT LOCK** mode was selected during power-up.

| <i>n</i> | Font |
|----------|----------|
| 0 | Roman |
| 1 | Sanserif |
| 2 | Courier |
| 3 | Prestige |
| 4 | Script |

Select italic characters

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

Causes subsequent characters except IBM block graphics to be printed in italics.

Select upright characters

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

Stops italic printing and causes subsequent characters to be printed upright.

Emphasized printing

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

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

Cancel emphasized printing

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

Cancels emphasized printing.

Double-strike printing

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

Causes subsequent characters to be printed in double-strike mode with a slight vertical paper motion in between, causing a thickening of vertical strokes.

For bold print, use of double-strike is recommended in LQ mode, and combined use of emphasized and double-strike is recommended in draft mode.

Cancel double-strike printing

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

Cancels double-strike printing.

Underlining

| Mode | ASCII | Decimal | Hexadecimal |
|------|----------------------|----------------|----------------|
| Both | <ESC> " _ " <i>n</i> | 27 45 <i>n</i> | 1B 2D <i>n</i> |

Causes subsequent characters to be underlined when *n* is 1, and stops underlining when *n* is 0. Block graphics characters and spaces skipped by horizontal tabulation are not underlined.

Overlining

| Mode | ASCII | Decimal | Hexadecimal |
|------|----------------------|----------------|----------------|
| IBM | <ESC> " _ " <i>n</i> | 27 95 <i>n</i> | 1B 5F <i>n</i> |

Causes subsequent characters to be overlined when *n* is 1, and stops overlining when *n* is 0. Spaces skipped by horizontal tabulation are not overlined.

Select score

| Mode | ASCII | Decimal | Hexadecimal |
|------|------------------------------------|-------------------------|----------------------------|
| Std. | <ESC> “(” “_” <3> <0> <1> n1 n2 | 27 40 45 3 0 1 n1 n2 | 1B 28 2D 03 00 01 n1 n2 |

Start score according to the values of *n1* and *n2*, as shown below.

| n1 | Function | n2 | Function |
|----|----------------|----|------------------------|
| 1 | Underlining | 0 | Cancel score |
| 2 | Strike-through | 1 | Single continuous line |
| 3 | Overlining | 2 | Double continuous line |
| | | 5 | Single broken line |
| | | 6 | Double broken line |

Select ornament character

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------------|----------|-------------|
| Std. | <ESC> “q” n | 27 113 n | 1B 71 n |

Selects an ornament character according to the value of *n*, as shown below.

| n | Character |
|---|--------------------|
| 0 | Normal |
| 1 | Outline |
| 2 | Shadow |
| 3 | Shadow and outline |

Superscript

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Both | <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" <I> | 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 character table

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

Selects a character table according to the value of *n* as shown below:

| <i>n</i> | Character table |
|----------|-------------------------------|
| 0 | Standard character set |
| 1 | IBM character set |
| 2 | Shift download character area |

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" n | 27 82 n | 1B 52 n |

Selects an international character set in the Standard character set according to the value of *n*.

| n | Character set | n | Character set |
|---|---------------|----|---------------|
| 0 | U.S.A | 8 | Japan |
| 1 | France | 9 | Norway |
| 2 | Germany | 10 | Denmark II |
| 3 | England | 11 | Spain II |
| 4 | Denmark I | 12 | Latin America |
| 5 | Sweden | 13 | Korea |
| 6 | Italy | 14 | Ireland |
| 7 | Spain I | 64 | Legal |

The first eight of these character sets (from U.S.A. to Spain I) can be selected as the power-up default by EDS switches D-3 to D-5.

Select IBM code page

| Mode | ASCII | Decimal | Hexadecimal |
|------|--|---------------------------|-------------------------------|
| Both | <ESC> "[" "T" <4> <0> <0> <0> n1 n2 | 27 91 84 4 0 0 0 n1 n2 | 1B 5B 54 04 00 00 00 n1 n2 |

Changes the code page of the current IBM character set according to the values of *n1* and *n2*, as shown below.

| n1 | n2 | Code page |
|----|-----|----------------------|
| 1 | 181 | #437 U.S.A. |
| 3 | 82 | #850 Multi-Lingual |
| 3 | 92 | #860 Portuguese |
| 3 | 93 | #861 Icelandic |
| 3 | 95 | #863 Canadian French |
| 3 | 97 | #865 Nordic |

One of these code pages can be selected as the power-up default by EDS switches D-3 to D-5.

Enable printing of all character codes

| Mode | ASCII | Decimal | Hexadecimal |
|------|------------------------|--------------------|--------------------|
| Std. | <FS> “\” <i>n1 n2</i> | 23 92 <i>n1 n2</i> | 1C 5C <i>n1 n2</i> |
| IBM | <ESC> “\” <i>n1 n2</i> | 27 92 <i>n1 n2</i> | 1B 5C <i>n1 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 |
|------|--------------------|----------------|----------------|
| Std. | <FS> “^” <i>n</i> | 28 94 <i>n</i> | 1C 5E <i>n</i> |
| IBM | <ESC> “^” <i>n</i> | 27 94 <i>n</i> | 1B 5E <i>n</i> |

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

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 elite or condensed to pica (10 cpi). Ignored if the **PITCH LOCK** mode was selected during power-on.

Elite pitch

| Mode | ASCII | Decimal | Hexadecimal |
|------|------------|---------|-------------|
| Std. | <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 pica or condensed to elite (12 cpi). Ignored if the **PITCH LOCK** mode was selected during power-on.

Semi-condensed pitch

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

Changes from either pica or elite to semi-condensed pitch (15 cpi). Ignored if the **PITCH LOCK** mode was selected 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 pica to condensed pica. Ignored if the **PITCH LOCK** mode was selected during power-on.

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 LOCK** mode was selected during power-on.

Proportional spacing

| Mode | ASCII | Decimal | Hexadecimal |
|------|--------------------|-----------------|----------------|
| Std. | <ESC> "p" <i>n</i> | 27 112 <i>n</i> | 1B 70 <i>n</i> |
| IBM | <ESC> "P" <i>n</i> | 27 80 <i>n</i> | 1B 50 <i>n</i> |

Causes subsequent characters to be proportionally spaced when *n* is 1, and cancels it when *n* is 0. Ignored if the **PITCH LOCK** mode was selected during power-up.

Select font and pitch

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

Changes the print font and pitch according to the value of *n*, as shown below:

| <i>n</i> | Font | Pitch |
|----------|----------------|----------------|
| 0 | Draft | Pica |
| 2 | Letter Quality | Pica |
| 3 | Letter Quality | Proportional |
| 4 | Draft download | Pica |
| 6 | LQ download | Pica |
| 7 | LQ download | Proportional |
| 8 | Draft | Elite |
| 10 | Letter Quality | Elite |
| 12 | Draft download | Elite |
| 14 | LQ download | Elite |
| 16 | Draft | Pica condensed |
| 18 | Letter Quality | Pica condensed |
| 20 | Draft download | Pica condensed |
| 22 | LQ download | Pica condensed |

Select print mode

| Mode | ASCII | Decimal | Hexadecimal |
|------|--|-------------------------------------|---------------------------------------|
| IBM | <ESC> "["[<2> <0> <i>n1</i> <i>n2</i> | 27 91 73 2 0 <i>n1</i> <i>n2</i> | 1B 5B 49 02 00 <i>n1</i> <i>n2</i> |

Changes the print mode according to the values of *n1* and *n2*, as shown below.

| <i>n1</i> | <i>n2</i> | Font | Mode | Pitch |
|-----------|-----------|----------|-------------------|-----------------|
| 0 | 11 | Courier | Normal | Pica |
| 0 | 12 | Prestige | Normal | Pica |
| 0 | 18 | Courier | Italic | Pica |
| 0 | 46 | Courier | Emphasized | Pica |
| 0 | 57 | Courier | Italic emphasized | Pica |
| 0 | 60 | Prestige | Emphasized | Pica |
| 0 | 85 | Courier | Normal | Elite |
| 0 | 86 | Prestige | Normal | Elite |
| 0 | 92 | Courier | Italic | Elite |
| 0 | 108 | Courier | Emphasized | Elite |
| 0 | 111 | Prestige | Emphasized | Elite |
| 0 | 112 | Prestige | Italic | Elite |
| 0 | 116 | Courier | Italic emphasized | Elite |
| 0 | 164 | Prestige | Normal | Proportional |
| 0 | 171 | Courier | Normal | Proportional |
| 0 | 172 | Courier | Italic | Proportional |
| 0 | 184 | Courier | Emphasized | Proportional |
| 0 | 185 | Courier | Italic emphasized | Proportional |
| 0 | 221 | Prestige | Normal | Semi-condensed |
| 0 | 253 | Courier | Emphasized | Pica condensed |
| 0 | 254 | Courier | Normal | Pica condensed |
| 1 | 1 | Prestige | Normal | Pica condensed |
| 1 | 201 | Prestige | Normal | Pica condensed |
| 1 | 202 | Prestige | Normal | Elite condensed |
| 1 | 235 | Courier | Normal | Elite |
| 1 | 236 | Courier | Normal | Semi-condensed |
| 1 | 237 | Courier | Normal | Pica condensed |
| 1 | 238 | Courier | Normal | Elite condensed |
| 1 | 239 | Prestige | Normal | Elite |
| 1 | 240 | Prestige | Normal | Semi-condensed |

Expanded printing

| Mode | ASCII | Decimal | Hexadecimal |
|------|--------------------|----------------|----------------|
| Both | <ESC> “W” <i>n</i> | 27 87 <i>n</i> | 1B 57 <i>n</i> |

Causes subsequent characters to be expanded to double width when *n* is 1, and cancels it when *n* is 0.

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.

| <i>n</i> | Character width |
|----------|-----------------|
| 0 | Normal-wide |
| 1 | Double-wide |
| 2 | Triple-wide |

Select master print mode

| Mode | ASCII | Decimal | Hexadecimal |
|------|--------------------|----------------|----------------|
| Std. | <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.

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

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.

The unit of movement is fixed at 1/120 inch in draft mode and 1/180 inch in LQ mode.

Print double-height characters

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|----------|-------------|
| Std. | <ESC> "w" <I> | 27 119 1 | 1B 77 01 |
| | <FS> "V" <I> | 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 |
|------|---------------|----------|-------------|
| Std. | <ESC> "w" <0> | 27 119 0 | 1B 77 00 |
| | <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 |
|------|-----------------------|--------------|----------------|
| IBM | <ESC> "[" "@" <4> <0> | 27 91 64 4 0 | 1B 5B 40 04 00 |
| | <0> <0> n m | 0 0 n m | 00 00 n m |

Selects a combination of character height, width, and line spacing according to the value of *n* and *m*, as shown 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 line | Unchanged |
| 17 | Single line | Single height |
| 18 | Single line | Double height |
| 32 | Double line | Unchanged |
| 33 | Double line | Single height |
| 34 | Double line | Double height |

| <i>m</i> | Character width |
|----------|------------------------------------|
| 0 | Unchanged |
| 1 | Single width (same as <ESC> "W" 0) |
| 2 | Double width (same as <ESC> "W" 1) |

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 1/6 inch

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Std. | <ESC> "2" | 27 50 | 1B 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 |
|------|--------------------|----------------|----------------|
| Std. | <ESC> "+" <i>n</i> | 27 43 <i>n</i> | 1B 2B <i>n</i> |
| | <FS> "3" <i>n</i> | 28 51 <i>n</i> | 1C 33 <i>n</i> |

Sets the distance the paper advances or reverses in subsequent line feeds to $n/360$ inch, where n is between 0 and 255.

Set base unit for line spacing

| Mode | ASCII | Decimal | Hexadecimal |
|------|----------------------|------------------|--------------------|
| IBM | <ESC> "[" "\<4> <0> | 27 91 92 4 0 | 1B 5B 5C 04 00 |
| | <0> <0> <i>n1 n2</i> | 0 0 <i>n1 n2</i> | 00 00 <i>n1 n2</i> |

Sets the base unit for the line spacing commands, <ESC> "3" and <ESC> "J", as shown below:

| <i>n1</i> | <i>n2</i> | Line spacing unit |
|-----------|-----------|-------------------|
| 0 | 180 | 1/180 inch |
| 0 | 216 | 1/216 inch |
| 1 | 104 | 1/360 inch |

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

| 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, $n/216$ inch or $n/360$ inch ($n/180$ inch for the Standard mode) according to the preceding base unit.

The value of 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 $n/60$ inch or $n/72$ inch

| Mode | ASCII | Decimal | Hexadecimal |
|------|--------------------|----------------|----------------|
| Both | <ESC> “A” <i>n</i> | 27 65 <i>n</i> | 1B 41 <i>n</i> |

In Standard mode, sets the distance the paper advances or reverses in subsequent line feeds to $n/60$ inch, where n is between 0 and 255. If $n = 0$, the line spacing is set to 0.

In IBM mode, this command defines the distance the paper advances or reverses in subsequent line feeds to $n/72$ inch, where n is between 1 and 85. 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. See the preceding commands for the line spacing.

Reverse line feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Std. | <ESC> <LF> | 27 10 | 1B 0A |
| IBM | <ESC> “J” | 27 93 | 1B 5D |

Prints the current line and feeds the paper in the reverse direction to the preceding line. Ignored when the Pull tractor unit is used. See the preceding commands for the line spacing.

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-on.

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 the Automatic Sheet Feeder is used.

