StarJet SJ-48

USERS MANUAL

star

Federal Communications Commission
Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Unauthorized modifications of this product by the user will void his authority to operate the equipment unless expressly approved by the party responsible for compliance.

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

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

Statement of
The Canadian Department of Communications
Radio Interference Regulations

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émen pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélecrrique édicté par le minisère des Communications du Canada.

The abovè statement applies only to printers marketed in Canada.

Self Declaration

Radio interference regarding this equipment has been eliminated according to Vfg 1046/1984 announced by the DBP.
DBP has been informed of the introduction of this special equipment and has been granted the right to examine the whole series.
It is the user's responsibility to see that his own assembled system is in accordance with the technical regulations under Vfg 1046/1984.
To conform to FTZ-regulations it is necessary to make all connections to the printer with shielded cable.

The equipment may only be opened by qualified service representatives.

The above statement applies only to printers marketed in Germany.

Trademark Acknowledgements
SJ-48, XB-2410, XB24-10, NX-2420, LC24-200, SC-10, BP-10, SF-10CA: Star Micronics Co., Ltd.
IBM-PC, PS/2, PC-AT, Proprinter X24/X24E, PC-DOS: International Business Machines Corp.
MS-DOS, Microsoft BASIC: Microsoft Corporation
LQ-850: Seiko Epson Corp.

NOTICE

HOW TO USE THIS MANUAL

This manual is organized into ten chapters. To learn how to make the best use of your printer you are urged to read through chapters 1 through 5. The remaining chapters may be treated as a reference guide for programming operations, etc. It assumes a degree of acknowledge of the operation of computers (for instance, it assumes you know about hexadecimal numbers). The chapters are as follows:

Chapter 1 — Introduction
This chapter indicates the some features of the printer, the names and those functions of the printer components. This chapter also indicates some requirements to printer, power supply and Ink Cartridge.

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 handling
This chapter describes instructions for printing such as selecting paper types, adjusting the printing gap, installing paper, and removing jammed 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 getting set up, read this chapter and try out the procedures in it to find out how the printer works.

Chapter 5 — DIP switch settings
This chapter explains how to set the DIP switches to make system settings on the printer.

Chapter 6 — Printer control commands
This chapter explains the different emulations provided by your printer, and the software commands used to drive it. This section is of use if you are writing or modifying programs to take advantage of the printer's features.

Chapter 7 — Download characters
This chapter explains the procedures to create your own characters.

Chapter 8 — 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 9 — Troubleshooting and maintenance

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

Chapter 10 — Reference

This section gives some references of your printer, such as specifications of your printer, the pinout of interface connecter, the character tables.
The character table charts give the different character sets available.

TABLE OF CONTENTS

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.

FEATURES OF THE PRINTER

Some of main features are the following:

- Ink jet printing system
- Auto-capping system
- Easy maintenance
- 2-way power supply
- Versatile paper handling
- Extensive software support
- Easy operation

Ink jet printing system

The ink jet printing system prints characters and graphics by firing ink drops at the paper from thin nozzles.

Heating the ink in these nozzles, by applying electrical pulses to the heating elements, produces bubbles that quickly expand and eject the ink.

A vacuum is then produced as the bubble contracts after the pulse ends. This draws fresh ink into the nozzle.
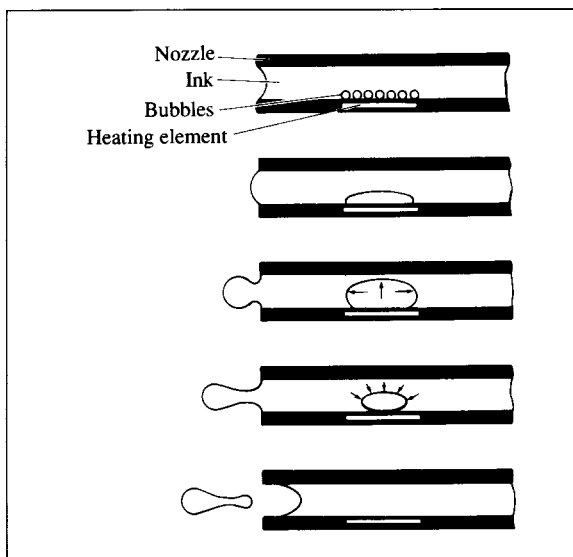
Figure 1-1. Ink jet printing system.

An important feature of this printing system is the simple construction of individual nozzles.
This construction has the following advantages in addition to reducing manufacturing costs.

- The printing mechanism is more durable and smaller.
- Print quality is higher because of greater nozzle density.
- Quiet, non-impact operation.

This means that the ink jet printer can be used for a much wider range of applications than other printers.

Auto-capping system

This printer moves the carriage to the home position and automatically caps the print head whenever the printer is turned on and off, or more than 5 seconds have passed since the last data was received.

This auto-capping system prevents the head from drying out or becoming clogged with dust, and ink dropping or evaporation.
It also helps to reduce ink spillage in the event the printer is held for any reason in other than the horizontal position or is shipped.

Easy maintenance

This printer uses a replaceable Ink Cartridge (SC-10) that contains both the print head and ink, the only maintenance required is a simple cartridge replacement. You can always rely on high-quality printouts without complicated maintenance.
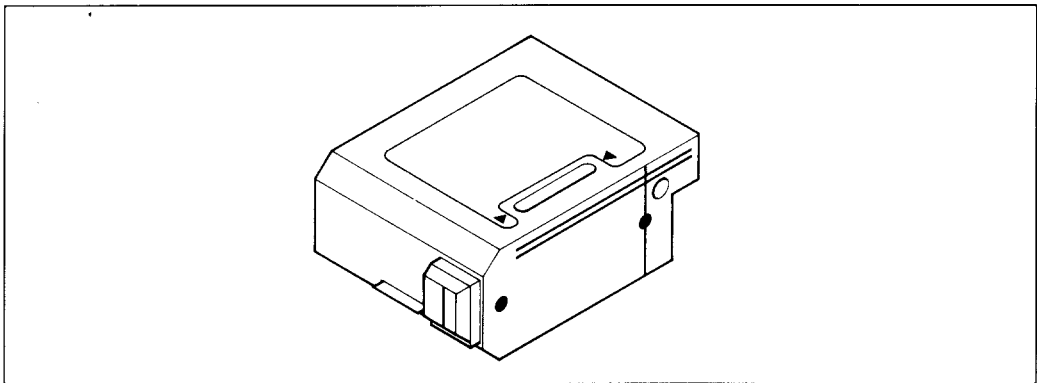
Figure 1-2. This printer uses a replaceable Ink Cartridge, SC-10.

2-way power supply

You can use this printer with the AC power source using the AC adapter, or without AC power source using the optional NiCd battery pack, BP-10.
With the optional battery pack, your printer can even be used outdoors. Great for laptop computer users.
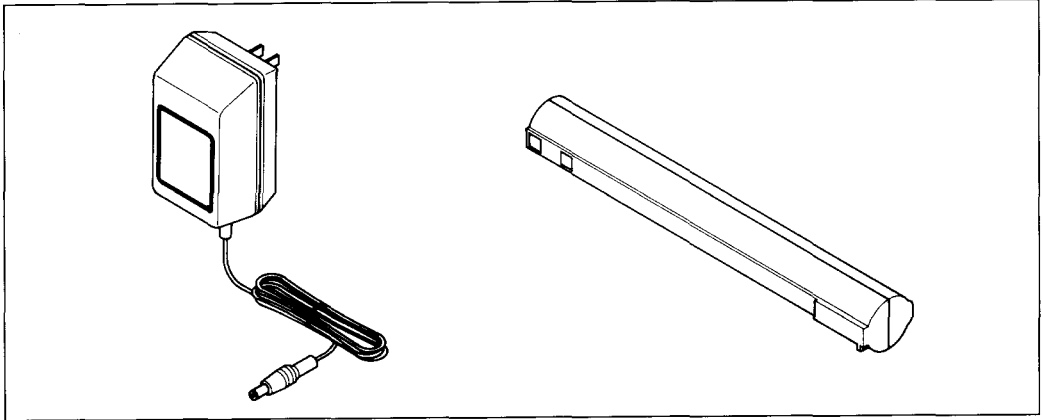
Figure 1-3. This printer can be used either AC adapter or optional NiCd battery pack.

Versatile paper handling

Single sheets and envelopes (COM 10 size) are all accepted, and you can use either roller feed or flat feed.
You can also feed paper with optional Automatic Sheet Feeder.
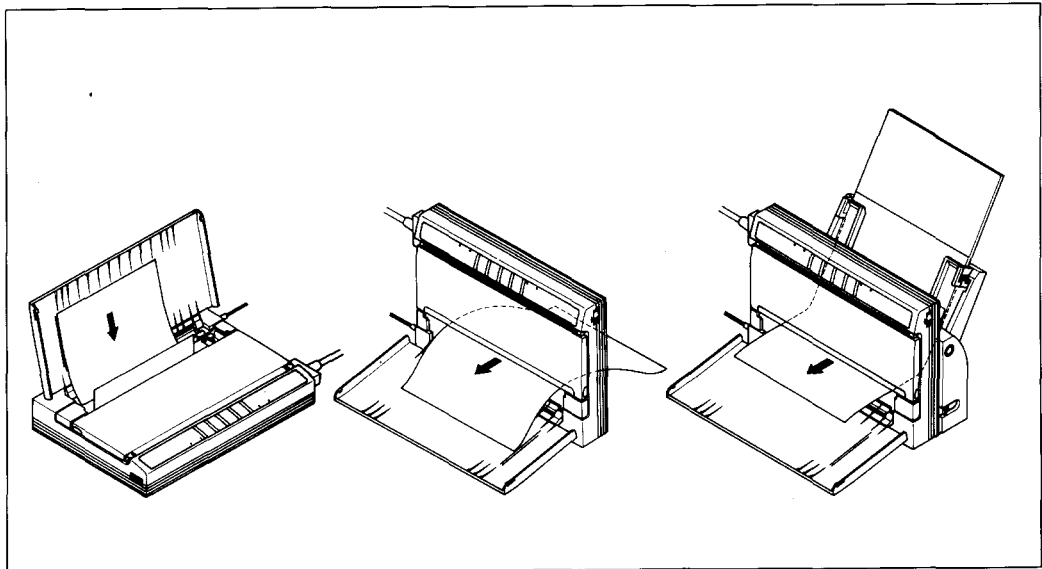
Figure 1-4. This printer can feed with three ways: Roller feed, Flat feed, and ASF feed.

Extensive software support

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

Easy operation

Indicator displays 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 micro-alignment.

PRINTER COMPONENTS

To get acquainted with the printer's components and capabilities, refer to the information below.

Battery switch

Top cover

Ink Cartridge

Lock lever

Control panel

AC adapter cable connector

Release lever

Paper cover

Interface connector

Adjustment dial

Power switch

Printer stand

Entry slot
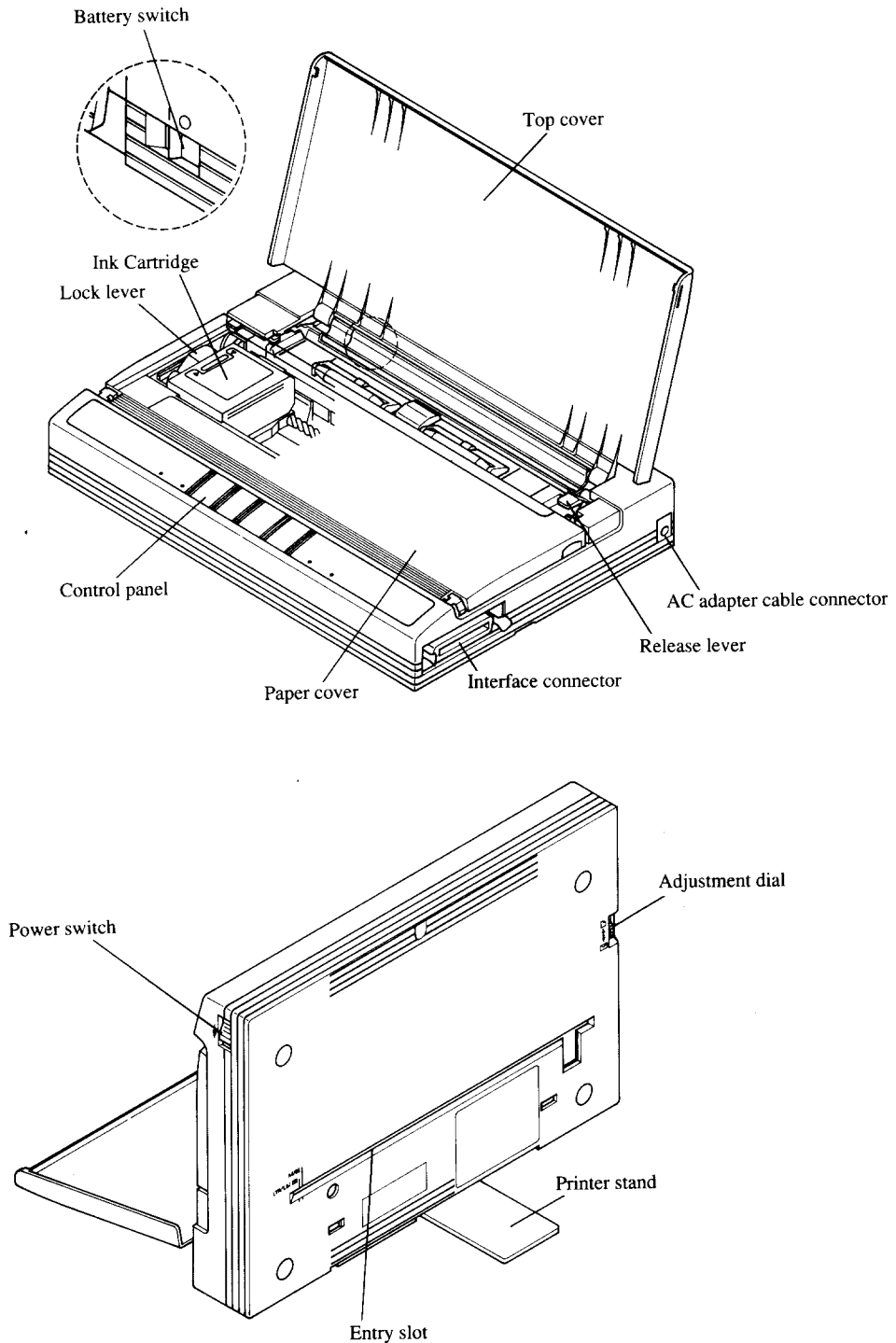
Top cover	Aligns single sheets (cut forms) to help the printer detect when paper is inserted. This cover is used as a paper tray when using the flat feed or optional Automatic Sheet Feeder.
Interface connector	Connects the computer to the printer.
Adjustment dial	Controls print darkness by adjusting for the thickness of forms being printed.
AC adapter cable connector	Connects the plug of the AC adapter. Do not remove the plug when the printer is turned on.
Print head cap	Caps the print head of Ink Cartridge to prevent ink from drying out.
Ink Cartridge	A disposable cartridge including ink and print head.
Lock lever	Locks or releases the Ink Cartridge.
Paper cover	Protects the Ink Cartridge and other internal components of your printer.
Control panel	Indicates printer status and makes various control of printer functions simple and convenient.
DIP switch	Sets the default printer conditions.
Release lever	Releases pressure on the paper. This lever must be down to feed paper, and upward to release paper.
Battery component cover	The optional battery pack is located under this cover.
Entry slot	For inserting single sheets of paper with flat feeding.
Power switch	Switches power on or off.
Printer stand	Adjustable to raise the printer.
Battery switch	Set the switch to ON position only when charging the optional battery pack or working the printer with it.

REQUIREMENTS

Before you start unpacking and setting up your printer, make sure that the following requirements are satisfied.

Location of the printer

Make sure that you have a suitable place on which to locate the printer. 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 or dust
- Use the printer where there is sufficient room for the paper and any paper being fed in or printed out.
- Make sure that the interface cable is within 2m (6ft) of the printer.
- Do not place objects on top of the printer.

Requirements of the power supply

- Supply it with "clean" electricity. Do not connect it to the same circuit as a large, noise-producing appliance such as a refrigerator.
- Make sure the line voltage is the voltage specified on the AC adapter's identification plate.
- Do not unplug the AC adapter cable to turn printer off. The print head will be damaged because it cannot be capped correctly. If the AC adapter cable is unplugged by mistake, plug it in again and switch the printer on and off to cap correctly.

Requirements of the Ink Cartridge

- Do not remove the Ink Cartridge from the printer unless it has to be replaced.
- Do not touch the print head of the Ink Cartridge. The print head is a special precision component.
- Do not subject the Ink Cartridge to physical shock or vibration. Ink may be spilled on your hands or clothes.
- Do not attempt to refill the Ink Cartridges. A clear printout cannot be obtained.
- Do not disassemble the Ink Cartridge. Ink may be spilled on your hands or clothes.
- Do not place the head of the Ink Cartridge face down.

Chapter 2
SETTING UP THE PRINTER

This chapter describes the following procedures to set up your new printer.
Before you start unpacking and setting up your printer, make sure that the requirements described in Chapter 1 are satisfied.

- Unpacking the carton box
- Connecting the power supply
- Installing the Ink Cartridge
- Connecting the printer to your computer

UNPACKING AND INSPECTION

Now unpack the contents of the shipping carton, and check each item in the box against Figure 2-1 to make sure that you have everything (there should be four items).
If any of these items are missing, contact your supplier.
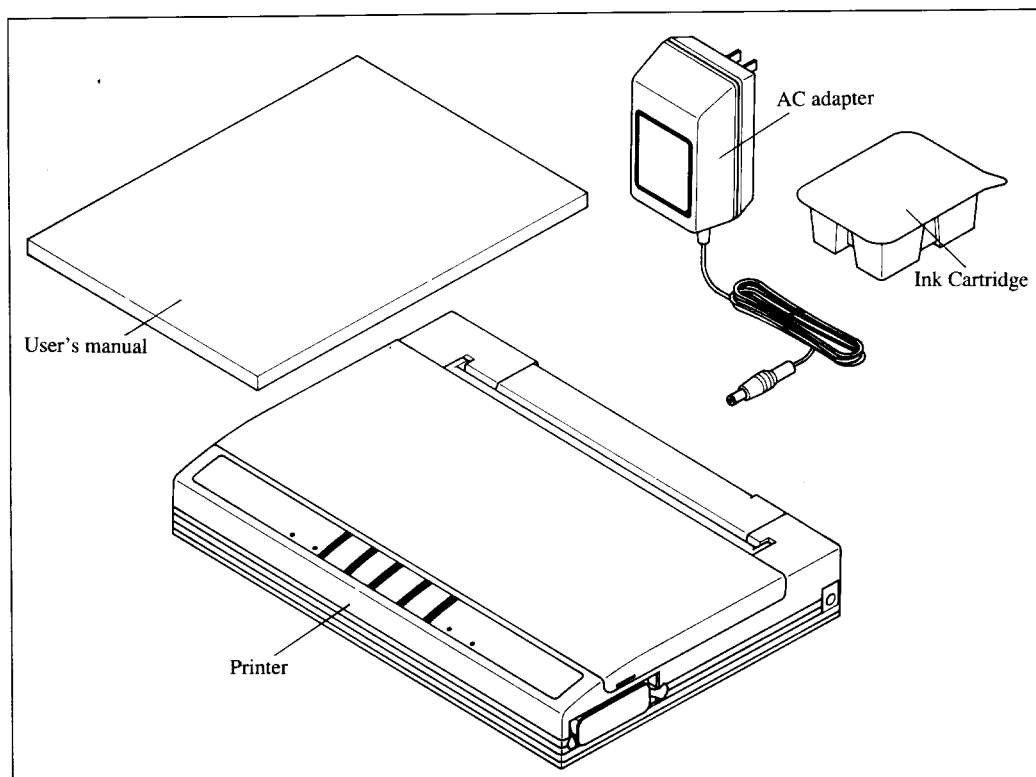
Figure 2-1. Check to make sure you have all four items: 1) Printer, 2) AC adapter, 3) Ink Cartridge, and 4) User's manual.

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

- Automatic Sheet Feeder (SF-10CA)
- NiCd battery pack (BP-10)

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.

Connecting the power supply

You can use either the AC adapter or the optional NiCd battery pack to supply the power to the printer.

