FX-80

OPERATION MANUAL

CORRECTIONS

Please correct the following:

Page 3-31 ESC 8
Append the following:

NOTE: This code is not effective on the TRS-80.

Page 3-37 Example program lines 70, 80 and 90
Page 3-39 Example program lines 40, 50 and 60
In regard to the above, please append the following:

In these examples, the way in which download character " � " is defined differs from that in the example program on page 3-38. This is to illustrate the fact that horizontally adjacent dots are not printed even if defined.

Page 3-52
Append the following:

NOTE: "MOD" is not valid in TRS-80 BASIC.

The description of ESC F should read as follows:

ESC F

Name   **ESC F** — Emphasized mode cancel

Expression   **CHR$(27);"F";**

Function   The ESC F code cancels the Emphasized mode set by the ESC E code.

See also   ESC E and ESC !

Example
```
10  'Emphasized Print
20  LPRINT CHR$(27);"E";
30  LPRINT "Emphasized Print";
40  LPRINT CHR$(27);"F";
50  LPRINT "    Normal Print"
60  END
```

Emphasized Print   Normal Print

"This command is not influenced by control codes such as . . ." should read:
"This command does not influence such control codes as . . ."

"the data following ESC K code is printed out as dot pattern(s)." should read:
"the data is printed out as dot pattern(s)."

Delete "**CHR$(m) . . .**"

"9/108" should read: "1/12"

FX-80

OPERATION MANUAL

EPSON

Trademark Acknowledgments

TRS-80 is a trademark of Radio Shack, a division of Tandy Corporation. Centronics is a trademark of Data Computer Corporation. Atari is a trademark of Atari Inc., a Warner Communications Company. Apple is a trademark of Apple Computer Inc. Microsoft BASIC is a trademark of Microsoft.

TABLE OF CONTENTS

WARNING

High voltage exists inside this unit and the case should be opened only by a service person!

INTRODUCTION

EPSON now offers a dot matrix printer which sets a new standard of excellence for hard copy technology—the FX-80.
It provides the same indisputable high quality output and reliability as the MX Series printers and so many new features with the best cost-performance ratio in the industry.

Unlike conventional printers, the FX-80 is not limited to the program-selectable ASCII and International character sets.
Any character or symbol that can be defined in a 9×11 matrix, can be created and added as part of the FX-80's character set.

New characters can be created easily by program.
The RAM stores up to 256 characters, extending the FX-80's versatility to meet almost any printing application. A true "Universal" printer.

The FX-80 prints at *160 characters per second* (CPS) to minimize the time you wait for your printout. A special "Quiet Mode" is selectable so that the FX-80 can be utilized in an office environment without disturbing office personnel. Its speed is 80 CPS.

The FX-80 provides a number of additional features. For example, any of nine bit image modes are program-selectable. And all nine can be used in the same print line in any combination. The modes include:
1920-dot/8-inch Quadruple Density, 640-dot/8-inch CRT Graphics I, 576-dot/8-inch Plotter Graphics, 720-dot/8-inch CRT Graphics II and two 9-dot Bit Image modes. The FX-80 can print in any character styles—Emphasized, Condensed, *Proportional*, Elite, Italic, and others—including all styles available with the MX Series.

Like the MX Series, the FX-80 prints on fanfold paper, cut sheet, or roll paper. An original and up to two copies at a time can be printed. A *Short Tear-off* function permits the paper to be cut within one inch of the last print position.

Setting of the number of columns per line, selection between normal and emphasized characters, setting of skip-over perforation, switching of one character set to another can be performed more rapidly, by setting the easily accessible DIP switches.

All these new features of the FX-80 combined with the features it has inherited from the MX Series, make it a true "Universal" printer, capable of meeting a wide range of business and home enthusiast needs.

Chapter 1   SET-UP

1.1 Unpacking Steps

1. Open the carton.
2. Grasp the FX-80 by its underside and lift straight out with packing material attached.
3. Place the printer on a flat surface.
4. Carefully remove packing material.
5. Remove the vinyl cover.

1.2 Counting the Parts

Check the box for evidence of shipping damage or mishandling. If such evidence is present, contact the store where you purchased the FX-80 as soon as possible.

The FX-80 and standard accessories are as shown below.

Printer lid

Separator

Cartridge ribbon

Power cord
(European type
only)

Operation manual

FX-80

* The manual paper feed knob is not attached to the printer when it is shipped.
Fit the manual paper feed knob by pushing it straight in, with firm but steady pressure.

Contents of Carton
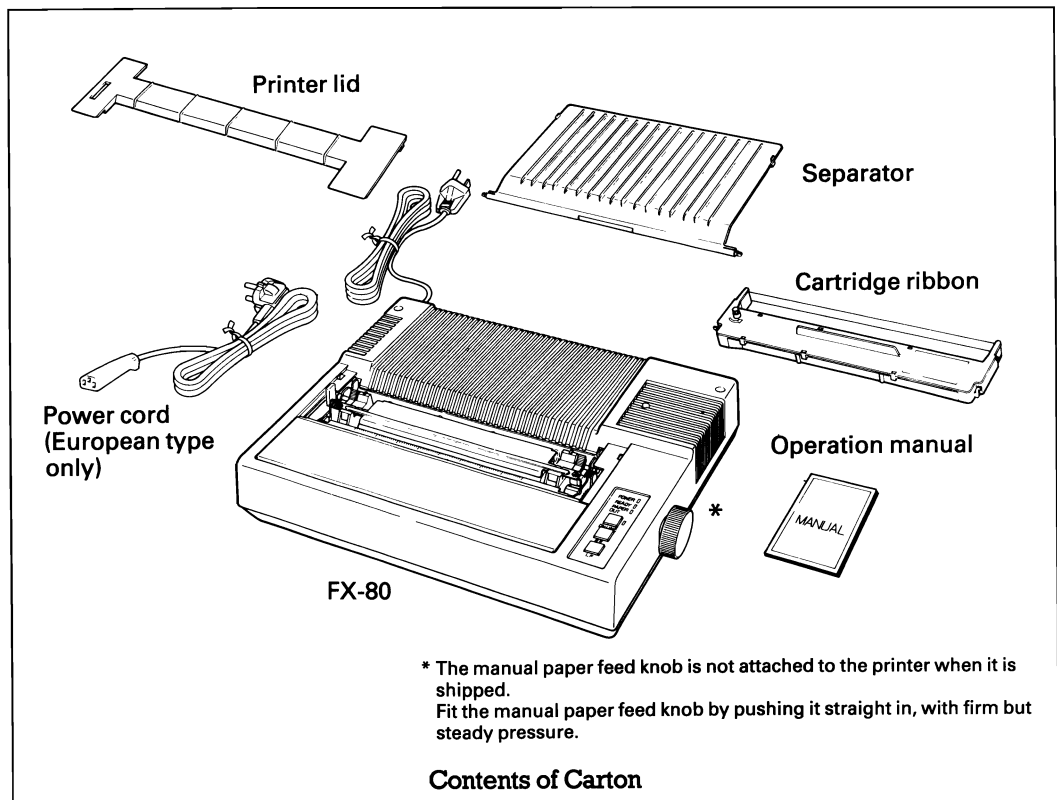
NOTE:
EPSON dealers provide a cable to connect the printer to your particular computer. Computers that do not use the Centronics™ standard parallel interface scheme need a special interfacing kit. EPSON dealers can supply kits for many popular computers.

1.3 Removal of Protective Paper

The FX-80 is provided with a protective paper inserted between the inner and outer paper guides to protect the paper end detector from damage due to shocks or vibrations during transportation. Before using the printer, be sure to remove this paper. If the FX-80 is to be reshipped, remember to return the paper to the original position.

<Repacking Steps>

Repacking can be carried out by following the above steps in the reverse order. (Repacking: Shipment for repair, storage, etc.)
NOTE:
It is recommended that all original packing materials be saved for reuse in case the FX-80 requires reshipment in the future.

1.4 Operation Site Selection

1. The FX-80 should be installed on a flat, firm surface with enough room as shown below.
2. Care should be exercised in locating the FX-80 in areas where it will not be exposed to direct sunlight or where the environment contains grease or dust.
3. The FX-80 should not be located in the vicinity of noise generating equipment or heat generating equipment.
4. Do not subject the FX-80 to temperatures below 5°C (41°F) or above 35°C (95°F) during operation. Also avoid sudden changes in temperature and extreme shock.

Laying Printer on Flat, Firm Surface
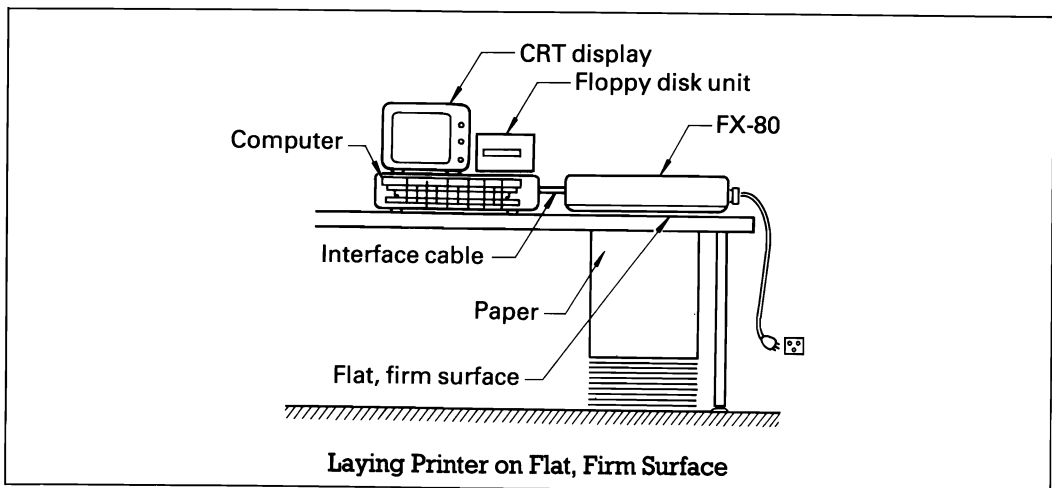
1.5 Removal of Printer Cover

Take off the printer cover for the cartridge ribbon to be set easily. Rough or careless handling of the printer cover may result in damage to, or even breakage of, its hinges.

1. Stand the printer cover upright.
2. Pull the printer cover upwards while holding it horizontally.

Printer cover

Removal of Printer Cover
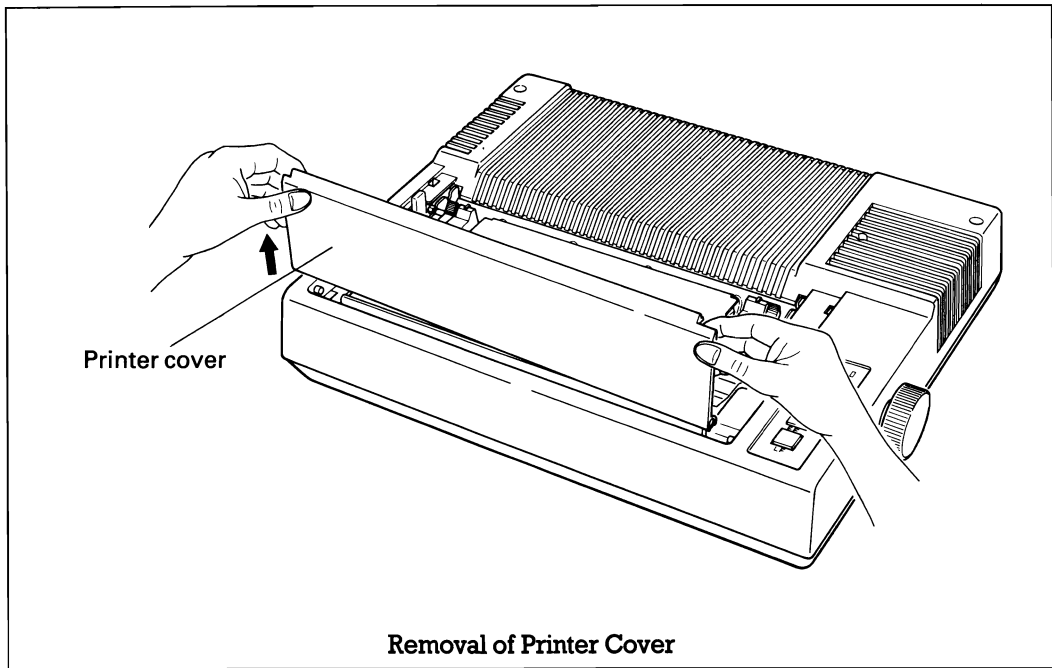
1.6 Cartridge Ribbon Setting