Perform one time 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* times the defined base unit (*n*/180 inches for the Standard mode). The value of *n* is between 0 and 255. If *n* = 0, the line-feed distance is set to 0. Does not move the print position right or left. Does not change the line-spacing setting.

Perform one n/180-inch reverse line feed

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

Feeds the paper once by $n/180$ inches in the reverse direction, where n is between 0 and 255. If $n = 0$, the line-feed distance is set to 0. Does not move the print position right or left. Does not change the line-spacing setting.

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.

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 32 in Standard mode or between 1 and 64 in IBM mode. The current line becomes the top of the page.

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.

Set bottom margin

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

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

Cancel bottom margin

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

Cancels 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 friction feed is used, this command ejects the current page.

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. The maximum number of vertical tab stops allowed is 16 in Standard mode and 64 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. 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 in channel

| Mode | ASCII | Decimal | Hexadecimal |
|------|---|---|--|
| Std. | <ESC> "b" <i>n0</i> <i>n1</i> <i>n2</i> <0> | 27 98 <i>n0</i> <i>n1</i> <i>n2</i> 0 | 1B 62 <i>n0</i> <i>n1</i> <i>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> "/" command.) See <ESC> "B" for parameters *n1*, *n2*, ... <0>.

Select vertical tab channel

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

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

Vertical tab

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

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

HORIZONTAL POSITION COMMANDS

Set left margin

| Mode | ASCII | Decimal | Hexadecimal |
|------|--------------------|-----------------|----------------|
| Std. | <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 currently 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 | $0 \leq n \leq 113$ |
| 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> |

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 |
|------|-------------------------------|---------------------------|---------------------------|
| IBM | <ESC> "X" <i>n1</i> <i>n2</i> | 27 88 <i>n1</i> <i>n2</i> | 1B 58 <i>n1</i> <i>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 EDS switch A-5 is set to OFF, also performs a line feed.

Set automatic line feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| IBM | <ESC> "5" <I> | 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 EDS switch A-5.

Cancel automatic line feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| IBM | <ESC> "5" <O> | 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 EDS switch A-5.

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.

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>.

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 according to which a tab stop is set every 8 columns starting at column 9. Also clears all vertical tab stops.

Horizontal tab

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

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

Relative horizontal tab

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

Moves the print position right or left a specified distance. 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 you want to move the print head to the left, *n1* and *n2* are obtained by subtracting the value from 65536, and dividing the result into high and low bytes.

The unit of movement is fixed at 1/120 inch in draft mode and 1/180 inch in LQ mode.

Relative horizontal tab in inches

| Mode | ASCII | Decimal | Hexadecimal |
|------|------------------------|---------------------|--------------------|
| IBM | <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 8 inches.

Absolute horizontal tab in inches

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

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

GRAPHICS COMMANDS

Print normal-density 8-bit graphics

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

Prints bit-image graphics at 60 dots per inch horizontally. The graphic image is 8 dots high and $n1 + n2 \times 256$ dots wide. Maximum width is 13.6 inches (816 dots). $m1$, $m2$, ... are the dot data, each a 1-byte value from 0 to 255 representing 8 vertical dots, with the most significant bit at the top and the least significant bit at the bottom. The number of data bytes must be $n1 + n2 \times 256$. Dots beyond the right margin are ignored. At the end of bit-image printing the printer returns automatically to character mode.

Print double-density 8-bit graphics

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

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

Print double-density, double-speed 8-bit 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 quadruple-density 8-bit 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 hex-density 24-bit graphics

| Mode | ASCII | Decimal | Hexadecimal |
|------|--|---------------------------------------|---------------------------------------|
| Std. | <FS> "Z" $n1$ $n2$ $m1$ $m2$ $m3$... | 28 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 graphics 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 |
|------|---|--|--|
| Std. | <ESC> "*" <i>n0</i> <i>n1</i> <i>n2</i> <i>m1</i> <i>m2</i> ... | 27 42 <i>n0</i> <i>n1</i> <i>n2</i> <i>m1</i> <i>m2</i> ... | 1B 2A <i>n0</i> <i>n1</i> <i>n2</i> <i>m1</i> <i>m2</i> ... |

Selects one of eleven graphics modes depending on the value of *n0* and prints bit-image 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*, ...

| <i>n0</i> | 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 | (120 dots per inch) |
| 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 bit-image graphics in this mode. The graphics 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*, ...

| <i>m0</i> | 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 | (120 dots per inch) |
| 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 |
|------|-----------------------------|---------------------------|---------------------------|
| Sid. | <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> |

Defines one or more new characters and stores them in RAM for later use. EDS switch A-3 must be set OFF; otherwise RAM is used as an input buffer, not 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* must be equal to or less than *n2*.

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 | 9 | 12 |
| LQ pica | 31 | 36 |
| LQ elite | 27 | 30 |
| LQ semi-condensed | 19 | 24 |
| LQ proportional | 38 | 42 |
| Draft super/subscript | 7 | 12 |
| LQ super/subscript | 19 | 36 |
| LQ prop. super/subscript | 38 | 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 most significant bit being the top dot, and the least significant bit being the bottom dot.

Define download characters

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------------------------------|-----------------------------------|-----------------------------------|
| IBM | <ESC> “=” <i>n1</i> <i>n2</i> “#” | 27 61 <i>n1</i> <i>n2</i> 35 | 1B 3D <i>n1</i> <i>n2</i> 23 |
| | <i>n3</i> <i>n4</i> <0> <i>n5</i> | <i>n3</i> <i>n4</i> 0 <i>n5</i> | <i>n3</i> <i>n4</i> 00 <i>n5</i> |
| | <i>m1</i> <i>m2</i> ... <i>m9</i> | <i>m1</i> <i>m2</i> ... <i>m9</i> | <i>m1</i> <i>m2</i> ... <i>m9</i> |
| | <i>d1</i> <i>d2</i> ... <i>dx</i> | <i>d1</i> <i>d2</i> ... <i>dx</i> | <i>d1</i> <i>d2</i> ... <i>dx</i> |

Defines new characters and stores them in RAM for later use. EDS switch A-3 must be OFF; otherwise RAM is used as an input buffer, not downloading characters, and this command is ignored.

Downloading characters in IBM mode requires Dot Pattern data and Character Index Table data. Dot Pattern data controls which pins fire when printing a character. Index Table data is placed in a “lookup table” that provides information on where Dot Pattern data is stored in memory and defines certain attributes of the character.

$(n1 + n2 \times 256)$ gives the number of bytes to be downloaded.

n3 and *n4* indicate the low order and high order addresses in which data is to be stored. *n3* should be 15 and *n4* should be 128 for this printer.

n5 determines the character mode to be downloaded, as shown below:

| <i>n5</i> | Character mode | Character width |
|-----------|-----------------|-----------------|
| 0 | Draft | 9 |
| 1 | LQ pica | 35 |
| 2 | LQ proportional | 17 to 41 |
| 3 | LQ elite | 29 |

m1 through *m9* indicate Index Table data.

m1 and *m2* indicate the address where Dot Pattern is stored. *m1* is the high-order byte. *m3* indicates the number of columns in the character memory, and *m4* indicates the number of columns in the character.

m5 through *m9* are compression mask bits. Data compression allows the efficient use of memory in storing downloaded characters, providing space for more characters than would be available without compression. The printer repeats the previous dot column in the current column when the current column compression mask bit is set to 1.

It is necessary to define all of Index Table data before the Dot Pattern data to download many characters.

$d1, d2, \dots d_x$ is the Dot Pattern data being downloaded.

Each data byte indicates eight vertical dots, with the most significant bit being the top dot, and the least significant bit being the bottom dot.

Copy character set from ROM into RAM

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------------------|---------------|-----------------|
| Std. | <ESC> “:” <0> n <0> | 27 58 0 n 0 | 1B 3A 00 n 00 |

Copies the selected character set with n , as shown below, to the corresponding download character RAM area, overwriting any download data already present. Ignored when EDS switch A-3 is set ON.

| n | Font |
|-----|-----------|
| 0 | Roman |
| 1 | San serif |
| 2 | Courier |
| 3 | Prestige |
| 4 | Script |

Select download character set

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Std. | <ESC> “%” <1> | 27 37 1 | 1B 25 01 |

Selects the download character set. Ignored when EDS switch A-3 is set ON.

Select ROM character set

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Std. | <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 EDS switch A-3 is set ON.

OTHER PRINTER COMMANDS

Set MSB to 1

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Std. | <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 |

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

Accept MSB as is

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Std. | <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.

Set printer off-line

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

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

Set printer on-line

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

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

Bell

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

Sounds a brief beep tone from the printer.

Bi-directional printing

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

Causes subsequent printing to be done in the normal bi-directional mode, which is faster than uni-directional printing.

Uni-directional printing

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

Causes subsequent printing to be done uni-directionally, ensuring maximum vertical alignment precision.

One-line uni-directional printing

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------|---------|-------------|
| Std. | <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 printing resumes on the next line.

Manual feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Both | <ESC> <0> | 27 25 0 | 1B 19 00 |

Selects manual sheet feeding even when the Automatic Sheet Feeder is used. Ignored when the EDS switch A-4 is set on.

Auto feed

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|---------|-------------|
| Both | <ESC> <4> | 27 25 4 | 1B 19 04 |

Selects automatic sheet feeding with the Automatic Sheet Feeder. Ignored when the EDS switch A-4 is set on.

Eject paper

| Mode | ASCII | Decimal | Hexadecimal |
|------|---------------|----------|-------------|
| Both | <ESC> "R" | 27 25 82 | 1B 19 52 |

Ejects the current page. Ignored when the EDS switch A-4 is set on.

Set print start position on Automatic Sheet Feeder

| Mode | ASCII | Decimal | Hexadecimal |
|------|-------------------------|-------------------|-------------------|
| Both | <ESC> "T" <i>n</i> | 27 25 84 <i>n</i> | 1B 19 54 <i>n</i> |

Skips *n*/6 inches at the top of the page, where *n* is equal to or greater than 1. Ignored when the EDS switch A-4 is set on.

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.

Set initial conditions

| Mode | ASCII | Decimal | Hexadecimal |
|------|-----------------------|--------------|----------------|
| IBM | <ESC> "[" "K" <3> <0> | 27 91 75 3 0 | 1B 5B 4B 03 00 |
| | <0> <3> <i>n</i> | 0 3 <i>n</i> | 00 03 <i>n</i> |

Reinitializes the printer to the initial conditions determined by the value of *n*.

The value of *n* is the sum of the values given below for the desired characteristics.

| Function | <i>n</i> value |
|------------------|----------------|
| Disable alarm | 32 |
| Auto CR with LF | 16 |
| Auto LF with CR | 8 |
| 12-inch forms | 4 |
| Slashed zero | 2 |
| Character set #2 | 1 |

Chapter 9

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 to 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.

Before you start to define your own characters, you must set the EDS switch A-3 to the OFF position. Otherwise, the RAM is used to store the input buffer, and the download commands are ignored.

DEFINING YOUR OWN CHARACTERS WITH STANDARD MODE

Designing and printing your own characters has two requirements: first, 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 depends upon the print mode as shown below:

| Character mode | Horizontal | Vertical |
|--------------------------|------------|----------|
| Draft characters | 9 | 24 |
| LQ pica characters | 31 | 24 |
| LQ elite characters | 27 | 24 |
| LQ semi-condensed | 19 | 16 |
| LQ proportional | 37 | 24 |
| Draft super/subscript | 7 | 16 |
| LQ super/subscript | 19 | 16 |
| LQ prop. super/subscript | 37 | 16 |

- The minimum width of a character is five dots.
- Dots cannot overlap.
- You may define any position in the ASCII table.

Photocopy the grid in Figure 9-1 to help design your new characters. We will use a tiny representation of a telephone symbol for our example.

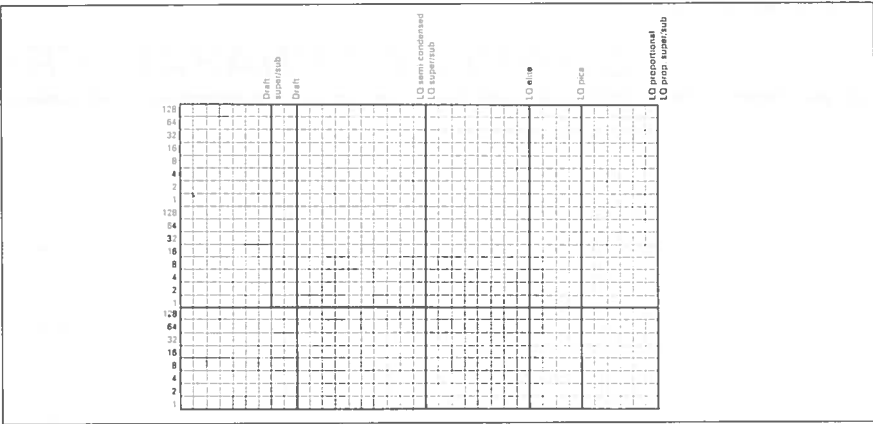


Figure 9-1. Use this grid (or one similar to it) to define your own characters.

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.

This is 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 powers of two we can take any combination of dots in a vertical column and assign them a unique value.