The procedure to connect the AC adapter is:

1. Plug the AC adapter into a properly grounded AC outlet.
2. Attach the AC adapter cable to the printer. Whenever connecting the AC cable, the carriage moves and the print head is recapped automatically.
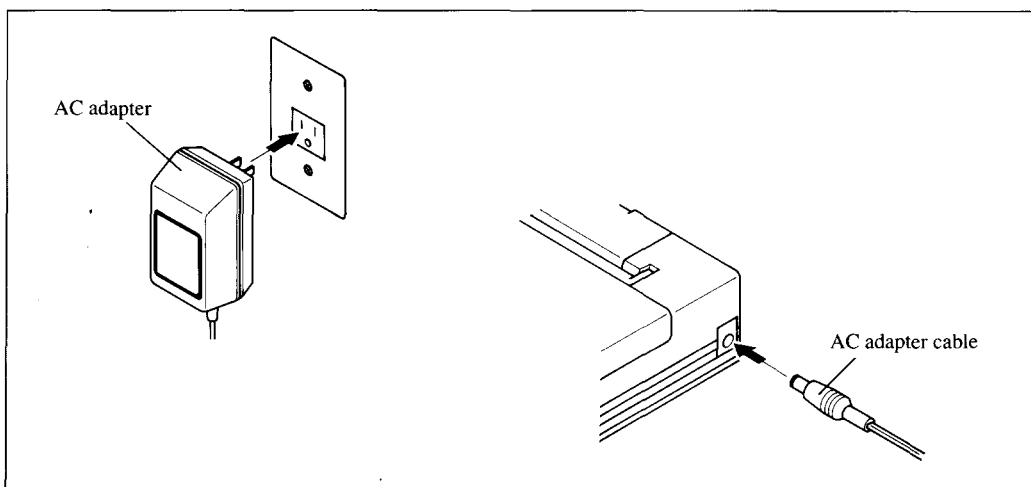
Figure 2-2. Connect the AC adapter cable to the printer.

The procedure to install the optional NiCd battery pack is:

1. Turn the printer upside down and turn the printer stand.
2. Open the battery compartment by pushing the two recesses as shown in Figure 2-3.
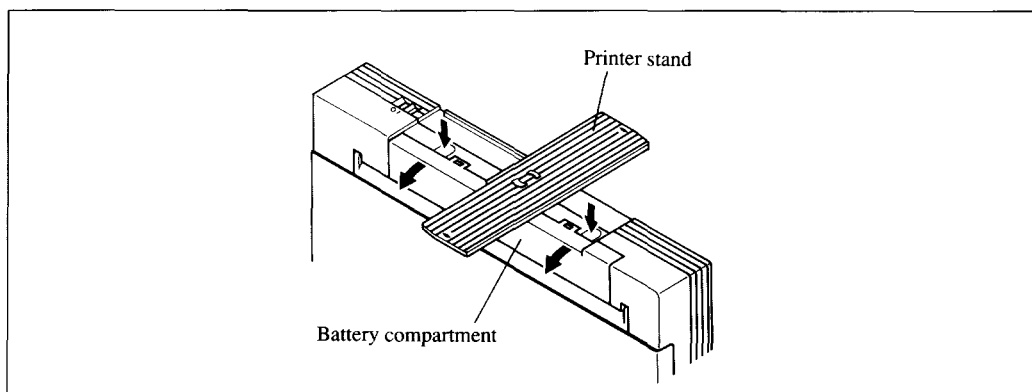
Figure 2-3. Open the battery compartment after turned the printer upside down and the printer stand.

8

3. Insert the battery pack into the battery compartment with the terminal end first.
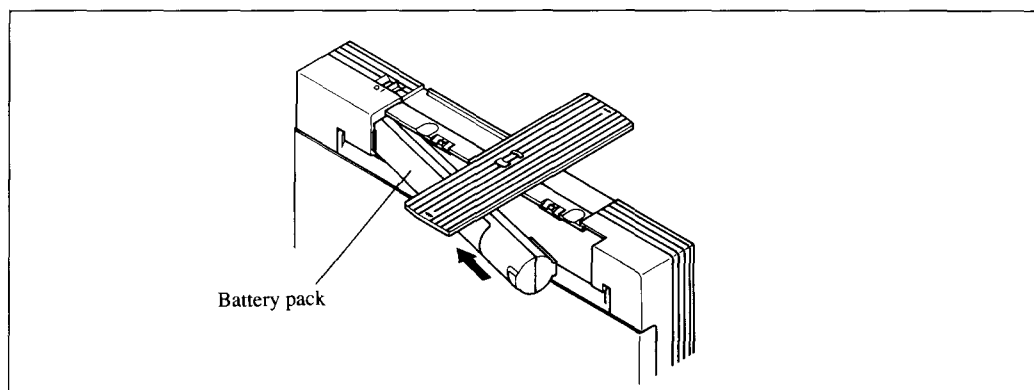
Figure 2-4. Insert the battery pack into place with the terminal end first.

4. Replace the battery compartment cover, and return the stand to its original position.
5. Turn on the battery switch located behind the printer. Whenever you turn on the battery switch, the carriage moves and the print head is recapped automatically.

Install the Ink Cartridge

Your printer uses a replaceable Ink Cartridge contains both the print head and ink.

The procedure to install the Ink Cartridge is:

1. Open the top cover and the paper cover.
2. Lift the lock lever on the carriage.
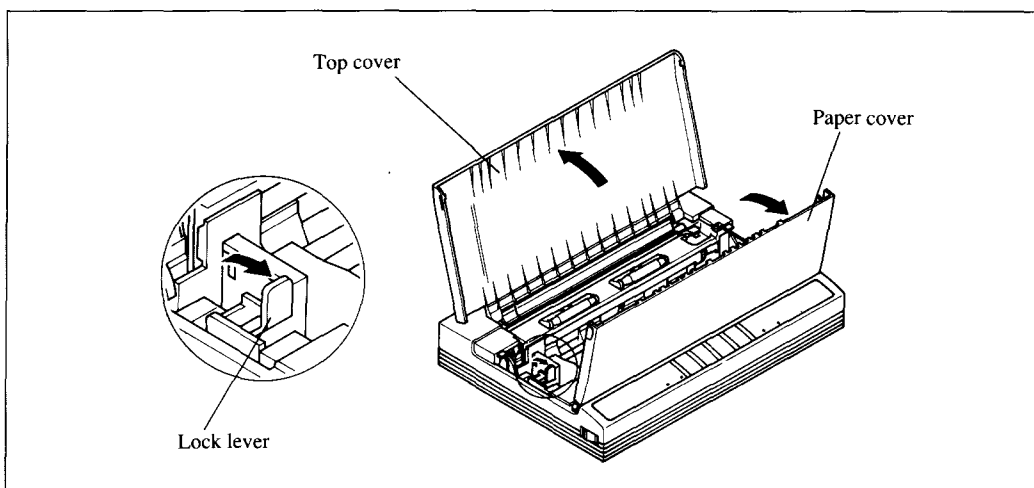
Figure 2-5. Open the top cover and the paper cover, then lift the lock lever on the carriage.

3. Open the package of the Ink Cartridge.
4. Push the right side of the head cap carefully as shown in Figure 2-6. It will pop off.
5. Remove the protection tape.
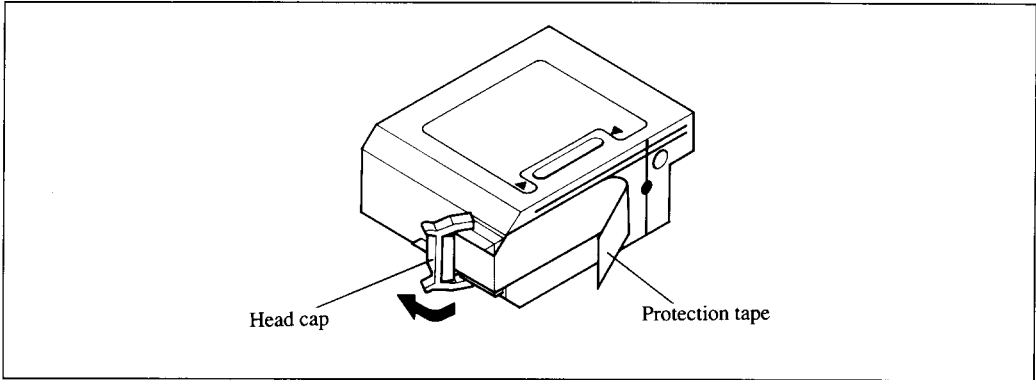
Figure 2-6. Remove the head cap and protection tape from the Ink Cartridge.

6. Load the Ink Cartridge by inserting the guide into the slot of the Ink Cartridge.
    CAUTION: Be careful not to touch the terminals on the flexible cable.
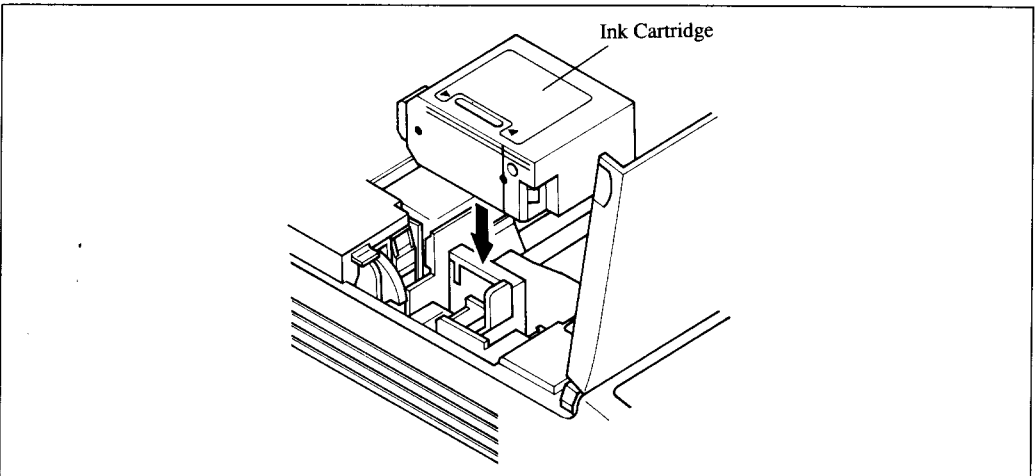
Figure 2-7. Load the Ink Cartridge.

7. Push the lock lever down to the end. (The Ink Cartridge is positioned and locked as shown below.)
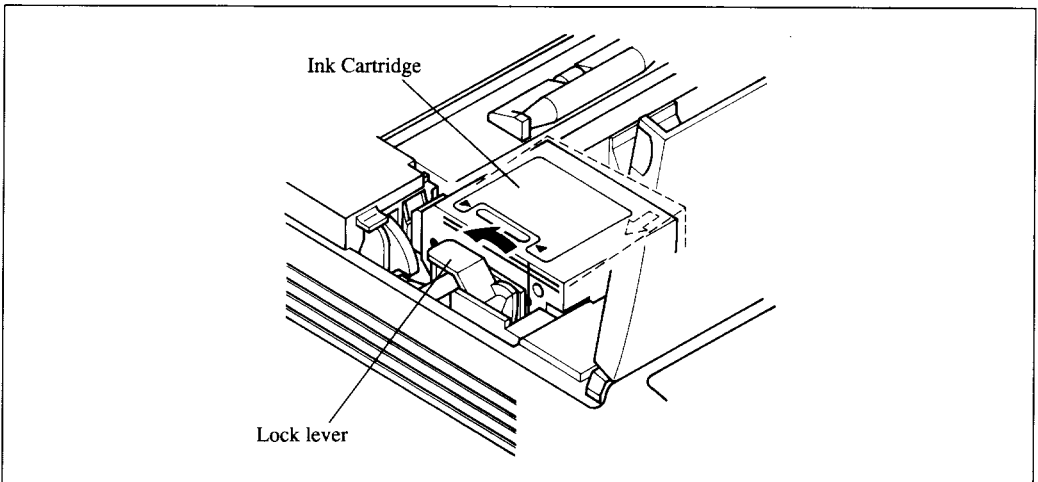
Figure 2-8. Push the lock lever down to position the Ink Cartridge.

8. Close both the paper cover and the top cover.
9. Turn on the Power switch while holding down the ⬚REV ADJ⬚ and ⬚PITCH⬚ buttons.
This will execute the head cleaning to fill up the ink into the print nozzles.

Connecting the interface cable

Connect the printer to your computer using a standard Centronics parallel interface cable. On a PS/2 or PC/AT-type computer, this means that you use the 25-pin D-type connector at the computer end, and the Amphenol-type 36-pin connector at the printer end. The configuration of the printer's connector is given in Chapter 10 should you need a cable for connecting to another computer.

Follow the procedures below to connect the interface cable:

1. Turn off the power switch both the printer and the computer.
2. Remove the connector cap from the interface connector.
3. Connect the interface cable to the printer as shown in Figure 2-9.
   Make sure that you press the plug fully into the interface connector.
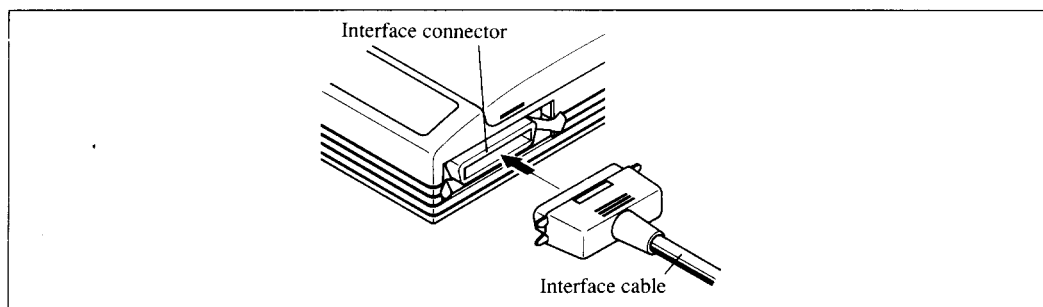
Figure 2-9. Connecting the interface cable.

4. Move both clips inside the extended prongs on the sides of the plug until you hear a click.
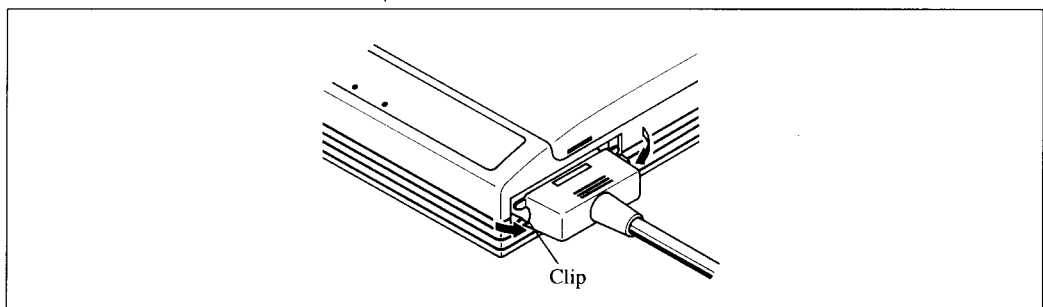
Figure 2-10. Move the clips until you hear a click.

5. Connect the other end of the interface cable to your computer. Use your computer instructions to attach the interface cable.
   NOTE: Because you need your computer when you start printing, ensure that it is completely installed.

MEMO

Chapter 3

PAPER HANDLING

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

SELECTION OF PAPER

Your printer accepts any of the following papers:

- Single sheets (cut forms) and stationery
    This printer can print on paper from 7.2 × 7.2 in. (182 × 182 mm) to 8.5 × 14 in. (216 × 356mm) without curls, folds or damaged edges.
    The paper thickness should be under 0.2mm and wights between 52 g/m² to 90 g/m² with roller feed, and between 52 g/m² to 105 g/m² with flat feed.
    Note that gauges for the paper sizes are printed on the top cover and the flat feed slot. You can also use the optional Automatic Sheet Feeder.

- Envelopes
    Commercial number 10 (4.1" × 9.5") can be only used with the flat feed. The following envelopes cannot be used.
    - Envelopes with: windows, holes, perforations, cutouts, and double flaps
    - Envelopes made with special coated paper or deep embossed paper
    - Envelopes using peel-off sealing strips
    - Envelopes in which letters have been enclosed

Figure 3-1 shows the recommended print area for each type of papers.
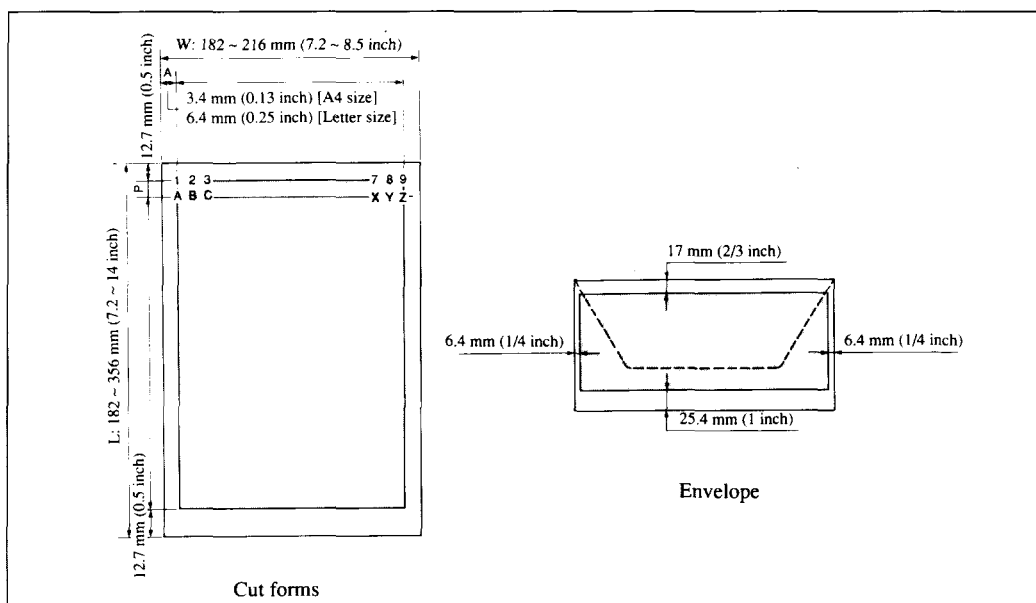
Figure 3-1. Recommended print area for acceptable papers.

ADJUSTING THE PRINTING GAP

The distance between the print head and the paper can be adjusted to accommodate different paper thicknesses. The adjustment dial is located behind the interface connector at the left side of the printer.

There are three positions, and you can feel the dial clicking into each position. The center position is for high density graphics printing on normal paper. Turning the adjustment dial clockwise is for the normal paper, and the counterclockwise is for thick paper or envelopes.
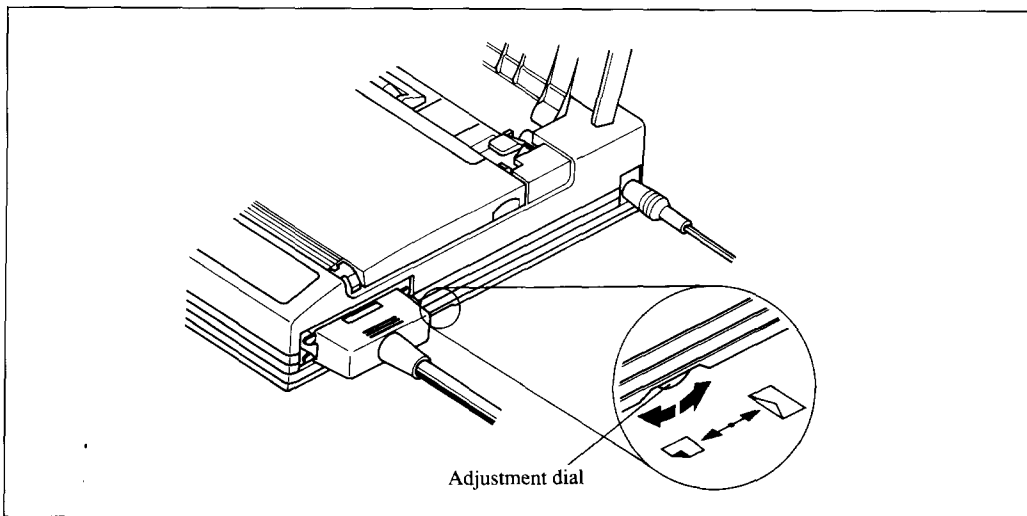
Figure 3-2. Location of the adjustment dial.

LOADING PAPER

This section will take you through the procedures for loading paper.
You can load paper either from the front slot or from the flat feed slot.
It is recommended to use the flat feed slot for thick paper or the envelopes.

Loading the paper from the front slot

1. Open the top cover and push down the release lever.
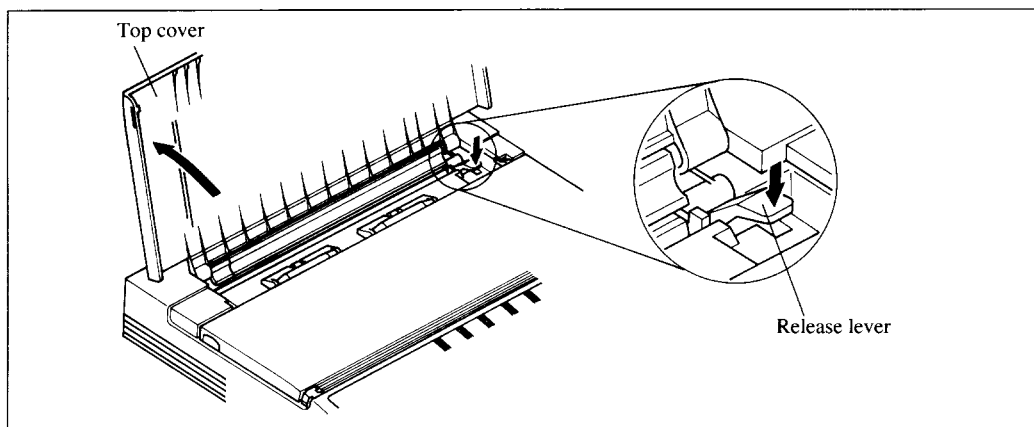
Figure 3-3. Open the top cover and confirm that the release lever is pushed down.