1. Take the cartridge ribbon from the box.

Ribbon

Ribbon feeding knob

Handle
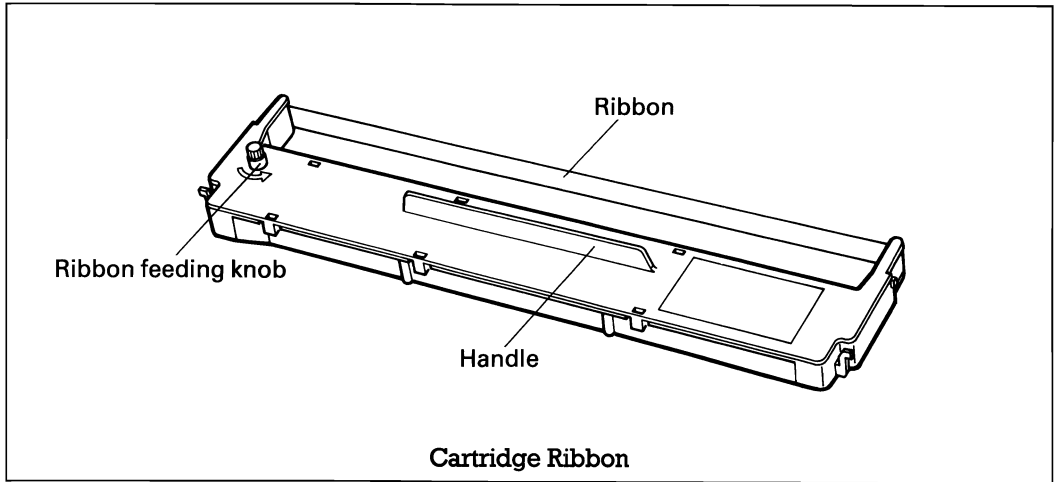
Cartridge Ribbon

2. Confirm that the scale is turned toward the platen.

Scale

Head

Condition before the Cartridge Ribbon is set
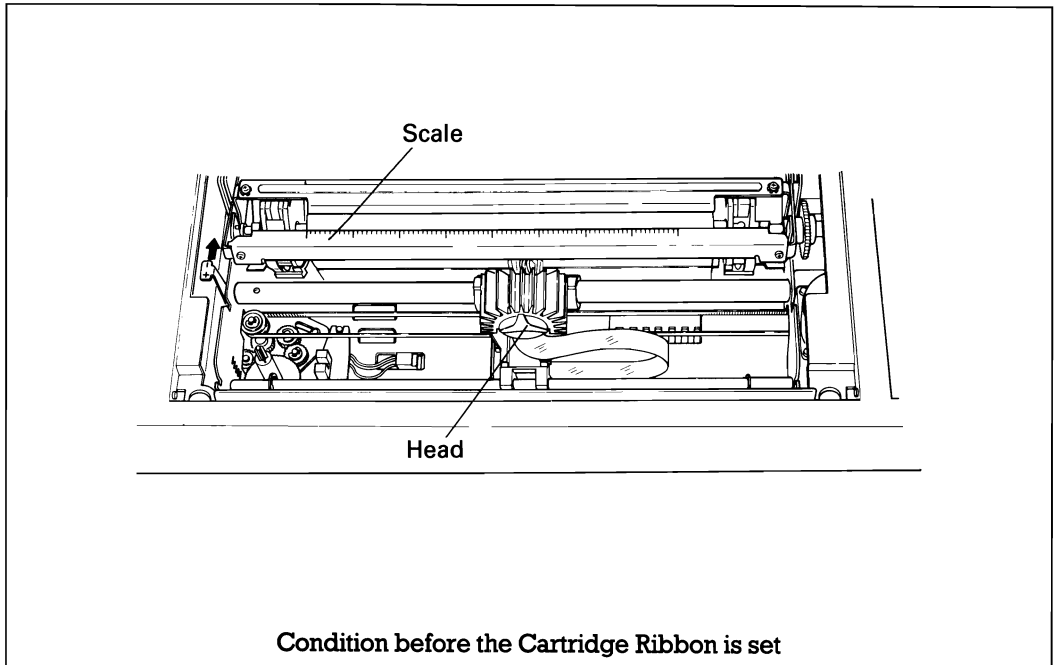
3. Push the cartridge ribbon down and set it on the printer mechanism.
   To facilitate the cartridge ribbon setting, be sure to hold the handle at the center
   of the cartridge case when pushing the cartridge ribbon down.

Cartridge Ribbon Setting (1)
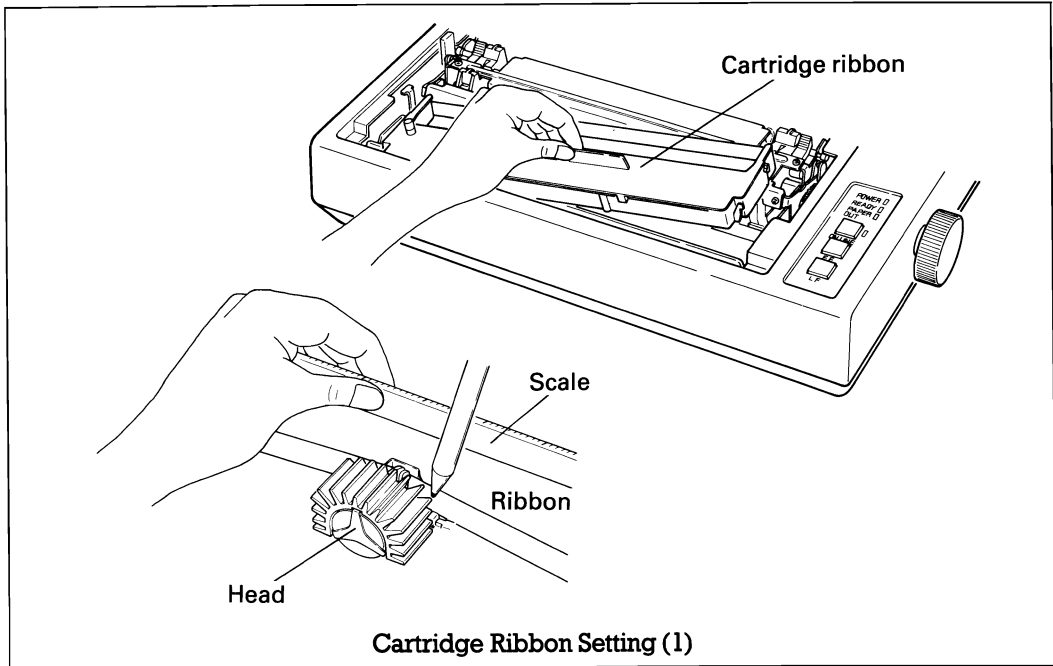
4. Put the ribbon between the head nose and the ribbon mask. In this case, the
   ribbon can be set easily by hooking it to the edge of the head nose and turning
   the ribbon feeding knob of the cartridge case counterclockwise, while
   depressing the ribbon with a ball-point pen.

5. Tension the ribbon by turning the ribbon feeding knob counterclockwise.

Cartridge Ribbon Setting (2)
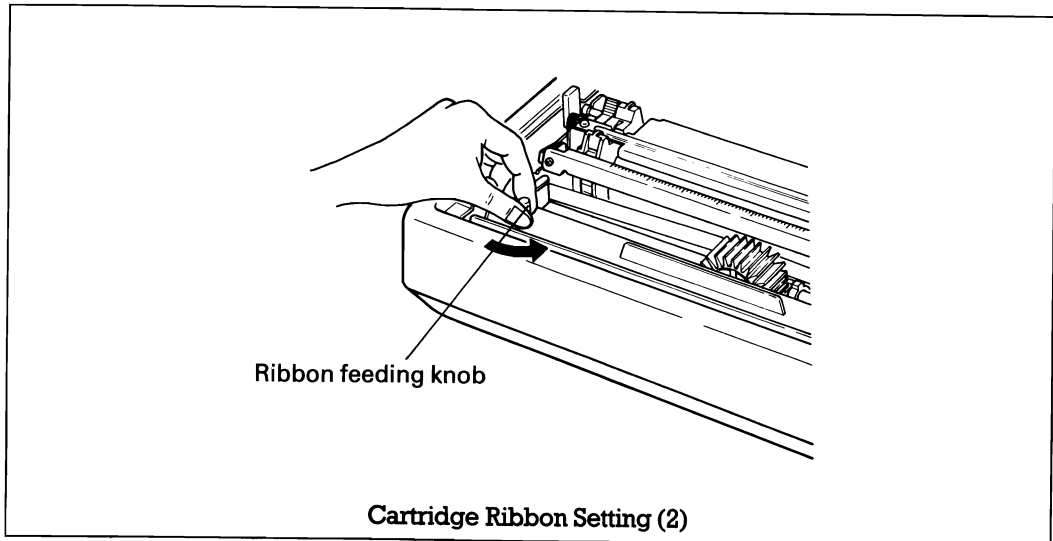
NOTES:
1. *Incorrect setting of the ribbon may cause it to come off.*
2. *Confirm that the ribbon is neither twisted nor creased and that the cartridge is set properly.*

Examples of Correct and Incorrect Ribbon Setting
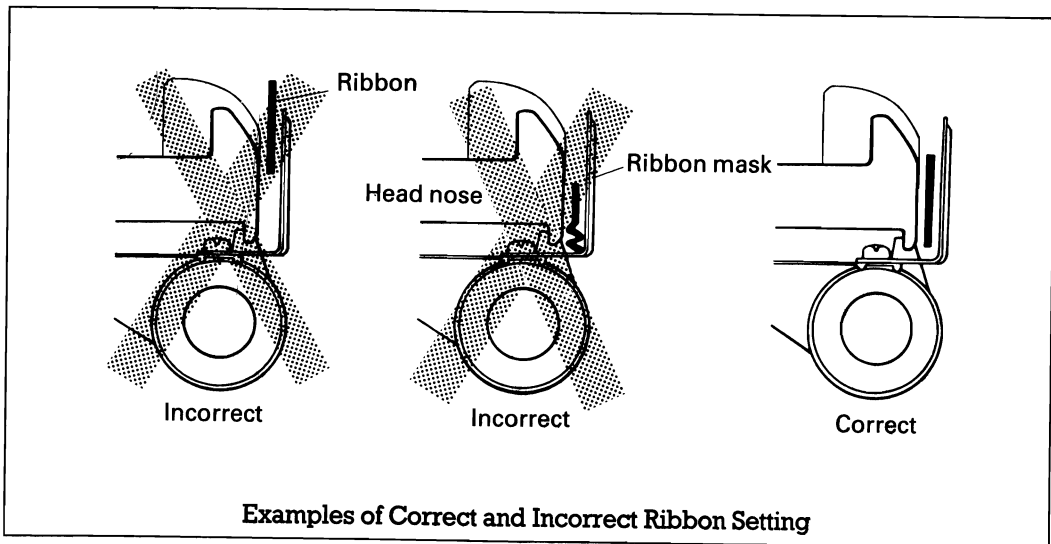
1.7 Paper Loading

1.7.1 Pin-feed paper

Pin-feed paper is defined as fanfold paper or business form paper with sprocket holes for paper feed on both sides.
The FX-80 accommodates pin-feed paper from 9.5″ to 10″ in width. (4.0″ to 9.0″ when the optional tractor unit is used.)

To load the pin-feed paper, observe the following procedure.
1. Remove the printer cover.
2. Turn the scale toward the front of the printer to detach it from the platen.

Insertion of Fanfold Paper
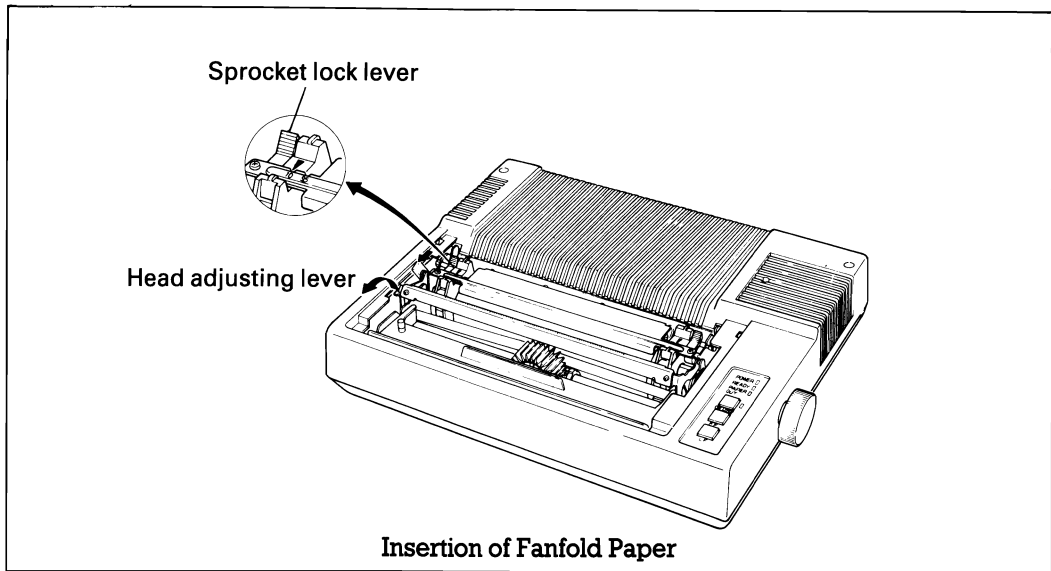
3. Unlock the release lever.
4. Pull the head adjusting lever forward (in the ⊕ direction) as far as it will go.
5. Fold the pin-feed paper in half to prevent it from wrinkling.
6. Push the leading edge of the paper into the insertion slot between the paper guides at the rear part of the printer mechanism.
7. Raise the two sprocket lock levers to loosen, and adjust the sprocket pin position slightly wider than the width of the paper.
   The scale inscribed; 9.5″ and 10″ on the frame can be used as a guide to adjust the sprocket pin position to the paper width.
8. Lock the two sprocket levers.

9. Gently turn the paper feed knob clockwise.

Course of paper

Paper feed knob

Insertion of Fanfold Paper
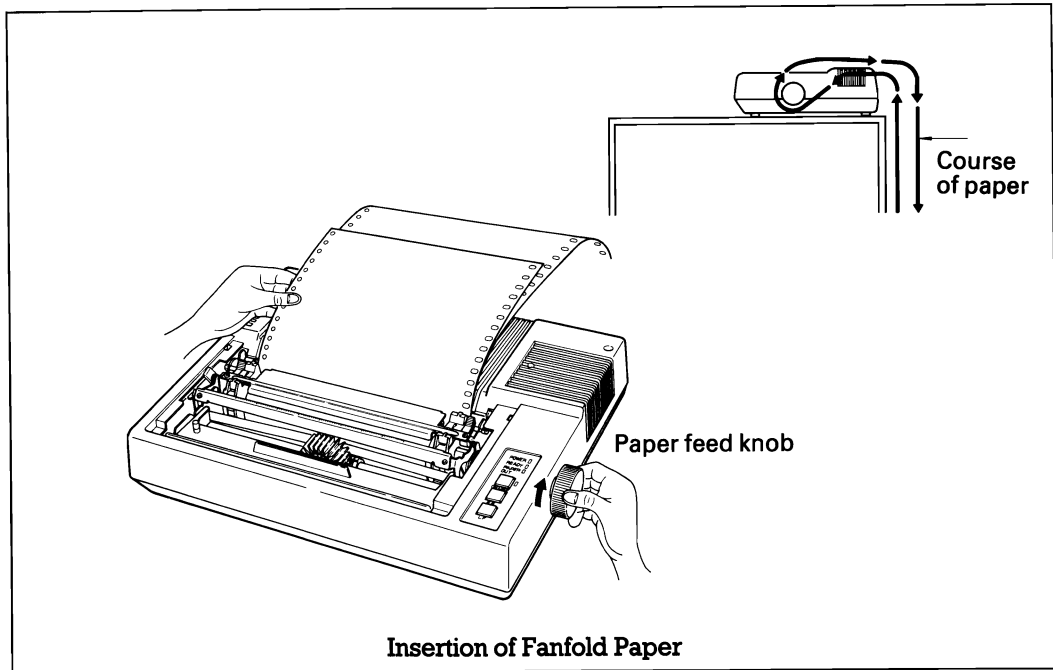
10. After the leading edge of the paper has emerged from the printer, smooth out the wrinkles of the paper by pulling the sprockets to both sides.
11. Push the scale back into position.
12. Adjust the gap to the thickness of paper to be used.