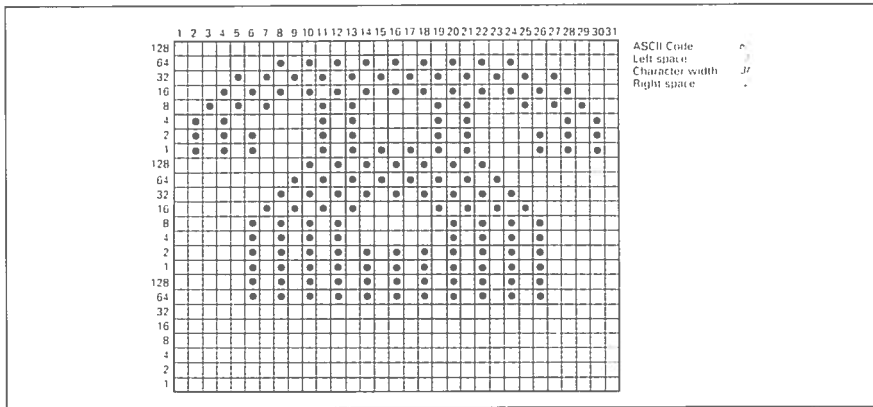


Figure 9-2. Telephone symbol with normal LQ pica.

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 if you are not 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 width of the character in dots. 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 | 31 | 36 |
| LQ elite characters | 27 | 30 |
| LQ semi-condensed | 19 | 24 |
| LQ proportional | 37 | 42 |
| Draft super/subscript | 7 | 12 |
| LQ super/subscript | 19 | 36 |
| LQ prop. super/subscript | 37 | 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 WIDTH "LPT1:",255
1010 LPRINT CHR$(27);"x1";
1020 LPRINT CHR$(27);"&";CHR$(0);
1030 LPRINT CHR$(60);CHR$(61);
1040 FOR N=60 TO 61
1050 READ LS :LPRINT CHR$(LS);
1060 READ CW :LPRINT CHR$(CW);
1070 READ RS :LPRINT CHR$(RS);
1080 FOR M=1 TO CW*3
1090 READ MM
1100 LPRINT CHR$(MM);
1110 NEXT M
1120 NEXT N
1130 LPRINT CHR$(27);"D";CHR$(11);CHR$(0)
1140 LPRINT CHR$(27);"k";CHR$(4);
1150 LPRINT CHR$(27);"w";CHR$(1);CHR$(27);"w";CHR$(1);
1160 LPRINT "    DIFFUSION RANGES OF" :LPRINT
1170 LPRINT "        CARS & TELEPHONES"
1180 LPRINT CHR$(27);"w";CHR$(0);CHR$(27);"w";CHR$(0)
1190 LPRINT CHR$(27);"k";CHR$(0);
1200 LPRINT CHR$(27);"%";CHR$(1);
1210 LPRINT "USA";CHR$(9);
1220 FOR I=0 TO 681 STEP 25 :LPRINT CHR$(60); :NEXT I
1230 LPRINT
1240 LPRINT CHR$(9);
1250 FOR I=0 TO 781 STEP 25 :LPRINT CHR$(61); :NEXT I
1260 LPRINT
1270 LPRINT "GERMANY";CHR$(9);
1280 FOR I=0 TO 412 STEP 25 :LPRINT CHR$(60); :NEXT I
1290 LPRINT
1300 LPRINT CHR$(9);
1310 FOR I=0 TO 488 STEP 25 :LPRINT CHR$(61); :NEXT I
1320 LPRINT
1330 LPRINT "JAPAN";CHR$(9);
1340 FOR I=0 TO 347 STEP 25 :LPRINT CHR$(60); :NEXT I
1350 LPRINT
1360 LPRINT CHR$(9);
1370 FOR I=0 TO 493 STEP 25 :LPRINT CHR$(61); :NEXT I
1380 LPRINT
1390 LPRINT CHR$(9);"+-";
1400 SCALE$="+-+-"
1410 FOR I=2 TO 8 :LPRINT SCALE$; :NEXT I
1420 LPRINT "+-+"
1430 LPRINT CHR$(9);"0 ";
1440 FOR I=1 TO 8
1450 LPRINT " ";I;
1460 NEXT I
1470 LPRINT CHR$(27);"%;CHR$(0)
1480 LPRINT CHR$(27);"M";
1490 LPRINT CHR$(27);"S";CHR$(0);
```



```

1500 LPRINT CHR$(9);"(100 UNITS/1000 PERSONS)"
1510 LPRINT CHR$(27);"T";
1520 LPRINT CHR$(27);"@"
1530 END
2000 ' DATA
2010 ' Telephone Symbol
2020 DATA 3, 31, 2
2030 DATA 0, 0, 0, 7, 0, 0, 8, 0, 0, 23, 0, 0, 40, 0, 0
2040 DATA 19, 15,192, 40, 16, 0, 80, 47,192, 32, 80, 0, 80,175,192
2050 DATA 47, 80, 0, 80,175,192, 47, 80, 0, 80,163,192, 33, 64, 0
2060 DATA 80,163,192, 33, 64, 0, 80,163,192, 47, 80, 0, 80,175,192
2070 DATA 47, 80, 0, 80,175,192, 32, 80, 0, 80, 47,192, 40, 16, 0
2080 DATA 19, 15,192, 40, 0, 0, 23, 0, 0, 8, 0, 0, 7, 0, 0
2090 DATA 0, 0, 0
2100 ' Car Symbol
2110 DATA 3, 31, 2
2120 DATA 0, 0, 0, 0, 30, 0, 0, 0, 0, 0, 60, 0, 0, 3, 0
2130 DATA 0,252,128, 0, 3, 64, 1,252,128, 2, 3, 64, 5,124,128
2140 DATA 10, 3, 0, 20,124, 0, 40, 0, 0, 80,126, 0, 32, 0, 0
2150 DATA 64,126, 0, 63,128, 0, 64,126, 0, 63,128, 0, 64,124, 0
2160 DATA 32, 3, 0, 64,124,128, 32, 3, 64, 64,124,128, 48, 3, 64
2170 DATA 76,124,128, 51, 3, 0, 12,252, 0, 3, 0, 0, 0,254, 0
2180 DATA 0, 0, 0

```

DIFFUSION RANGES OF CARS & TELEPHONES

USA

 #####

GERMANY

 #####

JAPAN

 #####

+-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+ +-+
 0 1 2 3 4 5 6 7 8
 (100 UNITS/1000 PERSONS)

DEFINING YOUR OWN CHARACTERS WITH IBM MODE

Downloading fonts in IBM mode requires downloading character Dot Pattern data and character Index Table data. Dot pattern data controls which pins fire when printing a character. Index Table data is placed in a “lookup table” that provides information on where Dot Pattern data is stored in memory and defines certain attributes of the character.

Assigning the download character set

You can define one or more download character sets for later use in IBM mode.

Before you start to design your characters, you must define what character set(s) you want to download.

The character width on which you design the characters depends upon the character set as shown below:

| Character set | Character width | Character ID |
|---------------------|-----------------|--------------|
| Draft characters | 9 | 0 |
| LQ pica characters | 35 | 1 |
| LQ elite characters | 29 | 2 |
| LQ proportional | 17 to 41 | 3 |

After you have decided your download character set, you must tell the printer where the download character data is to be stored, and how many download character sets you will define.

The first download font area starts from <800F>h, and you must enter 0 for the Format byte.

This Format byte indicates to the printer that the RAM is to store the download character set.

Following the format byte, you must enter the Character ID data. If you want to define more character sets, add 128 to the Character ID data.

The second area starts from <8911>h, the third area starts from <9212>h, and the last area starts from <9B13>h. But you need not enter a Format byte for these areas.

Assigning the character dot pattern

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

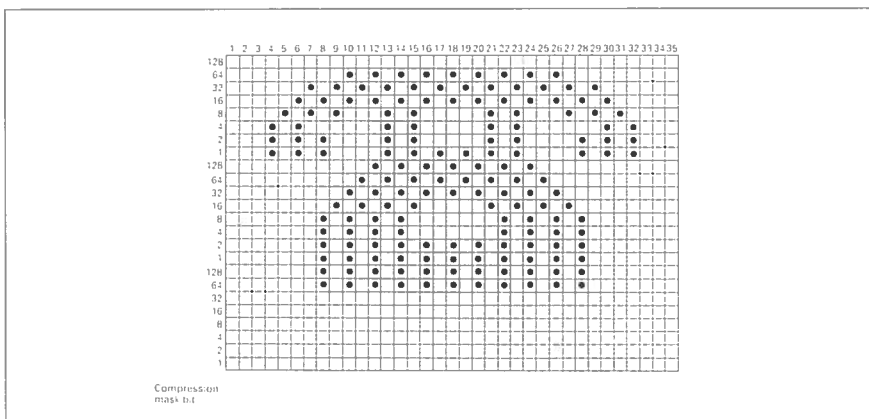


Figure 9-3. Telephone symbol with LQ pica.

After you have designed the character pattern, you need to compress the Dot Pattern.

Data compression allows you to store more download characters than without compression. It is a more efficient use of memory. The printer will repeat the previous dot column when the current column compression mask bit is set to "1".

Fill up the adjacent dot column even if it does not print, then compare each vertical line to the line on its left. If the line is the same as the left one, write "1" in the column for the compression mask bit. If it is not, write "0".

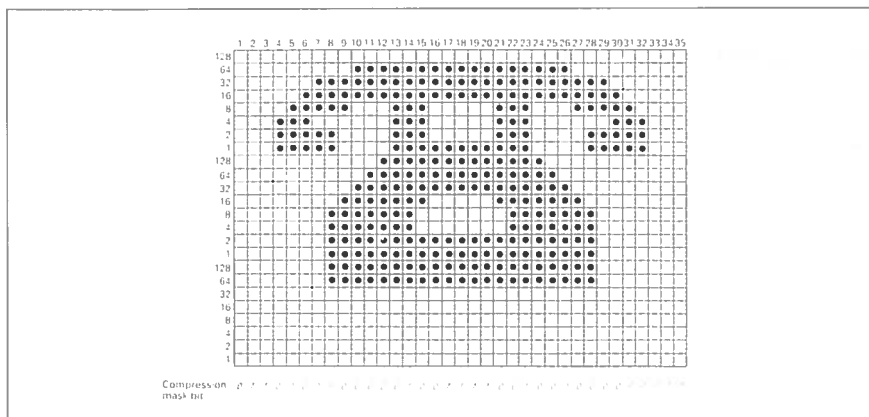


Figure 9-4. Fill up the adjacent dots, then write the compression data.

After you have written the compression mask bit data, line up all the character data for the compression mask bit that requires “0”. The telephone symbol looks like Figure 9-5.

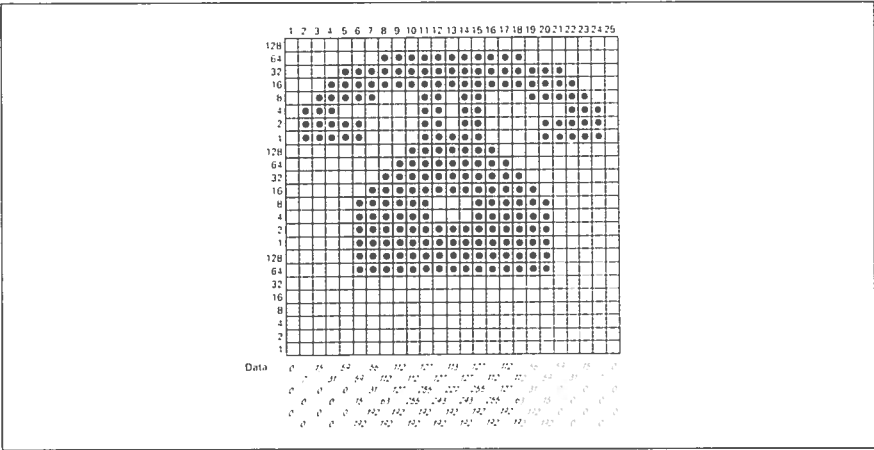


Figure 9-5. Compressed character pattern of telephone symbol.

Now we calculate the vertical numerical values of the columns of dots, and enter them underneath the grid. Each vertical column is first divided into three groups 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 powers of two we can take any combination of dots in a vertical column and assign them a unique value.

Assigning the Index Table data

Unlike defining in the Standard mode, you must assign the Index Table in the IBM mode.

This Index Table is prepared for the attribute data of each character, such as character type (Normal 24-dot high, or 30-dot high block graphics), the dot pattern data in the memory, and the compression mask bit data.

Each character requires 9 index table data.

The first and the second bytes (*m1* and *m2*) indicate the position of the first dot pattern in the memory. *m1* is the high order byte, and *m2* is the low order byte.

The third byte, *m3*, indicates the character type and the dot pattern data width in the memory.

If the character is normal, simply enter the width of the dot pattern in the memory. If your character is block graphics, add 128 to the width of the dot pattern in the memory.

Our telephone symbol is a normal character and the width of the dot pattern in the memory should be 25, so this value is 25.

The fourth byte, *m4*, indicates the printing attribute.

This byte indicates the character width to be printed and information on the repetition dots for block graphics characters.

If your character is a normal character, add 192 to the character width.

If your character is a block character and it should be printed as a line draw character, add 64 to the character width. If the block character is not a line draw character, this byte should be the same as the character width.

Our telephone symbol is a normal pica character, so the character width is 35, and this byte should be 227.

The remaining five bytes (*m5* through *m9*) indicate the compression mask bit. Each bits of this byte shows the data that will translate the compressed dot pattern data back to the original character pattern.

For example, the compression mask bits of our telephone symbol are 01100000 00000100 11110010 00000000 01100000. So these bytes are 96, 4, 242, 0, and 96.

You must define the index table data for all characters from 0 to 255. If you do not want to define a particular character, enter 0 into that index table data.

Sample program

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