2. Check the adjustment dial to accommodate the paper thickness.
3. Slide to turn on the Power switch located at the left side of the printer.
   The PAPER indicator will illuminate and the ERROR indicator will blink that there is no paper in position for printing.
   NOTE: The Power switch will return to its original position automatically.
4. Match the paper with the paper size scales on the top cover and insert the paper straightly.
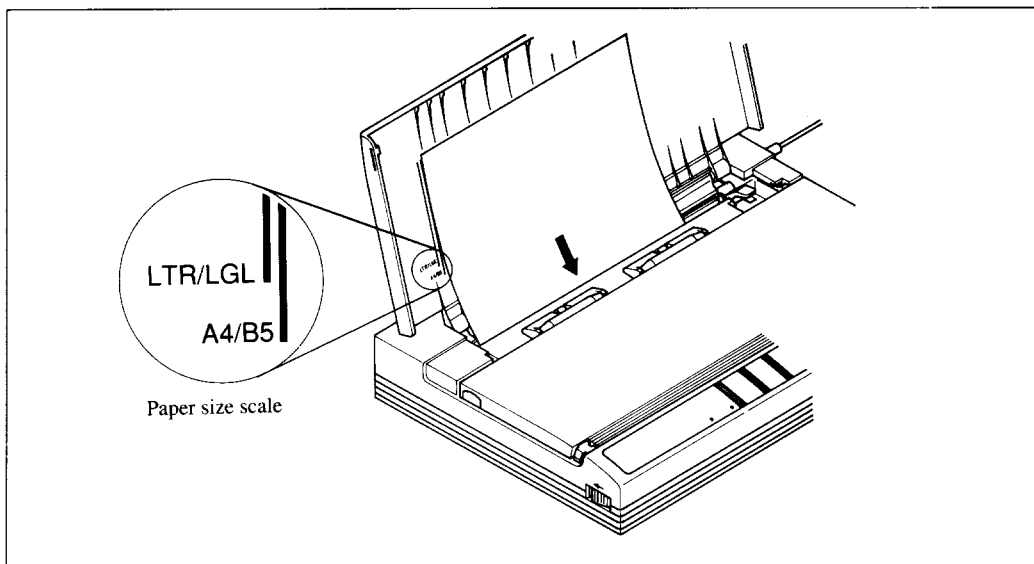
Figure 3-4. Insert the paper from the front slot to match the paper with the paper size scale.

5. Now, press the ⌜LINE FEED⌟ button down to advance and position the paper.
6. If you want to set the paper to a different position, set the printer off-line by pressing the ⌜ON LINE⌟ button, then set the paper position by using the micro-feed function. (For details, refer to Chapter 4.)
7. Press the ⌜ON LINE⌟ button to set the printer on-line.

NOTE: 1. Do not open the paper cover while printing.
2. If the paper catches at the top of cover as it is being fed through the printer, it will curl and may not stack properly. If you notice the paper catching on the cover as shown below, lightly tap the paper with your hand so that it stacks against the cover.
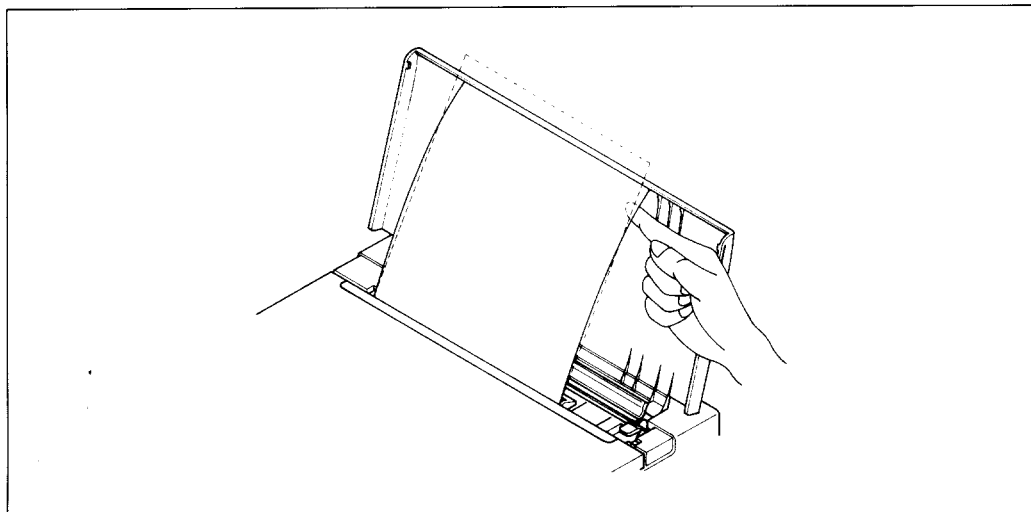
Figure 3-5. Tap the paper with your hand to stack the paper against the cover.

Loading the paper from the flat feed slot

1. Raise the printer by adjusting the printer stand as shown below.
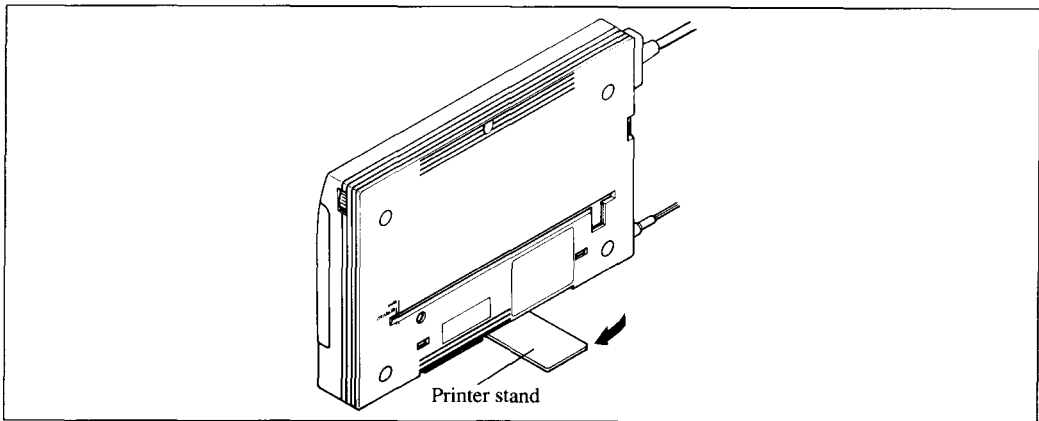
Figure 3-6. Raise the printer with the printer stand.

2. Open the top cover and rotate the adjustment dial counterclockwise.
3. Slide the Power switch to turn on the power, and press the ⌷ ON LINE ⌷ and ⌷ FWD ADJ ⌷ buttons until you hear a short beep tone.
4. Align the envelope (or the paper) with the scales of the flat feed slot and insert the envelope straight into the slot.
    The envelope automatically sets to the printing position.
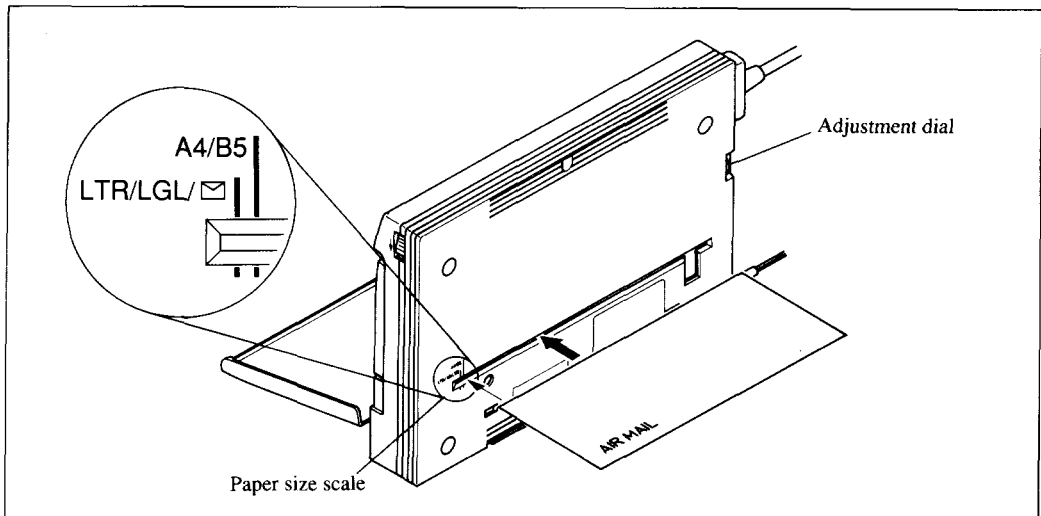
Figure 3-7. Align the envelope with the scales of the flat feed slot to feed it.

5. If you want to set the paper to a different position, set the printer off-line by pressing the ⌷ ON LINE ⌷ button, then set the paper position by using the micro-feed function. (For details, refer to Chapter 4.)
6. Press the ⌷ ON LINE ⌷ button to set the printer on-line.

NOTE: Remove the envelope by hand if it is not ejected after printing.

REMOVING PAPER JAMS

When paper jams occur, the ERROR indicator illuminates and the printer is set off-line. In this case, remove the jammed paper according to the following procedure.

1. Lift up the paper release lever.
2. Remove the jammed paper carefully by pulling on the end of the paper.
   If the paper is wrapped around the platen, pull the end of the paper while holding down the [REV ADJ] button.
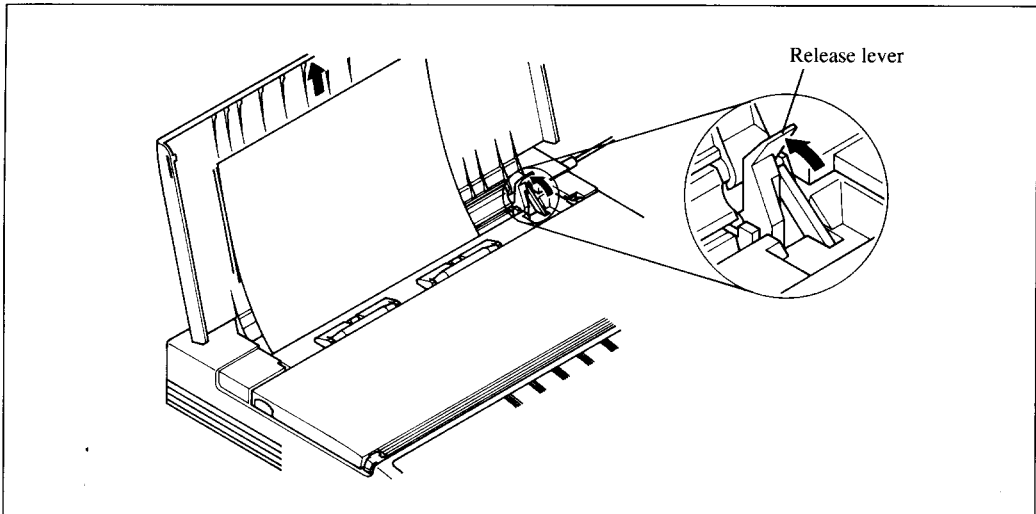
Figure 3-8. Remove the paper from the end after lift up the release lever.

3. Open the paper cover, and confirm that any paper remained in the printer.
4. Press down the paper release lever.
5. Load a new sheet of paper and press the [ON LINE] button to set the printer on-line.

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 holding these buttons down when you turn the printer's power on, or by pressing the control panel buttons in combination.

This chapter explains all the button and indicator functions.

- Pause printing
- Feed paper (fast and slow, forward and reverse)
- Select the print pitch
- Select the font
- Select paper feed mode
- Set the top-of-form position
- Cleaning the Ink cartridge
- Clear the printer's buffer
- Charge the optional battery pack
- Print test patterns
- Print a hexadecimal dump
- Prevent software from changing the panel pitch selection

BUTTONS AND INDICATORS

The printer is equipped with five buttons on the control panel. From left to right they are
[ON LINE] , [LINE FEED] , [FWD ADJ] , [REV ADJ] and [PITCH] .

The following is a brief guide to the buttons and indicators on the control panel.
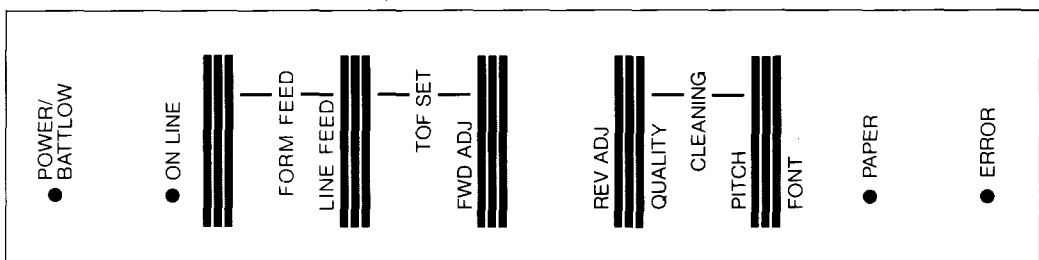
Figure 4-1. Control panel.

ON LINE button

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. 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 if paper is loaded. If paper is not loaded, the printer powers up off-line with the PAPER indicator illuminating and the ERROR indicator blinking. When you load paper, you must press the ⌷ON LINE⌷ button to set the printer 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.

LINE FEED button

If you press this button while off-line, the paper will feed forward. 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 eject automatically the current page. This is explained later.

FWD ADJ button

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 and hold down the ⌷FWD ADJ⌷ button. The paper will start advancing in a series of small steps. When you want to stop, release this button.

REV ADJ button

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 and hold down the ⌷REV ADJ⌷ button. The paper will start moving backwards in a series of small steps. When you want to stop, release this button.

If you press this button while on-line, this will change the Print Quality between High Quality (HQ) and Economy. You will hear one beep tone when the Economy mode is selected, and twice when the HQ mode is selected. The print speed is the same in both the Economy and HQ mode, but the Economy mode uses less ink.
When you select the Economy mode with this button, the printer ignores the Print Quality commands from the computer, and prints all text and graphics with the Economy mode.

PITCH button

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 select the following options in order (Note that semi-condensed pitch is not available in the IBM mode):

Pitch
Pica (10CPI)
Elite (12CPI)
Semi-condensed (15CPI)
Condensed pica (17CPI)
Condensed elite (20CPI)
Proportional

If you press this button while on-line, this will change the Font style.
You will hear one beep tone when the H-Gothic font is selected, and twice when the Roman font is selected.

SWITCH COMBINATION FUNCTIONS

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

Flat feed

This printer can load paper either from the front slot of from the flat feed slot.
It is recommended to use the flat feed for thick paper or the envelopes.

Before you load paper from the flat feed slot, it is necessary to indicate the printer that the paper will be fed by the flat feed with the following procedure:

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 down the ‾ON LINE‾ button down, press and hold the ‾FWD ADJ‾ button.
   Continue holding these two button down. In a few second, you will hear a short beep tone signaling that the flat feed mode is selected.
   If you hold these buttons after the short beep tone, you will hear two beep tones signaling that the flat feed mode is cancelled.
4. Release these buttons, and load paper from the flat feed slot.

Form feed

When you want to eject the current paper, follow the procedures below instead of pressing the ‾LINE FEED‾ button several times:

1. Press the ‾ON LINE‾ button to set the printer off-line.
2. Press the ‾LINE FEED‾ button and hold it down. The printer will start performing successive line feeds.
3. While holding the ‾LINE 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 first line position is automatically set to the current position.

If this is not where you want the top line of the page to be, you can change the top-of-form position as follows:

1. Press the [ON LINE] button to set the printer off-line.
2. Move the paper to the desired top-of-form position by pressing the [LINE FEED] button, or by performing a forward or reverse micro-feed with [FWD ADJ] or [REV ADJ] button.
3. Press the [ON LINE] button to set the printer on-line.
4. While holding the [LINE FEED] button down, press the [FWD ADJ] button, then release both buttons at the same time. You will hear a beep tone indicating that the top-of-form position has been set.

Head cleaning

The printer's unique head cleaning system clears paper particles and dust accumulated around the print head nozzles that may otherwise cause printing problems. It also clears the nozzles and helps maintain a high level of print quality. However, if printing problems such as irregular dot print or dot missing should occur, perform the print head cleaning according to the procedure below.

1. Make sure that the printer is turned on and the paper is loaded.
2. Press and hold down the [REV ADJ] and [PITCH] buttons while in on-line.
3. The ON LINE indicator blinks for five seconds while the print head is being cleaned. The check pattern shown below can be printed by pressing one of any button within 1.5 seconds after pressing the [REV ADJ] and [PITCH] buttons.

> **NOTE:** The printer does not print the check pattern when the data in the buffer is retained.

When the print check is completed, the printer returns to normal status.
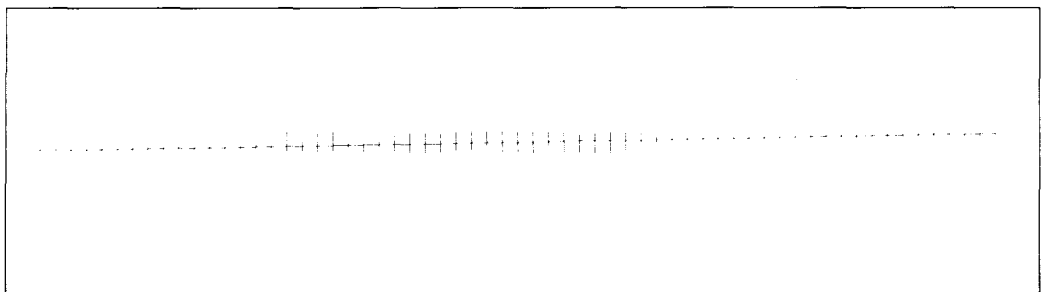
Figure 4-3. Sample of check print pattern.

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 and hold the [ON LINE] button.
3. While pressing the [ON LINE] button down, press and hold the [PITCH] button. Continue holding these two buttons down. In one second you will hear three beep tones signaling that the printer has been initialized to the power-on default settings.
4. Release these buttons, make any necessary control panel settings, then set the printer back on-line.

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

POWER-UP FUNCTIONS

In addition to their normal functions, all the control panel buttons have special functions that operate if you hold them down while switching power on.
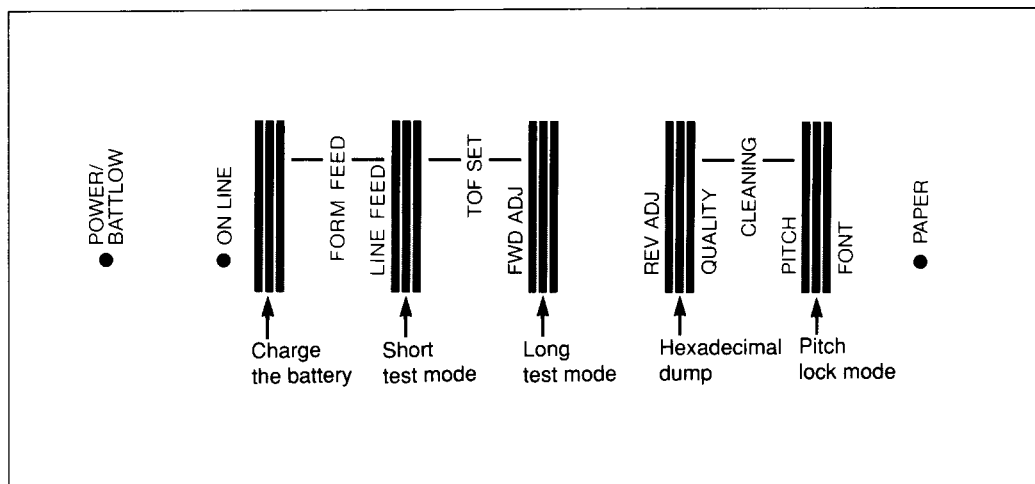
Figure 4-4. Power-up functions of control panel.

Charge the optional battery pack

The printer can operate with the optional NiCd battery pack when an external power source is not available. Battery life varies depending on the options and the print density. Normally, a single charge works the printer for 40 minutes. A battery charge will take about ten hours.

1. Set the battery switch on the back of the printer to the ON position.
2. Turn the Power switch on while holding down the ‾‾ON LINE‾‾ button.
3. The POWER indicator blinks while the battery is being charged.
   When the battery reaches a nearly full charge, the POWER indicator automatically goes off (auto power off function).

CAUTION: Do not overcharge the battery pack.

Short test mode

If the printer is turned on while the ‾‾LINE FEED‾‾ 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 six lines of the character set.
Each line will be offset by one character from the one before it. The final result will be something like Figure 4-5.

```
        *** Ver 1.0 ***


 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
```

Figure 4-5. Short self-test.

Long test mode

If the printer is turned on while the [FWD ADJ] button is pressed, the printer will enter the long self-test mode. The printer will print the version number of the printer's ROM, followed by the whole character set printed in each font and pitch available.