NOTES:
1. Remove the optional tractor unit when using pin-feed paper measuring 9.5" to 10.0" in width.
2. Do not perform reverse paper feed after short tear-off of the paper.
3. The paper cutter is designed to cut the paper at the perforation and not at any other part of the paper.
4. Use carbon copies joined by spot-pasting or line-pasting.

<Print Area for Pin-Feed Paper>

The print area must be within the range indicated below.
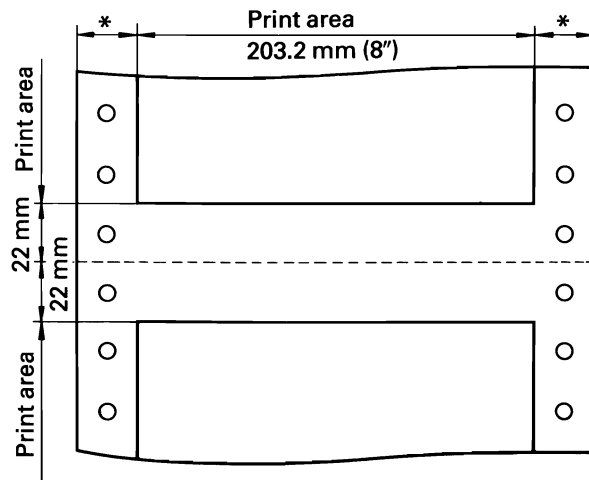
* = 19 mm when using 241 mm paper width
* = 25.4 mm when using 254 mm paper width

\<Separator Installation\>

The separator of the printer contributes to smooth paper feeding. Set the separator by inserting its edge into the two holes located at the rear part of the frame of the printer mechanism.

Separator Installation
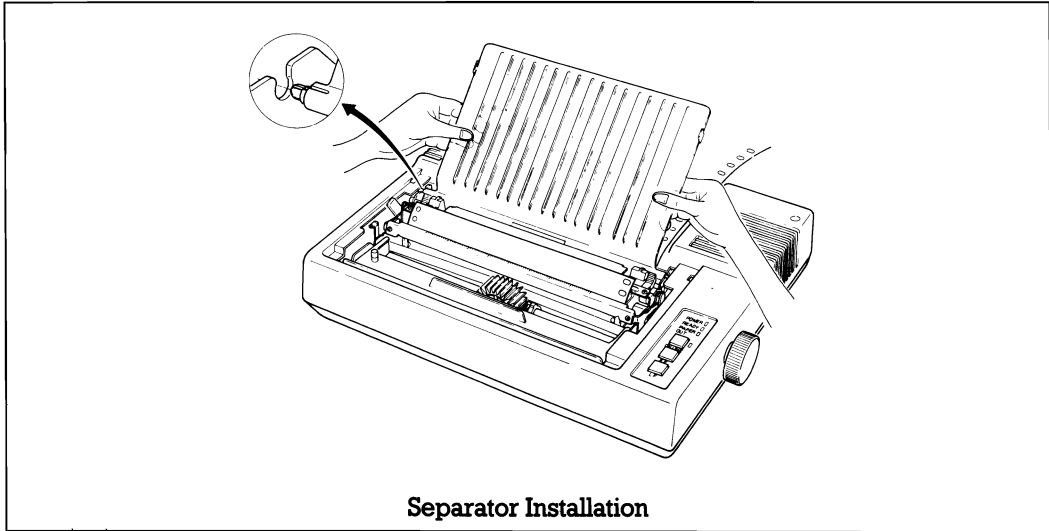
Install the printer cover and printer lid on the printer.

Printer cover

<Additional Information>
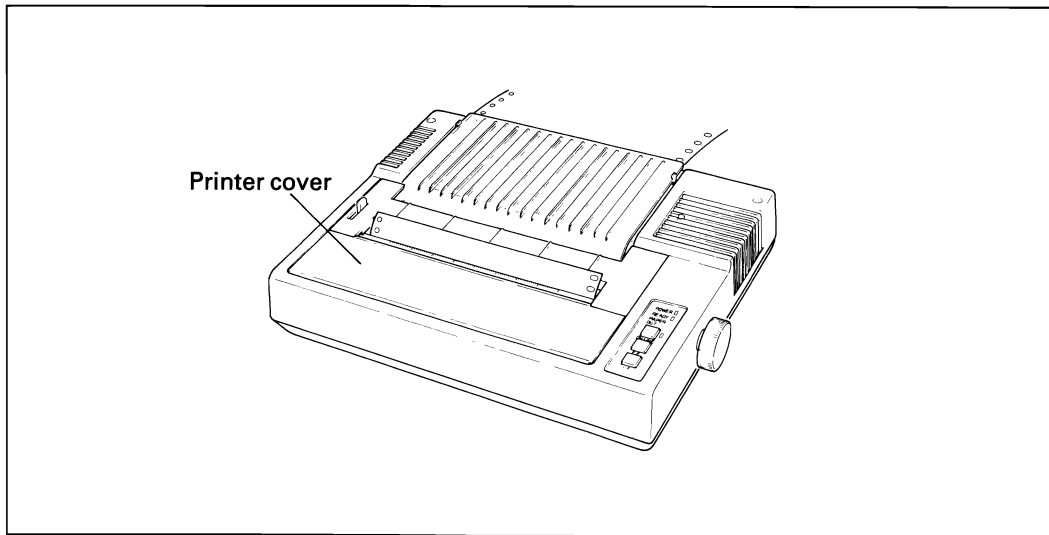
(1) Paper arrangement

When the FX-80 is to be used on a desk or a bench, arrangement of the pin-feed paper in parallel with the FX-80 as shown below will permit the paper to be folded in an accordion style.

Course of paper

Example of Paper Arrangement
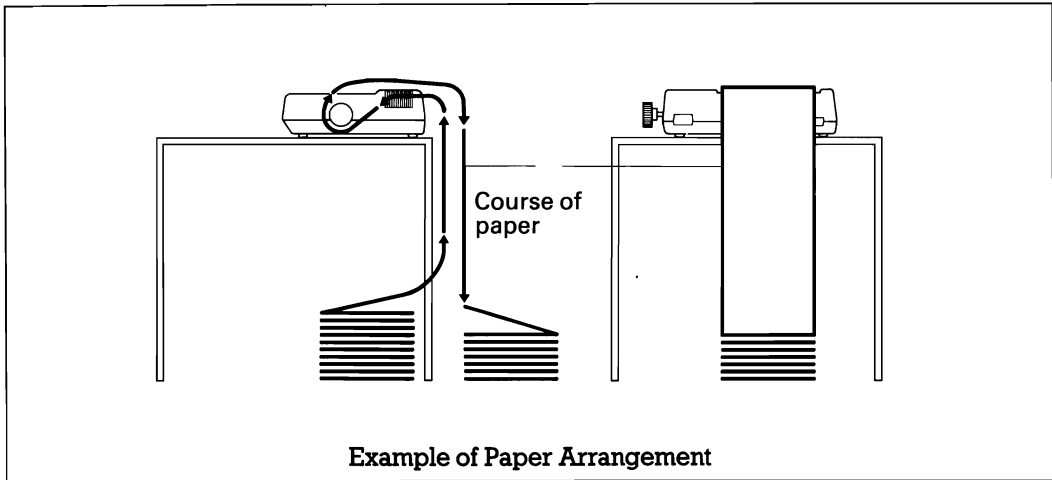
(2) Column layout on pin-feed paper

When pin-feed paper of from 9.5″ to 10″ in width is supplied with the FX-80, the graduations on the scale can be used as the indexes of print column positions (1 to 80). Alignment of the print start position on pin-feed paper with the 1st column position at the extreme left of the scale will facilitate column layout.
Accordingly, center the paper by adjusting it to these indexes of the scale.

(3) Removal of pin-feed paper

To remove the pin-feed paper, follow either of the two methods described below.
1) Pull the paper forward out of the printer by turning paper feed knob.
   NOTES:
   1. Do not attempt to pull out the paper in the backward direction.
   2. Do not turn the paper-feed knob while the power is ON.

2) Feed the paper out of the printer by pushing the Line Feed or Form Feed switch. At this time, the power switch of the printer must be set to the ON position and the printer must be in the OFF-LINE mode.

1.7.2 Roll paper

EPSON offers the roll paper holder as an option for the FX-80.
The FX-80 accommodates a roll of single ply paper measuring 8.5″ in width with a 1-inch core.

1. Remove the printer lid and the printer cover.
2. Raise the two sprocket levers to loosen and adjust the sprocket pin position at both ends of the sprocket shaft. Then lock the sprocket lever.
3. Pull the scale toward the front of the printer to detach the scale from the platen.
4. Unlock the release lever by pulling it forward.
5. Push the paper into the insertion slot between the paper guides at the rear part of the printer mechanism.
6. Lock the release lever.
   NOTE:
   Two-ply roll paper is not recommended for use.

Loading of Roll Paper (1)
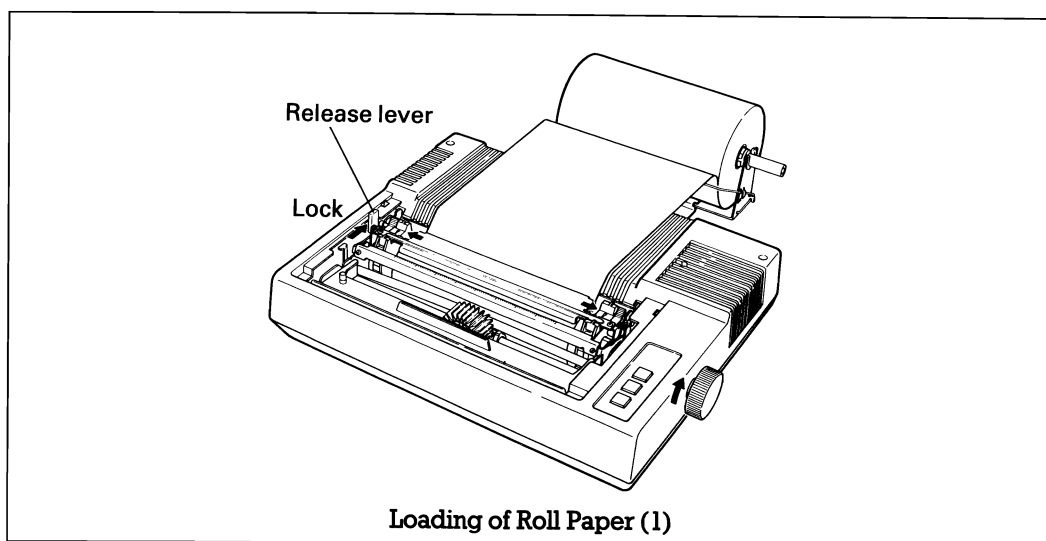
7. While turning the paper feed knob clockwise, confirm that the paper advances straight up. If not, adjust the inserted paper position by unlocking the release lever.
8. Push the scale back into position.

Loading of Roll Paper (2)
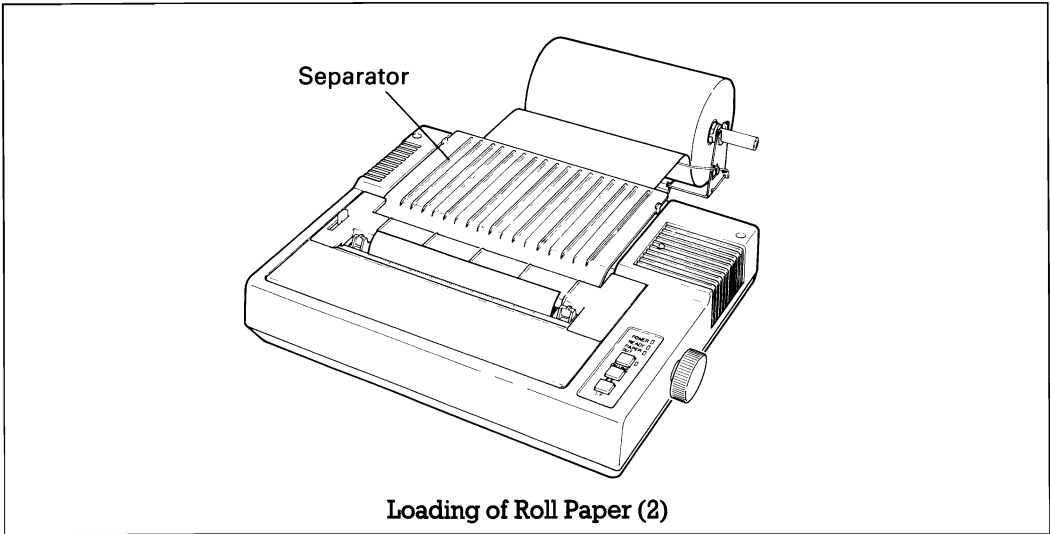
9. Install the separator and printer cover.
10. Put the printer lid on the printer.

<Print Area for Roll Paper>
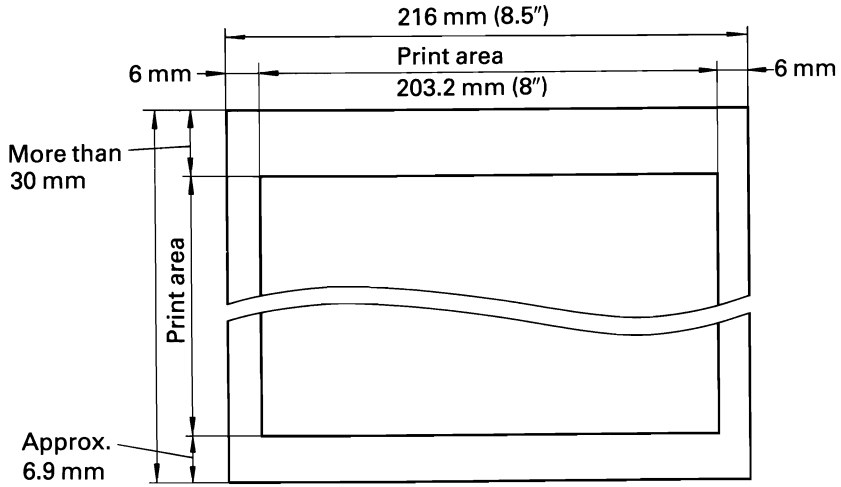
1.7.3 Cut sheet

The FX-80 accommodates cut sheets measuring 7.25″ to 8.5″ by 12″ (maximum).
NOTE:
When using cut sheet, be sure to remove the optional tractor unit.