```
1000 WIDTH "LPT1:",255
1010 LPRINT CHR$(27);"=";CHR$(164);CHR$(9);"#";
1020 LPRINT CHR$(80);CHR$(80);CHR$(0);
1030 ' INDEX TABLE
1040 LPRINT CHR$(1);
1050 FOR I=0 TO 59
1060 LPRINT STRING$(9,0);
1070 NEXT I
1080 FOR IT=1 TO 9 :READ MM :LPRINT CHR$(MM); :NEXT IT
1090 FOR IT=1 TO 9 :READ MM :LPRINT CHR$(MM); :NEXT IT
1100 FOR I=62 TO 255
1110 LPRINT STRING$(9,0);
1120 NEXT I
1130 ' DOT PATTERN
1140 FOR DP=1 TO 159
1150 READ MM
1160 LPRINT CHR$(MM);
1170 NEXT DP
1180 ' PRINTOUT PROGRAM
1190 LPRINT CHR$(27);"D";CHR$(11);CHR$(0)
1200 LPRINT CHR$(27);"k";CHR$(4);
1210 LPRINT CHR$(27);"[";"@";CHR$(4);CHR$(0);
1220 LPRINT CHR$(0);CHR$(0);CHR$(34);CHR$(2);
1230 LPRINT "    DIFFUSION RANGES OF"
1240 LPRINT "        CARS & TELEPHONES"
1250 LPRINT CHR$(27);"[";"@";CHR$(4);CHR$(0);
1260 LPRINT CHR$(0);CHR$(0);CHR$(17);CHR$(1);
1270 LPRINT CHR$(27);"k";CHR$(0)
1280 LPRINT "USA";CHR$(9);
1290 LPRINT CHR$(27);"I";CHR$(6);
1300 FOR I=0 TO 681 STEP 25 :LPRINT CHR$(60); :NEXT I
1310 LPRINT
1320 LPRINT CHR$(9);
1330 FOR I=0 TO 781 STEP 25 :LPRINT CHR$(61); :NEXT I
1340 LPRINT CHR$(27);"I";CHR$(2)
1350 LPRINT "GERMANY";CHR$(9);
1360 LPRINT CHR$(27);"I";CHR$(6);
1370 FOR I=0 TO 412 STEP 25 :LPRINT CHR$(60); :NEXT I
1380 LPRINT
1390 LPRINT CHR$(9);
1400 FOR I=0 TO 488 STEP 25 :LPRINT CHR$(61); :NEXT I
1410 LPRINT CHR$(27);"I";CHR$(2)
1420 LPRINT "JAPAN";CHR$(9);
1430 LPRINT CHR$(27);"I";CHR$(6);
1440 FOR I=0 TO 347 STEP 25 :LPRINT CHR$(60); :NEXT I
1450 LPRINT
1460 LPRINT CHR$(9);
1470 FOR I=0 TO 493 STEP 25 :LPRINT CHR$(61); :NEXT I
1480 LPRINT CHR$(27);"I";CHR$(2)
1490 LPRINT CHR$(9);"+-";
```

```

1500 SCALE$="+-+="-
1510 FOR I=1 TO 7          :LPRINT SCALES;      :NEXT I
1520 LPRINT "+--+"
1530 LPRINT CHR$(9);"O ";
1540 FOR I=1 TO 8
1550 LPRINT " ";I;
1560 NEXT I
1570 LPRINT CHR$(27);":"
1580 LPRINT CHR$(27);"S";CHR$(0);
1590 LPRINT CHR$(9);"(100 UNITS/1000 PERSONS)"
1600 LPRINT CHR$(27);"T";
1610 LPRINT CHR$(27);"@
1620 END
2000 ' DATA
2010 ' Index Table Data
2020 DATA 137, 17, 25,227, 96, 4,242, 0, 96
2030 DATA 137, 92, 28,227, 96, 0, 80, 64, 96
2040 ' Dot Pattern Data
2050 ' Telephone symbol
2060 DATA 0, 0, 0, 7, 0, 0, 15, 0, 0, 31, 0, 0, 59, 0, 0
2070 DATA 59, 15,192, 56, 31,192,112, 63,192,112,127,192,112,255,192
2080 DATA 127,255,192,127,243,192,113,227,192,127,243,192,127,255,192
2090 DATA 112,255,192,112,127,192,112, 63,192, 56, 31,192, 59, 15,192
2100 DATA 59, 0, 0, 31, 0, 0, 15, 0, 0, 7, 0, 0, 0, 0, 0
2110 ' Car Symbol
2120 DATA 0, 0, 0, 0, 30, 0, 0, 28, 0, 0, 60, 0, 0, 63, 0
2130 DATA 0,255,128, 0,255,192, 1,255,192, 3,255,192, 7,127,128
2140 DATA 14,127, 0, 28,124, 0, 56,124, 0,112,126, 0, 96,124, 0
2150 DATA 127,254, 0,127,252, 0, 96,124, 0, 96,127, 0, 96,127,128
2160 DATA 96,127,192,112,127,192,124,127,128, 63,127, 0, 15,124, 0
2170 DATA 3,124, 0, 0,254, 0, 0, 0, 0

```

MEMO

Chapter 10

MS-DOS AND YOUR PRINTER

When using your printer with an IBM PS/2, PC-AT or compatible, you will probably be using PC-DOS or MS-DOS as the 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 those manuals.

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 as there may be 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, you can make this setting from the control panel before you start printing. See Chapter 4.

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 8. We suggest the following:

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

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

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. Do not type the symbol “^”. This symbol means to hold the CTRL key down while pressing the next key: for example, ^V means to type CTRL-V. ^C means to type CTRL-C, which indicates the end of the input.

```
A>EDLIN LQELITE.DAT
```

```
New file
```

```
* I
```

```
1: * ^V [x1 ^V [! ^VA
```

```
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 from A in the ASCII sequence. Similarly, ^VA enters the control code <I>. See your DOS manual if you need further information about EDLIN.

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

```
A>COPY LQELITE.DAT PRN
```

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

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

```
A>COPY CON LQPRINT.BAT
```

```
COPY LQELITE.DAT PRN
```

```
PRINT %1
```

```
^Z
```

```
A>LQPRINT README.DOC
```

The first line above 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 downloadable condition.

```
1000 ' Set control codes
1010 ES=CHR$(27) 'Escape code
1020 DS=ES+"x0" 'Draft quality
1030 LS=ES+"x1"+ES+"k" 'Letter quality
1040 RMS=LS+CHR$(0) 'Roman character
1050 HS=CHR$(9) 'Horizontal tab
1060 PI$=ES+"P" 'Pica pitch
1070 ' Start printing
1080 WIDTH "LPT1:",255
1090 LPRINT ES;"D";CHR$(8);CHR$(24);CHR$(0) 'Set HT
1100 LPRINT RMS;"Resident fonts are:"
1110 LPRINT HS;DS;"Draft characters,";
1120 LPRINT HS;LS;CHR$(0);"Roman characters,"
1130 LPRINT HS;LS;CHR$(1);"Sanserif characters,"
1140 LPRINT HS;LS;CHR$(2);"Courier characters,"
1150 LPRINT HS;LS;CHR$(3);"Prestige characters,"
1160 LPRINT HS;LS;CHR$(4);"Script characters."
1170 LPRINT
1180 LPRINT RMS;"Print pitches are:"
1190 LPRINT HS;PI$;"Pica pitch (10 CPI),";
1200 LPRINT HS;ES;"M";"Elite pitch (12 CPI),";
1210 LPRINT HS;ES;"g";"Semi-condensed pitch (15 CPI),";
1220 LPRINT HS;PI$;
1230 LPRINT CHR$(15); 'Select condensed print
1240 LPRINT "Condensed pica pitch (17 CPI),";
1250 LPRINT HS;ES;"M";"Condensed elite pitch (20 CPI),";
1260 LPRINT CHR$(18) 'Cancel condensed print
1270 LPRINT HS;ES;"p1"; 'Select proportional spacing
1280 LPRINT PI$;"Normal proportional,"
1290 LPRINT HS;CHR$(15);"Condensed proportional.";
1300 LPRINT CHR$(18);
1310 LPRINT ES;"p0" 'Cancel proportional spacing
1320 LPRINT
1330 LPRINT HS;ES;"w1";"Double-height,";ES;"w0"
1340 LPRINT HS;ES;"W1";"Double width,";ES;"W0"
1350 LPRINT HS;CHR$(28);"E";CHR$(2);"Triple width.";
1360 LPRINT CHR$(28);"E";CHR$(0)
1370 LPRINT
1380 LPRINT RMS;"Various line and character spacings:"
1390 FOR I=1 TO 7
1400 LPRINT ES;"A";CHR$(I); 'Line spacing set
1410 LPRINT ES;" ";CHR$(I); 'Increase character space
1420 LPRINT HS;"THE SPACINGS ARE CHANGED"
1430 NEXT I
1440 FOR I=7 TO 1 STEP -1
1450 LPRINT ES;"A";CHR$(I); 'Line spacing set
1460 LPRINT ES;" ";CHR$(I); 'Increase character space
1470 LPRINT HS;"THE SPACINGS ARE CHANGED"
1480 NEXT I
1490 LPRINT ES;"3";CHR$(30); 'Set 1/6" line spacing
```

```

1500 LPRINT ES;" ";CHR$(0);          'Normal character space
1510 LPRINT :LPRINT
1520 LPRINT RMS;"Other features:"
1530 LPRINT HS;ES;"q";CHR$(1);"OUTLINED";ES;"q";CHR$(0);", "
1540 LPRINT ES;"q";CHR$(2);"SHADOWED";ES;"q";CHR$(0);", "
1550 LPRINT HS;ES;"q";CHR$(3);"OUTLINED WITH SHADOWED";
1560 LPRINT ES;"q";CHR$(0);", "
1570 LPRINT HS;ES;"E";"Emphasized";ES;"F";", "
1580 LPRINT ES;"G";"Double-strike";ES;"H";", "
1590 LPRINT ES;"4";"Italics";ES;"5";", "
1600 LPRINT HS;ES;"1";"Underlining";ES;"0";", "
1610 LPRINT ES;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(2);CHR$(2);
1620 LPRINT "Strike-through";
1630 LPRINT ES;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(2);CHR$(0);", "
1640 LPRINT ES;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(3);CHR$(1);
1650 LPRINT "Overlining";
1660 LPRINT ES;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(3);CHR$(0);", "
1670 LPRINT HS;ES;"S0";"SUPERSCRIPT";ES;"T";" and ";
1680 LPRINT ES;"S1";"SUBSCRIPT";ES;"T";", "
1690 LPRINT HS;RMS;"Download characters: ";
1700 SS$=ES+"S0"                    'Superscript
1710 GOSUB 2520
1720 LPRINT ES;"%1";                  'Select download character
1730 FOR I=1 TO 5
1740 LPRINT CHR$(60);                'Print download character
1750 NEXT I
1760 LPRINT ES;"%0";                  'Select normal character
1770 LPRINT ES;"T";                  'Cancel superscript
1780 GOSUB 2650
1790 LPRINT ES;"%1";                  'Select download character
1800 FOR I=1 TO 5
1810 LPRINT CHR$(60);                'Print download character
1820 NEXT I
1830 LPRINT ES;"%0";                  'Select normal character
1840 SS$=ES+"S1"                      'Subscript
1850 GOSUB 2520
1860 LPRINT ES;"%1";                  'Select download character
1870 FOR I=1 TO 5
1880 LPRINT CHR$(60);                'Print download character
1890 NEXT I
1900 LPRINT ES;"%0";                  'Select normal character
1910 LPRINT ES;"T";                  'Cancel superscript
1920 LPRINT HS;RMS;"Dot graphics:"
1930 RESTORE 3170
1940 LPRINT ES;"A";CHR$(8);           'Set 8/60" line spacing
1950 FOR I=1 TO 3
1960 LPRINT ES;"$";CHR$(160);CHR$(0); 'Absolute tab
1970 LPRINT ES;"*";CHR$(33);CHR$(240);CHR$(0);
1980 FOR J=1 TO 240*3
1990 READ DAT
2000 LPRINT CHR$(DAT);
2010 NEXT J
2020 LPRINT
2030 NEXT I
2040 LPRINT ES;"@"                    'Initialize printer
2050 END
2500 '
2510 ' SUBROUTINES