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

```
                *** Ver 1.0 ***




      < TMS-ROMN >

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
áíóúñÑªº¿
±

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
áíóúñÑªº¿



      < HELVET >

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
áíóúñÑªº¿

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
áíóúñÑªº¿
```
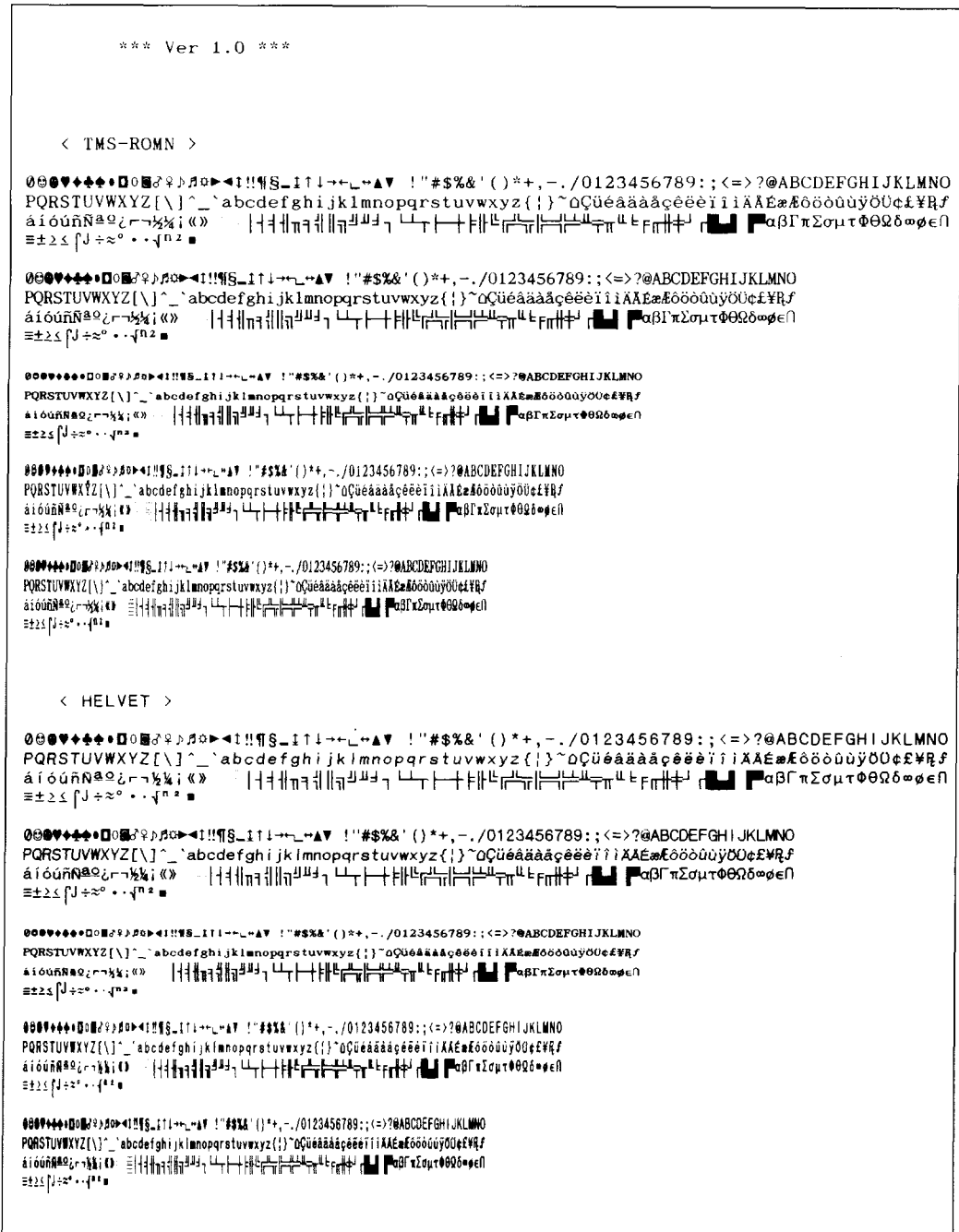
Figure 4-6. Long self-test.

Hexadecimal dump

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

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

This mode is accessed with the following procedure:

1. While holding the ☐ REV ADJ ☐ button down, turn power ON. A beep tone will be heard.
2. Begin printing. In place of the usual printout you will get a formatted dump showing exactly what data the printer receives. Each line presents sixteen characters, their hexadecimal codes to the left and printable characters printed on the right.
3. At the end of the hexadecimal dump, set the printer off-line with the ☐ ON LINE ☐ button. This is necessary to print the last line.

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

```
10 WIDTH "LPT1:",255
20 FOR I=0 TO 255
30 LPRINT CHR$(I);
40 NEXT I
50 LPRINT
60 END
```

If your system passes the codes directly to the printer without changing them, you will get a printout like Figure 4-7.

```
00 01 02 03 04 05 06 07    08 09 0A 0B 0C 0D 0E 0F    ................
10 11 12 13 14 15 16 17    18 19 1A 1B 1C 1D 1E 1F    ................
20 21 22 23 24 25 26 27    28 29 2A 2B 2C 2D 2E 2F    !"#$%&'()*+,-./
30 31 32 33 34 35 36 37    38 39 3A 3B 3C 3D 3E 3F    0123456789:;<=>?
40 41 42 43 44 45 46 47    48 49 4A 4B 4C 4D 4E 4F    @ABCDEFGHIJKLMNO
50 51 52 53 54 55 56 57    58 59 5A 5B 5C 5D 5E 5F    PQRSTUVWXYZ[\]^_
60 61 62 63 64 65 66 67    68 69 6A 6B 6C 6D 6E 6F    `abcdefghijklmno
70 71 72 73 74 75 76 77    78 79 7A 7B 7C 7D 7E 7F    pqrstuvwxyz{|}~.
80 81 82 83 84 85 86 87    88 89 8A 8B 8C 8D 8E 8F    ................
90 91 92 93 94 95 96 97    98 99 9A 9B 9C 9D 9E 9F    ................
A0 A1 A2 A3 A4 A5 A6 A7    A8 A9 AA AB AC AD AE AF    ................
B0 B1 B2 B3 B4 B5 B6 B7    B8 B9 BA BB BC BD BE BF    ................
C0 C1 C2 C3 C4 C5 C6 C7    C8 C9 CA CB CC CD CE CF    ................
D0 D1 D2 D3 D4 D5 D6 D7    D8 D9 DA DB DC DD DE DF    ................
E0 E1 E2 E3 E4 E5 E6 E7    E8 E9 EA EB EC ED EE EF    ................
F0 F1 F2 F3 F4 F5 F6 F7    F8 F9 FA FB FC FD FE FF    ................
0D 0A                                                 ..
```

Figure 4-7. Sample hexadecimal dump.

Most BASICs, however, are not quite that straightforward. For example, the IBM-PC will give you a printout similar to Figure 4-8.

When the IBM-PC BASIC interpreter sends hex code 0D (carriage return) it adds an extra hex 0A (line feed). Hex code 1A (end-of-file) also gets special treatment: the interpreter does not send it at all. This can cause problems with graphics or download character data. However, you can solve this problem by changing line 30 in the preceding program and adding the coding shown below.

```
00 01 02 03 04 05 06 07     08 09 0A 0B 0C 0D 0A 0E         . . . . . . . . . . . . . . . .
0F 10 11 12 13 14 15 16     17 18 19 1B 1C 1D 1E 1F         . . . . . . . . . . . . . . . .
20 21 22 23 24 25 26 27     28 29 2A 2B 2C 2D 2E 2F          ! " # $ % & ' ( ) * + , - . /
30 31 32 33 34 35 36 37     38 39 3A 3B 3C 3D 3E 3F         0123456789: ; < = > ?
40 41 42 43 44 45 46 47     48 49 4A 4B 4C 4D 4E 4F         @ABCDEFGHIJKLMNO
50 51 52 53 54 55 56 57     58 59 5A 5B 5C 5D 5E 5F         PQRSTUVWXYZ[\]^_
60 61 62 63 64 65 66 67     68 69 6A 6B 6C 6D 6E 6F         `abcdefghijklmno
70 71 72 73 74 75 76 77     78 79 7A 7B 7C 7D 7E 7F         pqrstuvwxyz{¦}~.
80 81 82 83 84 85 86 87     88 89 8A 8B 8C 8D 8E 8F         . . . . . . . . . . . . . . . .
90 91 92 93 94 95 96 97     98 99 9A 9B 9C 9D 9E 9F         . . . . . . . . . . . . . . . .
A0 A1 A2 A3 A4 A5 A6 A7     A8 A9 AA AB AC AD AE AF         . . . . . . . . . . . . . . . .
B0 B1 B2 B3 B4 B5 B6 B7     B8 B9 BA BB BC BD BE BF         . . . . . . . . . . . . . . . .
C0 C1 C2 C3 C4 C5 C6 C7     C8 C9 CA CB CC CD CE CF         . . . . . . . . . . . . . . . .
D0 D1 D2 D3 D4 D5 D6 D7     D8 D9 DA DB DC DD DE DF         . . . . . . . . . . . . . . . .
E0 E1 E2 E3 E4 E5 E6 E7     E8 E9 EA EB EC ED EE EF         . . . . . . . . . . . . . . . .
F0 F1 F2 F3 F4 F5 F6 F7     F8 F9 FA FB FC FD FE FF         . . . . . . . . . . . . . . . .
0D 0A                                                       . .
```

Figure 4-8. Sample hexadecimal dump with IBM-PC.

Coding for IBM-PC with monochrome display:

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

Coding for IBM-PC with color adapter:

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

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 on-line and start printing. The pitch you selected will not be reset or otherwise changed by any commands your software may issue.

Chapter 5

DIP SWITCH SETTINGS

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

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

LOCATION OF THE DIP SWITCHES

When you open the top cover and the paper cover and look inside, you will see the small compartment at the right side of the printer with small white switches. These are the printer's DIP switches, named 1 to 10 from left to right.
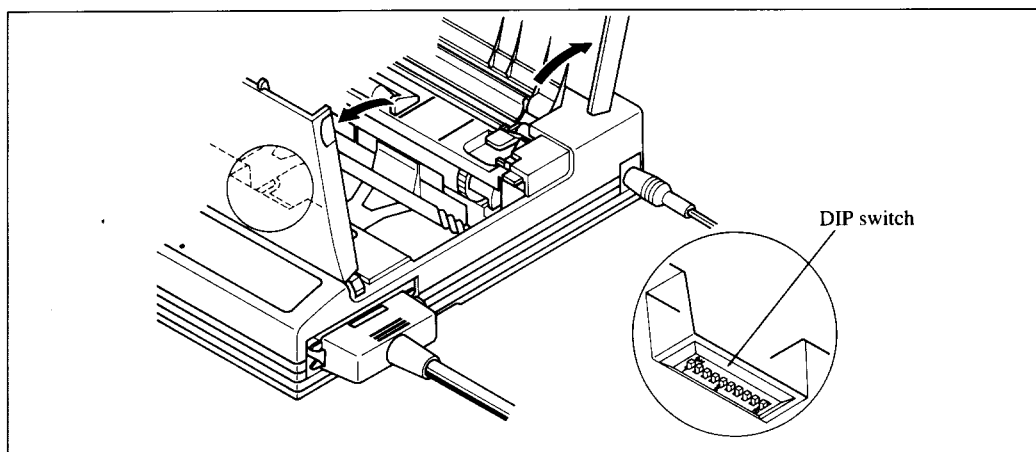
Figure 5-1. DIP switches are located inside the printer case.

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

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

FUNCTIONS OF THE DIP SWITCHES

The printer is factory-set with all DIP switches in the ON position. These are the standard settings. By changing the settings, you can alter various printer functions to match your requirements. The following questions will help you choose the proper settings.

Switch	Function	ON	OFF
1	Emulation	Standard	IBM
2	RAM usage	Buffer	Download
3	Auto LF with CR	Disabled	Enabled
4	Automatic Sheet Feeder	Inactive	Active
5	Font style	Tms Romn	Helvet
6	Print mode	Normal size	Quarter size
7	Character set (Standard mode)	Graphics	Italics
	Character set (IBM mode)	Set #2	Set #1
8	International Character Set		
9	or		
10	IBM Code Page		

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

Select the mode compatible with your computer and software. In standard mode the printer operates like the Epson LQ-850. In IBM mode it operates like the IBM Proprinter X24E. The ON position selects standard mode. The OFF position selects IBM mode.

Switch 2: Does your software download new characters to the printer with the Standard mode?

In order to download characters with the Standard mode, 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 data faster than the printer prints.
NOTE: This switch takes no effect with the IBM mode. In the IBM mode, you cannot download characters.

Switch 3: Do you want an automatic line feed?

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 4: Are you going to use the optional Automatic Sheet Feeder (ASF)?

In order to use the optional Automatic Sheet Feeder, move this switch to the OFF position. Otherwise leave it ON.

Switch 5: Do you want to print with Roman font style or H-Gothic font style?

This printer has two font styles: Roman and H-Gothic.
The ON position selects the Roman font style, and the OFF position selects the H-Gothic font style as the power-on default.

Switch 6: Do you want to print quarter sized mode?

This printer has special print mode. If you move this switch to the OFF position, all data received are printed in half-sized both horizontally and vertically. This mode is called as "Quarter sized print mode". If you leave this switch ON, the printer prints with normal print mode.

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

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

Set this switch OFF to print italics in the standard character set. If you leave this switch to the ON position, in place of italics you will get the graphic characters, international characters, and mathematical symbols of IBM character set #2.

If you selected IBM mode, do you want IBM character set #1 or #2?

ON selects character set #2, which is for computers with an 8-bit interface (the most common kind).
OFF selects character set #1, for computers with a 7-bit interface.

Switches 8 to 10: Do you want an international character set or IBM code page?

International character sets differ in their assignment of 14 character codes in the Standard Italic character set. See the character tables at the back of this manual. With these switches you can select one of eight character sets as follows:

Country	8	9	10	Country	8	9	10
U.S.A.	ON	ON	ON	Denmark I	ON	ON	OFF
France	OFF	ON	ON	Sweden	OFF	ON	OFF
Germany	ON	OFF	ON	Italy	ON	OFF	OFF
England	OFF	OFF	ON	Spain I	OFF	OFF	OFF

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

Code Page	8	9	10	Code Page	8	9	10
#437 U.S.A.	ON	ON	ON	#863 Canadian French	ON	ON	OFF
#850 Multi-Lingual	OFF	ON	ON	#865 Nordic	OFF	ON	OFF
#860 Portuguese	ON	OFF	ON	(Reserved)	ON	OFF	OFF
#861 Icelandic	OFF	OFF	ON	(Reserved)	OFF	OFF	OFF

MEMO

Chapter 6
PRINTER CONTROL COMMANDS

The printer has two emulation modes: Standard mode and IBM mode.
In standard mode, the printer emulates the functions of the Epson LQ-850. In IBM mode, the printer emulates the IBM Proprinter X24E.
Additional command codes are included as a superset of these emulations.

The emulation is changed by means of DIP switch 1. When this switch is set ON, the printer will be in standard mode, and when this switch is set OFF, the printer will be in IBM mode (see Chapter 5).
It is not possible to change 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 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 49	1B 78 31
	<ESC> "x" <1>	27 120 1	1B 78 01

  Mode: Indicates the mode in which the command is recognized.
     Std. Standard mode (DIP switch 1 is ON.)
     IBM IBM mode (DIP switch 1 is OFF.)
     Both Both standard and IBM modes

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

  Decimal: Gives the command in decimal character codes.

  Hexadecimal: Gives the command in hexadecimal character codes.

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

FONT CONTROL COMMANDS

Select Economy mode

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "x" "0"	27 120 48	1B 78 30
	<ESC> "x" <0>	27 120 0	1B 78 00

Changes from High Quality mode to Economy mode.
The print speed is the same in both the Economy and HQ (High Quality) mode, but the Economy mode uses less ink.
Ignored if the Economy mode was selected with the control panel.

Select High Quality mode

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "x" "1"	27 120 49	1B 78 31
	<ESC> "x" <1>	27 120 1	1B 78 01

Changes from Economy mode to High Quality mode.
Ignored if the Economy mode was selected with the control panel.

Select print quality

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

Selects the print quality according to the value of n as shown below.

n	Print quality
0	No change
1 ~ 127	Economy mode
128 ~ 254	High Quality
255	Factory default

Ignored if the Economy mode was selected with the control panel.

Select Tms Romn font

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "0"	40 40 70 41 41 48	28 28 46 29 29 30
	<ESC> "k" "0"	27 107 48	1B 6B 30

Selects the Tms Romn font. This is the default font if DIP switch 5 is set to ON.

Select H-Gothic font

Mode	ASCII	Decimal	Hexadecimal
Both	"(" "(" "F" ")" ")" "L"	40 40 70 41 41 76	28 28 46 29 29 4C
	<ESC> "k" <FF>	27 107 12	1B 6B 0C

Selects the H-Gothic font. This is the default font if DIP switch 5 is set to OFF.

Select italic characters

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

Causes subsequent characters 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 vertical strokes.

Cancel emphasized printing

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

Cancels emphasized printing.

Double-strike printing

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

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

Cancel double-strike printing

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

Cancels double-strike printing.

Start underlining

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

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

Stop underlining

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "–" "0"	27 45 48	1B 2D 30
	<ESC> "–" <0>	27 45 0	1B 2D 00

Stops underlining.

Start overlining

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "_" "1"	27 95 49	1B 5F 31
	<ESC> "_" <1>	27 95 1	1B 5F 01

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

Stop overlining

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "_" "0"	27 95 48	1B 5F 30
	<ESC> "_" <0>	27 95 0	1B 5F 00

Stops overlining.

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
1	Underlining
2	Strike-through
3	Overlining

n2	Function
0	Cancel score
1	Single continuous line
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 48	1B 53 30
	<ESC> "S" <0>	27 83 0	1B 53 00

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

Subscript

Mode	ASCII	Decimal			Hexadecimal		
Both	<ESC> "S" "1"	27	83	49	1B	53	31
	<ESC> "S" <1>	27	83	1	1B	53	01

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

Cancel superscript or subscript

Mode	ASCII	Decimal		Hexadecimal	
Both	<ESC> "T"	27	84	1B	54

Stops printing superscripts or subscripts and returns to normal printing.

CHARACTER SET COMMANDS

Select standard character set

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

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

Select IBM character set

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

Selects an IBM character set. This is the power-up default in IBM mode, or DIP switch 7 is set to ON in standard mode.

Select character set #1

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

Selects character set #1.

Select character set #2

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

Selects character set #2.

Select international character set

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "R" *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	Irish
7	Spain I	64	Legal

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.

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 power-up defaults by DIP switches 8 to 10.

Enable printing of all character codes

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "\" *n1* *n2*	27 92 *n1* *n2*	1B 5C *n1* *n2*

Enables printing of all characters in the IBM character set, including those assigned to character codes which are normally considered control codes. This command remains in effect for the next $n1 + n2 \times 256$ characters, where *n1* and *n2* are numbers between 0 and 255.

During this interval no control functions are executed. If a code with no assigned character is received, the printer prints a space.

Enable printing of all character codes on next character

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "^" *n*	27 94 *n*	1B 5E *n*

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

Select slash zero

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "~" "1"	27 126 49	1B 7E 31
	<ESC> "~" <1>	27 126 1	1B 7E 01

Causes subsequent zero characters to be overprinted with a slash ($\emptyset$).

Select normal zero

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "~" "0"	27 126 48	1B 7E 30
	<ESC> "~" <0>	27 126 0	1B 7E 00

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

CHARACTER SIZE AND PITCH COMMANDS

Pica pitch

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

In Standard mode, changes from either elite or semi-condensed to pica pitch (10 cpi) or from condensed elite to condensed pica (17 cpi). In IBM mode, changes from either elite or condensed to pica (10 cpi). Ignored if the PITCH LOCK mode was selected during power-up.

Select pica characters with Economy mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <0>	27 73 0	1B 49 00

Changes to pica pitch (10 cpi) with Economy mode. Ignored if the PITCH LOCK mode was selected during power-up.

Select pica characters with High Quality mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <2>	27 73 2	1B 49 02

Changes to pica pitch (10 cpi) with High Quality mode. Ignored if the PITCH LOCK mode was selected during power-up, or the Economy mode was selected with the control panel.

Elite pitch

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "M"	27 77	1B 4D
IBM	<ESC> ":"	27 58	1B 3A

Changes from either pica or semi-condensed to elite pitch (12 cpi) or from condensed pica to condensed elite (20 cpi). Ignored if the PITCH LOCK mode was selected during power-up.

Select elite characters with Economy mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <8>	27 73 8	1B 49 08

Changes to elite pitch (12 cpi) with Economy mode. Ignored if the PITCH LOCK mode was selected during power-up.

Select elite characters with High Quality mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <LF>	27 73 10	1B 49 0A

Changes to elite pitch (12 cpi) with High Quality mode. Ignored if the PITCH LOCK mode was selected during power-up, or the Economy mode was selected with the control panel.