To load a cut sheet, observe the following procedure.
1. Raise the printer cover.
2. Slide both sprockets outward to the sides and lock the sprocket lock levers.
3. Pull the scale toward the front of the printer to detach the scale from the platen.
4. Unlock the release lever.

Release lever

Paper guide roller

Scale

Loading of Cut Sheet
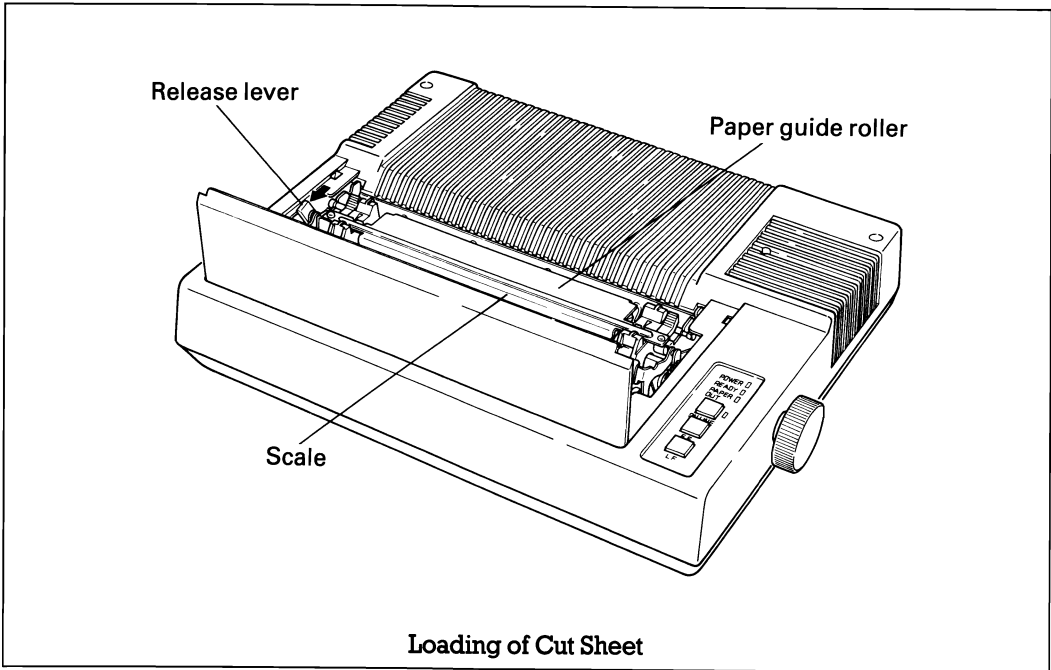
5. Insert the cut sheet between the paper guides at the rear part of the printer mechanism. The paper must be positioned so that the sprockets will not be in the way.

6. Lock the release lever.
7. While turning the paper feed knob clockwise, confirm that the paper advances straight up.

Adjustment of Inserted Paper Position
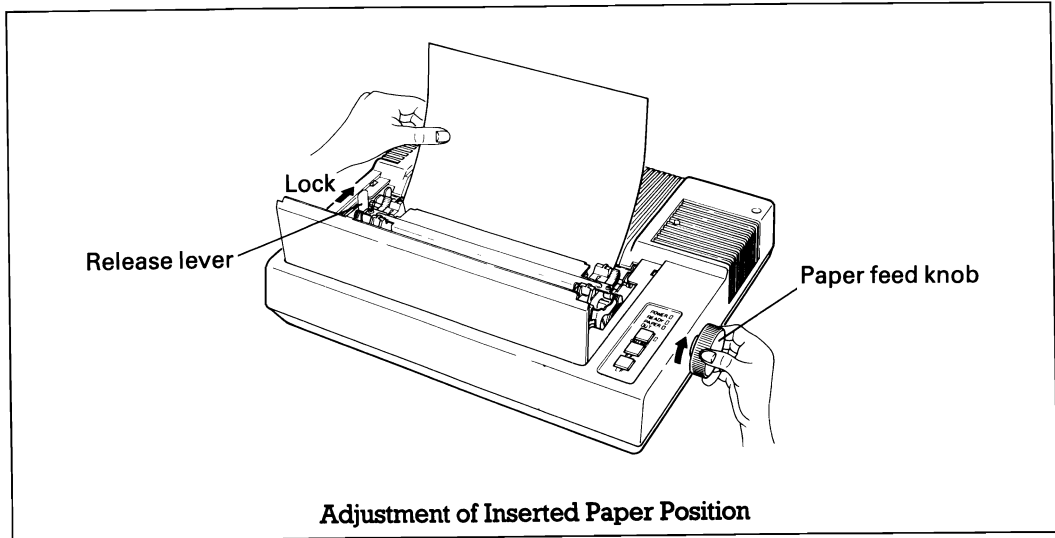
If it does not, adjust the inserted paper position by aligning the edges of the paper after unlocking the release lever as shown below.

Alignment of Side Edges
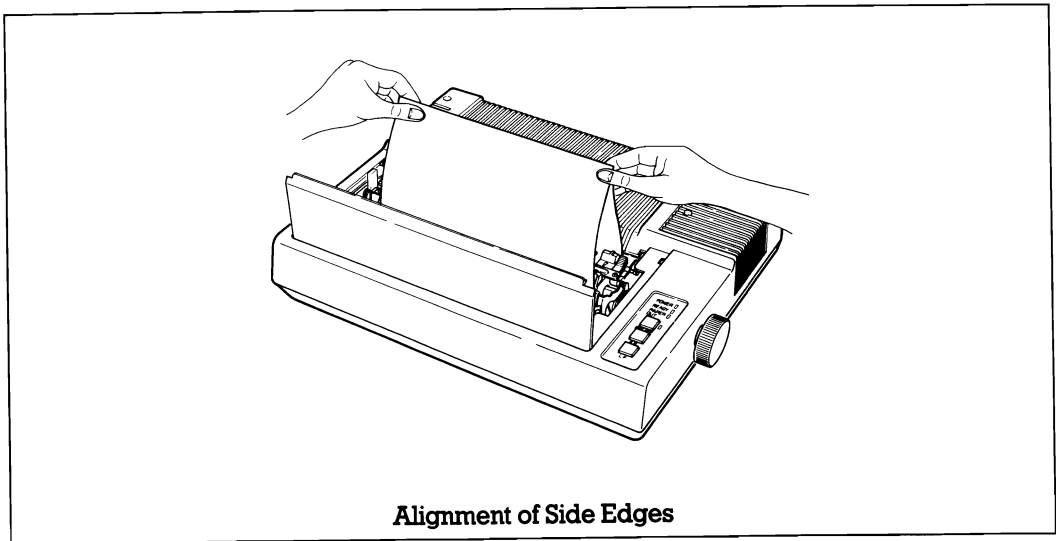
8. Push the scale back into position and put the printer lid on the printer.

Printer with Cut Sheet Set Completely

<Print Area for Cut Sheet>

184 mm (7.25″)–216 mm (8.5″)

3–6 mm | Print area | 3–6 mm

203.2 mm (8″)

More than 25 mm

304.8 mm (12″) max. Print area

More than 30 mm
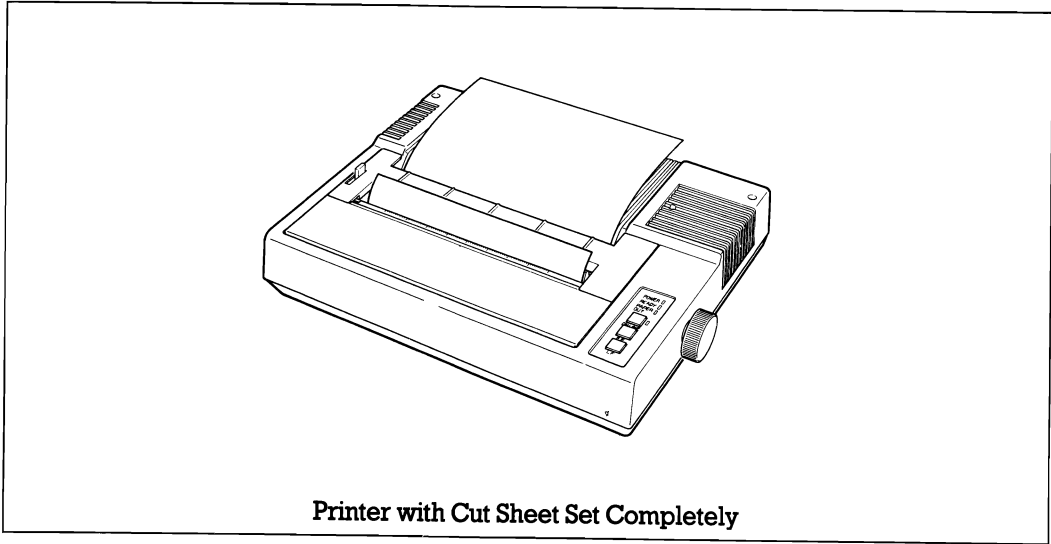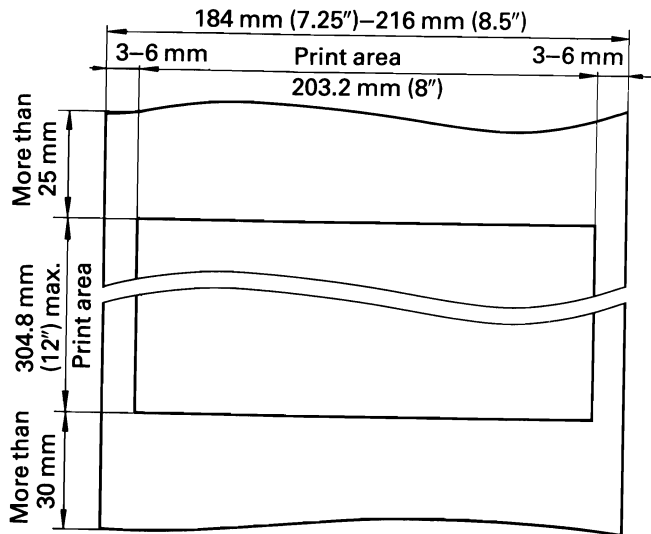
1.7.4 Short tear-off

The FX-80 permits the paper to be cut within 1 inch from the last print position: a Short Tear-off function.

Cutting Paper
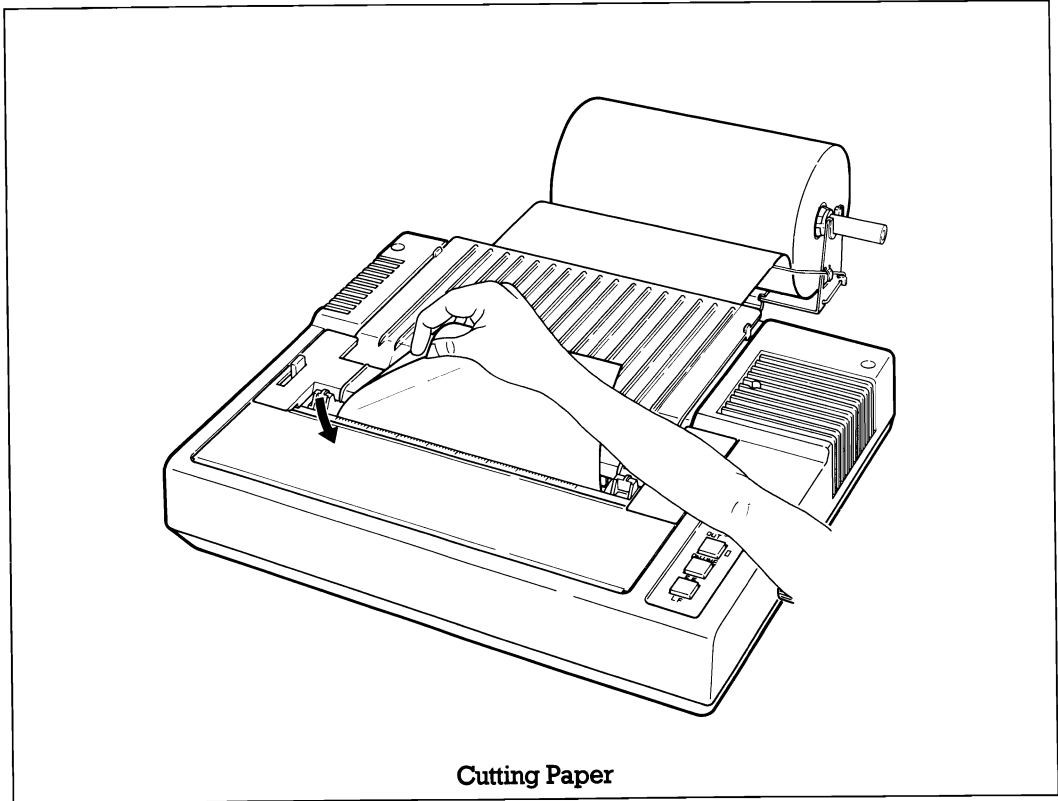
The printer resumes printing 1 inch below the position where the paper has been cut off.

1.7.5 Gap adjustment

The adjustment of a gap between the head nose and the platen is used to adjust the printing pressure as well as to suit paper of a different thickness.

(1) Move the head adjusting lever (located on the left frame of the printer) forward or backward to adjust the gap between the head nose and the platen.

> Forward: To widen gap.
> Backward: To narrow gap.

NOTE:
With a thick paper, be sure to widen this gap.