```

```

2520 ' Define super/subscript download character
2530 LPRINT SSS; 'Select super/subscript
2540 LPRINT ES;"&";CHR$(0);CHR$(60);CHR$(60);
2550 RESTORE 3010
2560 READ LS :LPRINT CHR$(LS);
2570 READ CW :LPRINT CHR$(CW);
2580 READ RS :LPRINT CHR$(RS);
2590 FOR M=1 TO CW*2
2600 READ MM
2610 LPRINT CHR$(MM);
2620 NEXT M
2630 RETURN
2640 '
2650 ' Define LQ pica download character
2660 LPRINT CS;
2670 LPRINT ES;"&";CHR$(0);CHR$(60);CHR$(60);
2680 RESTORE 3070
2690 READ LS :LPRINT CHR$(LS);
2700 READ CW :LPRINT CHR$(CW);
2710 READ RS :LPRINT CHR$(RS);
2720 FOR M=1 TO CW*3
2730 READ MM
2740 LPRINT CHR$(MM);
2750 NEXT M
2760 RETURN
3000 ' DATA
3010 ' Super/subscript download character data
3020 DATA 9, 19, 8
3030 DATA 12, 0, 16, 0, 44, 0, 80,120, 32,128, 95,120, 32,128
3040 DATA 95,120, 32,128, 65,120, 32,128, 95,120, 32,128, 95,120
3050 DATA 32,128, 80,120, 44, 0, 16, 0, 12, 0
3060 '
3070 ' LQ pica download character data
3080 DATA 3, 31, 2
3090 DATA 0, 0, 0, 7, 0, 0, 8, 0, 0, 23, 0, 0, 40, 0, 0
3100 DATA 19, 15,192, 40, 16, 0, 80, 47,192, 32, 80, 0, 80,175,192
3110 DATA 47, 80, 0, 80,175,192, 47, 80, 0, 80,163,192, 33, 64, 0
3120 DATA 80,163,192, 33, 64, 0, 80,163,192, 47, 80, 0, 80,175,192
3130 DATA 47, 80, 0, 80,175,192, 32, 80, 0, 80, 47,192, 40, 16, 0
3140 DATA 19, 15,192, 40, 0, 0, 23, 0, 0, 8, 0, 0, 7, 0, 0
3150 DATA 0, 0, 0
3160 '
3170 ' Dot graphics data
3180 ' 1ST LINE
3190 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3200 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3210 DATA 0, 0, 0, 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, 127,255, 0,255,255
3240 DATA 1,255,255, 3, 0, 0, 7, 0, 0, 7, 0, 0, 15, 0, 0
3250 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3260 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3270 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3280 DATA 31, 0, 0, 31,128, 0, 31,224, 0, 31,248, 0, 31,255, 0
3290 DATA 31,255,224, 15,255,248, 7,255,255, 1,255,255, 0,127,255
3300 DATA 0, 7,255, 0, 0,255, 0, 0, 63, 0, 0, 63, 0, 0,248
3310 DATA 0, 3,192, 0, 63, 0, 0,248, 0, 1,128, 0, 3, 0, 0
3320 DATA 7, 0, 0, 15, 0, 0, 15, 0, 0, 31, 0, 0, 31, 0, 0

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```

3330 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3340 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3350 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3360 DATA 31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,255
3370 DATA 31,255,255, 15,255,255, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
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, 60, 0, 3,255, 0, 11,195, 0, 28, 0
3410 DATA 0, 12, 0, 0, 96, 0, 0,192, 0, 0,192, 0, 1,128, 0
3420 DATA 3, 0, 0, 3, 0, 0, 7, 0, 0, 7, 0, 0, 15, 0, 0
3430 DATA 15, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 15
3440 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
3450 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
3460 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31
3470 DATA 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 31, 31, 0, 63
3480 DATA 31,255,255, 31,255,255, 31,255,247, 31,255,231, 31,255,199
3490 DATA 15,255,135, 7,255, 7, 0, 0, 3, 0, 0, 1, 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, 0,254, 0
3520 DATA 1,255,240, 3,135,255, 7, 0, 63, 15, 0, 0, 15, 0, 0
3530 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3540 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31,128, 0, 31,128, 0
3550 DATA 31,192, 0, 31,255, 0, 31,255,255, 31,255,255, 31,255,255
3560 DATA 31,255,255, 15,255,255, 7,255,255, 0,255,240, 1,254, 0
3570 DATA 1,240, 0, 3,128, 0, 7, 0, 0, 15, 0, 0, 31, 0, 0
3580 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3590 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31,128, 0, 31,128, 0
3600 DATA 31,192, 0, 31,240, 0, 31,255, 0, 31,255,240, 31,255,255
3610 DATA 31,255,255, 7,255,255, 0,255,255, 0,255,255, 1,255,240
3620 DATA 3,192, 0, 7,128, 0, 15, 0, 0, 31, 0, 0, 31, 0, 0
3630 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 0
3640 DATA 31, 0, 0, 31, 0, 0, 31, 0, 0, 31, 0, 15, 31,135,255
3650 DATA 31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,240
3660 DATA 15,252, 0, 47,128, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3670 ' 2ND LINE
3680 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3690 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3700 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3710 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3720 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,255,255,255,255,255,255
3730 DATA 255,255,255, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3740 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3750 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3760 DATA 255,255,255, 31,255,255, 7,255,255, 0,255,255, 0, 31,255
3770 DATA 0, 3,255, 0, 0,255, 0, 0, 31, 0, 0, 7, 0, 0, 0
3780 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,224, 0, 0,252, 0, 0
3790 DATA 254, 0, 0,248, 0, 0,192, 0, 0, 0, 0, 0, 0, 0, 0
3800 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 7, 0, 63
3810 DATA 0, 1,255, 0, 15,255, 0,127,255, 1,255,255, 15,255,255
3820 DATA 255,255,255, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3830 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3840 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3850 DATA 255,255,255,255,255,255,255,255,255,255,255,255,255,255
3860 DATA 255,255,255,255,255,255, 0, 0, 0, 0, 0, 0, 0, 0, 0
3870 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3880 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3890 DATA 0, 7,224, 0, 63,252,128,120, 31,192,224, 3, 97,128, 0
3900 DATA 59, 0, 0, 30, 0, 0, 14, 0, 0, 12, 0, 0, 12, 0, 0

```

```

3910 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3920 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 63, 0
3930 DATA 128,127,128,128,127,128,128,127,128,128,127,128,128,255,128
3940 DATA 223,255,128,255,255,128,255,255, 0,224, 0, 0,224, 0, 0
3950 DATA 224, 0, 0,224, 0, 0,224, 0, 0,224, 0, 0,224, 0, 0
3960 DATA 224, 0, 0,224, 0, 0,224, 0, 0,224, 0, 0,224, 0, 0
3970 DATA 224, 0, 1,224, 0, 3,240, 0, 15,255,255,255,255,254
3980 DATA 255,255,254,255,255,252,255,255,248,255,255,224,255,255,128
3990 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4000 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4010 DATA 0, 0, 0, 0, 0, 0, 0,240, 0, 0,255, 0, 0,15,248, 0
4020 DATA 0, 63, 0, 0, 3,248, 0, 0, 31, 0, 0, 3, 0, 0, 0
4030 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4040 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0,255, 0, 0,255,224, 0
4050 DATA 255,128, 0,240, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4060 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 7, 0, 0,127
4070 DATA 0, 7,255, 0, 63,255, 1,255,255, 31,255,255, 3,255,255
4080 DATA 0,127,254, 0, 7,252, 0, 0,127, 0, 0, 7, 0, 0, 0
4090 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,128, 0, 0
4100 DATA 248, 0, 0,255, 0, 0,255,192, 0,128, 0, 0, 0, 0, 0, 0
4110 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4120 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 63
4130 DATA 0, 31,255, 7,255,255,255,255,255,255,255,255,255,254
4140 DATA 255,255,192,255,248, 0,255, 0, 0, 0, 0, 0, 0, 0, 0, 0
4150 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4160 ' 3RD LINE
4170 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 0, 0, 56
4180 DATA 0, 0, 56, 0, 0,120, 0, 0,248, 0, 1,248, 0, 1,248
4190 DATA 0, 3,248, 0, 7,248, 0, 7,248, 0, 15,248, 0, 15,248
4200 DATA 0, 31,248, 0, 63,248, 0,127,248, 0,127,248, 0,255,248
4210 DATA 0,255,248, 1,255,248, 3,255,248,199,255,248,247,255,248
4220 DATA 255,255,248, 31,255,240, 15,255,240, 15,255,224, 15,255,224
4230 DATA 15,255,192, 15,255,192, 15,255,192, 15,255,128, 15,255,128
4240 DATA 15,255, 0, 15,255, 0, 15,255, 0, 15,254, 0, 15,254, 0
4250 DATA 252,252, 24,252,252, 56,249,252,248,249,252,248,243,255,248
4260 DATA 227,255,248,231,255,248,199,255,248,231,255,248,255,255,248
4270 DATA 31,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
4280 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,207,248
4290 DATA 31, 15,248, 30, 31,248,252, 63,248,248,127,248,240,127,240
4300 DATA 224,255,240,225,255,240,195,255,224,199,255,192,247,255,128
4310 DATA 255,255,128, 63,255, 0, 31,254, 0, 15,254, 0, 15,252, 0
4320 DATA 15,248, 0, 15,240, 0, 15,240, 0, 15,224, 0, 15,192, 0
4330 DATA 15,192, 0, 15,128, 0, 15, 0, 0, 31, 0, 0, 62, 0, 0
4340 DATA 252, 0, 0,252, 0, 0,248, 0, 0,240, 0,224,240, 0,240
4350 DATA 224, 1,240,192, 1,248, 0, 3,248, 0, 3,248, 0, 3,248
4360 DATA 0, 7,248, 0, 7,248, 0, 63,248, 0,127,248, 0,127,248
4370 DATA 0,255,248, 0,255,248, 1,255,248, 1,255,248, 1,255,248
4380 DATA 3,255,248, 3,255,248, 3,255,248,131,255,248,199,255,248
4390 DATA 103,255,248,119,255,248, 55,255,248, 63,255,248, 31,255,248
4400 DATA 31,255,248, 31,255,248, 15,255,248, 15,255,248, 15,255,248
4410 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
4420 DATA 15,255,240, 15,255,224, 15,255,192, 15,255,192, 15,254, 0
4430 DATA 15,254, 0, 15,254, 0, 15,254, 0, 15,254, 0, 15,254, 0
4440 DATA 15,252, 0, 15,252, 0, 15,248, 0, 15,240, 0, 31,240, 0
4450 DATA 31,224, 0, 31,192, 0, 55,128, 0, 48, 0, 8, 96, 0, 24
4460 DATA 192, 0, 24,128, 0, 56, 0, 0, 56, 0, 0,120, 0, 0,120
4470 DATA 0, 0,248, 0, 0,248, 0, 1,248, 0, 1,248, 0, 3,248
4480 DATA 0, 3,248, 0, 7,248, 0, 7,248, 0, 15,248, 0, 15,248