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

. Changes from pica to condensed pica (17 cpi) or from elite to condensed elite (20 cpi). Ignored if the PITCH LOCK mode was selected during power-up.

Select condensed characters with Economy mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <16>	27 73 16	1B 49 10

Changes to condensed pitch (17 cpi) with Economy mode. Ignored if the PITCH LOCK mode was selected during power-up.

Select condensed characters with High Quality mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "I" <DC2>	27 73 18	1B 49 12

Changes to condensed pitch (17 cpi) with High Quality mode. Ignored if the PITCH LOCK mode was selected during power-up, or the Economy mode was selected with the control panel.

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-up.

Expanded printing

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

Causes subsequent characters to be expanded to double width.

Cancel expanded printing

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

· Stops expanded printing and returns to normal width.

Expanded printing for one line

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

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

Cancel one-line expanded printing

Mode	ASCII	Decimal	Hexadecimal
Both	<DC4>	20	14

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

Select character width

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

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

n	Character width
0	Normal-wide
1	Double-wide
2	Triple-wide

Select proportional spacing

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

Causes subsequent characters to be proportionally spaced. Ignored if the PITCH LOCK mode was selected during power-up.

Select proportional characters with High Quality mode

Mode	ASCII			Decimal			Hexadecimal		
IBM	<ESC>	"I"	<3>	27	73	3	1B	49	03

Changes to proportional pitch with High Quality mode. Ignored if the PITCH LOCK mode was selected during power-up, or the Economy mode was selected with the control panel.

Select fixed spacing

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

Causes subsequent characters to be printed with fixed character spacing. Ignored if the PITCH LOCK mode was selected during power-up.

Select master print mode

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "!" *n*	27 33 *n*	1B 21 *n*

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	*n* value
Underline	128
Italic	64
Expanded	32
Double strike	16
Emphasized	8
Condensed [*]	4
Proportional [*]	2
Elite [*]	1

[*] Ignored if the PITCH LOCK mode was selected during power-up.

Examples: *n* = 1 gives elite; *n* = 9 (1 + 8) gives emphasized elite; *n* = 137 (1 + 8 + 128) gives underlined emphasized elite.

Increase character spacing

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> <SP> *n*	27 32 *n*	1B 20 *n*

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

Select double or quadruple size

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "h" *n*	27 104 *n*	1B 68 *n*

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

n	Effect
0	Normal size
1	Double-high, double-wide
2	Quadruple-high, quadruple-wide

Select character size

Mode	ASCII						Decimal						Hexadecimal					
Both	"("	"("	"S"	")"	")"	d	40	40	83	41	41	d	28	28	53	29	29	d

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

d	Line spacing	Character height
0	Single width	Single weight
1	Double width	Single height
2	Single width	Double height
3	Double width	Double height

Print double-height characters

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

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

Return to normal height

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

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

Select character height, width, and line spacing

Mode	ASCII					Decimal					Hexadecimal				
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 below. Does not move the base line.

n	Line spacing	Character height
0	Unchanged	Unchanged
1	Unchanged	Single height
2	Unchanged	Double height
16	Single	Unchanged
17	Single	Single height
18	Single	Double height
32	Double	Unchanged
33	Double	Single height
34	Double	Double height

m	Character width
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 in subsequent line feeds to 1/8 inch.

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

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

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

Set line spacing to 1/6 inch

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "2"	27 50	1B 32

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

Set line spacing to n/360 inch

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

Sets the distance the paper advances 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> <0> <0> <0> n	27 91 92 4 0 0 0 0 n	1B 5B 5C 04 00 00 00 00 n

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

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

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

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

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

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "A" n	27 65 n	1B 41 n

In Standard mode, sets the distance the paper advances 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 in subsequent line feeds to $n/72$ inch, where n is between 1 and 85. The new line spacing does not take effect until 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.

Perform one n/180-inch or n/216-inch line feed

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

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

Feed paper n lines

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "f" "1" n	27 102 49 n	1B 66 31 n
	<ESC> "f" <1> n	27 102 1 n	1B 66 01 n

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

Set top of page at current position

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

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

Set bottom margin

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

Sets the bottom margin to n lines, where n is between 1 and 127 in Standard mode or between 1 and 255 in IBM mode.

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, and moves the print position to the left margin.

Set vertical tab stops

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

Cancels all current vertical tab stops and sets new vertical tab stops at lines n1, n2, etc., where n1, n2, etc. are numbers between 1 and 255. A maximum of 16 vertical tab stops can be set. The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code. The vertical tab stops are set in terms of the current line spacing and do no..... ove if the line spacing is changed later.

Set vertical tab stops every n lines

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "e" "1" *n*	27 101 49 *n*	1B 65 31 *n*
	<ESC> "e" <1> *n*	27 101 1 *n*	1B 65 01 *n*

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

Set vertical tab stops in channel

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "b" *n0* *n1* *n2* .... <0>	27 98 *n0* *n1* *n2* 0	1B 62 *n0* *n1* *n2* ... 00

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

Select vertical tab channel

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

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> "l" *n*	27 108 *n*	1B 6C *n*

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

Pica	$0 \leq n \leq 76$	Expanded pica	$0 \leq n \leq 38$
Elite	$0 \leq n \leq 91$	Expanded elite	$0 \leq n \leq 45$
Semi-condensed	$0 \leq n \leq 114$	Expanded semi-condensed	$0 \leq n \leq 57$
Condensed pica	$0 \leq n \leq 130$	Expanded condensed pica	$0 \leq n \leq 64$
Condensed elite	$0 \leq n \leq 152$	Expanded condensed elite	$0 \leq n \leq 76$

Set right margin

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "Q" *n*	27 81 *n*	1B 51 *n*

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

Set left and right margins

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "X" *n1* *n2*	27 88 *n1* *n2*	1B 58 *n1* *n2*

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

Carriage return

Mode	ASCII	Decimal	Hexadecimal
Both	<CR>	13	0D

Prints the current line and returns the next print position to the left margin. If DIP switch 3 is set to OFF, also performs a line feed.

Set automatic line feed

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

Causes the printer to perform both a carriage return and line feed each time it receives a <CR> code. This command takes priority over DIP switch 3.

Cancel automatic line feed

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

Causes the printer to perform only a carriage return when it receives a <CR> code. This command takes priority over DIP switch 3.

Backspace

Mode	ASCII	Decimal	Hexadecimal
Both	<BS>	8	08

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

Left justify

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "a" "0"	27 97 48	1B 61 30
	<ESC> "a" <0>	27 97 0	1B 61 00

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

Center text

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "a" "1"	27 97 49	1B 61 31
	<ESC> "a" <1>	27 97 1	1B 61 01

Centers subsequent text between the left and right margins.

Right justify

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "a" "2"	27 97 50	1B 61 32
	<ESC> "a" <2>	27 97 2	1B 61 02

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

Set horizontal tab stops

Mode	ASCII	Decimal	Hexadecimal
Both	<ESC> "D" *n1* *n2* .... <0>	27 68 *n1* *n2* 0	1B 44 *n1* *n2* ... 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 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. To clear all tab stops, specify <ESC> "D" <0>.

Set horizontal tab stop every n columns

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "e" "0" *n*	27 101 48 *n*	1B 65 30 *n*
	<ESC> "e" <0> *n*	27 101 0 *n*	1B 65 00 *n*

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

Reset all tab stops

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

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

Horizontal tab

Mode	ASCII	Decimal	Hexadecimal
Both	<HT>	9	09

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

Relative horizontal tab

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "\" *n1* *n2*	27 92 *n1* *n2*	1B 5C *n1* *n2*

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.

Relative horizontal tab in inches

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "d" *n1* *n2*	27 100 *n1* *n2*	1B 64 *n1* *n2*

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

Absolute horizontal tab in inches

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "$" *n1* *n2*	27 36 *n1* *n2*	1B 24 *n1* *n2*

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

Absolute horizontal tab in columns

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "f" "0" *n*	27 102 48 *n*	1B 66 30 *n*
	<ESC> "f" <0> *n*	27 102 0 *n*	1B 66 00 *n*

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

GRAPHICS COMMANDS

Print 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 48 dots high and $n1 + n2 \times 256$ dots wide. Maximum width is 8 inches (480 dots). $m1$, $m2$, ... are the dot data, each a 1-byte value from 0 to 255 representing 48 vertical dots, with the most significant bit at the top six dots and the least significant bit at the bottom six dots.
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 $n1$ $n2$ $m1$ $m2$ ...
	\<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 960 dots wide).
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 1920 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 48 dots high and $n1 + n2 \times 256$ dots wide. Maximum width is 8 inches (2880 dots). In the data $m1, m2, m3$ ... each three bytes represent 48 vertical dots. In the leftmost position, the most significant bit of $m1$ is the top and second dot; the least significant bit of $m1$ is the 15th and 16th dot from the top; the most significant bit of $m2$ is the 17th and 18th dot; the least significant bit of $m2$ is the 31st and 32nd dot from the top; the most significant bit of $m3$ is the 33rd and 34th dot from the top; the least significant bit of $m3$ is the bottom two dots. The rest of 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.

Print hex-density 48-bit graphics

Mode	ASCII		Decimal	Hexadecimal
Std.	`<ESC>` "I" "*" $n1$ $n2$	$m1$ $m2$ $m3$ ...	27 124 42 $n1$ $n2$ $m1$ $m2$ $m3$ ...	1B 7C 2A $n1$ $n2$ $m1$ $m2$ $m3$ ...

Prints 48-bit dot graphics at 360 dots per inch horizontally. The graphics image is 48 dots high and $n1 + n2 \times 256$ dots wide. Maximum width is 8 inches (2880 dots). In the data $m1, m2, m3$ ... each six bytes represent 48 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, and so on. The rest of data is similar. The number of data bytes must be $6 \times (n1 + n2 \times 256)$. 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> "*" *n0* *n1* *n2* *m1* *m2* ...	27 42 *n0* *n1* *n2* *m1* *m2* ...	1B 2A *n0* *n1* *n2* *m1* *m2* ...

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), <FS> "Z" (for 24-bit graphics) or <ESC> "l" "*" (for 48-bit graphics) for information on *n1*, *n2*, *m1*, *m2*, ...

n0	Graphics mode	
0	8-bit Normal-density	(60 dots per inch)
1	8-bit Double-density	(120 dots per inch)
2	8-bit Double-density	(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)
64	48-bit Normal-density	(60 dots per inch)
65	48-bit Double-density	(120 dots per inch)
70	48-bit CRT graphics	(90 dots per inch)
71	48-bit Triple-density	(180 dots per inch)
72	48-bit Hex-density	(360 dots per inch)

Select graphics mode

Mode	ASCII	Decimal	Hexadecimal
IBM	<ESC> "[" "g" *n1* *n2* *m0* *m1* *m2* ...	28 91 103 *n1* *n2* *m0* *m1* *m2* ...	1B 5B 67 *n1* *n2* *m0* *m1* *m2* ...

Selects one of eight graphics modes depending on the value of *m0* and prints dot 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*, ...

m0	Graphics mode	
0	8-bit Normal-density	(60 dots per inch)
1	8-bit Double-density	(120 dots per inch)
2	8-bit Double-density	(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
Std.	<ESC> "?" *n* *m*	27 63 *n* *m*	1B 3F *n* *m*

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 24-dot download characters

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "&" <0> *n1* *n2* *m0* *m1* *m2* *d1* *d2* ... *dx*	27 38 0 *n1* *n2 m0 m1 m2* *d1 d2 ... dx*	1B 26 00 *n1* *n2 m0 m1 m2* *d1 d2 ... dx*

Clears the 48-dot download characters and defines one or more new 24-dot characters and stores them in RAM for later use. DIP switch 2 must be set to 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	*m1*	*m0 + m1 + m2*
Pica	31	36
Elite	27	30
Semi-condensed	19	24
Proportional	37	42
Super/Subscript	19	36
Prop. super/subscript	37	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.

For further details, please refer to chapter 7.

Define 48-dot download characters

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "I" "&" *n1* *n2* <0> *n3* *n4* *m0* *m1* *m2* *d1* *d2* ... *dx*	27 124 38 *n1* *n2* 0 *n3* *n4* *m0* *m1* *m2* *d1* *d2* ... *dx*	1B 7C 26 *n1* *n2* 00 *n3* *n4* *m0* *m1* *m2* *d1* *d2* ... *dx*

Clears the 24-dot download characters and defines one or more new 48-dot characters and stores them in RAM for later use. DIP switch 2 must be set to OFF; otherwise RAM is used as an input buffer, not downloading characters, and this command is ignored.

$n1 + n2 \times 256$ indicates how many bytes that will follow with this command.

$n3$ is the character code of the first character defined and $n4$ is the character code of the last character defined. $n3$ must be equal to or less than $n4$.

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	$m1$	$m0 + m1 + m2$
Pica	31	36
Elite	27	30
Semi-condensed	19	24
Proportional	37	42
Super/Subscript	19	36
Prop. super/subscript	37	42

Next comes the dot data. Normal character height is 48 dots, so there must be 6 $\times m1$ bytes of dot data. If the printer is in super/subscript mode, however, the character height is 32 dots, so there must be $4 \times m1$ 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.

For further details, please refer to chapter 7.

Select download character set

Mode	ASCII	Decimal	Hexadecimal
Std.	<ESC> "%" "1"	27 37 49	1B 25 31
	<ESC> "%" <1>	27 37 1	1B 25 01

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

Shift download character area

Mode	ASCII			Decimal			Hexadecimal		
Std.	<ESC> "t" "2"			27	116	50	1B	74	32
	<ESC> "t" <2>			27	116	2	1B	74	02
	<FS> "I" "2"			28	73	50	1C	49	32
	<FS> "I" <2>			28	73	2	1C	49	02

Shifts the download character area defined between 0 to 127 to the area between 128 to 255.

Select ROM character set

Mode	ASCII			Decimal			Hexadecimal		
Std.	<ESC> "%" "0"			27	58	48	1B	25	30
	<ESC> "%" <0>			27	58	0	1B	25	00

Stops using the download character set and returns to the built-in ROM character set.
Ignored when DIP switch 2 is set to 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.	<DEL>	127	7F

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

Cancel last line

Mode	ASCII	Decimal	Hexadecimal
Both	<CAN>	24	18

Deletes the last line currently present in the print buffer.

Set printer off-line

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

Sets the printer off-line. The printer disregards all subsequent characters and commands except <DC1>, which returns it to the on-line. 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 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 48	1B 55 30
	<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" "1"	27 85 49	1B 55 31
	<ESC> "U" <1>	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>` `<EM>` `<0>`	27 25 0	1B 19 00
	"(" "(" "0" ")" ")"	40 40 48 41 41	28 28 30 29 29

Selects manual sheet feeding even when the optional automatic sheet feeder is mounted. Ignored if DIP switch 4 is set to ON.

Auto feed

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

Selects the automatic sheet feeder. Ignored if DIP switch 4 is set to ON.

Eject paper from ASF

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

. Ejects the current page. Ignored if DIP switch 4 is set to ON.

Set print start position on ASF

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

Skips $n/6$ inches at the top of the page, where n is equal to or greater than 1. Ignored if DIP switch 4 is set to 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 except the Print Quality and Pitch Lock mode set with the control panel, downloaded characters, ASF selections, or the top of form position.

Chapter 7

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 DIP switch 2 to OFF. Otherwise, the RAM is used to store the input buffer, and the download commands are ignored.

DEFINING YOUR OWN 24-DOT CHARACTERS

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
Pica characters	31	24
Elite characters	27	24
Semi-condensed	19	16
Proportional	37	24
Super/subscript	19	16
Proportional 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 upto 127 characters.

Photocopy the grid in Figure 7-1 to help design your new characters. We will use a tiny representation of a telephone symbol for our example.
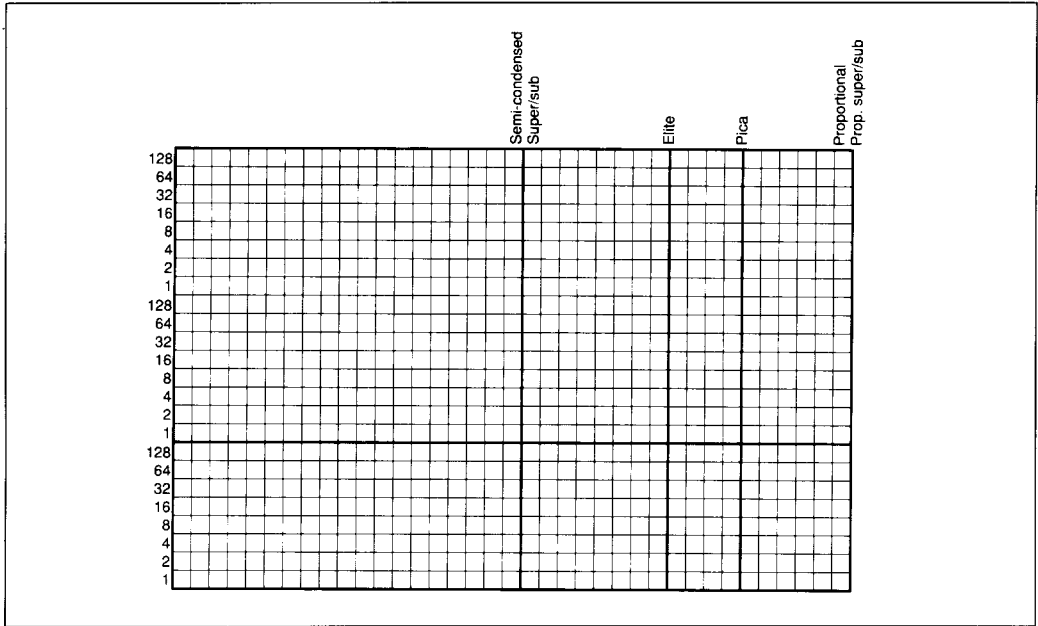
Figure 7-1. Use this grid (or one similar to it) to define your own 24-dot characters.

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.
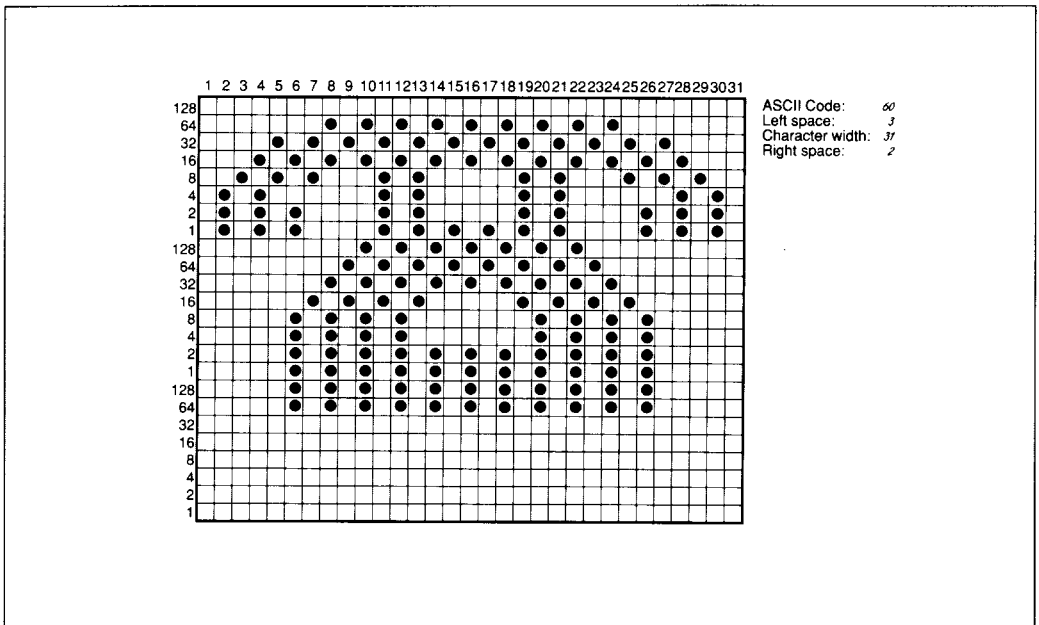

Figure 7-2. Telephone symbol with 24-dot pica.

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.

Assigning a value of character space

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

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	$m1$	$m0 + m1 + m2$
Pica characters	31	36
Elite characters	27	30
Semi-condensed	19	24
Proportional	37	42
Super/subscript	19	36
Proportional super/subscript	37	42

Sample program

To demonstrate how to use the 24-dot 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$(MM);
1110 NEXT M
1120 NEXT N
```
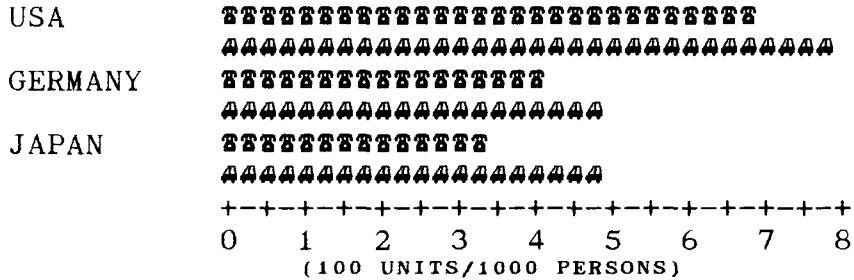
```
1130 LPRINT CHR$(27);"D";CHR$(11);CHR$(0)
1140 LPRINT CHR$(27);"k";CHR$(12);CHR$(27);"4";
1150 LPRINT CHR$(27);"h";CHR$(1);
1160 LPRINT "  DIFFUSION RANGES OF"
1170 LPRINT "   CARS & TELEPHONES"
1180 LPRINT CHR$(27);"h";CHR$(0)
1190 LPRINT CHR$(27);"k";CHR$(0);CHR$(27);"5";
1200 LPRINT CHR$(27);"%";CHR$(1);
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

```
USA      ☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎
         🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗
GERMANY  ☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎☎
         🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗
JAPAN    ☎☎☎☎☎☎☎☎☎☎☎☎☎☎
         🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗🚗
         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
         0    1    2    3    4    5    6    7    8
              (100  UNITS/1000  PERSONS)
```

DEFINING YOUR OWN 48-DOT CHARACTERS

You can define 48-dot download characters. By downloading this 48-dot characters, you can print fine characters.