Gap Adjustment (1)
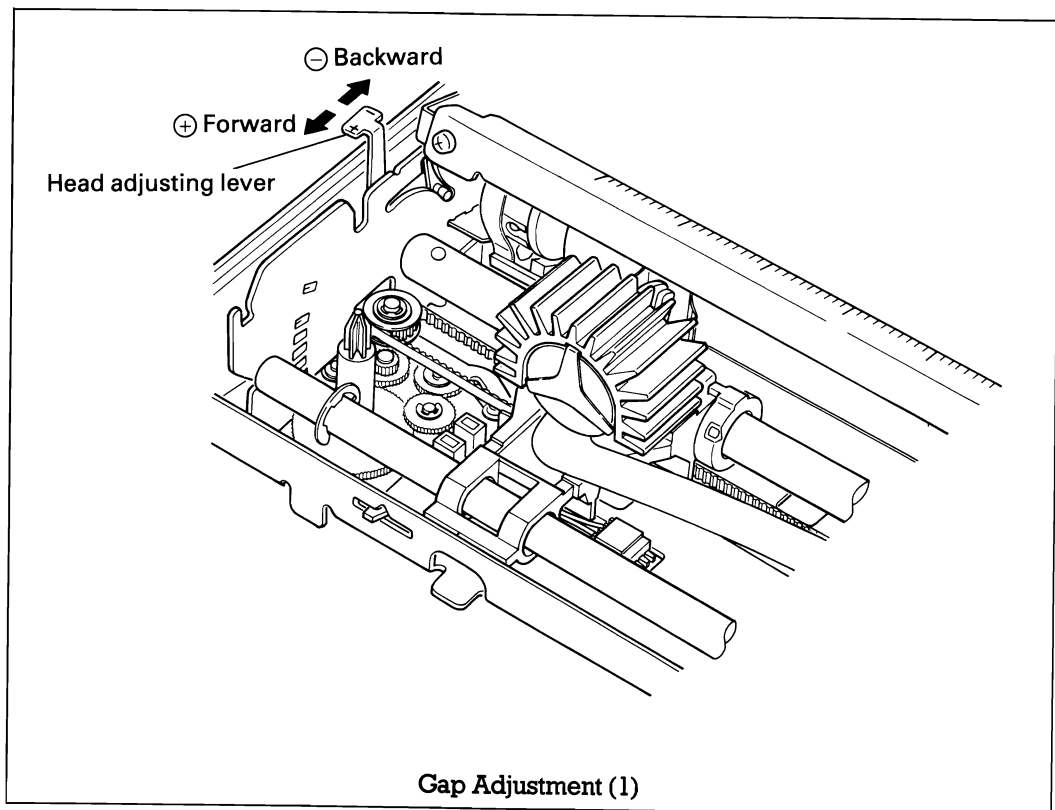
(2) Adjust the position of the head adjusting lever according to the type of paper to be used.

Paper	Position of adjusting lever
Single-leaf paper	Set the lever to the 4th step.
Carbon paper sheets	Set the lever to the 7th step.

Gap Adjustment (2)
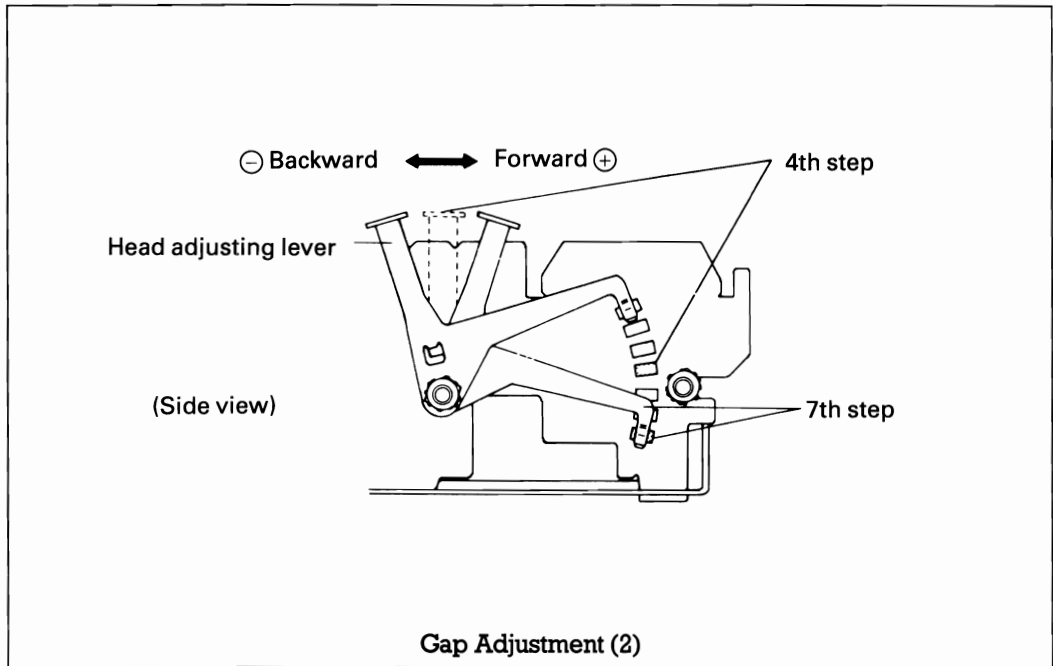
NOTES:
1. *Should printed characters become faint due to the use of the printer for an extended period, move the head adjusting lever backward (in the ⊖ direction) by one step.*
2. *When a set of carbon paper sheets is used, be sure that no characters are printed within the area two lines each above and below the perforation.*

Chapter 2   OPERATION

2.1 Printer Cable Connection

2.1.1 Power connection

The EPSON FX-80 Dot Matrix Printer is capable of operating on the following three types of AC power.

    (1) AC 120V, 50/60 Hz
    (2) AC 220V, 50/60 Hz
    (3) AC 240V, 50/60 Hz

Before connecting the FX-80 to a power source, make certain of the primary AC rating from the label.
After connection of the printer to the proper power source and upon application of power to the printer, "Initialization" will take place in the printer with the effects described in paragraph 2.6. If your FX-80 has a primary AC rating different from the available power source, do not attempt to operate the printer.
Please obtain a replacement unit with the correct AC rating from the store where you purchased the FX-80.

Connector

Printer Cable Connection
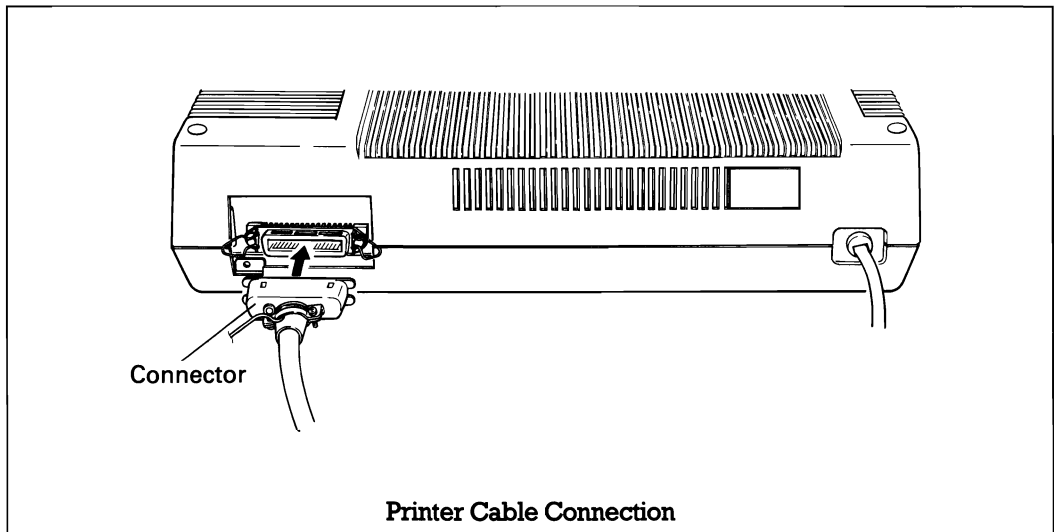
1. Be sure both the computer and printer are turned OFF.
2. Be sure you have the right cable and connect it to the printer by giving it a firm push to secure the clips.
3. Double-check to ensure that the cable is in place and locked.

2.2 Switches and Indicators

There are three switches and four indicators on the control panel and one power switch on the left side of the printer case.

In this section, panel operating procedures are covered in sufficient detail for the user to become familiar with the printer.

Switches and Indicators on Control Panel
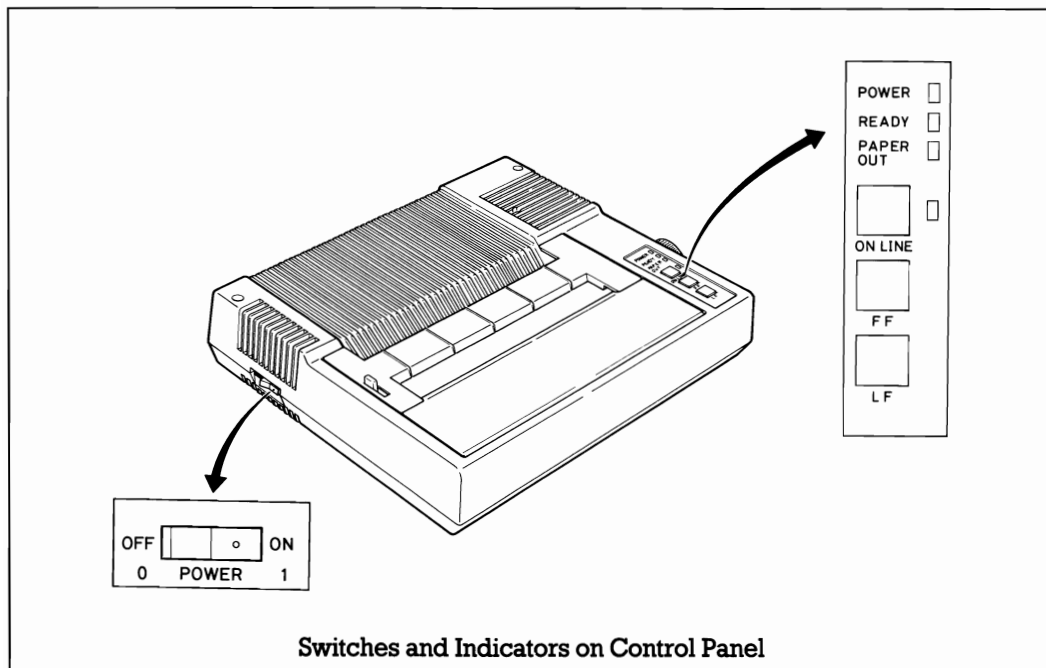
2.2.1 Switches

POWER SW: Controls primary AC power to the printer.

NOTE:
Before turning this switch ON, check to see if the paper is properly set in the printer.
Incorrect setting of the paper may prevent the printer from operating properly.

ON LINE SW: When the power switch is turned ON after paper has been loaded, the printer enters the ON-LINE mode and can be utilized in conjunction with a host computer.

Depressing the ON-LINE switch will set the printer in the OFF-LINE mode and cause the green LED to go out. The switch does not function while the printer is actively engaged in printing. The printer is automatically placed OFF-LINE if the paper supply is exhausted or if a mechanical error occurs in the printer. The operations of the Line Feed and Form Feed switches are effective only while the printer is OFF-LINE.

FF SW:
(Form Feed)

When this switch is depressed once, the paper is advanced vertically to the next Top of Form position.

This switch must be depressed while the printer is OFF-LINE. Otherwise, the form feed operation will not be carried out. The Top of Form position is initialized when the POWER switch is turned on, when $\overline{\text{INIT}}$ signal is applied to the interface connector, or when the ESC @ code is input.

Therefore, before turning the POWER switch ON to start operating the printer, set the paper at the appropriate Top of Form position.

LF SW:
(Line Feed)

The paper advances while this switch is being depressed. The line feed operation is prohibited while the printer is actively engaged in printing.

2.2.2 Indicators

POWER: Illuminates while the printer is receiving AC power.
READY: Illuminates when the printer is ready to receive data.
PAPER OUT: Illuminates when the paper supply is near its end.
ON LINE: Illuminates when the printer is in the ON-LINE mode.

2.3 Buzzer

The buzzer is located inside the printer case, and sounds for approximately 0.1 second when the printer receives BEL code.

When one of the following errors occurs, the buzzer also sounds as follows.

1. Pee, Pee, Pee, Pee: Short circuit between the collector and emitter has occurred. (4 long pip sounds)
2. Pi, Pi, Pi, Pee: Abnormally high voltage is detected. (3 short and one long pip sounds)
3. Pi, Pi, Pi Pi, Pi, Pi: An error has occured in the slave CPU. (3 continuous short pip sounds repeated twice with a pause.).
4. Pi, Pi, Pi, Pi (repeats 5 times):   Paper-end status is detected. (4 continuous short pip sounds repeated 5 times with a pause.)

For all the above errors except Paper-end error the buzzer always sounds, regardless of the ON/OFF position of DIP switch pin 2-2.
If an error other than 4 above occurs, contact your nearest EPSON dealer.

2.4 Paper-End Detector

(1) When the paper-end detector (a reed switch located on the paper guide) detects that the paper supply is nearly exhausted, the printer informs to the host computer that an error has occurred and the printing operation stops.
(2) In the paper-out status, the printer is automatically put in the OFF-LINE state and paper advancement can be performed by depressing the LF or FF switch. After setting new paper in the printer, depress the ON-LINE switch so that the printer may resume operation.
(3) There is another way to start the printer when it falls into paper-out status. Set new paper in the printer, and turn the POWER switch OFF and ON again. In this case, however, all previously established data such as TAB, line spacing, etc., are cancelled.
(4) The paper-end detecting function is useful to prevent erroneous printing when the printer is out of paper. If the printing is to be continued up to the last line of the paper, the paper-end detecting function may be made invalid by either of the following two methods.

    1) Set the DIP switch pin 1-3 to the ON position, and the paper-end detecting function will become invalid hardwarewise.
    2) Enter control code ESC 8 to disable the paper-end detecting function by software.
    3) Feed a second sheet of paper in behind the first one after the first one has passed part way through.

Interface Signals in Paper-Out Status

Signal	Pin No.	Paper-End Detector Enabled	Paper-End Detector Disabled
ERROR	32	LOW	HIGH
PE (Paper-End)	12	HIGH	HIGH
BUSY	11	HIGH	LOW
ACKNLG	10	No pulse is output.	Pulse is output.