```



```

4490 DATA 0, 31,248, 0, 31,240, 0, 63,240, 0, 63,224, 0,127,224
4500 DATA 0,127,192, 0,255,192, 0,255,128, 1,255,128, 1,255, 24
4510 DATA 3,255, 56, 3,255,248,231,255,248,255,255,248, 31,255,248
4520 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
4530 DATA 15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
4540 DATA 15,255,240, 15,255,240, 15,255,224, 15,255,224, 15,255,192
4550 DATA 15,255,192, 31,255,128,254,127,128,252,127, 24,248,255, 56
4560 DATA 248,255,248,240,255,248,225,255,248,193,255,248,131,255,248
4570 DATA 3,255,248, 7,255,248,135,255,248,231,255,248,255,255,248
4580 DATA 63,255,248, 31,255,248, 15,255,248, 15,255,248, 15,255,240
4590 DATA 15,255,240, 15,255,224, 15,255,192, 15,255,128, 15,255, 0
4600 DATA 15,254, 0, 15,252, 0, 15,248, 0, 15,240, 0, 15,224, 0
4610 DATA 15,192, 0, 15, 0, 0, 62, 0, 0,252, 0, 0,248, 0, 0
4620 DATA 240, 0, 0,224, 0, 0,192, 0, 0,128, 0, 0, 0, 0, 0
4630 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4640 DATA 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 1060). You can find most of these commands near the beginning of chapter 8.

The WIDTH “LPT1:” 255 statement in line 1080 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 1090. Using the preassigned commands, the program prints samples of its different fonts, followed by samples of the print pitches, then some expanded 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 two printer commands: a command to vary the line spacing (lines 1400 and 1450); and a command to micro-adjust the space between characters (lines 1410 and 1460).

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

The row of telephone symbols in the next printed line is created by downloading two new character patterns, which are printed in place of the character “<” (character 60). Details can be found in Chapter 9.

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 3180 to 4640 with the help of a calculator. Each number represents eight vertical dots. (See “Graphics commands” in Chapter 8 for details.)

The pattern is printed in three rows, each row is twenty-four dots high and 240 dots wide. Line 1940 sets the line spacing to 8/60 inch so that the rows will connect vertically. The loop in lines 1950 to 2030 does the printing in three passes of the print head.

Chapter 11

REFERENCE

SPECIFICATIONS

| | | | |
|--|---|-------------|----------------|
| Printing system | Serial Impact Dot-matrix | | |
| Printing speed | Pica | Elite | Semi-condensed |
| Draft | 200 cps | 240 cps | 300 cps |
| Letter Quality | 67 cps | 80 cps | 100 cps |
| Print direction | Bi-directional, logic-seeking Uni-directional, logic-seeking (selectable) | | |
| Print head | 24 pins | | |
| Life | 200 million dots/pin | | |
| Line spacing | 1/6, 1/8, <i>n</i> /60, <i>n</i> /70, <i>n</i> /180, <i>n</i> /216, <i>n</i> /360 inches | | |
| Font styles | Draft, Roman, Sanserif, Courier, Prestige, Script | | |
| Characters | ASCII | 96 | |
| | International | 16 sets (*) | |
| | IBM special | 111 | |
| | IBM block graphic | 50 | |
| | IBM code page | 6 sets (**) | |
| | Download | 256 | |
| * USA, France, Germany, England, Denmark I, Sweden, Italy, Spain I, Japan, Norway, Denmark II, Spain II, Latin America, Korea, Ireland, Legal | | | |
| ** #437 (USA), #850 (Multi-Lingual), #860 (Portuguese), #861 (Icelandic), #863 (Canadian French), #865 (Nordic) | | | |
| Number of columns | | | |
| Pica (10 CPI) | 136 | | |
| Elite (12 CPI) | 163 | | |
| Semi-condensed (15 CPI) | 204 | | |
| Condensed pica (17 CPI) | 233 | | |
| Condensed elite (20 CPI) | 272 | | |
| Proportional | Variable | | |

| Character matrix | Draft | LQ |
|------------------|--------|---------------|
| Pica | 24 × 9 | 24 × 31 |
| Elite | 24 × 9 | 24 × 27 |
| Semi-condensed | 16 × 7 | 16 × 21 |
| Condensed pica | 24 × 9 | 24 × 16 |
| Condensed elite | 24 × 9 | 24 × 16 |
| Proportional | — | 24 × <i>n</i> |

Bit image dot-matrix

| | |
|------------------------------------|-----------|
| 8-pin normal (60 DPI) | 8 × 816 |
| 8-pin double (120 DPI) | 8 × 1632 |
| 8-pin high-speed double (120 DPI)* | 8 × 1632 |
| 8-pin quadruple (240 DPI)* | 8 × 3264 |
| 8-pin CRT I (80 DPI) | 8 × 1088 |
| 8-pin CRT II (90 DPI) | 8 × 1224 |
| 24-pin normal (60 DPI) | 24 × 816 |
| 24-pin double (120 DPI) | 24 × 1632 |
| 24-pin CRT III (90 DPI) | 24 × 1224 |
| 24-pin Triple (180 DPI) | 24 × 2448 |
| 24-pin Hex (360 DPI)* | 24 × 4896 |

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

Paper feed

| | |
|----------------|--|
| Standard | Friction feed with paper guide |
| | Push tractor feed from the rear of the printer |
| Option | Friction feed with Automatic Sheet Feeder |
| | Pull tractor feed from the rear of the printer |

Paper feed speed3.4 inches/second max

Paper specifications

Cut sheet

| | |
|-----------------|---|
| Width | 7.17" - 16.54" (182.0 - 420.0 mm) |
| Length | 5.5" - 14.0" (139.7 - 355.6 mm) |
| Thickness | 0.08 - 0.12 mm |
| Weight | 60 - 90 g/m ² , 52 - 77 kg, 16 - 24 lb |

Fanfold (continuous)

| | |
|-----------------|---|
| Width | 4.0" - 16.0" (101.6 - 406.4 mm) |
| Length | Minimum 5.5" (139.7 mm) |
| Thickness | Single-ply paper 0.07 - 0.11 mm Total for multi-part forms 0.25 mm |
| Weight | 52 - 82 g/m ² , 45 - 70 kg, 14 - 22 lb |
| Copies | Original + 2 copies |

| | |
|---------------------------|---|
| Maximum buffer size | Without Download 40.0 kB With Download 256 Bytes |
|---------------------------|---|

Emulations

| | |
|---------------------|--|
| Standard mode | Epson LQ-1060, NEC 24-wire Graphics commands |
|---------------------|--|

| | |
|----------------|----------------------|
| IBM mode | IBM Proprinter XL24E |
|----------------|----------------------|

| | |
|-----------------|---|
| Interface | Centronics parallel (standard) RS-232C serial (option) |
|-----------------|---|

| | |
|-------------------|---|
| Ribbon type | On-carriage, dedicated Monochrome (Black only) |
|-------------------|---|

Ribbon life

| | |
|------------------------|-----------------------------------|
| Monochrome (Z24) | 2 million characters (draft pica) |
|------------------------|-----------------------------------|

| | |
|--|-----------------------------------|
| Long life monochrome (LZ24HD) | 4 million characters (draft pica) |
|--|-----------------------------------|

Dimensions and Weight

| | |
|--------------|-------------------|
| Width | 590 mm (23.2") |
| Depth | 332 mm (13.1") |
| Height | 127 mm (5.0") |
| Weight | 7.65 kg (16.9 lb) |

| | |
|--------------------|--|
| Power supply | 120VAC, 220VAC, 230VAC, 240VAC, 50/60 Hz (varies according to the country of purchase) |
|--------------------|--|

| | |
|---------------|---|
| Options | Automatic Sheet Feeder (SF-15DJ) Pull Tractor Unit (PT-15XJ) Serial-Parallel Converter (SPC-8K) |
|---------------|---|

PINOUT OF INTERFACE CONNECTOR

The following describes the pinout of the interface connector (signals which are low when active are overlined).

Parallel interface

| 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 EDS 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 | <u>SELECT IN</u> | Always high |

Serial Interface

| Pin | Name | Function |
|------------|-------------|--|
| 1 | GND | Printer's chassis ground |
| 2 | TXD | This pin carries data from the printer |
| 3 | RXD | This pin carries data to the printer |
| 4 | RTS | This pin is always set to Space |
| 5 | CTS | This pin is Space when the computer is ready to send data. This printer does not check this pin |
| 6 | N/C | |
| 7 | GND | Signal ground |
| 8 ~ 10 | N/C | |
| 11 | RCH | This printer turns this pin to Space when it is ready to receive data. This line carries the same signal as pin 20 |
| 12 | N/C | |
| 13 | GND | Signal ground |
| 14 ~ 19 | N/C | |
| 20 | DTR | This printer turns this pin to Space when it is ready to receive data |
| 21 ~ 25 | N/C | |

CHARACTER SETS

The following tables show the 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 | <NUL> 0 16 32 48 64 80 96 112 | <DLE> 1 17 33 49 65 81 97 113 | 2 18 34 50 66 82 98 114 | 0 48 64 80 96 112 | @ 64 80 96 112 | P 80 96 112 | 96 112 | p 112 |
| 1 | 1 17 33 49 65 81 97 113 | <DC1> 1 17 33 49 65 81 97 113 | ! 17 33 49 65 81 97 113 | 1 49 65 81 97 113 | A 65 81 97 113 | Q 81 97 113 | a 97 113 | q 113 |
| 2 | 2 18 34 50 66 82 98 114 | <DC2> 2 18 34 50 66 82 98 114 | " 18 34 50 66 82 98 114 | 2 50 66 82 98 114 | B 66 82 98 114 | R 82 98 114 | b 98 114 | r 114 |
| 3 | 3 19 35 51 67 83 99 115 | <DC3> 3 19 35 51 67 83 99 115 | # 19 35 51 67 83 99 115 | 3 51 67 83 99 115 | C 67 83 99 115 | S 83 99 115 | s 99 115 | |
| 4 | 4 20 36 52 68 84 100 116 | 4 20 36 52 68 84 100 116 | 4 20 36 52 68 84 100 116 | 4 52 68 84 100 116 | D 68 84 100 116 | 84 100 116 | 100 116 | |

Standard character set #2

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|--|--|---|---|--------------------------------------|--------------------------------------|--------------------------------------|--|
| 0 | <NUL> 0 16 32 48 64 80 96 112 | | | 0 1 2 3 4 5 6 7 | @ A B C D E F G | P Q R S T U V W | ` a b c d e f g | p q r s t u v w |
| 1 | | <DC1> 1 17 33 49 65 81 97 113 | ! | 1 2 3 4 5 6 7 | A B C D E F G | Q R S T U V W | a b c d e f g | q r s t u v w |
| 2 | | <DC2> 2 18 34 50 66 82 98 114 | " | 2 3 4 5 6 7 | B C D E F G | R S T U V W | b c d e f g | r s t u v w |
| 3 | | <DC3> 3 19 35 51 67 83 99 115 | # | 3 4 5 6 7 | C D E F G | S T U V W | c d e f g | s t u v w |
| 4 | | <DC4> 4 20 36 52 68 84 100 116 | \$ | 4 5 6 7 | D E F G | T U V W | d e f g | t u v w |
| 5 | | | % 37 53 69 85 101 117 | 5 6 7 | E F G | U V W | e f g | u v w |
| 6 | | | & 38 54 70 86 102 118 | 6 7 | F G | V W | f g | v w |
| 7 | <BEL> 7 23 39 55 71 87 103 119 | | ' | 7 8 9 10 11 12 13 14 | G H I J K L M N | W X Y Z [\ ^ _ | g h i j k l m n | w x y z { ~ |
| 8 | <BS> 8 24 40 56 72 88 104 120 | <CAN> 24 40 56 72 88 104 120 | (| 8 9 10 11 12 13 14 | H I J K L M N | X Y Z [\ ^ _ | h i j k l m n | x y z { ~ |
| 9 | <HT> 9 25 41 57 73 89 105 121 | 25 41 57 73 89 105 121 |) | 9 10 11 12 13 14 | I J K L M N | Y Z [\ ^ _ | i j k l m n | y z { ~ |
| A | <LF> 10 26 42 58 74 90 106 122 | | * | 10 11 12 13 14 | J K L M N | Z [\ ^ _ | j k l m n | z { ~ |
| B | <VT> 11 27 43 59 75 91 107 123 | <ESC> 27 43 59 75 91 107 123 | + | 11 12 13 14 | K L M N | [\ ^ _ | k l m n | { ~ |
| C | <FF> 12 28 44 60 76 92 108 124 | <FS> 28 44 60 76 92 108 124 | , | 12 13 14 | L M N | \ ^ _ | l m n | ~ |