Fundamentally, the process to define and print downloaded 48-dot character is the same as for 24-dot characters, except that you must supply about twice as much character data, and you must indicate the printer how many download data that will follow.

We will use a tiny representation of a telephone symbol for our example.
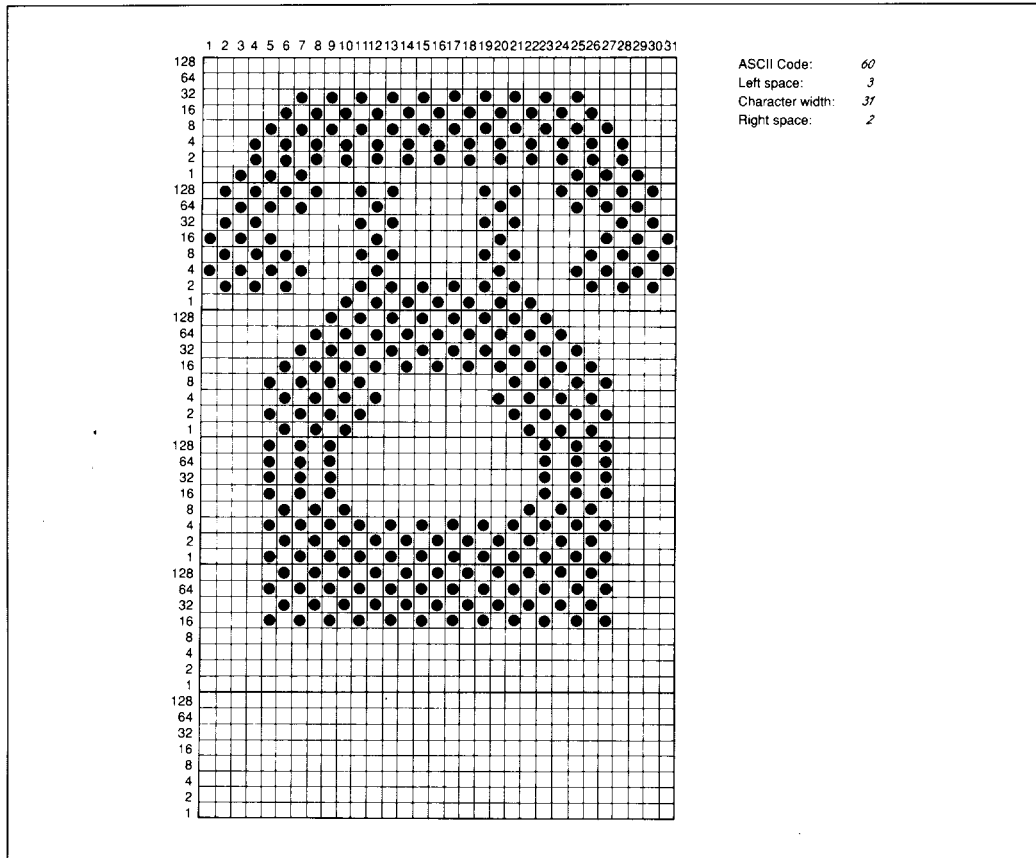
FIGURE 7-3. Telephone symbol with 48-dot pica.

The procedure to assign the character data is the same as the 24-dot characters, except that the vertical height is twice to it. So, our telephone symbol requires 186 character data.
In addition, it also requires the three attribute infomations for each character and three bytes. Therefore, the telephone character is made up with 192 byte data.

When you want to download two pica characters with 48-dot, the download data should be 381 data.
This value is devided into two-byte data as shown in the following program.

To demonstrate how to define and to use the 48-dot 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$(125);CHR$(1);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*6
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$(27);"k";CHR$(12);CHR$(27);"4";
1150 LPRINT CHR$(27);"h";CHR$(1);
1160 LPRINT "   DIFFUSION RANGES OF"
1170 LPRINT "    CARS & TELEPHONES"
1180 LPRINT CHR$(27);"h";CHR$(0)
1190 LPRINT CHR$(27);"k";CHR$(0);CHR$(27);"5";
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, 20,  0,  0,  0,  0,  0,170,  0,  0,  0,  0
2040 DATA    1, 84,  0,  0,  0,  0,  6,170,  0,  0,  0,  0
2050 DATA    9, 84, 10,245, 80,  0, 21,138, 21, 10,160,  0
2060 DATA   41, 68, 42,245, 80,  0, 22,128, 85, 10,160,  0
2070 DATA   40,  0,170,245, 80,  0, 22,  1, 85, 10,160,  0
2080 DATA   40,170,170,  3, 80,  0, 22, 85, 84,  2,160,  0
2090 DATA   40,170,160,  5, 80,  0, 22,  1, 80,  2,160,  0
2100 DATA   40,  2,160,  5, 80,  0, 22,  1, 80,  2,160,  0
```
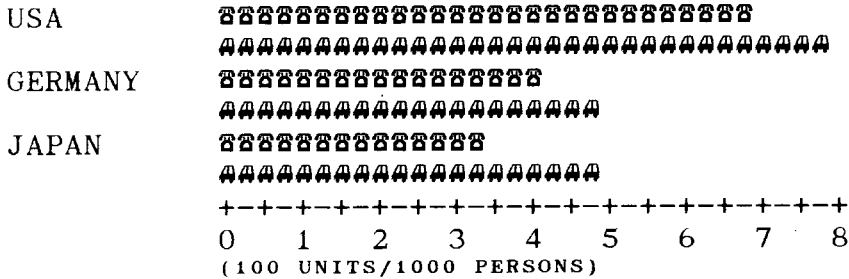
```
2110 DATA   40,   2,160,   5, 80,   0, 22,   1, 80,   2,160,   0
2120 DATA   40,170,160,   5, 80,   0, 22, 85, 84,   2,160,   0
2130 DATA   40,170,170,   5, 80,   0, 22,   1, 85, 10,160,   0
2140 DATA   40,   0,170,245, 80,   0, 22,128, 85, 10,160,   0
2150 DATA   41,  68,  42,245, 80,   0, 22,138, 21, 10,160,   0
2160 DATA    9,  84,  10,245, 80,   0,  6,170,   0,   0,   0,   0
2170 DATA    1,  84,   0,   0,   0,   0,  0,170,   0,   0,   0,   0
2180 DATA    0,  20,   0,   0,   0,   0
2190 ' Car Symbol
2200 DATA    3,  31,   2
2210 DATA    0,   0,   0,   0,   0,   0,  0,   0,   2,172,   0,   0
2220 DATA    0,   0,   5, 80,   0,   0,  0,   0, 10,160,   0,   0
2230 DATA    0,   0,  21, 91,   0,   0,  0,   1,234,164,224,   0
2240 DATA    0,   6,  21, 91, 16,   0,  0,  27,234,164,224,   0
2250 DATA    0,102,  21, 91, 16,   0,  1,152,  42,164,224,   0
2260 DATA    6,  96,  21, 91,   0,   0,  9,128,  42,160,   0,   0
2270 DATA   38,   0,  17, 64,   0,   0, 40,   0,  42,184,   0,   0
2280 DATA   16,   0,  21, 64,   0,   0, 40,   0,  42,184,   0,   0
2290 DATA   23,255,213, 64,   0,   0, 40,   0,  42,184,   0,   0
2300 DATA   23,255,213, 64,   0,   0, 40,   0,  42,160,   0,   0
2310 DATA   16,   0,  21, 91,   0,   0, 40,   0,  42,164,224,   0
2320 DATA   16,   0,  21, 91, 16,   0, 40,   0,  42,164,224,   0
2330 DATA   16,   0,  17, 91, 16,   0, 47,128,  42,164,224,   0
2340 DATA   16,126,  21, 91,   0,   0,  7,129,234,160,   0,   0
2350 DATA    0,126,  21, 64,   0,   0,  0,   1,234,188,   0,   0
2360 DATA    0,   0,   0,   0,   0,   0
```

DIFFUSION RANGES OF
CARS & TELEPHONES

USA

GERMANY

JAPAN

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

Chapter 8
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 an operating system. A number of software tricks may be useful here. This chapter is not, however, a substitute for the operating system manuals supplied with your computer.
To learn how to print files, etc. it is best to read the relevant parts of these manuals.

INSTALLING APPLICATION SOFTWARE WITH YOUR PRINTER

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

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

#	Standard mode	IBM mode
1	Star XB-2410/XB24-10	Proprinter X24E
2	Star NX-2420/LC24-200	Proprinter X24
3	Epson LQ-850	

You can also select one of NEC 24-wire printers to print graphics in the Standard emulation mode.

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

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

	CPI	Number of columns
Pica	10	80
Elite	12	96
Semi-condensed	15	120
Condensed pica	17.1	137
Condensed elite	20	160
Proportional		Variable

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

Make sure that the DIP switches are set for the correct printer emulation, and that you have selected the appropriate character set using the DIP switches.

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

EMBEDDING PRINTER COMMANDS

Many word-processors and other software lack commands for changing font, printing double-size characters. Your printer therefore has commands that can be embedded in documents to control these functions without software help. The commands consist of a capital letter enclosed in double parentheses, followed by a digit (or a capital letter):

Font:	((F))0	Tms Romn
	((F))L	Helvet
Size:	((S))0	Standard size
	((S))1	Double width
	((S))2	Double height
	((S))3	Double width and height

If you want to print a title in double-size Helvet, then change to different size with Tms Romn'for other text, you can use these commands as follows:

File as seen on computer screen:

```
((F))L ((S))3
Printer commands
((F))0 ((S))0
Printer commands ((S))2can be ((S))0embedded
((S))1anywhere ((S))0in a document.
```

Printout:

Printer commands

```
Printer commands can be embedded
anywhere   in a document.
```

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

- A line consisting of commands alone prints as a blank line.
- The software will not know that these are commands, so you cannot trust your software to give you the correct line width. The printed line may be considerably shorter than the line on the screen; the extra space being the space that was occupied by the commands.

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

If you do not use these commands or the panel controls, the printer will print standard-size, Tms Romn characters.

The printer supports various commands in addition to the above, such as quadruple-size printing.
Most of these other commands consist of the escape code followed by one or more letters or numbers.
If your software enables you to place the escape code in your files, or if you are able to define this as a user option during installation, you can also embed these escape sequences.

PROGRAMMING THE PRINTER WITH DOS COMMANDS

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

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

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

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

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

A single PRINT command can print two or more files. List the file names consecutively on the same line, or use wild-card characters (* and ?). Each file will be printed starting on a new page. The PRINT command also has control options. For example, you can terminate a printing job in progress with the /T option. (The printer may not stop printing immediately 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, or print pitch, you can make these settings 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 Economy mode, and select elite pitch with the Standard mode. You can find the commands in Chapter 6. We suggest the following:

- Economy mode   <ESC> "x" "0"
- Elite pitch   <ESC> "!" <1>

<ESC> "!" <1> is a powerful command that, in addition to selecting elite pitch, cancels unwanted features such as underlining which might be left from previous commands. The angle brackets around the <1> indicate character code 1, which is a control code, not the printable digit "1".

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

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

An appropriate name for this setup file would be SJELITE.DAT. To use the DOS line editor, type the command EDLIN SJELITE.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 SJELITE.DAT
New file
*1
        1:*^V[x1^V[!^VA
        2:*^C
*E
```

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

You can now set up the printer by sending it the file SJELITE.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 Economy elite type, give the following two commands:

```
A>COPY SJELITE.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 SJPRINT.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 SJPRINT.BAT
COPY SJELITE.DAT PRN
PRINT %1
^Z
A>SJPRINT README.DOC
```