2.5 Self-Test

The FX-80 has a self-test (self-diagnostic) function to check the following.
(1) Print head operation and printing quality
(2) Operation of the printer mechanisms (motor, cartridge ribbon mechanism, drive belt, etc.)

The self-test function is preprogrammed in the printer's circuitry and can be performed by turning the POWER switch ON while depressing the LF switch. All characters provided by the internal software are printed out on the paper.

```
COPYRIGHT 1982 (C) BY EPSON CORPORATION   VER 1.0

 ! "#$%&'()*+,-./01234567    WXYZ[\]^_`abcdefghijklmno
 ! "#$%&'()*+,-./012345678   XYZ[\]^_`abcdefghijklmnop
 "#$%&'()*+,-./0123456789    YZ[\]^_`abcdefghijklmnopq
 #$%&'()*+,-./0123456789:    Z[\]^_`abcdefghijklmnopqr
 $%&'()*+,-./0123456789:;    [\]^_`abcdefghijklmnopqrs
```

NOTE:
The self-test function cannot be performed when the printer is out of paper.

2.6 Printer Initialization

Printer initialization is accomplished in one of the three ways described below.

(1) Initialization takes place automatically each time the primary AC power source is interrupted and reapplied (i.e., by turning the Power Switch OFF and ON).
(2) Initialization may be initiated remotely by activating the $\overline{\text{INIT}}$ signal to the parallel interface connector.
Upon application of the initialization signal, the following sequence of events take place in the printer.

    1) The print head returns to its home position.
    2) The printer is automatically placed ON-LINE, unless it is out of paper.
    3) The print buffer is cleared.
    4) The line spacing is set at 1/6 inch.
    5) The form length per page is set.
    6) The operation mode reverts to the Text mode.

(3) Initialization may be initiated programmably upon input of the ESC @ code.

2.7 Setting DIP Switches

In order to suit user's specific requirement, desired control modes are selectable via two built-in DIP switches. These DIP switches are located inside the printer.

To obtain access to the DIP switches, follow the steps listed below.

CAUTION:
The electronic components in the printer can be damaged by static electricity discharges. To avoid damage, make sure you discharge any static electricity from your hands and avoid touching components on the circuit boards other than the DIP switches.

1. Unplug the power cord.
2. Remove the screws on SW Access Cover with a Phillips-type screwdriver.
3. Pull the cover in the direction of the arrow with both hands as shown below.

Removal of the SW Access Cover
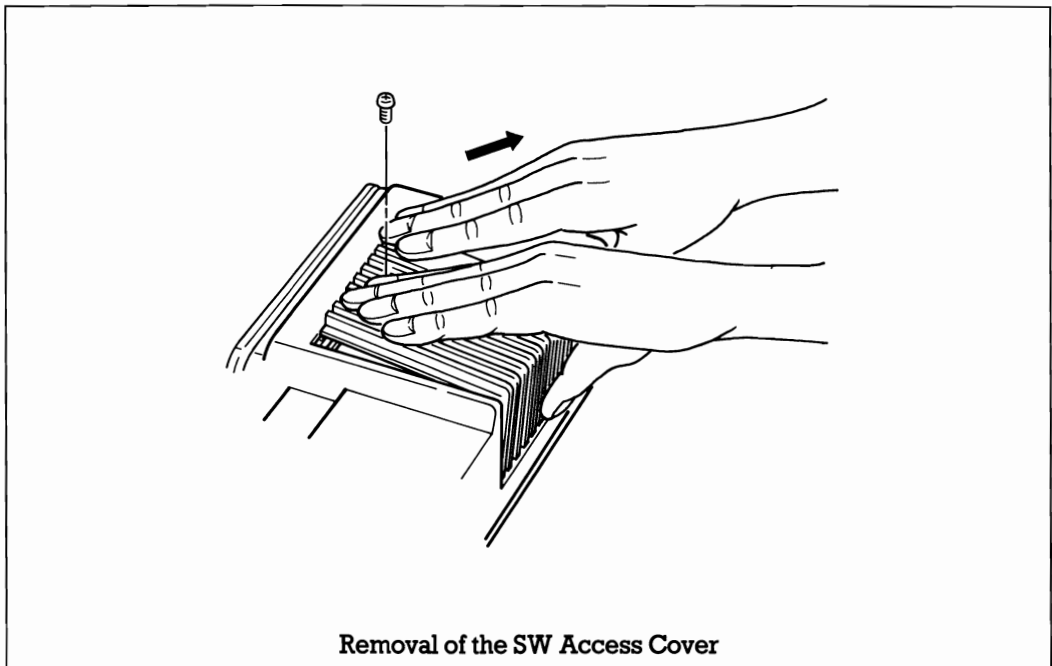
There are two DIP (Dual In-Line Package) switches inside the printer.
The switches set to the upper positon are ON, to the lower position are OFF.
After confirming that the power cord has been disconnected from the AC outlet,
set these switches.

Location of DIP Switches	Setting DIP Switches
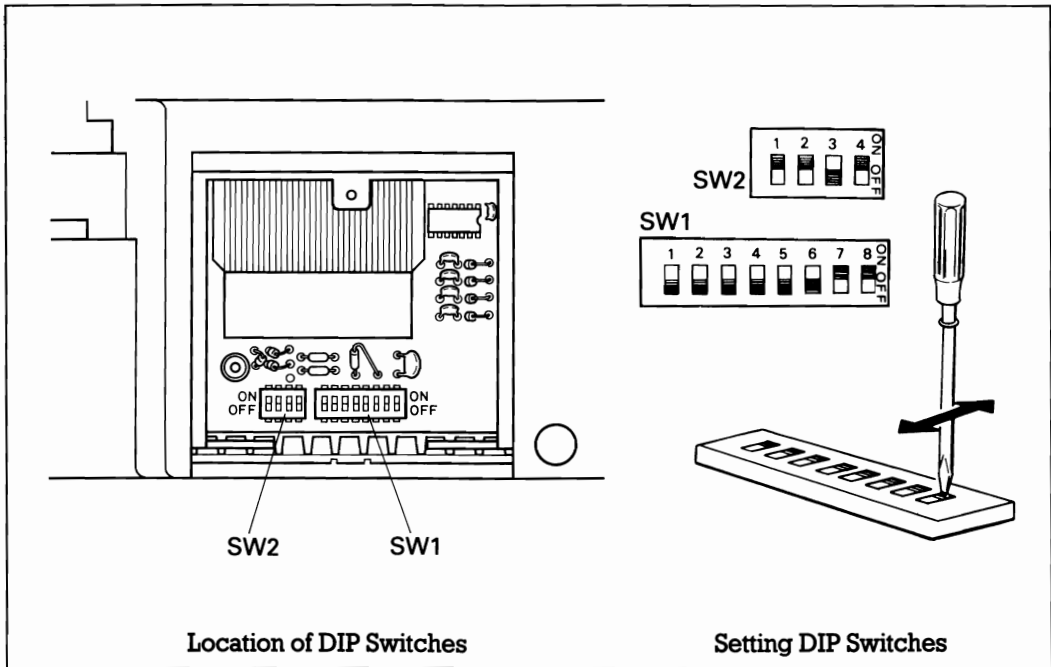
To install SW Access Cover again, take the following procedure.
1. Put the projection of SW Access Cover inside the lower case.
2. Push the SW Access Cover softly to install into the printer case.

Installation of SW Access Cover
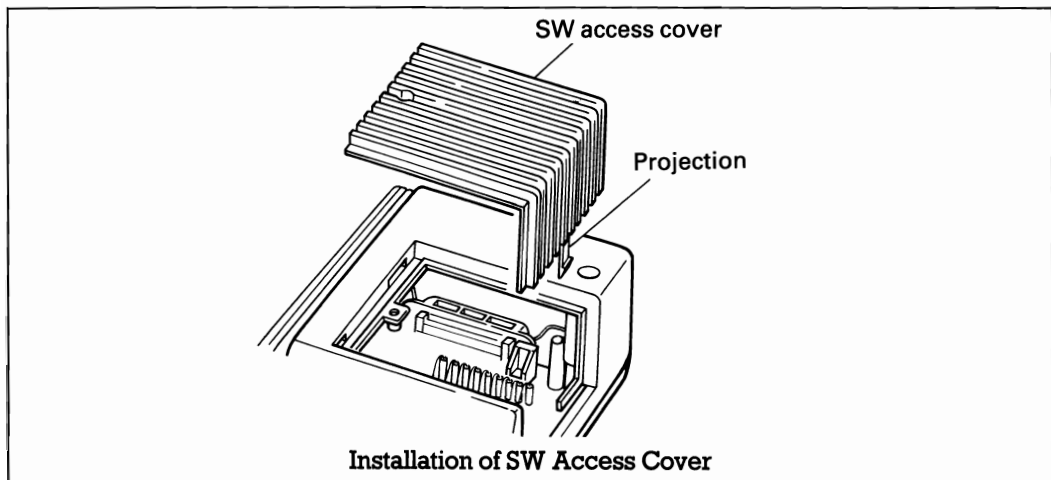
2.7.1 Setting of DIP switch No. 1

The DIP switch No. 1 consists of the following 8 pins. A summary of the functions of the respective DIP switch pins and their preset conditions at the time of shipment are shown in Table 2-2.

Table 2-2   Functions and Conditions of DIP Switch No. 1

SW pin	Function	OFF	ON	Factory-set Condition
1-1	Column length	80	132	OFF
1-2	ZERO font	0	Ø	OFF
1-3	Paper-end detector	Valid	Invalid	OFF
1-4	Input buffer	Invalid	Valid	OFF
1-5	Print mode at POWER ON	Normal	Emphasized	OFF
1-6	International character set	See Table 2-4.		
1-7	International character set	See Table 2-4.		
1-8	International character set	See Table 2-4.		

(1) *SW1-1:* Setting this pin to the ON position will cause the column length to be set to 132 characters per line; setting to the OFF position, to 80 characters per line.

(2) *SW1-2:* Setting this pin to the ON position will cause character "Ø" (zero with slash) to be printed.

(3) *SW1-3:* This pin is used to activate or inactivate the paper end detector. When this pin is turned ON, the paper end detection function becomes invalid upon power application and the printer is allowed to operate even if it is out of paper.
With the printer in this state, input of control code "ESC 9" will permit the paper end detector to be activated again.

(4) *SW1-4:* Download characters can be defined by setting this pin to the OFF positon.

(5) *SW1-5:* Setting this pin to the ON position will cause the printer mode to be set to the Emphasized mode upon power application; setting to the OFF positon, to the Normal mode.

(6) *SW1-6, SW1-7 and SW1-8:* Combined use of these three pins permits selection of an international character set.

2.7.2 Setting of DIP switch No. 2

The DIP switch No. 2 consists of the following 4 pins. A summary of the functions of the respective DIP switch pins and their preset conditions at the time of shipment are shown in Table 2-3.

Table 2-3   Functions and Conditions of DIP Switch No. 2

SW pin No.	Function	OFF	ON	Factory-set condition
2-1	SLCT IN signal internally fixed or not fixed	Not fixed	Fixed	ON
2-2	Buzzer	Invalid	Valid	ON
2-3	1 inch skip-over perforation	Invalid	Valid	OFF
2-4	Automatic line feed	LF must be from host	Auto LF with CR	OFF

(1) *SW2-1:* When the switch is ON, printer is permanently in the "selected" mode and no external command can "deselect" it.
   In the OFF position, it theoretically can be selected and deselected by external software codes.
   This refers to pin 36 on the connector. Some computers control this pin; if they do control the pin, SW should be OFF.

(2) *SW2-2:* If ON, buzzer will sound, and if OFF, buzzer will not sound at all.

(3) *SW2-3:* This pin is used to set the automatic skip-over perforation function.

   1) When this pin is set to the ON position, the 1-inch automatic skip-over perforation will be performed.
      By this function, the paper automatically advances to the first line of the next page when the remaining page length is 1 inch.

   2) When this pin is set to the OFF position, the 1-inch automatic skip-over perforation will not be performed.

(4) *SW2-4:* Forces automatic LF with each CR. When OFF, LF must be provided via software as needed. This pin is used to fix $\overline{\text{AUTO FEED XT}}$ signal internally. The signal line is wired ORed with pin No. 14 of the interface connector. To control pin No. 14, leave this DIP switch in the OFF position.

2.7.3 International character sets

Appendix H shows all available codes by setting the DIP switch pins 1-6, 1-7 and 1-8 all to ON position. Table 2-4 shows International Character Set Designation according to the combination of the DIP switch setting.

Table 2-4   International Character Set Designation

Country	SW 1-6	SW 1-7	SW 1-8	Country	SW 1-6	SW 1-7	SW 1-8
U.S.A.	ON	ON	ON	DENMARK	OFF	ON	ON
FRANCE	ON	ON	OFF	SWEDEN	OFF	ON	OFF
GERMANY	ON	OFF	ON	ITALY	OFF	OFF	ON
ENGLAND	ON	OFF	OFF	SPAIN	OFF	OFF	OFF

The above settings can be changed to any country character sets by inputting ESC R control codes. (Described in Chapter 3.)
The above countries' characters are addressed as per the following table.

Table 2-5   International Character Sets

Country Dec.code	U.S.A.	France	Germany	England	Denmark	Sweden	Italy	Spain	Japan
35 (23)	#	#	#	£	#	#	#	Pt	#
36 (24)	$	$	$	$	$	Ö.	$	$	$
64 (40)	@	à	§	@	@	É	@	@	@
91 (5B)	[	°	Ä	[	Æ	Ä	°	¡	[
92 (5C)	\	ç	Ö	\	Ø	Ö	\	Ñ	¥
93 (5D)	]	§	Ü	]	Å	Å	é	¿	]
94 (5E)	^	^	^	^	^	Ü	^	^	^
96 (60)	`	`	`	`	`	é	ù	`	`
123 (7B)	{	é	ä	{	æ	ä	à	¨	{
124 (7C)	¦	ù	ö	¦	ø	ö	ò	ñ	¦
125 (7D)	}	è	ü	}	å	å	è	}	}
126 (7E)	~	¨	ß	~	~	ü	ì	~	~

Numbers in parentheses are hexadecimal codes.