| D | <CR> 13 29 45 61 77 93 109 125 | | - | 13 14 | M N |] ^ _ | m n | } ~ |
| E | <SO> 14 30 46 62 78 94 110 126 | | . | 14 | N | ^ _ | n | ~ |
| F | <SI> 15 31 47 63 79 95 111 127 | | / | 15 | O | _ | o | |

| | 8 | 9 | A | B | C | D | E | F |
|---|-------|--------|--------|-------|-------|-------|-------|-------|
| 0 | à 128 | š 144 | 160 | ó 176 | @ 192 | P 208 | 224 | ƒ 240 |
| 1 | è 129 | ß 145 | ! 161 | ì 177 | À 193 | Q 209 | á 225 | q 241 |
| 2 | ù 130 | Æ 146 | " 162 | 2 178 | B 194 | R 210 | b 226 | r 242 |
| 3 | ò 131 | æ 147 | # 163 | 3 179 | C 195 | S 211 | c 227 | s 243 |
| 4 | ì 132 | Ø 148 | \$ 164 | 4 180 | D 196 | T 212 | d 228 | t 244 |
| 5 | ° 133 | ø 149 | % 165 | 5 181 | E 197 | U 213 | e 229 | u 245 |
| 6 | £ 134 | '' 150 | & 166 | 6 182 | F 198 | V 214 | f 230 | v 246 |
| 7 | í 135 | À 151 | ' 167 | 7 183 | G 199 | W 215 | g 231 | w 247 |
| 8 | í 136 | Ö 152 | (168 | 8 184 | H 200 | X 216 | h 232 | x 248 |
| 9 | Ñ 137 | U 153 |) 169 | 9 185 | I 201 | Y 217 | i 233 | y 249 |
| A | ñ 138 | ä 154 | * 170 | : 186 | J 202 | Z 218 | j 234 | z 250 |
| B | α 139 | ö 155 | + 171 | ; 187 | K 203 | ı 219 | k 235 | ı 251 |
| C | ŕ 140 | ü 156 | . 172 | < 188 | L 204 | \ 220 | l 236 | / 252 |
| D | Ā 141 | Ē 157 | - 173 | = 189 | M 205 | ı 221 | m 237 | ı 253 |
| E | ā 142 | é 158 | . 174 | > 190 | N 206 | ^ 222 | n 238 | ~ 254 |
| F | ç 143 | ¥ 159 | / 175 | ? 191 | O 207 | — 223 | o 239 | 255 |

International character sets

When an international character set is selected by a command from software, the following changes are made in the Standard character set:

| Country | 35 | 36 | 64 | 88 | 90 | 91 | 92 | 93 | 94 | 96 | 123 | 124 | 125 | 126 |
|---------------|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| U.S.A. | # | \$ | @ | X | Z | [| \ |] | ^ | ` | { | | } | ~ |
| FRANCE | # | \$ | à | X | Z | ° | ç | § | ^ | ` | é | ù | è | ¨ |
| GERMANY | # | \$ | § | X | Z | À | Ö | Ü | ^ | ` | ä | ö | ü | ß |
| ENGLAND | £ | \$ | @ | X | Z | [| \ |] | ^ | ` | { | | } | ~ |
| DENMARK I | # | \$ | @ | X | Z | Æ | Ø | A | ^ | ` | æ | ø | å | ~ |
| SWEDEN | # | ¤ | ¢ | X | Z | À | Ö | A | Ü | é | ä | ö | å | ü |
| ITALY | # | \$ | @ | X | Z | ° | \ | é | ^ | ù | à | ò | è | ì |
| SPAIN I | ₧ | \$ | @ | X | Z | ; | ñ | ¿ | ^ | ´ | ñ | ñ | } | ~ |
| JAPAN | # | \$ | @ | X | Z | [| ¥ |] | ^ | ` | { | | } | ~ |
| NORWAY | # | ¤ | ¢ | X | Z | Æ | Ø | A | Ü | é | æ | ø | å | ü |
| DENMARK II | # | \$ | ¢ | X | Z | Æ | Ø | A | Ü | é | æ | ø | å | ü |
| SPAIN II | # | \$ | á | X | Z | ; | ñ | ¿ | é | ´ | í | ñ | ó | ú |
| LATIN AMERICA | # | \$ | á | X | Z | ; | ñ | ¿ | é | ü | í | ñ | ó | ú |
| KOREA | # | \$ | @ | X | Z | [| ₩ |] | ^ | ` | { | | } | ~ |
| IRELAND | # | \$ | @ | Ú | ˊ | [| \ |] | ^ | ` | Á | É | Ó | ~ |
| LEGAL | # | \$ | § | X | Z | ° | ' | " | ¶ | ` | © | ® | † | ™ |

The command for selecting the international character set is:

<ESC> "R" *n*

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

| | | |
|-------------|---------------|------------------|
| 0 U.S.A. | 6 Italy | 12 Latin America |
| 1 France | 7 Spain I | 13 Korea |
| 2 Germany | 8 Japan | 14 Ireland |
| 3 England | 9 Norway | 64 Legal |
| 4 Denmark I | 10 Denmark II | |
| 5 Sweden | 11 Spain II | |

IBM character set #2







Code Page #437 (U.S.A.)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|------------|-------------|----|----|----|---|----|--------------|
| 0 | <NUL> 0 | 16 | 32 | 48 | @ | P | ` | p |
| 1 | <DC1> 1 | 17 | 33 | 49 | A | Q | a | q |
| 2 | <DC2> 2 | 18 | 34 | 50 | B | R | b | r |
| 3 | ♥ 3 | <DC3> 19 | # | 35 | 3 | C | S | c |
| 4 | ♦ 4 | <DC4> 20 | \$ | 36 | 4 | D | T | d |
| 5 | ♠ 5 | § | % | 37 | 5 | E | U | e |
| 6 | ♣ 6 | | & | 38 | 6 | F | V | f |
| 7 | <BEL> 7 | 23 | ' | 39 | 7 | G | W | g |
| 8 | <BS> 8 | <CAN> 24 | (| 40 | 8 | H | X | h |
| 9 | <HT> 9 | 25 |) | 41 | 9 | I | Y | i |
| A | <LF> 10 | | * | 42 | | J | Z | j |
| B | <VT> 11 | <ESC> 27 | + | 43 | | K | [| k |
| C | <FF> 12 | <FS> 28 | , | 44 | | L | \ | l |
| D | <CR> 13 | | - | 45 | | M |] | m |
| E | <SO> 14 | | . | 46 | | N | ^ | n |
| F | <SI> 15 | | / | 47 | | O | _ | o |
| | | 31 | | 63 | 79 | | 95 | 127 |

| | 8 | 9 | A | B | C | D | E | F |
|---|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | Ç 128 | Ė 144 | á 160 | 176 | Ł 192 | и 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 | π 210 | Γ 226 | ≥ 242 |
| 3 | à 131 | ô 147 | ú 163 | 179 | ⌋ 195 | и 211 | π 227 | ≤ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | † 180 | − 196 | ℓ 212 | Σ 228 | ∫ 244 |
| 5 | à 133 | ò 149 | ñ 165 | ‡ 181 | † 197 | ƒ 213 | σ 229 | ℵ 245 |
| 6 | â 134 | û 150 | ä 166 | ‡ 182 | ‡ 198 | π 214 | μ 230 | ÷ 246 |
| 7 | ç 135 | ù 151 | ó 167 | π 183 | ‡ 199 | ‡ 215 | τ 231 | ≈ 247 |
| 8 | ê 136 | ÿ 152 | ¿ 168 | ‡ 184 | ℓ 200 | ≠ 216 | Φ 232 | ° 248 |
| 9 | ë 137 | ö 153 | ƒ 169 | ‡ 185 | ℓ 201 | ⌋ 217 | Θ 233 | • 249 |
| A | è 138 | ü 154 | ƒ 170 | ‡ 186 | ℓ 202 | ƒ 218 | Ω 234 | • 250 |
| B | ï 139 | ¢ 155 | ½ 171 | π 187 | π 203 | ■ 219 | δ 235 | √ 251 |
| C | î 140 | £ 156 | ¾ 172 | π 188 | π 204 | ■ 220 | ∞ 236 | ∞ 252 |
| D | ì 141 | ¥ 157 | ì 173 | π 189 | = 205 | ■ 221 | ∅ 237 | ² 253 |
| E | Ë 142 | ℓ 158 | « 174 | ‡ 190 | ‡ 206 | ■ 222 | € 238 | ■ 254 |
| F | À 143 | ƒ 159 | » 175 | ‡ 191 | ℓ 207 | ■ 223 | ∩ 239 | 255 |

Code Page #850 (Multi-lingual)

Other characters are identical to Code Page #437.

| | 8 | 9 | A | B | C | D | E | F |
|---|----------|----------|----------|--|----------|--|----------|-----------|
| 0 | Ç 128 | É 144 | Á 160 |  176 | Ł 192 | Ǿ 208 | Ó 224 | — 240 |
| 1 | ü 129 | æ 145 | í 161 |  177 | Ł 193 | Ð 209 | β 225 | ± 241 |
| 2 | é 130 | Æ 146 | ó 162 |  178 | Ṭ 194 | Ê 210 | Ô 226 | = 242 |
| 3 | à 131 | ò 147 | ú 163 | 179 | Ṭ 195 | Ê 211 | ò 227 | ≈ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | † 180 | — 196 | È 212 | ō 228 | ¶ 244 |
| 5 | à 133 | ò 149 | Ñ 165 | À 181 | † 197 | ı 213 | Ō 229 | § 245 |
| 6 | â 134 | û 150 | ä 166 | Ä 182 | ã 198 | ı 214 | μ 230 | + 246 |
| 7 | ç 135 | ù 151 | ó 167 | À 183 | Ä 199 | İ 215 | þ 231 | · 247 |
| 8 | ê 136 | ÿ 152 | ¿ 168 | © 184 | Ł 200 | Ÿ 216 | þ 232 | ° 248 |
| 9 | ë 137 | ö 153 | ® 169 | ¶ 185 | Ł 201 | Ÿ 217 | ú 233 | .. 249 |
| A | è 138 | ù 154 | ¬ 170 | 186 | Ł 202 | Ÿ 218 | û 234 | · 250 |
| B | ï 139 | ø 155 | ½ 171 | ¶ 187 | Ł 203 |  219 | ü 235 | ¹ 251 |
| C | î 140 | £ 156 | ¾ 172 | ¶ 188 | Ł 204 |  220 | ý 236 | ³ 252 |
| D | ì 141 | Ø 157 | ì 173 | ¢ 189 | = 205 | ı 221 | Ÿ 237 | ² 253 |
| E | Ä 142 | × 158 | « 174 | ≠ 190 | ¶ 206 | İ 222 | — 238 | ■ 254 |
| F | À 143 | f 159 | » 175 | ƒ 191 | α 207 |  223 | · 239 | 255 |

Code Page #860 (Portuguese)

Other characters are identical to Code Page #437.

| | B | 9 | A | B | C | D | E | F |
|---|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | Ç | Ê | Á | | Ł | „ | α | ≡ |
| | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | ü | À | Í | | Ł | ƒ | β | ± |
| | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | é | È | Ó | | ƒ | π | Γ | ≥ |
| | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | à | ô | ú | ı | ı | „ | κ | ≤ |
| | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | ã | õ | ñ | ı | — | Ł | Σ | ƒ |
| | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | ä | ò | Ñ | ı | ı | ƒ | σ | ı |
| | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | Á | Ó | ä | ı | ı | π | μ | ı |
| | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | ç | ù | ó | π | ı | ı | τ | ≈ |
| | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | ê | İ | ı | ı | Ł | ı | Φ | ° |
| | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | Ê | Ö | Ò | ı | ı | ı | Θ | • |
| | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | è | Ù | ı | ı | „ | ı | Ω | • |
| | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | í | Φ | ½ | ı | ı | ■ | δ | √ |
| | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | ô | £ | ¾ | ı | ı | ■ | ∞ | n |
| | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | ì | Û | ı | „ | = | ı | ø | ² |
| | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | Ä | Ř | « | ı | ı | ı | € | ■ |
| | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | Å | Ó | » | ı | ı | ■ | Ŋ | |
| | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |









Code Page #861 (Icelandic)

Other characters are identical to Code Page #437.

| | 8 | 9 | A | B | C | D | E | F |
|---|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | È 144 | Á 160 | ⌘ 176 | Ł 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 | π 210 | Γ 226 | ≥ 242 |
| 3 | à 131 | ð 147 | ú 163 | 179 | † 195 | Ⓔ 211 | π 227 | ≤ 243 |
| 4 | ä 132 | ö 148 | À 164 | † 180 | — 196 | Ł 212 | Σ 228 | ∫ 244 |
| 5 | á 133 | þ 149 | Í 165 | ‡ 181 | † 197 | ƒ 213 | σ 229 | ℐ 245 |
| 6 | â 134 | û 150 | Ö 166 | ‡ 182 | ƒ 198 | π 214 | μ 230 | + 246 |
| 7 | ç 135 | ÿ 151 | Û 167 | π 183 | ‡ 199 | ‡ 215 | τ 231 | ≈ 247 |
| 8 | ê 136 | ý 152 | ¿ 168 | ‡ 184 | Ł 200 | ‡ 216 | Φ 232 | ° 248 |
| 9 | ë 137 | ÿ 153 | ƒ 169 | ‡ 185 | ƒ 201 | ƒ 217 | Θ 233 | • 249 |
| A | è 138 | Û 154 | ƒ 170 | ‡ 186 | Ł 202 | ƒ 218 | Ω 234 | • 250 |
| B | Ð 139 | ø 155 | ½ 171 | ƒ 187 | ƒ 203 | ■ 219 | δ 235 | √ 251 |
| C | ð 140 | £ 156 | ¼ 172 | ƒ 188 | ‡ 204 | ■ 220 | ∞ 236 | n 252 |
| D | þ 141 | Ø 157 | ı 173 | Ⓔ 189 | = 205 | ■ 221 | ø 237 | ² 253 |
| E | À 142 | ƒ 158 | « 174 | ƒ 190 | ‡ 206 | ■ 222 | ε 238 | ■ 254 |
| F | Á 143 | ƒ 159 | » 175 | ƒ 191 | ± 207 | ■ 223 | ∩ 239 | 255 |

Code Page #863 (Canadian French)

Other characters are identical to Code Page #437.

| | 8 | 9 | A | B | C | D | E | F |
|---|----------|----------|----------|--|----------|--|----------|----------|
| 0 | Ç 128 | ß 144 | ı 160 |  176 | Ł 192 | ⋈ 208 | α 224 | ≡ 240 |
| 1 | ü 129 | Ɔ 145 | ˆ 161 |  177 | Ł 193 | Ƨ 209 | β 225 | ± 241 |
| 2 | é 130 | Ɔ 146 | ó 162 |  178 | Ƨ 194 | Π 210 | Γ 226 | ≥ 242 |
| 3 | à 131 | ø 147 | ú 163 | 179 | † 195 | ⋈ 211 | π 227 | ≤ 243 |
| 4 | À 132 | Ɔ 148 | ˆ 164 | † 180 | — 196 | Ł 212 | Σ 228 | ƒ 244 |
| 5 | á 133 | Ÿ 149 | ˆ 165 | ‡ 181 | † 197 | Ɔ 213 | σ 229 | Ƶ 245 |
| 6 | ¶ 134 | Ů 150 | ³ 166 | ‡ 182 | † 198 | Π 214 | μ 230 | + 246 |
| 7 | ç 135 | ù 151 | — 167 | Π 183 | ‡ 199 | ‡ 215 | τ 231 | ≈ 247 |
| 8 | ê 136 | α 152 | ı 168 | Ƨ 184 | ⋈ 200 | ≠ 216 | Φ 232 | ° 248 |
| 9 | ë 137 | ô 153 | Ɔ 169 | ‡ 185 | Ɔ 201 | Ƶ 217 | Θ 233 | • 249 |
| A | è 138 | Ů 154 | Ɔ 170 | ‡ 186 | ⋈ 202 | Ɔ 218 | Ω 234 | • 250 |
| B | ï 139 | ϕ 155 | ½ 171 | Ƨ 187 | Ƨ 203 |  219 | δ 235 | √ 251 |