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

PROGRAMMING WITH BASIC

As an example of programming the printer on Microsoft BASIC, we have listed the program for the IBM-PC. This program runs in the printer's Standard mode, and the downloadable condition.

```
1000 ' Set control codes
1010 E$=CHR$(27)                        'Escape code
1020 TM$=E$+"k"+CHR$(0)                  'Roman character
1030 H$=CHR$(9)                          'Horizontal tab
1040 PI$=E$+"P"                          'Pica pitch
1050 EL$=E$+"M"                          'Elite pitch
1060 ' Start printing
1070 WIDTH "LPT1:",255
1080 LPRINT E$;"D";CHR$(3);CHR$(30);CHR$(0)      'Set HT
1090 LPRINT TM$;"Resident fonts are:"
1100 LPRINT H$;E$;"k";CHR$(0);"Roman characters,";
1110 LPRINT H$;E$;"k";CHR$(12);"H-Gothic characters."
1120 LPRINT
1130 LPRINT TM$;"Print pitches are:"
1140 LPRINT H$;PI$;"Pica pitch (10 CPI),";
1150 LPRINT H$;EL$;"Elite pitch (12 CPI),"
1160 LPRINT H$;E$;"g";"Semi-condensed pitch (15 CPI),";
1170 LPRINT H$;PI$;
1180 LPRINT CHR$(15);                    'Select condensed print
1190 LPRINT "Condensed pica pitch (17 CPI),"
1200 LPRINT H$;EL$;"Condensed elite pitch (20 CPI),";
1210 LPRINT CHR$(18)                     'Cancel condensed print
1220 LPRINT H$;E$;"p1";                  'Select proportional spacing
1230 LPRINT PI$;"Normal proportional,";
1240 LPRINT H$;CHR$(15);"Condensed proportional.";
1250 LPRINT CHR$(18);
1260 LPRINT E$;"p0"                      'Cancel proportional spacing
1270 LPRINT
1280 LPRINT H$;E$;"w1";"Double-height,";E$;"w0"
1290 LPRINT H$;E$;"W1";"Double width, ";E$;"W0"
1300 LPRINT H$;CHR$(28);"E";CHR$(2);"Triple width,";
1310 LPRINT CHR$(28);"E";CHR$(0)
1320 LPRINT H$;E$;"h";CHR$(1);"Double-sized,"
1330 LPRINT E$;"h";CHR$(0)
1340 LPRINT E$;"Q";CHR$(47)              'Set right margin
```

```
1350 LPRINT :LPRINT
1360 LPRINT E$;"Q";CHR$(47)                'Set right margin
1370 LPRINT TM$;"Various line and character spacings:"
1380 LPRINT E$;"a1"                        'Center text
1390 FOR I=1 TO 7
1400 LPRINT E$;"A";CHR$(I);               'Line spacing set
1410 LPRINT E$;" ";CHR$(I);               'Increase character space
1420 LPRINT "THE SPACINGS ARE CHANGED"
1430 NEXT I
1440 FOR I=7 TO 1 STEP -1
1450 LPRINT E$;"A";CHR$(I);               'Line spacing set
1460 LPRINT E$;" ";CHR$(I);               'Increase character space
1470 LPRINT "THE SPACINGS ARE CHANGED"
1480 NEXT I
1490 LPRINT E$;"a0"                        'Left justify
1500 LPRINT E$;"3";CHR$(30);              'Set 1/6" line spacing
1510 LPRINT E$;" ";CHR$(0);               'Normal character space
1520 LPRINT :LPRINT
1530 LPRINT TM$;"Other features:"
1540 LPRINT H$;E$;"x";CHR$(0);
1550 LPRINT "Economy printing, ";
1560 LPRINT E$;"x";CHR$(1);
1570 LPRINT "and High Quality."
1580 LPRINT H$;E$;"q";CHR$(1);"OUTLINED";E$;"q";CHR$(0);", ";
1590 LPRINT E$;"q";CHR$(2);"SHADOWED";E$;"q";CHR$(0);", ";
1600 LPRINT E$;"q";CHR$(3);"OUTLINED WITH SHADOWED";
1610 LPRINT E$;"q";CHR$(0);", "
1620 LPRINT H$;E$;"E";"Emphasized";E$;"F";", ";
1630 LPRINT E$;"G";"Double-strike";E$;"H";", ";
1640 LPRINT E$;"4";"Italics";E$;"5";", "
1650 LPRINT H$;E$;"-1";"Underlining";E$;"-0";", ";
1660 LPRINT E$;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(2);CHR$(2);
1670 LPRINT "Strike-through";
1680 LPRINT E$;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(2);CHR$(0);", ";
1690 LPRINT E$;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(3);CHR$(1);
1700 LPRINT "Overlining";
1710 LPRINT E$;"(-";CHR$(3);CHR$(0);CHR$(1);CHR$(3);CHR$(0);", "
1720 LPRINT H$;E$;"S0";"SUPERSCRIPT";E$;"T";" and ";
1730 LPRINT E$;"S1";"SUBSCRIPT";E$;"T";", "
1740 LPRINT H$;TM$;"Download characters: ";
1750 GOSUB 2520
1760 LPRINT E$;"%1";                       'Select download character
1770 FOR I=1 TO 5
1780 LPRINT CHR$(60);                      'Print download character
1790 NEXT I
1800 LPRINT E$;"%0";                       'Select normal character
1810 GOSUB 2640
1820 LPRINT E$;"%1";                       'Select download character
1830 FOR I=1 TO 5
1840 LPRINT CHR$(60);                      'Print download character
1850 NEXT I
1860 LPRINT E$;"%0"                        'Select normal character
1870 LPRINT H$;TM$;"Dot graphics:"
1880 RESTORE 3290
1890 LPRINT E$;"A";CHR$(8);               'Set 8/60" line spacing
1900 FOR I=1 TO 3
1910 LPRINT E$;"f0";CHR$(8);
1920 LPRINT E$;"*";CHR$(33);CHR$(240);CHR$(0);
1930 FOR J=1 TO 240*3
1940 READ DAT
1950 LPRINT CHR$(DAT);
1960 NEXT J
1970 LPRINT
1980 NEXT I
1990 LPRINT E$;"@"                         'Initialize printer
```

```
2000 ' SUBROUTINES
2010 ' Define 24-dot download character
2020 LPRINT E$;"&";CHR$(0);CHR$(60);CHR$(60);
2030 RESTORE 2510
2040 READ LS :LPRINT CHR$(LS);
2050 READ CW :LPRINT CHR$(CW);
2060 READ RS :LPRINT CHR$(RS);
2070 FOR M=1 TO CW*3
2080 READ MM
2090 LPRINT CHR$(MM);
2100 NEXT M
2110 RETURN
2120 '
2130 ' Define 48-dot download character
2140 LPRINT CHR$(27);"¦";"&";CHR$(192);CHR$(0);CHR$(0);
2150 LPRINT CHR$(60);CHR$(60);
2160 RESTORE 2600
2170 READ LS :LPRINT CHR$(LS);
2180 READ CW :LPRINT CHR$(CW);
2190 READ RS :LPRINT CHR$(RS);
2200 FOR M=1 TO CW*6
2210 READ MM
2220 LPRINT CHR$(MM);
2230 NEXT M
2240 RETURN
2500 ' DATA
2510 ' 24-dot download character data
2520 DATA    3, 31,  2
2530 DATA    0,  0,  0,  7,  0,  0,  8,  0,  0, 23,  0,  0, 40,  0,  0
2540 DATA   19, 15,192, 40, 16,  0, 80, 47,192, 32, 80,  0, 80,175,192
2550 DATA   47, 80,  0, 80,175,192, 47, 80,  0, 80,163,192, 33, 64,  0
2560 DATA   80,163,192, 33, 64,  0, 80,163,192, 47, 80,  0, 80,175,192
2570 DATA   47, 80,  0, 80,175,192, 32, 80,  0, 80, 47,192, 40, 16,  0
2580 DATA   19, 15,192, 40,  0,  0, 23,  0,  0,  8,  0,  0,  7,  0,  0
2590 DATA    0,  0,  0
2600 ' 48-dot download character data
2610 DATA    3, 31,  2
2620 DATA    0, 20,  0,  0,  0,  0,  0,170,  0,  0,  0,  0
2630 DATA    1, 84,  0,  0,  0,  0,  6,170,  0,  0,  0,  0
2640 DATA    9, 84, 10,245, 80,  0, 21,138, 21, 10,160,  0
2650 DATA   41, 68, 42,245, 80,  0, 22,128, 85, 10,160,  0
2660 DATA   40,  0,170,245, 80,  0, 22,  1, 85, 10,160,  0
2670 DATA   40,170,170,  3, 80,  0, 22, 85, 84,  2,160,  0
2680 DATA   40,170,160,  5, 80,  0, 22,  1, 80,  2,160,  0
2690 DATA   40,  2,160,  5, 80,  0, 22,  1, 80,  2,160,  0
2700 DATA   40,  2,160,  5, 80,  0, 22,  1, 80,  2,160,  0
2710 DATA   40,170,160,  5, 80,  0, 22, 85, 84,  2,160,  0
2720 DATA   40,170,170,  5, 80,  0, 22,  1, 85, 10,160,  0
2730 DATA   40,  0,170,245, 80,  0, 22,128, 85, 10,160,  0
2740 DATA   41, 68, 42,245, 80,  0, 22,138, 21, 10,160,  0
2750 DATA    9, 84, 10,245, 80,  0,  6,170,  0,  0,  0,  0
2760 DATA    1, 84,  0,  0,  0,  0,  0,170,  0,  0,  0,  0
2770 DATA    0, 20,  0,  0,  0,  0
2780 '
2790 ' Dot graphics data
2800 ' 1ST LINE
2810 DATA    0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
2820 DATA    0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
2830 DATA    0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
2840 DATA    0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
2850 DATA    0,  0,  0,  0,  0,  0,  0,  0,  0,  0,127,255,  0,255,255
2860 DATA    1,255,255,  3,  0,  0,  7,  0,  0,  7,  0,  0, 15,  0,  0
2870 DATA   31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0
2880 DATA   31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0
2890 DATA   31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0, 31,  0,  0
```

```
3380 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3390 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3400 DATA   31,   0,   0, 31,128,   0, 31,224,   0, 31,248,   0, 31,255,   0
3410 DATA   31,255,224, 15,255,248,  7,255,255,   1,255,255,   0,127,255
3420 DATA    0,   7,255,   0,   0,255,   0,   0, 63,   0,   0, 63,   0,   0,248
3430 DATA    0,   3,192,   0, 63,   0,   0,248,   0,   1,128,   0,   3,   0,   0
3440 DATA    7,   0,   0, 15,   0,   0, 15,   0,   0, 31,   0,   0, 31,   0,   0
3450 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3460 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3470 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3480 DATA   31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,255
3490 DATA   31,255,255, 15,255,255,   0,   0,   0,   0,   0,   0,   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,   0,   0
3520 DATA    0,   0,   0,   0,   0, 60,   0,   3,255,   0, 11,195,   0, 28,   0
3530 DATA    0, 12,   0,   0, 96,   0,   0,192,   0,   0,192,   0,   1,128,   0
3540 DATA    3,   0,   0,   3,   0,   0,   7,   0,   0,   7,   0,   0, 15,   0,   0
3550 DATA   15,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0, 15
3560 DATA   31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31
3570 DATA   31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31
3580 DATA   31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31
3590 DATA   31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 31, 31,   0, 63
3600 DATA   31,255,255, 31,255,255, 31,255,247, 31,255,231, 31,255,199
3610 DATA   15,255,135,  7,255,  7,   0,   0,   3,   0,   0,   1,   0,   0,   0
3620 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3630 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,254,   0
3640 DATA    1,255,240,   3,135,255,   7,   0, 63, 15,   0,   0, 15,   0,   0
3650 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3660 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,128,   0, 31,128,   0
3670 DATA   31,192,   0, 31,255,   0, 31,255,255, 31,255,255, 31,255,255
3680 DATA   31,255,255, 15,255,255,   7,255,255,   0,255,240,   1,254,   0
3690 DATA    1,240,   0,   3,128,   0,   7,   0,   0, 15,   0,   0, 31,   0,   0
3700 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3710 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,128,   0, 31,128,   0
3720 DATA   31,192,   0, 31,240,   0, 31,255,   0, 31,255,240, 31,255,255
3730 DATA   31,255,255,   7,255,255,   0,255,255,   0,255,255,   1,255,240
3740 DATA    3,192,   0,   7,128,   0, 15,   0,   0, 31,   0,   0, 31,   0,   0
3750 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0,   0
3760 DATA   31,   0,   0, 31,   0,   0, 31,   0,   0, 31,   0, 15, 31,135,255
3770 DATA   31,255,255, 31,255,255, 31,255,255, 31,255,255, 31,255,240
3780 DATA   15,252,   0, 47,128,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3790 ' 2ND LINE
3800 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3810 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3820 DATA    0,   0,   0,   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,   0,255,255,255,255,255,255
3850 DATA  255,255,255,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3860 DATA    0,   0,   0,   0,   0,   0,   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  255,255,255, 31,255,255,   7,255,255,   0,255,255,   0, 31,255
3890 DATA    0,   3,255,   0,   0,255,   0,   0, 31,   0,   0,   7,   0,   0,   0
3900 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,224,   0,   0,252,   0,   0
3910 DATA  254,   0,   0,248,   0,   0,192,   0,   0,   0,   0,   0,   0,   0,   0
3920 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   7,   0,   0, 63
3930 DATA    0,   1,255,   0, 15,255,   0,127,255,   1,255,255, 15,255,255
3940 DATA  255,255,255,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3950 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3960 DATA    0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
3970 DATA  255,255,255,255,255,255,255,255,255,255,255,255,255,255,255
3980 DATA  255,255,255,255,255,255,   0,   0,   0,   0,   0,   0,   0,   0,   0
3990 DATA    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
4010 DATA    0,   7,224,   0, 63,252,128,120, 31,192,224,   3, 97,128,   0
4020 DATA   59,   0,   0, 30,   0,   0, 14,   0,   0, 12,   0,   0, 12,   0,   0
```

```
3550 DATA 128,127,128,128,127,128,128,127,128,128,127,128,128,255,128
3560 DATA 223,255,128,255,255,128,255,255,  0,224,  0,  0,224,  0,  0
3570 DATA 224,  0,  0,224,  0,  0,224,  0,  0,224,  0,  0,224,  0,  0
3580 DATA 224,  0,  0,224,  0,  0,224,  0,  0,224,  0,  0,224,  0,  0
3590 DATA 224,  0,  1,224,  0,  3,240,  0, 15,255,255,255,255,255,254
3600 DATA 255,255,254,255,255,252,255,255,248,255,255,224,255,255,128
3610 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
3620 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
3630 DATA   0,  0,  0,  0,  0,  0,240,  0,  0,255,  0,  0, 15,248,  0
3640 DATA   0, 63,  0,  0,  3,248,  0,  0, 31,  0,  0,  3,  0,  0,  0
3650 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
3660 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,255,  0,  0,255,224,  0
3670 DATA 255,128,  0,240,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
3680 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  7,  0,127
3690 DATA   0,  7,255,  0, 63,255,  1,255,255, 31,255,255,  3,255,255
3700 DATA   0,127,254,  0,  7,252,  0,  0,127,  0,  0,  7,  0,  0,  0
3710 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,128,  0,  0
3720 DATA 248,  0,  0,255,  0,  0,255,192,  0,128,  0,  0,  0,  0,  0
3730 DATA   0,  0,  0,  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,  1,  0,  0, 63
3750 DATA   0, 31,255,  7,255,255,255,255,255,255,255,255,255,255,254
3760 DATA 255,255,192,255,248,  0,255,  0,  0,  0,  0,  0,  0,  0,  0
3770 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0
3780 ' 3RD LINE
3790 DATA   0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 24,  0,  0, 56
3800 DATA   0,  0, 56,  0,  0,120,  0,  0,248,  0,  1,248,  0,  1,248
3810 DATA   0,  3,248,  0,  7,248,  0,  7,248,  0, 15,248,  0, 15,248
3820 DATA   0, 31,248,  0, 63,248,  0,127,248,  0,127,248,  0,255,248
3830 DATA   0,255,248,  1,255,248,  3,255,248,199,255,248,247,255,248
3840 DATA 255,255,248, 31,255,240, 15,255,240, 15,255,224, 15,255,224
3850 DATA  15,255,192, 15,255,192, 15,255,192, 15,255,128, 15,255,128
3860 DATA  15,255,  0, 15,255,  0, 15,255,  0, 15,254,  0, 15,254,  0
3870 DATA 252,252, 24,252,252, 56,249,252,248,249,252,248,243,255,248
3880 DATA 227,255,248,231,255,248,199,255,248,231,255,248,255,255,248
3890 DATA  31,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
3900 DATA  15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,207,248
3910 DATA  31, 15,248, 30, 31,248,252, 63,248,248,127,248,240,127,240
3920 DATA 224,255,240,225,255,240,195,255,224,199,255,192,247,255,128
3930 DATA 255,255,128, 63,255,  0, 31,254,  0, 15,254,  0, 15,252,  0
3940 DATA  15,248,  0, 15,240,  0, 15,240,  0, 15,224,  0, 15,192,  0
3950 DATA  15,192,  0, 15,128,  0, 15,  0,  0, 31,  0,  0, 62,  0,  0
3960 DATA 252,  0,  0,252,  0,  0,248,  0,  0,240,  0,224,240,  0,240
3970 DATA 224,  1,240,192,  1,248,  0,  3,248,  0,  3,248,  0,  3,248
3980 DATA   0,  7,248,  0,  7,248,  0, 63,248,  0,127,248,  0,127,248
3990 DATA   0,255,248,  0,255,248,  1,255,248,  1,255,248,  1,255,248
4000 DATA   3,255,248,  3,255,248,  3,255,248,131,255,248,199,255,248
4010 DATA 103,255,248,119,255,248, 55,255,248, 63,255,248, 31,255,248
4020 DATA  31,255,248, 31,255,248, 15,255,248, 15,255,248, 15,255,248
4030 DATA  15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
4040 DATA  15,255,240, 15,255,224, 15,255,192, 15,255,192, 15,254,  0
4050 DATA  15,254,  0, 15,254,  0, 15,254,  0, 15,254,  0, 15,254,  0
4060 DATA  15,252,  0, 15,252,  0, 15,248,  0, 15,240,  0, 31,240,  0
4070 DATA  31,224,  0, 31,192,  0, 55,128,  0, 48,  0,  8, 96,  0, 24
4080 DATA 192,  0, 24,128,  0, 56,  0,  0, 56,  0,  0,120,  0,  0,120
4090 DATA   0,  0,248,  0,  0,248,  0,  1,248,  0,  1,248,  0,  3,248
4100 DATA   0,  3,248,  0,  7,248,  0,  7,248,  0, 15,248,  0, 15,248
4110 DATA   0, 31,248,  0, 31,240,  0, 63,240,  0, 63,224,  0,127,224
4120 DATA   0,127,192,  0,255,192,  0,255,128,  1,255,128,  1,255, 24
4130 DATA   3,255, 56,  3,255,248,231,255,248,255,255,248, 31,255,248
4140 DATA  15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,248
4150 DATA  15,255,248, 15,255,248, 15,255,248, 15,255,248, 15,255,240
4160 DATA  15,255,240, 15,255,240, 15,255,224, 15,255,224, 15,255,192
4170 DATA  15,255,192, 31,255,128,254,127,128,252,127, 24,248,255, 56
4180 DATA 248,255,248,240,255,248,225,255,248,193,255,248,131,255,248
4190 DATA   3,255,248,  7,255,248,135,255,248,231,255,248,255,255,248
```

```
4680 DATA 248,255,248,240,255,248,225,255,248,193,255,248,131,255,248
4690 DATA   3,255,248,   7,255,248,135,255,248,231,255,248,255,255,248
4700 DATA  63,255,248,  31,255,248,  15,255,248,  15,255,248,  15,255,240
4710 DATA  15,255,240,  15,255,224,  15,255,192,  15,255,128,  15,255,   0
4720 DATA  15,254,   0,  15,252,   0,  15,248,   0,  15,240,   0,  15,224,   0
4730 DATA  15,192,   0,  15,   0,   0,  62,   0,   0,252,   0,   0,248,   0,   0
4740 DATA 240,   0,   0,224,   0,   0,192,   0,   0,128,   0,   0,   0,   0,   0
4750 DATA   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0
4760 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 1050). You can find most of these commands near the beginning of chapter 6.

The WIDTH "LPT1:" 255 statement in line 1070 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 1080. Using the preassigned commands, the program prints samples of its different fonts, followed by samples of the print pitches, then some double and quadruple-sized printing.

Next comes the central attraction of the program: a line of text printed fourteen times in expanding and contracting loops to give a barrel effect. The work is done by four printer commands: a command setting the right margin (line 1340); a centering command (line 1360); a command to vary the line spacing (lines 1380 and 1430); and a command to micro-adjust the space between characters (lines 1390 and 1440).

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 7.

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 2800 to 4260 with the help of a calculator. Each number represents eight vertical dots. (See "Graphics commands" in Chapter 6 for details.)

The pattern is printed in three rows, each row is twenty-four dots high and 240 dots wide. Line 1870 sets the line spacing to 8/60 inch so that the rows will connect vertically. The loop in lines 1880 to 1960 does the printing in three passes of the print head.

Resident fonts are:
    Tms Romn characters, Helvet 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,
Double-sized,

Quad-sized.

Various line and character spacings:

Other features:
    Economy printing, and High Quality.
    OUTLINED, SHADOWED, OUTLINED WITH SHADOWED,
    Emphasized, **Double-strike**, *Italics*,
    Underlining, ~~Strike-through~~, O̅v̅e̅r̅l̅i̅n̅i̅n̅g̅,
    SUPERSCRIPT and SUBSCRIPT,
    Download characters: ᚦᚦᚦᚦᚦᚦᚦᚦᚦ
    Dot graphics:

Chapter 9
TROUBLESHOOTING AND MAINTENANCE

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

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

TROUBLESHOOTING

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

Region of fault	Description
Power supply	Power is not being supplied to the printer
Printing	The printer does not print, or stops printing
	The print is faint or uneven
	Dots are missing in characters or graphics
	While using application software, fonts or characters cannot be printed
	The printout is not what is expected when running a program
Paper feeding	Single sheets do not feed properly with roller feed mode
	Single sheets do not feed properly with flat feed mode
	The ASF is not operating or is not feeding paper properly
	Text is being printed all on one line, or with extra blank lines

Power supply

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

Check	Possible remedy
Is the AC adapter cable properly plugged into the electrical outlet?	Turn off the printer, ensure the AC adapter cable is securely connected, and then turn the printer back on.
Is power being supplied to the outlet?	Turn off the printer, unplug the AC adapter, and try the outlet with another appliance to determine if electricity is being supplied from that outlet.
Is the battery switch is turned on?	Check the battery switch is turned on to use the optional battery pack. If it is on, reinstall the battery pack correctly.
Is the printer voltage correct?	Check the AC adapter to ensure that the outlet voltage corresponds to the voltage required by the AC dapter. If they do not match, DO NOT try to operate the printer. Contact your supplier.
Is the power indicator blinking while using the battery pack?	Indicates that the optional battery power is low. Recharge the battery pack.
Is the Power and Error indicators blinking while using the battery pack?	Indicates that the service life of the optional battery pack has expired. Use a new battery pack.

Printing

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

Check	Possible remedy
Is the interface cable connected securely?	Check both ends of the cable - printer and computer to make sure that the connector is firmly in position.
Is the ON LINE indicator illuminated?	If it is not, press the ⎍ ON LINE ⎍ button to set the printer on-line.
Is the Paper and Error indicators illuminating?	If it is, the paper has run out. Load more paper.
Is the paper caught up internally?	Remove the jammed paper, replace new paper, and continue printing. Make sure that the loading edge of the paper is smooth and uncreased.
Is the software you are using properly installed for your printer?	Check the installation settings in your software, and reinstall if necessary.
Can the printer perform self-test operations?	Turn the printer off, and turn it on again, holding down one of the buttons to perform a self-test. If these do not work, contact your dealer.

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

Check	Possible remedy
Is the Economy mode was selected with the control panel?	Cancel the Economy mode with the control panel.
Is the ink cartridge properly installed?	Check and reinstall if necessary.
Is the ink cartridge worn out?	Make the print head cleaning, and check the result. Replace the ink cartridge if necessary.

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

Check	Possible remedy
Are dots missing at random in the printing?	Perform the print head cleaning, and check the result. Replace the ink cartridge if necessary.
Is a line of dots missing consistently throughout the printing?	Perform the print head cleaning, and check the result. Replace the ink cartridge if necessary.

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

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

If the printout is not what is expected:

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