NOTES:
1. DIP switch pins SW1-6, SW1-7 and SW1-8 are factory-set as follows.

> *120V version: U.S.A.*
> *240V version: England*
> *220V version: Germany*

> *Select your desired character set by the DIP switch setting or programming.*
2. The Form Length is factory-set at 12 inches for the 220V version.

Chapter 3   CONTROL CODES

3.1 Definitions of Some Terms Often Used

Before attempting to program, please read this section carefully as it contains information essential to programming.

(1) 2 (Binary), D (Decimal) and H (Hexadecimal)

$(\ )_2$, $(\ )_D$ and $< \ >_H$ respectively represent binary, decimal and hexadecimal numbers.

(2) ASCII code

Characters in computer systems are represented by groups of bits. The various groups of bits that represent the set of characters that are the "alphabet" of any given system are called a "coding system", or simply "code".

Codes for representing the information vary in relation to both the number of bits used to define a single character in the assignment of bit patterns to each particular character.

In ASCII (American Standard Code for Information Interchange) the bit group $(01000001)_2 = <41>_H = (65)_D$ represents the character "A".

The sending and receiving equipment must be programmed to acknowledge the code used in computer systems.

The printer has a 96 character set, control codes, and 9 International Character sets. These characters are also available in the Alternate mode. International characters are put in some addresses of the ASCII code table instead of the standard characters.

Alphabets, numbers and special symbols are addressed from $(32)_D$ to $(126)_D$ and from $(160)_D$ to $(254)_D$. Same characters are put in two different addresses. If your host computer can send 8-bit data to the printer, the selection of which one to use is up to you.

(3) Escape codes

In order to expand its processing capability, the FX-80 is provided with control codes called the ESC sequence.

ESC code $(27)_D$ followed by any alphanumeric or symbolic character (MSB is ignored.), gives special functions to the printer.

For example,

    1) To set column length
    2) To enter Bit image print mode, etc.

In ESC sequence codes, a, n or m represent 7- or 8-bit binary numbers.

Depending on the MSB control codes, the following values are derived.

    (i)   MSB = 1   128 to 255
    (ii) MSB = 0   0 to 127
    (iii) MSB = as it is   0 to 255

Generally, printer control codes, especially like "ESCAPE", i.e., CHR$(27), are not standardized. Every computer and printer manufacturer applies its own meaning to such codes.

The "ESCAPE" codes used in the printer should not be confused with the escape key which some computers have. So be familiar with these control codes.

(4) Buffer-full print

When a full line of print data (including spaces) has been input and the next data is valid and printable, the contents of the print buffer will be automatically printed followed by a line feed. Printing in this manner is called "Buffer-full print."

At this time, the Enlarged mode set by the SO code is cancelled.

When power is applied to the printer, the column width in each print mode becomes as follows;

    Normal mode   80 columns
    Condensed mode   132 columns

The column width may be changed by the ESC Q code (right margin setting). However, since the right margin is set as an absolute position, the column width set to 80 columns in the normal mode will become 137 columns, in the Condensed mode.

Also, when the left margin is set by ESC l, the buffer becomes full at the right margin setting in effect at that time.

(5) Hex. Dump

Turn the Power switch ON while holding down both the LF and FF switches. The printer then enters the Hex. Dump mode. If you execute programs or list programs in this mode, all data sent from the host computer will be printed out in Hex. codes.

For example;
When the following 4 data are sent from the host computer,

    LPRINT CHR$(0);CHR$(27);"A";CHR$(24);

the data are output on the printer in Hex. codes as follows.

    00 1B 41 18

Printing in the Hex. Dump mode is performed only when the printer is in the buffer-full state. The data remaining in the print buffer can be printed out when the printer is set in OFF-LINE mode.

Hex. Dump mode cannot be cancelled during printing operation.

Note that in some programming languages such as BASIC, PASCAL, etc., there are a few codes that cannot be sent to the printer.
In such a case, you may use Hex. Dump to check if the correct codes are being sent to the printer.

(6) Character sets

Character sets may by broadly divided into the following two types.

(1) Pre-defined character set
(2) User-definable character set (Download characters)

The FX-80 is provided with ASCII codes (0 to 255) for both (1) and (2) above. These character sets are selectable by software.

ROM Character
Generator

0	Standard Characters	Alternate Characters	
			255

Download
Character
Generator
(RAM Character
Generator)

0	Standard Characters	Alternate Characters	
			255
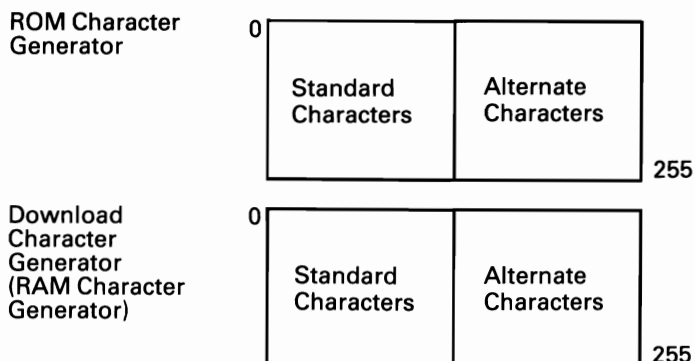
(7) How to send control codes

Printing and other functions are controlled by inputting control codes such as CR, ESC −, etc.
Control codes may be broadly divided into the following two categories.

    (1) 1-byte control codes
    (2) Control codes expanded by an ESC code

In BASIC, control codes can be sent to the printer as follows.

(Example 1) To send BEL code,

        LPRINT CHR$(7);

        <beep>

(Example 2) To send ESC − $(1)_D$ code,

        LPRINT CHR$(27);"−";CHR$(1);

(8) Input buffer

The FX-80 is capable of storing up to 2k bytes of data in its input buffer for quick data proceessing. This function is enabled by setting DIP switch pin 1-4 ON.
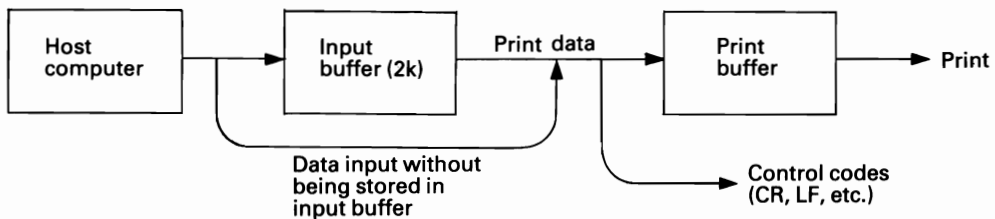
Normally, data from the host computer is sent to the printer without being stored in the input buffer, as shown in the figure above.
When the input buffer function is enabled by setting the DIP switch, all the data output from the host computer will be stored first in the input buffer before being sent to the printer.

Two kinds of data are stored in the input buffer: print data and control codes. Print data is then sent to the print buffer. This data is printed when a print execution control code such as CR is input or when the print buffer becomes full.

Since the input buffer secures 2k bytes of RAM area, the host computer begins its next job as soon as all the data has been output to the printer and functions irrespective of whether or not the printer is printing.

NOTE:
This function cannot be used simultaneously with the definition of download characters.

— NOTICE —

For convenience' sake, program examples in this manual have been written in one of Microsoft BASIC.
For details of BASIC, refer to the reference manual of your host computer.
BASIC itself is different depending on the specifications of the host computer and there are versions in which certain codes (such as CHR$(9) and CHR$(13)) cannot be sent to the printer.

3.2 1-byte Control Codes

BEL

Name   **BEL** — Bell

Expression   **CHR$(7);**

Function   When the BEL code is input, the buzzer sounds for approximately 0.1 second.

Example   LPRINT CHR$(7);

<beep>

NOTE:
To disable the buzzer, set DIP switch pin 2-2 to the OFF position.

BS

Name	**BS** — Backspace

Expression **CHR$(8);**

Function   When this code is input, all the data stored in the print buffer is printed out and the next print start position returns to the left by one column.
In the Enlarged mode, the print positions is backspaced by two normal characters.
BS is not guaranteed when the print mode has been changed.

See also   DEL

Example 1
```
10 'Backspace
20 LPRINT "YYYYY";
30 LPRINT CHR$(8);CHR$(8);
40 LPRINT "====="
```

```
YYY¥¥===
```

Example 2

```
10 'Backspace 2'
20 LPRINT CHR$(27);"W";CHR$(1);    :'Enlarged mode
30 LPRINT "<<<<<";
40 LPRINT CHR$(8);CHR$(8);
50 LPRINT CHR$(27);"W";CHR$(0);    :'Normal mode
60 LPRINT "-----"
```

```
< < < <-<--
```

CAN

Name	**CAN** — Cancel
Expression	**CHR$(24);**
Function	When this code is input, all the data previously stored in the print buffer on the same line is cancelled.
See also	DEL and BS
Example	

```
10 REM Cancel
20 LPRINT "Gone!"
30 LPRINT "xxxxx";CHR$(24);
40 LPRINT "   with ";
50 LPRINT "the bucket."
60 END


Gone!
    with the bucket.
```

HT

Name	**HT** — Horizontal TAB
Expression	**CHR$(9);**

Function This code carries out the horizontal TAB to the predetermined position set by ESC D code.

In the Enlarged mode, input of an HT code executes the TAB in twice the width as that in Normal mode.

When the power is turned ON, TAB is automatically set every 8 characters.

The HT code will be ignored if no TAB position has been set previously by the ESC D code.

Since the TAB set position is stored as an absolute position, this position will not change even if you change the print mode. Horizontal TAB will be cancelled upon input of ESC l.

See also ESC D, ESC Q and ESC l

Example
```
10 REM Horizontal TAB
20 LPRINT "012345678901234567890123456789"
30 FOR A=1 TO 5
40 LPRINT CHR$(137);"TAB";
50 NEXT
```

```
012345678901234567890123456789
          TAB       TAB       TAB       TAB       TAB
```

NOTE:
This code may not be used in some Microsoft BASICs.
In such cases, use CHR$(137) instead.

LF

Name	**LF** — Line feed
Expression	**CHR$(10);**
Function	When this code is input, all the data stored in the print buffer is printed out and then line feed is carried out. If no data precedes the LF code, or if all preceding data is SPACE, only line feed is performed. This code cancels the Enlarged mode set by the SO code. The amount of paper feed may be set by ESC 0, ESC 1, ESC 2, ESC 3 or ESC A code. If the data is input in the order of print data → CR → LF, data will be printed by the CR code. Then the printer carries out one line feed because no print data precedes the LF code.
See also	SO, ESC 0, ESC1, ESC 2 and ESC 3, ESC A and ESC W

VT

Name   **VT** — Vertical TAB

Expression **CHR$(11);**

Function   When this code is input, all the data stored in the print buffer is printed out and then rapid line feed is carried out to the predetermined vertical TAB position set by ESC B or ESC b.

If the vertical TAB positon is not predetermined, this code functions the same as the LF code.

This code cancels the Enlarged mode set by the SO code. Even if one vertical TAB position is set, line feed will be performed to this position or to the top of form position.

See also   SO, ESC B, ESC b, ESC / and ESC W

Example

```
10 ' Vertical TAB
20 LPRINT CHR$(27);"B";
30 LPRINT CHR$(1);CHR$(3);CHR$(6);CHR$(10);CHR$(0);
40 FOR I=1 TO 4
50 LPRINT CHR$(11);" TAB";
60 NEXT I
70 END
```

TAB

TAB

TAB

TAB

FF

Name	**FF** — Form feed
Expression	**CHR$(12);**
Function	When this code is input, all the data stored in the print buffer is printed out and then paper feed is carried out in accordance with the predetermined page length. This code cancels the Enlarged mode set by the SO code.
See also	ESC C and ESC C 0

CR

Name	**CR** — Carriage return
Expression	**CHR$(13);**
Function	When this code is input, all the data stored in the print buffer is printed. When $\overline{\text{AUTO FEED XT}}$ (Pin No. 14 of the interface connector) is at "LOW" level, the paper is advanced one line automatically after the execution of printing by the CR code. Input of CR code with line feed will cancel the Enlarged mode set by the SO code. If no data precedes the CR code, or if all preceding data is SPACE, the carriage assembly does not move. Under this condition, if $\overline{\text{AUTO FEED XT}}$ is at "LOW" level or if the DIP switch pin 2-4 is ON, the paper is advanced by one line.
See also	LF

Example

```
10 'Carriage return
20 LPRINT "Underscore by CR";CHR$(13);
30 LPRINT "_____"
```

Underscore by CR

SO

Name	**SO** — Shift out
Expression	**CHR$(14);**
Function	When the SO code is input, all the data that follows this code on the same line is printed out in enlarged characters. This code is cancelled by line feed or by the input of a DC4, ESC ! or ESC W code. Normal and enlarged characters can be mixed on the same line.
See also	DC4, ESC ! and ESC W
Example	

```
10 'Enlarged mode with auto-reset
20 LPRINT CHR$(14);"Enlarged Mode"
30 LPRINT "Normal Mode"
```

Enlarged Mode
Normal Mode

SI

Name   **SI** — Shift in

Expression   **CHR$(15);**

Function   When this code is input, all the data stored in the buffer is printed out and subsequent data is printed in condensed characters (17 characters per inch).
This code is cancelled by the input of a DC2 or ESC ! code.

When the SO (Shift Out) code is input in Condensed mode, condensed enlarged characters (6 characters per inch) can be printed.

See also   DC2, ESC M and ESC !

Example 1
```
10 'Condensed mode
20 LPRINT CHR$(15):"Condensed Mode"
30 LPRINT "Still in Condensed Mode"
```

Condensed Mode
Still in Condensed Mode

Example 2

```
10 'Condensed mode 2
20 LPRINT CHR$(15):"Condensed mode"
30 LPRINT CHR$(14):"Now in Condensed enlarged mode"
40 END
```

Condensed mode
Now in Condensed enlarged mode

DC1

Name **DC1** — Selection of the printer

Expression **CHR$(17);**

Function The DC1 code places the printer in the Selected state. It enables the printer to receive data.
With the printer in the Selected state, if the DC1 code is input during data transfer, all the data stored before the DC1 code is ignored.