| C | î 140 | £ 156 | ¾ 172 | Ƨ 188 | ‡ 204 |  220 | ∞ 236 | ⁿ 252 |
| D | = 141 | Ů 157 | ¾ 173 | ⋈ 189 | = 205 |  221 | ø 237 | ² 253 |
| E | À 142 | Ô 158 | « 174 | Ɔ 190 | ⋈ 206 |  222 | € 238 | ■ 254 |
| F | Š 143 | ƒ 159 | » 175 | Ƨ 191 | ± 207 |  223 | ∩ 239 | 255 |

Code Page #865 (Nordic)

Other characters are identical to Code Page #437.

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

Character set #1

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.

| | 0 | 1 |
|---|------------|-------------|
| 0 | <NUL> 0 | 16 |
| 1 | 1 | <DC1> 17 |
| 2 | 2 | <DC2> 18 |
| 3 | 3 | <DC3> 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 | <NUL> 128 | 144 |
| 1 | 129 | <DC1> 145 |
| 2 | 130 | <DC2> 146 |
| 3 | 131 | <DC3> 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 |

IBM special character set

Additional characters can be printed by special commands.

| | 0 | 1 |
|---|---|----|
| 0 | Ø | ► |
| 1 | ⊕ | ◄ |
| 2 | ⊙ | ↑ |
| 3 | ♥ | !! |
| 4 | ♦ | ¶ |
| 5 | ♣ | § |
| 6 | ♠ | — |
| 7 | • | ‡ |
| 8 | ▣ | ↑ |
| 9 | ◦ | ↓ |
| A | ◻ | → |
| B | ♂ | ← |
| C | ♀ | └ |
| D | ♯ | ↔ |
| E | ♪ | ▲ |
| F | ✱ | ▼ |

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COMMAND SUMMARY

Standard Mode

The following commands take effect with the Standard mode.

| Control code | Function | Page |
|--|--|------|
| <BEL> | Bell | 98 |
| <BS> | Backspace | 87 |
| <HT> | Horizontal tab | 88 |
| <LF> | Line feed | 82 |
| <VT> | Vertical tab | 85 |
| <FF> | Form feed | 84 |
| <CR> | Carriage return | 87 |
| <SO> | Expanded printing for one line | 77 |
| <SI> | Condensed printing | 74 |
| <DC1> | Set printer on-line | 98 |
| <DC2> | Cancel condensed printing | 75 |
| <DC3> | Set printer off-line | 98 |
| <DC4> | Cancel one-line expanded printing | 77 |
| <CAN> | Cancel last line | 97 |
| <ESC> <LF> | Reverse line feed | 82 |
| <ESC> <SO> | Expanded printing for one line | 77 |
| <ESC> <SI> | Condensed printing | 74 |
| <ESC> <0> | Manual feed | 99 |
| <ESC> <4> | Auto feed | 99 |
| <ESC> "R" | Eject paper | 99 |
| <ESC> "T" <i>n</i> | Set print start position on ASF | 100 |
| <ESC> <SP> <i>n</i> | Increase character spacing | 78 |
| <ESC> "!" <i>n</i> | Select master print mode | 78 |
| <ESC> "#" <i>n</i> | Accept MSB as is | 97 |
| <ESC> "\$" <i>n1 n2</i> | Absolute horizontal tab in inches | 89 |
| <ESC> "%" 0 | Select ROM character set | 96 |
| <ESC> "%" 1 | Select download character set | 96 |
| <ESC> "&" <0> <i>n1 n2 m0 m1 m2 d1 d2 ... dx</i> | Define download characters | 94 |
| <ESC> "(" "—" <3> <0> <1> <i>n1 n2</i> | Select score | 69 |
| <ESC> "*" <i>n0 n1 n2 m1 m2 ...</i> | Select graphics mode | 92 |
| <ESC> "+" <i>n</i> | Set line spacing to <i>n</i> /360 inch | 80 |
| <ESC> "-" <i>n</i> | Underlining | 68 |
| <ESC> "f" <i>n0</i> | Select vertical tab channel | 85 |
| <ESC> "0" | Set line spacing to 1/8 inch | 80 |
| <ESC> "2" | Set line spacing to 1/6 inch | 80 |
| <ESC> "3" <i>n</i> | Set line spacing to <i>n</i> /180 inch | 81 |
| <ESC> "4" | Select italic characters | 67 |
| <ESC> "5" | Select upright characters | 67 |
| <ESC> "6" | Select character set #2 | 71 |
| <ESC> "7" | Select character set #1 | 71 |
| <ESC> ":" <0> <i>n</i> <0> | Copy character set from ROM into RAM | 96 |
| <ESC> "<" | One-line uni-directional printing | 99 |
| <ESC> "=" | Set MSB to 0 | 97 |
| <ESC> ">" | Set MSB to 1 | 97 |
| <ESC> "?" <i>n m</i> | Convert graphics density | 93 |
| <ESC> "@" | Reset printer | 100 |
| <ESC> "A" <i>n</i> | Set line spacing to <i>n</i> /60 inch | 81 |
| <ESC> "B" <i>n1 n2 ...</i> <0> | Set vertical tab stops | 84 |
| <ESC> "C" <0> <i>n</i> | Set page length to <i>n</i> inches | 83 |

| Control code | Function | Page |
|---|--|------|
| <ESC> "C" <i>n</i> | Set page length to <i>n</i> lines | 83 |
| <ESC> "D" <i>n1 n2 ...</i> <0> | Set horizontal tab stops | 88 |
| <ESC> "E" | Emphasized printing | 67 |
| <ESC> "F" | Cancel emphasized printing | 67 |
| <ESC> "G" | Double-strike printing | 68 |
| <ESC> "H" | Cancel double-strike printing | 68 |
| <ESC> "J" <i>n</i> | Perform one <i>n</i> /180-inch line feed | 82 |
| <ESC> "K" <i>n1 n2 m1 m2 ...</i> | Print normal-density 8-bit graphics | 90 |
| <ESC> "L" <i>n1 n2 m1 m2 ...</i> | Print double-density 8-bit graphics | 90 |
| <ESC> "M" | Elite pitch | 74 |
| <ESC> "N" <i>n</i> | Set bottom margin | 84 |
| <ESC> "O" | Cancel bottom margin | 84 |
| <ESC> "P" | Pica pitch | 74 |
| <ESC> "Q" <i>n</i> | Set right margin | 86 |
| <ESC> "R" <i>n</i> | Select international character set | 72 |
| <ESC> "S" 0 | Superscript | 69 |
| <ESC> "S" 1 | Subscript | 70 |
| <ESC> "T" | Cancel superscript or subscript | 70 |
| <ESC> "U" 0 | Bi-directional printing | 98 |
| <ESC> "U" 1 | Uni-directional printing | 99 |
| <ESC> "W" <i>n</i> | Expanded printing | 77 |
| <ESC> "Y" <i>n1 n2 m1 m2 ...</i> | Print double-density, double-speed 8-bit graphics | 90 |
| <ESC> "Z" <i>n1 n2 m1 m2 ...</i> | Print quadruple-density 8-bit graphics | 91 |
| <ESC> "[" "T" <4> <0> <0> <0> <i>n1 n2</i> | Select IBM code page | 72 |
| <ESC> "N" <i>n1 n2</i> | Relative horizontal tab | 89 |
| <ESC> "b" <i>n0 n1 n2 ...</i> <0> | Set vertical tab stops in channel | 85 |
| <ESC> "g" | Semi-condensed pitch | 74 |
| <ESC> "j" <i>n</i> | Perform one <i>n</i> /180-inch reverse line feed | 83 |
| <ESC> "k" <i>n</i> | Select LQ font | 66 |
| <ESC> "l" <i>n</i> | Set left margin | 86 |
| <ESC> "p" <i>n</i> | Proportional spacing | 75 |
| <ESC> "q" <i>n</i> | Select ornament character | 69 |
| <ESC> "t" <i>n</i> | Select character table | 71 |
| <ESC> "w" 0 | Return to normal height | 79 |
| <ESC> "w" 1 | Print double-height characters | 78 |
| <ESC> "x" <i>n</i> | Select print quality | 66 |
| <FS> "3" <i>n</i> | Set line spacing to <i>n</i> /360 inch | 80 |
| <FS> "@" | Reset printer | 100 |
| <FS> "E" <i>n</i> | Select character width | 77 |
| <FS> "F" | Select forward feed mode | 82 |
| <FS> "l" <i>n</i> | Select character table | 71 |
| <FS> "R" | Select reverse feed mode | 82 |
| <FS> "V" 0 | Return to normal height | 79 |
| <FS> "V" 1 | Print double-height characters | 78 |
| <FS> "Z" <i>n1 n2 m1 m2 m3 ...</i> | Print hex-density 24-bit graphics | 91 |
| <FS> "N" <i>n1 n2</i> | Enable printing of all character codes | 73 |
| <FS> "A" <i>n</i> | Enable printing of all character codes on next character | 73 |
| | Delete last character sent | 97 |

IBM Mode

The following commands take effect with the IBM mode.

| Control code | Function | Page |
|---|---|------|
| <BEL> | Bell | 98 |
| <BS> | Backspace | 87 |
| <HT> | Horizontal tab | 88 |
| <LF> | Line feed | 82 |
| <VT> | Vertical tab | 85 |
| <FF> | Form feed | 84 |
| <CR> | Carriage return | 87 |
| <SO> | Expanded printing for one line | 77 |
| <SI> | Condensed printing | 74 |
| <DC1> | Set printer on-line | 98 |
| <DC2> | Pica pitch | 74 |
| <DC4> | Cancel one-line expanded printing | 77 |
| <CAN> | Cancel last line | 97 |
| <ESC> <SO> | Expanded printing for one line | 77 |
| <ESC> <SI> | Condensed printing | 74 |
| <ESC> <0> | Manual feed | 99 |
| <ESC> <4> | Auto feed | 99 |
| <ESC> "R" | Eject paper | 99 |
| <ESC> "T" <i>n</i> | Set print start position on ASF | 100 |
| <ESC> "=" <i>n</i> | Underlining | 68 |
| <ESC> "0" | Set line spacing to 1/8 inch | 80 |
| <ESC> "2" | Execute <ESC> "A" | 81 |
| <ESC> "3" <i>n</i> | Set line spacing to <i>n</i> /180 inch, <i>n</i> /216 inch, or <i>n</i> /360 inch | 81 |
| <ESC> "4" | Set top of page at current position | 83 |
| <ESC> "5" <0> | Cancel automatic line feed | 87 |
| <ESC> "5" <1> | Set automatic line feed | 87 |
| <ESC> "6" | Select character set #2 | 71 |
| <ESC> "7" | Select character set #1 | 71 |
| <ESC> ":" <0> <i>n</i> <0> | Elite pitch | 74 |
| <ESC> "=" <i>n1 n2</i> "#" <i>n3 n4</i> <0> <i>n5 m1 m2 ... m9 d1 d2 ... dx</i> | Define download characters | 95 |
| <ESC> "@" | Reset printer | 100 |
| <ESC> "A" <i>n</i> | Set line spacing to <i>n</i> /72 inch | 81 |
| <ESC> "B" <i>n1 n2 ...</i> <0> | Set vertical tab stops | 84 |
| <ESC> "C" <0> <i>n</i> | Set page length to <i>n</i> inches | 83 |
| <ESC> "C" <i>n</i> | Set page length to <i>n</i> lines | 83 |
| <ESC> "D" <i>n1 n2 ...</i> <0> | Set horizontal tab stops | 88 |
| <ESC> "E" | Emphasized printing | 67 |
| <ESC> "F" | Cancel emphasized printing | 67 |
| <ESC> "G" | Double-strike printing | 68 |
| <ESC> "H" | Cancel double-strike printing | 68 |
| <ESC> "I" <i>n</i> | Select font and pitch | 75 |
| <ESC> "J" <i>n</i> | Perform one <i>n</i> /180-inch, <i>n</i> /216-inch, or <i>n</i> /360-inch line feed | 82 |
| <ESC> "K" <i>n1 n2 m1 m2 ...</i> | Print normal-density 8-bit graphics | 90 |
| <ESC> "L" <i>n1 n2 m1 m2 ...</i> | Print double-density 8-bit graphics | 90 |
| <ESC> "N" <i>n</i> | Set bottom margin | 84 |
| <ESC> "O" | Cancel bottom margin | 84 |
| <ESC> "P" <i>n</i> | Proportional spacing | 75 |
| <ESC> "Q" "S" | Set printer off-line | 98 |
| <ESC> "R" | Reset all tab stops | 88 |
| <ESC> "S" 0 | Superscript | 69 |
| <ESC> "S" 1 | Subscript | 70 |
| <ESC> "T" | Cancel superscript or subscript | 70 |
| <ESC> "U" 0 | Bi-directional printing | 98 |

| Control code | Function | Page |
|-------------------------------------|---|------|
| <ESC> "U" l | Uni-directional printing | 99 |
| <ESC> "W" n | Expanded printing | 77 |
| <ESC> "X" n1 n2 | Set left and right margins | 87 |
| <ESC> "Y" n1 n2 m1 m2 ... | Print double-density, double-speed 8-bit graphics | 90 |
| <ESC> "Z" n1 n2 m1 m2 ... | Print quadruple-density 8-bit graphics | 91 |
| <ESC> "[" "@" <4> <0> <0> <0> n m | Select character height, width, and line spacing | 79 |
| <ESC> "[" "I" <2> <0> <0> n1 n2 | Select print mode | 76 |
| <ESC> "[" "K" <3> <0> <0> <3> n | Select initial conditions | 100 |
| <ESC> "[" "T" <4> <0> <0> <0> n1 n2 | Select IBM code page | 72 |
| <ESC> "[" "\" <4> <0> <0> <0> n1 n2 | Set base unit for line spacing | 80 |
| <ESC> "[" "d" <1> <0> n | Select print quality | 66 |
| <ESC> "[" "g" n1 n2 m0 m1 m2 ... | Select graphics mode | 92 |
| <ESC> "^" n1 n2 | Enable printing of all character codes | 73 |
| <ESC> "I" | Reverse line feed | 82 |
| <ESC> "^" n | Enable printing of all character codes on next character | 73 |
| <ESC> " " n | Overlining | 68 |
| <ESC> "d" n1 n2 | Relative horizontal tab in inches | 89 |
| <ESC> "j" | Stop printing | 98 |
| <ESC> "k" n | Select LQ font | 66 |
| <ESC> "t" n | Select character table | 71 |

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