Paper feeding

If paper is not feeding smoothly with the roller feed, check the following:

Check	Possible remedy
Is the paper release lever pushed down?	Set the release lever to the downward position.
Is the ASF selected with the DIP setting?	If it is, then deselect it.
Are you trying to feed paper using the front panel buttons while the ON LINE indicator illuminated?	You can only feed paper in this way the printer is off-line. Set the printer off-line and then feed paper.
Is the paper too thick?	There are limits to the thickness of paper that can be fed in this way. Try with thinner paper or flat feed.

If paper is not feeding smoothly with the flat feed, check the following:

Check	Possible remedy
Is the paper release lever pushed down?	Set the release lever to the downward position.
Is the flat feed mode selected with the contol panel?	Set the flat feed mode with the control panel operation.
Is the ASF selected with the DIP setting?	If it is, then deselect it.
Are you trying to feed paper using the front panel buttons while the ON LINE indicator illuminated?	You can only feed paper in this way the printer is off-line. Set the printer off-line and then feed paper.

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

Check	Possible remedy
Has the ASF option been selected with the DIP switch?	Select correct option.
Is the release lever set to the down position?	The release lever should be set to the downward position.
Is the ASF correctly mounted?	Make sure that the ASF is properly seated on the printer.
Is paper caught up near the print head?	Stop printing, remove the jammed sheet, and continue.
Are the left and right guides too close together?	If the left and right guides are too close together, the paper will not feed smoothly. Move them a little further apart to allow the paper to feed freely.
Is there too much paper in the paper feed hopper or stacker?	The ASF's paper feed hopper can hold 30 sheets at a time. Make sure that there is no more paper than this in the hopper.
Was the paper fanned before being fed into the ASF?	If this is not done, paper jams may occur. Remove the stack of paper from the ASF and fan it before reinserting.
Has the paper been used already or is it creased?	Only new, uncreased paper should be used with the ASF.
Are you trying to feed paper using the front panel buttons while the ON LINE indicator illuminated?	You can only feed paper in this way the printer is off-line. Set the printer off-line and then feed paper.
Is the paper too thick or too thin?	There are limits to the thickness of paper that can be fed in this way. Try with different paper.

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

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

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 1).

- Do not subject the printer to physical shocks or excessive vibration.

- Avoid over-dusty environments. Dust is the enemy of all precision mechanical devices.

- To clean the exterior of the printer, use a cloth barely dampened with either water with a little detergent or a little alcohol, but do not allow any liquid to fall inside the printer.

- The interior of the printer may be cleaned with a small vacuum cleaner or a compressed-air aerosol (sold for this purpose). When performing this operation, be sure not to bend or damage any cable connections or electronic components.

Chapter 10

REFERENCE

SPECIFICATIONS

Printing system .... Serial Ink Jet Dot-matrix

Printing speed .... High Quality mode   Economy mode
Pica	83 cps	83 cps
Elite	100 cps	100 cps
Semi-condensed	124 cps	124 cps
Condensed pica	142 cps	142 cps
Condensed elite	166 cps	166 cps

Print direction .... Bi-directional, logic-seeking
Uni-directional, logic-seeking
(selectable)

Print head .... 48 nozzles
Life: 700,000 characters

Line spacing .... 1/6, 1/8, $n/60$, $n/72$, $n/180$, $n/216$, $n/360$ inches

Font styles .... Roman and H-Gothic

Characters ....
ASCII	96
International	16 sets (*)
IBM special	111
IBM block graphic	50
IBM code page	6 sets (**)
Download	128

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

** #437 (USA), #850 (Multi-Lingual), #860 (Portuguese), #861 (Icelandic), #863 (Canadian French), #865 (Nordic)

Number of columns
Pica (10 CPI)	80
Elite (12 CPI)	96
Semi-condensed (15 CPI) ...	120
Condensed pica (17 cpi)	137
Condensed elite (20 CPI)	160
Proportional	Variable

Character matrix ....High Quality   Economy
    Pica   48 × 36   24 × 36
    Elite   48 × 30   24 × 30
    Semi-condensed   32 × 24   16 × 24
    Condensed pica   48 × 21   24 × 21
    Condensed elite   48 × 18   24 × 18
    Proportional $48 \times n$ $24 \times n$

Bit image dot-matrix..................DPI 8-bit   24-bit   48-bit

	DPI	8-bit	24-bit	48-bit
Normal-density	60	8 × 480	24 × 480	48 × 480
CRT graphics mode I	80	8 × 640	(Not supplied)	(Not supplied)
CRT graphics mode II	90	8 × 720	24 × 720	48 × 720
Double-density	120	8 × 960	24 × 960	48 × 960
Triple-density	180	(Not supplied)	24 × 1440	48 × 1440
Quadruple-desity	240	8 × 1920	(Not supplied)	(Not supplied)
Hex-density	360	(Not supplied)	24 × 2880	48 × 2880

Paper feed ....Friction roller feed
    Friction flat feed

Paper feed speed ....5/6 inches/second max

Paper specifications
    Width..................................7.2" ~ 8.5" (182 ~ 216 mm)
    Length ....7.2" ~ 14" (182 ~ 356 mm)
    Weight ....52 ~ 105 g/m^2
    Envelope ....Commercial 10 only

Maximum buffer size ....Without Download   28 kB
    With Download   4 kB

Emulations
    Standard mode ....Epson LQ-860, NEC 24-wire Graphics commands
    IBM mode ....IBM Proprinter X24E

Interface ....Centronics parallel

Ink Cartridge
    Type ....Single cartridge ink supply (SC-10)
    Ink Color ....Black only
    Ink amount ....28 g (0.9 oz)

Dimensions and Weight
    Width..................................310 mm (12.2")
    Depth..................................216.5 mm (8.5")
    Height.................................47.5 mm (1.9")
    Weight................................1.8 Kg (4.0 lb)

AC adapter power supply .... 120VAC, 220VAC, 240VAC, 50/60 Hz
(varies according to the country of purchase)

Options .... Battery pack (BP-10)
Automatic Sheet Feeder (SF-10CA)

PINOUT OF INTERFACE CONNECTOR

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

Pin	Name	Function
1	$\overline{\text{STROBE}}$	Goes from high to low (for ≥ 0.5 μs) 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	$\overline{\text{ACK}}$	4 μs low pulse acknowledges receipt of data
11	BUSY	Low when printer ready to receive data
12	PAPER	High when paper out.
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	N/C	
19 ~ 30	GND	Twisted pair ground return
31	$\overline{\text{RESET}}$	When this input signal is low, printer is reset
32	$\overline{\text{ERROR}}$	Outputs low when printer cannot continue, due to an error
33	EXT GND	External ground
34	N/C	
35	+5V	+5V DC output from printer
36	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 entires 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 < >.

Character

Hexadecimal value (high order)

	0	1	2	3	4	5	6	7
0	`<NUL>` 0	16	32	Q 48	@ 64	P 80	` 96	p 112
1	1	`<DC1>` 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	`<DC2>` 18	" 34	2 50	B 66	R 82	b 98	r 114
3	3	`<DC3>` 19	# 35	3 51	C 67	S 83	c 99	s 115
4	4	`<DC4>`	$ 36	4 52	D 68	T		

Decimal value

Control code

Hexadecimal value (low order)

Standard character set #2

	0	1	2	3	4	5	6	7
0	⟨NUL⟩ 0	16	32	0 48	@ 64	P 80	` 96	p 112
1	1	⟨DC1⟩ 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	⟨DC2⟩ 18	'' 34	2 50	B 66	R 82	b 98	r 114
3	3	⟨DC3⟩ 19	# 35	3 51	C 67	S 83	c 99	s 115
4	4	⟨DC4⟩ 20	$ 36	4 52	D 68	T 84	d 100	t 116
5	5	21	% 37	5 53	E 69	U 85	e 101	u 117
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118
7	⟨BEL⟩ 7	23	' 39	7 55	G 71	W 87	g 103	w 119
8	⟨BS⟩ 8	⟨CAN⟩ 24	(40	8 56	H 72	X 88	h 104	x 120
9	⟨HT⟩ 9	⟨EM⟩ 25	) 41	9 57	I 73	Y 89	i 105	y 121
A	⟨LF⟩ 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	⟨VT⟩ 11	⟨ESC⟩ 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	⟨FF⟩ 12	⟨FS⟩ 28	, 44	< 60	L 76	\ 92	l 108	¦ 124
D	⟨CR⟩ 13	29	— 45	= 61	M 77	] 93	m 109	} 125
E	⟨SO⟩ 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	⟨SI⟩ 15	31	/ 47	? 63	O 79	— 95	o 111	⟨DEL⟩ 127

	8	9	A	B	C	D	E	F
0	à 128	§ 144	160	0 176	@ 192	P 208	` 224	p 240
1	è 129	ß 145	! 161	1 177	A 193	Q 209	a 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	º 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	¡ 135	Ä 151	' 167	7 183	G 199	W 215	g 231	w 247
8	¿ 136	Ö 152	(168	8 184	H 200	X 216	h 232	x 248
9	Ñ 137	Ü 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	¤ 139	ö 155	+ 171	; 187	K 203	[219	k 235	{ 251
C	₧ 140	ü 156	, 172	< 188	L 204	\ 220	l 236	¦ 252
D	Å 141	É 157	– 173	= 189	M 205	] 221	m 237	} 253
E	å 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 Italic 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	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ENGLAND	£	$	@	X	Z	[	\	]	^	`	{	¦	}	~
DENMARK 1	#	$	@	X	Z	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	¤	É	X	Z	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	$	@	X	Z	°	\	é	^	ù	à	ò	è	ì
SPAIN 1	₧	$	@	X	Z	¡	Ñ	¿	^	´	¨	ñ	}	~
JAPAN	#	$	@	X	Z	[	¥	]	^	`	{	¦	}	~
NORWAY	#	¤	É	X	Z	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK 2	#	$	É	X	Z	Æ	Ø	Å	Ü	é	æ	ø	å	ü
SPAIN 2	#	$	á	X	Z	¡	Ñ	¿	é	´	í	ñ	ó	ú
LATIN AMERICA	#	$	á	X	Z	¡	Ñ	¿	é	ü	í	ñ	ó	ú
KOREA	#	$	@	X	Z	[	₩	]	^	`	{	¦	}	~
IRISH	#	$	@	Ú	´	[	\	]	^	`	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	Irish
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	0 48	@ 64	P 80	` 96	p 112
1	1	⟨DC1⟩ 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	⟨DC2⟩ 18	" 34	2 50	B 66	R 82	b 98	r 114
3	♥ 3	⟨DC3⟩ 19	# 35	3 51	C 67	S 83	c 99	s 115
4	♦ 4	⟨DC4⟩ 20	$ 36	4 52	D 68	T 84	d 100	t 116
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117
6	♠ 6	22	& 38	6 54	F 70	V 86	f 102	v 118
7	⟨BEL⟩ 7	23	' 39	7 55	G 71	W 87	g 103	w 119
8	⟨BS⟩ 8	⟨CAN⟩ 24	(40	8 56	H 72	X 88	h 104	x 120
9	⟨HT⟩ 9	⟨EM⟩ 25	) 41	9 57	I 73	Y 89	i 105	y 121
A	⟨LF⟩ 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	⟨VT⟩ 11	⟨ESC⟩ 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	⟨FF⟩ 12	⟨FS⟩ 28	, 44	< 60	L 76	\ 92	l 108	¦ 124
D	⟨CR⟩ 13	29	— 45	= 61	M 77	] 93	m 109	} 125
E	⟨SO⟩ 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	⟨SI⟩ 15	31	/ 47	? 63	O 79	_ 95	o 111	⟨DEL⟩ 127

	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	▓ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Æ 146	ó 162	░ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	· 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	2 253
E	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	⊥ 207	▀ 223	∩ 239	255

102

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	└ 192	ð 208	Ó 224	─ 240
1	ü 129	æ 145	í 161	177	┴ 193	Ð 209	ß 225	± 241
2	é 130	Æ 146	ó 162	178	┬ 194	Ê 210	Ô 226	= 242
3	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	Õ 229	§ 245
6	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	، 247
8	ê 136	ÿ 152	¿ 168	© 184	Ŀ 200	Ï 216	Þ 232	° 248
9	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	ý 236	³ 252
D	ì 141	Ø 157	¡ 173	¢ 189	= 205	¦ 221	Ý 237	² 253
E	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	¤ 207	■ 223	´ 239	255

Code Page #860 (Portuguese)

Other characters are identical to Code Page #437.

	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	À 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	È 146	ó 162	▓ 178	┬ 194	π 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	Ê 137	Õ 153	Ò 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	• 250
B	Í 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	ì 141	Ù 157	¡ 173	╜ 189	= 205	▌ 221	φ 237	² 253
E	Ã 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	Â 143	Ó 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	É 144	á 160	▓ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Æ 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	Á 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	Þ 149	Í 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	Ó 166	╢ 182	╞ 198	╓ 214	μ 230	÷ 246
7	ç 135	Ý 151	Ú 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ý 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	Ð 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	Ö 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	þ 141	Ø 157	¡ 173	╜ 189	= 205	▌ 221	φ 237	² 253
E	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 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	É 144	¦ 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	È 145	´ 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Ê 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	Â 132	Ë 148	¨ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	Ï 149	¸ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	¶ 134	û 150	³ 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	─ 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	˙ê 136	¤ 152	Î 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ô 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	= 141	Ù 157	¾ 173	╜ 189	= 205	▌ 221	ø 237	² 253
E	À 142	Û 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	§ 143	ƒ 159	» 175	┐ 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	└ 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	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	F 213	σ 229	⌡ 245
6	å 134	û 150	ª 166	╢ 182	╞ 198	π 214	μ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	ì 141	Ø 157	¡ 173	╜ 189	= 205	▌ 221	φ 237	² 253
E	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	ƒ 159	¤ 175	┐ 191	⊥ 207	▀ 223	∩ 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 in the standard mode.

	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	<EM> 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	<EM> 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

108

IBM special character set

Additional characters can be printed by special commands.

	0	1
0	Ø `0`	► `16`
1	☺ `1`	◄ `17`
2	● `2`	↕ `18`
3	♥ `3`	‼ `19`
4	♦ `4`	¶ `20`
5	♣ `5`	§ `21`
6	♠ `6`	▬ `22`
7	• `7`	↨ `23`
8	◘ `8`	↑ `24`
9	○ `9`	↓ `25`
A	◙ `10`	→ `26`
B	♂ `11`	← `27`
C	♀ `12`	∟ `28`
D	♪ `13`	↔ `29`
E	♫ `14`	▲ `30`
F	☼ `15`	▼ `31`

MEMO

INDEX

COMMAND SUMMARY

Standard Mode

The following commands take effect with the Standard mode.

Control code	Function	Page
\<BEL>	Bell	65
\<BS>	Backspace	54
\<HT>	Horizontal tab	55
\<LF>	Line feed	50
\<VT>	Vertical tab	52
\<FF>	Form feed	51
\<CR>	Carriage return	53
\<SO>	Expanded printing for one line	44
\<SI>	Condensed printing	43
\<DC1>	Set printer on-line	65
\<DC2>	Cancel condensed printing	44
\<DC3>	Set printer off-line	64
\<DC4>	Cancel one-line expanded printing	44
\<CAN>	Cancel last line	64
\<ESC> \<SO>	Expanded printing for one line	44
\<ESC> \<SI>	Condensed printing	43
\<ESC> \<EM> \<0>	Manual feed	66
\<ESC> \<EM> \<4>	Auto feed	66
\<ESC> \<EM> "R"	Eject paper from ASF	66
\<ESC> \<EM> "T" n	Set print start position on ASF	66
\<ESC> \<SP> n	Increase character spacing	46
\<ESC> "!" n	Select master print mode	46
\<ESC> "#"	Accept MSB as is	64
\<ESC> "$" $n1$ $n2$	Absolute horizontal tab in inches	56
\<ESC> "%" 0	Select ROM character set	63
\<ESC> "%" 1	Select download character set	62
\<ESC> "&" \<0> $n1$ $n2$ $m0$ $m1$ $m2$ $d1$ $d2$ ... dx		
	Define 24-dot download characters	61
\<ESC> "(" "–" \<3> \<0> \<1> $n1$ $n2$		
	Select score	37
\<ESC> "*" $n0$ $n1$ $n2$ $m1$ $m2$ ...	Select graphics mode	59
\<ESC> "+" n	Set line spacing to $n/360$ inch	49
\<ESC> "–" 0	Stop underlining	36
\<ESC> "–" 1	Start underlining	36
\<ESC> "/" $n0$	Select vertical tab channel	52
\<ESC> "0"	Set line spacing to 1/8 inch	49
\<ESC> "1"	Set line spacing to 7/60 inch	49
\<ESC> "2"	Set line spacing to 1/6 inch	49

\<ESC\> "3" *n*	Set line spacing to *n*/180 inch	50
\<ESC\> "4"	Select italic characters	35
\<ESC\> "5"	Select upright characters	35
\<ESC\> "6"	Select character set #2	39
\<ESC\> "7"	Select character set #1	39
\<ESC\> "<"	One-line uni-directional printing	65
\<ESC\> "="	Set MSB to 0	64
\<ESC\> ">"	Set MSB to 1	64
\<ESC\> "?" *n m*	Convert graphics density	60
\<ESC\> "@"	Reset printer	66
\<ESC\> "A" *n*	Set line spacing to *n*/60 inch	50
\<ESC\> "B" *n1 n2 .... <0>*	Set vertical tab stops	51
\<ESC\> "D" *n1 n2 .... <0>*	Set horizontal tab stops	55
\<ESC\> "E"	Emphasized printing	35
\<ESC\> "F"	Cancel emphasized printing	35
\<ESC\> "G"	Double-strike printing	35
\<ESC\> "H"	Cancel double-strike printing	36
\<ESC\> "J" *n*	Perform one *n*/180-inch line feed	50
\<ESC\> "K" *n1 n2 m1 m2 ...*	Print normal-density 8-bit graphics	57
\<ESC\> "L" *n1 n2 m1 m2 ...*	Print double-density 8-bit graphics	57
\<ESC\> "M"	Elite pitch	42
\<ESC\> "N" *n*	Set bottom margin	51
\<ESC\> "O"	Cancel bottom margin	51
\<ESC\> "P"	Pica pitch	42
\<ESC\> "Q" *n*	Set right margin	53
\<ESC\> "R" *n*	Select international character set	40
\<ESC\> "S" 0	Superscript	37
\<ESC\> "S" 1	Subscript	38
\<ESC\> "T"	Cancel superscript or subscript	38
\<ESC\> "U" 0	Bi-directional printing	65
\<ESC\> "U" 1	Uni-directional printing	65
\<ESC\> "W" 0	Cancel expanded printing	44
\<ESC\> "W" 1	Expanded printing	44
\<ESC\> "Y" *n1 n2 m1 m2 ...*	Print double-density 8-bit graphics	57
\<ESC\> "Z" *n1 n2 m1 m2 ...*	Print quadruple-density 8-bit graphics	57
\<ESC\> "[" "T" \<4\> \<0\> \<0\> \<0\> *n1 n2*		
	Select IBM code page	40
\<ESC\> "\" *n1 n2*	Relative horizontal tab	56
\<ESC\> "a" 0	Left justify	54
\<ESC\> "a" 1	Center text	54
\<ESC\> "a" 2	Right justify	54
\<ESC\> "b" *n0 n1 n2 .... <0>*	Set vertical tab stops in channel	52
\<ESC\> "e" 0 *n*	Set horizontal tab stop every *n* columns	55
\<ESC\> "e" 1 *n*	Set vertical tab stops every *n* lines	52
\<ESC\> "f" 0 *n*	Absolute horizontal tab in columns	56
\<ESC\> "f" 1 *n*	Feed paper *n* lines	51
\<ESC\> "g"	Semi-condensed pitch	43

IBM Mode

The following commands take effect with the IBM mode.

Control code	Function	Page
<BEL>	Bell	65
<BS>	Backspace	54
<HT>	Horizontal tab	55
<LF>	Line feed	50
<VT>	Vertical tab	52
<FF>	Form feed	51
<CR>	Carriage return	53
<SO>	Expanded printing for one line	44
<SI>	Condensed printing	43
<DC1>	Set printer on-line	65
<DC2>	Pica pitch	42
<DC4>	Cancel one-line expanded printing	44
<CAN>	Cancel last line	64
<ESC> <SO>	Expanded printing for one line	44
<ESC> <SI>	Condensed printing	43
<ESC> <EM> <0>	Manual feed	66
<ESC> <EM> <4>	Auto feed	66
<ESC> .<EM> "R"	Eject paper from ASF	66
<ESC> <EM> "T" n	Set print start position on ASF	66
<ESC> "–" 0	Stop underlining	36
<ESC> "–" 1	Start underlining	36
<ESC> "0"	Set line spacing to 1/8 inch	49
<ESC> "1"	Set line spacing to 7/72 inch	49
<ESC> "2"	Execute <ESC> "A"	50
<ESC> "3" n	Set line spacing to $n/180$ inch or $n/216$ inch	50
<ESC> "4"	Set top of page at current position	51
<ESC> "5" <0>	Cancel automatic line feed	54
<ESC> "5" <1>	Set automatic line feed	54
<ESC> "6"	Select character set #2	39
<ESC> "7"	Select character set #1	39
<ESC> ":"	Elite pitch	42
<ESC> "@"	Reset printer	66
<ESC> "A" n	Set line spacing to $n/72$ inch	50
<ESC> "B" n1 n2 .... <0>	Set vertical tab stops	51
<ESC> "D" n1 n2 .... <0>	Set horizontal tab stops	55
<ESC> "E"	Emphasized printing	35
<ESC> "F"	Cancel emphasized printing	35
<ESC> "G"	Double-strike printing	35
<ESC> "H"	Cancel double-strike printing	36
<ESC> "I" <0>	Select pica characters with Economy mode	42
<ESC> "I" <2>	Select pica characters with High Quality mode	42

<ESC> "I" <3>	Select proportional characters with High Quality mode	45
<ESC> "I" <8>	Select elite characters with Economy mode	42
<ESC> "I" <LF>	Select elite characters with High Quality mode	43
<ESC> "I" <16>	Select condensed characters with Economy mode	43
<ESC> "I" <DC2>	Select condensed characters with High Quality mode	43
<ESC> "J" *n*	Perform one *n*/180-inch or *n*/216-inch line feed	50
<ESC> "K" *n1 n2 m1 m2* ...	Print normal-density 8-bit graphics	57
<ESC> "L" *n1 n2 m1 m2* ...	Print double-density 8-bit graphics	57
<ESC> "N" *n*	Set bottom margin	51
<ESC> "O"	Cancel bottom margin	51
<ESC> "P" <0>	Select fixed spacing	45
<ESC> "P" <1>	Select proportional spacing	45
<ESC> "Q" "$"	Set printer off-line	64
<ESC> "R"	Reset all tab stops	55
<ESC> "S" 0	Superscript	37
<ESC> "S" 1	Subscript	38
<ESC> "T"	Cancel superscript or subscript	38
<ESC> "U" 0	Bi-directional printing	65
<ESC> "U" 1	Uni-directional printing	65
<ESC> "W" 0	Cancel expanded printing	44
<ESC> "W" 1	Expanded printing	44
<ESC> "X" *n1 n2*	Set left and right margins	53
<ESC> "Y" *n1 n2 m1 m2* ...	Print double-density 8-bit graphics	57
<ESC> "Z" *n1 n2 m1 m2* ...	Print quadruple-density 8-bit graphics	57
<ESC> "[" "@" <4> <0> <0> <0> *n m*	Select character height, width, and line spacing	48
<ESC> "[" "T" <4> <0> <0> <0> *n1 n2*	Select IBM code page	40
<ESC> "[" "\" <4> <0> <0> <0> <0> *n*	Set base unit for line spacing	49
<ESC> "[" "d" <0> <1> *n*	Select print quality	34
<ESC> "[" "g" *n1 n2 m0 m1 m2* ...	Select graphics mode	59
<ESC> "\" *n1 n2*	Enable printing of all character codes	40
<ESC> "^" *n*	Enable printing of all character codes on next character	41
<ESC> "_" 0	Stop overlining	36
<ESC> "_" 1	Start overlining	36
<ESC> "d" *n1 n2*	Relative horizontal tab in inches	56
<ESC> "j"	Stop printing	65
<ESC> "k" "0"	Select Tms Romn font	34

Consumer Response

Star Micronics Co., Ltd. invites your suggestions and comments on your printer and this manual. Please address your correspondence to:

Worldwide Headquarters:
STAR MICRONICS CO., LTD.
194 Nakayoshida
Shizuoka, JAPAN 422-91
Attn: Product Manager

American Market:
STAR MICRONICS AMERICA, INC.
420 Lexington Avenue, Suite 2702-25
New York, NY 10170
Attn: Product Manager

European Market:
STAR MICRONICS DEUTSCHLAND GMBH
Westerbachstraße 59
P.O. Box 940330
D-6000 Frankfurt/Main 90
F.R. of Germany
Attn: Product Manager

U.K. Market:
STAR MICRONICS U.K., LTD.
Star House
Peregrine Business Park
Gomm Road, High Wycombe
Bucks. HP13 7DL, U.K.
Attn: Product Manager

French Market:
STAR MICRONICS FRANCE S.A.R.L.
25, rue Michaël Faraday
78180 Montigny-le-Bretonneux
Attn: Product Manager

Asian Market:
STAR MICRONICS ASIA LTD.
Room 2408-10 Sincere Building;
173 Des Voeux Road, Central, HONG KONG
Attn: Product Manager

PRINTED IN JAPAN

Free Manuals Download Website

http://myh66.com

http://usermanuals.us

http://www.somanuals.com

http://www.4manuals.cc

http://www.manual-lib.com

http://www.404manual.com

http://www.luxmanual.com

http://aubethermostatmanual.com

Golf course search by state

http://golfingnear.com

Email search by domain

http://emailbydomain.com

Auto manuals search

http://auto.somanuals.com

TV manuals search

http://tv.somanuals.com