See also DC3

Example 1
```
10 ' Device Control 1
20 LPRINT CHR$(17);"AAAAA";CHR$(19);
30 LPRINT "BBBBB";CHR$(17);"CCCCC"
40 END
```

```
AAAAACCCCC
```

Example 2
```
10 ' Device Control 1
20 LPRINT "AAAAA";CHR$(17);
30 LPRINT "BBBBB";CHR$(19);"CCCCC";CHR$(17)
40 END
```

```
BBBBB
```

NOTE:
DC1 code is effective only when DIP switch pin 2-1 is OFF. See Table on page 3-17.

DC2

Name	**DC2** — Condensed mode cancel
Expression	**CHR$(18);**
Function	The DC2 code cancels the Condensed mode set by the SI code.
See also	SI and ESC M
Example	

```
10 'Device Control 2
20 LPRINT CHR$(15):"Condensed Mode":
30 LPRINT CHR$(18):"         Now in Normal Mode"
```

Condensed Mode   Now in Normal Mode

NOTE:
Although the Enlarged mode set by the SO code can be cancelled by line feed, the Condensed mode set by the SI code cannot.

DC3

Name	**DC3** — Deselection of the printer
Expression	**CHR$(19);**
Function	The DC3 code places the printer in the Deselected state. In other words, it disables the printer to receive data.
See also	DC1

NOTE:
When the DC1 and DC3 codes are used, the DIP switch pin 2-1 on the control circuit board should be in the "OFF" position.

Relations among the ON-LINE switch, $\overline{\text{SLCT IN}}$ signal, DC1/DC3 code and interface signals are shown in the table below.

Relations among ON-LINE, $\overline{\text{SLCT IN}}$, DC1/DC3 and Interface Signal

ON-LINE Switch	$\overline{\text{SLCT IN}}$ Signal	DC1/DC3	$\overline{\text{ERROR}}$	BUSY	$\overline{\text{ACKNLG}}$	DATA ENTRY
OFF-LINE	HIGH/LOW	DC1/DC3	LOW	HIGH	Not generated	Unable
ON-LINE	HIGH	DC1	HIGH	LOW/HIGH	Generated	Enable (Normal entry)
		DC3	HIGH	LOW/HIGH	Generated	Enable (See Note 2.)
	LOW	DC1/DC3	HIGH	LOW/HIGH	Generated	Enable (Normal entry)

NOTES:
1. *In the above table, it is assumed that no ERROR status exists other than that attributable to the OFF-LINE mode.*
2. *Once DC 3 is input and the printer enters the Deselected state, it will remain in that state until DC1 is input. In other words, while the printer is in the Deselected state, all input data will be invalid.*
3. *The DC1/DC3 code is valid provided that the DIP switch pin 2-1 is OFF, namely, the level of $\overline{\text{SLCT IN}}$ at the pin No. 36 of the interface connector is HIGH. With $\overline{\text{SLCT IN}}$ at LOW level or the DIP switch pin 2-1 position at ON, the printer is always placed in the Selected state, and the DC1/DC3 code is not valid.*
4. *When power is applied, if $\overline{\text{SLCT IN}}$ is at HIGH level or the DIP switch pin 2-1 is OFF, the printer is regarded as in the Deselected state.*

DC4

Name   **DC 4** — Enlarged mode cancel

Expression   **CHR$(20);**

Function   The DC4 code cancels the Enlarged mode set by the SO code.

See also   SO, ESC W and ESC !

Example

```
10 'Device Control 4
20 LPRINT CHR$(14):"Enlarged Mode";
30 LPRINT CHR$(20):"      Now in Normal Mode"
```

Enlarged Mode   Now in Normal Mode

NOTE:
The Enlarged mode set by the ESC W or ESC ! code cannot be cancelled by input of this code.

DEL

| Name | **DEL** — Delete |

| Expression | **CHR$(127);** |

| Function | Input of the DEL code causes the last character stored in the print buffer to be deleted. |

| See also | BS |

| Example | |

```
10 'Delete last character
20 LPRINT "Delete":
30 LPRINT CHR$(127);"ing"


Deleting
```

3.2 ESC Control Codes

ESC SO

Name   **ESC SO** — Enlarged mode setting

Expression   **CHR$(27);CHR$(14);**

Function   Same as SO.

See also   SO

Example

```
10 'Enlarged Mode by ESC SO
20 LPRINT CHR$(27):CHR$(14):"Enlarged Mode";
30 LPRINT CHR$(20):"      Now in Normal Mode"
```

Enlarged Mode   Now in Normal Mode

ESC SI

Name   **ESC SI** — Condensed mode setting

Expression   **CHR$(27);CHR$(15);**

Function   Same as SI.

See also   SI

Example
```
10 'Condensed Mode by ESC SI
20 LPRINT CHR$(27);CHR$(15);"Condensed Mode";
30 LPRINT CHR$(18):"      Now in Normal Mode"
```

Condensed Mode   Now in Normal Mode

ESC 0

Name   **ESC 0** — 1/8 inch line spacing

Expression   **CHR$(27);"0";**

Function   Input of the ESC 0 code causes the subsequent line spacing to be set at 1/8 inch.

See also   ESC 1, ESC 2 and ESC 3

Example

```
10 ' 1/8" Line Spacing
20 LPRINT CHR$(27);"0";
30 FOR I=1 TO 4
40 LPRINT "1/8 inch  LINE SPACING"
50 NEXT
60 END
```

```
1/8 inch   LINE SPACING
1/8 inch   LINE SPACING
1/8 inch   LINE SPACING
1/8 inch   LINE SPACING
```

ESC 1

Name	**ESC 1** — 7/72 inch line spacing
Expression	**CHR$(27);"1";**
Function	Input of the ESC 1 code causes the subsequent line spacing to be set at 7/72 inch.
See also	ESC 0, ESC 2 and ESC 3
Example	

```
10 ' 7/72" Line Spacing
20 LPRINT CHR$(27);"1";
30 FOR I=1 TO 5
40 LPRINT "7/72 inch LINE SPACING"
50 NEXT
60 END
```

```
7/72 inch LINE SPACING
7/72 inch LINE SPACING
7/72 inch LINE SPACING
7/72 inch LINE SPACING
```

ESC 2

Name   **ESC 2** — 1/6 inch line spacing

Expression   **CHR$(27);"2";**

Function   Input of the ESC 2 code causes the subsequent line spacing to be set at 1/6 inch.

See also   ESC 0, ESC 1 and ESC 3

Example
```
10 ' 1/6" Line Spacing
20 LPRINT CHR$(27);"2";
30 FOR I=1 TO 4
40 LPRINT "1/6 inch  LINE SPACING"
50 NEXT
60 END
```

```
1/6 inch   LINE SPACING
1/6 inch   LINE SPACING
1/6 inch   LINE SPACING
1/6 inch   LINE SPACING
```

ESC 3

Name	**ESC 3** — n/216 inch line spacing
Experssion	**CHR$(27);"3";CHR$(n);** **(0 ≤ n ≤ 255)**
Function	This code sets the amount of line spacing in units of 1/3 dot. Input of the ESC 3 $(n)_D$ code causes the subsequent line spacing to be set at n/216 inch.
See also	ESC 0, ESC 1 and ESC 2
Example	To set 5/54 inch line spacing,

```
10 ' n/216 inch Line Spacing
20 LPRINT CHR$(27);"3";CHR$(20);
30 FOR I=1 TO 4
40 LPRINT "Approx. 20/216 inch  LINE SPACING"
50 NEXT
60 END
```

```
Approx. 20/216 inch  LINE SPACING
Approx. 20/216 inch  LINE SPACING
Approx. 20/216 inch  LINE SPACING
Approx. 20/216 inch  LINE SPACING
```

NOTE:
With n = 1 and n = 2, paper feeding accuracy is not guaranteed.

ESC 4

Name **ESC 4** — Alternate mode selection

Expression **CHR$(27);"4";**

Function Input of the ESC 4 code causes the data following this code to be printed in Alternate mode.
In Alternate mode, the italic characters which have previously been set in the CG area are selected for printing.

See also ESC 5

Example
```
10 ' Selects Italic CG set
20 LPRINT "Standard"
30 LPRINT CHR$(27);"4";
40 LPRINT "Italic"
50 LPRINT CHR$(27);"5";
60 LPRINT "Standard"
70 END
```

```
Standard
Italic
Standard
```

Code Table in Normal Mode

(U.S.A.)

Hex No. → Binary → ↓ Hex / Binary	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 / 0000	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	ø 176	@ 192	P 208	` 224	p 240
1 / 0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 / 0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 / 0011	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4 / 0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5 / 0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 / 0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 / 0111	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8 / 1000	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9 / 1001	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A / 1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B / 1011	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C / 1100	FF 12	28	, 44	< 60	L 76	\ 92	l 108	| 124	FF 140	156	, 172	< 188	L 204	\ 220	l 236	| 252
D / 1101	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E / 1110	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F / 1111	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

Code Table in Alternate mode

(U.S.A.)

Hex No. → Binary No.	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 0000	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	0 176	@ 192	P 208	` 224	p 240
1 0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 0011	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4 0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5 0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 0111	BEL 7	CAN 23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8 1000	BS 8	24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9 1001	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A 1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B 1011	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C 1100	FF 12	28	, 44	< 60	L 76	\ 92	l 108	| 124	FF 140	156	, 172	< 188	L 204	\ 220	l 236	| 252
D 1101	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E 1110	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F 1111	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

ESC 5

Name	**ESC 5** — Alternate mode cancel
Expression	**CHR$(27); "5";**
Function	This code cancels the Alternate mode set by the ESC 4 code.
See also	ESC 4

ESC 6

Name **ESC 6** — Printable code area expansion

Expression **CHR$(27);"6";**

Function When this code is input, ASCII codes $(128)_D$ to $(159)_D$, and $(255)_D$ are set as printable characters.
This code is used to define the download characters into codes $(128)_D$ to $(159)_D$, etc.

In the FX-80, international characters are provided in ASCII $(128)_D$ to $(159)_D$, which are usually set as unprintable codes.
These codes become printable upon input of an ESC 6 code.

Dec. code	Char.	Dec. code	Char.	Dec. code	Char.	Dec. code	Char.
128	à	137	Ñ	145	ß	153	Ü
129	è	138	ñ	146	Æ	154	ä
130	ù	139	¤	147	æ	155	ö
131	ò	140	P_t	148	Ø	156	ü
132	ì	141	Å	149	ø	157	É
133	°	142	å	150	¨	158	é
134	£	143	ç	151	Ä	159	¥
135	í	144	§	152	Ö	255	Ø
136	¿						

See also ESC 7

Example
```
10 'Sets Codes printable
20 LPRINT CHR$(27);"6";
30 FOR I=128 TO 159
40 LPRINT CHR$(I);
50 NEXT
60 LPRINT
70 LPRINT CHR$(27);"7";
80 END
```

àèùòì°£í¿Ññ¤РÅåç§ßÆæØø¨ÄÖäöüÉé¥

NOTE:
If MSB is set after input of the ESC 6 code, data will not be printed unless the buffer is full. Please note that the printer will not be able to escape from this state.

ESC 7

Name   **ESC 7** — ESC 6 setting cancel

Expression   **CHR$(27);"7";**

Function   Input of this code causes the printer to ignore all codes except control codes in ASCII codes $(128)_D$ to $(159)_D$, and $(255)_D$. This is the default setting.

See also   ESC 6

Example
```
10 ' Sets codes printable
20 LPRINT CHR$(27);"6";
30 LPRINT CHR$(134);CHR$(135)
40 ' Resets ESC 6 mode
50 LPRINT CHR$(27);"7";
60 LPRINT CHR$(134);CHR$(135)
70 END
```

£ /

ESC 8

Name	**ESC 8** — Deselection of the paper-end detector
Expression	**CHR$(27);"8";**
Function	Input of this code enables the printer to print data to the last line of the paper when the paper is nearing its end. With the DIP switch pin 1-3 on the control circuit board set to the ON position, the printer is placed in the ESC 8 condition upon application of power.
See also	ESC 9

ESC 9

Name	**ESC 9** — Selection of the paper-end detector
Expression	**CHR$(27);"9";**
Function	This code cancels the ESC 8 condition, and the printer cannot continue printing and enters OFF-LINE mode when there is no paper. With the DIP switch pin 1-3 set to the OFF position, the printer is placed in the ESC 9 condition upon application of power.
See also	ESC 8

ESC !

Name   **ESC !** — Print mode selection

Expression   **CHR$(27);"!";CHR$(n);**
(0 ≤ n ≤ 63)

Function   This code specifies the print mode.
Each print mode is determined by the value of n as shown on the next page.
This code takes precedence over other commands (such as ESC E, etc.) which set the print mode.

The precedence of print modes is as shown below.

    Emphasized > Condensed > Normal

    Superscript/Subscript > Double-strike

See also   SI, SO, DC2, DC4, ESC E, ESC F, ESC G, ESC H, ESC M, ESC P and ESC W

NOTES:
1. In Proportional mode, character are always emphasized.
2. In Elite mode, emphasized and condensed mode settings will be ignored.
3. ESC ! may be mixed with other ESC sequences, SO, or SI code etc.

Definition of each bit

Bit	7	6	5	4	3	2	1	0
"1"	Always 0		Enlarged	Double-strike	Empha-sized	Con-densed	Always 0	Elite
"0"			—	—	—	—		Pica

Mixed Print Mode

n (dec.)	En	D	Em	C	El	n (dec.)	En	D	Em	C	El
0						32	○				
1					○	33	○				○
2						34	○				
3					○	35	○				○
4				○		36	○			○	
5					○	37	○				○
6				○		38	○			○	
7					○	39	○				○
8			○			40	○		○		
9					○	41	○				○
10			○			42	○		○		
11					○	43	○				○
12			○			44	○		○		
13					○	45	○				○
14			○			46	○		○		
15					○	47	○				○
16		○				48	○	○			
17		○			○	49	○	○			○
18		○				50	○	○			
19		○			○	51	○	○			○
20		○		○		52	○	○		○	
21		○			○	53	○	○			○
22		○		○		54	○	○		○	
23		○			○	55	○	○			○
24		○	○			56	○	○	○		
25		○			○	57	○	○			○
26		○	○			58	○	○	○		
27		○			○	59	○	○			○
28		○	○			60	○	○	○		
29		○			○	61	○	○			○
30		○	○			62	○	○	○		
31		○			○	63	○	○			○

En: Enlarged mode
D: Double-strike mode
Em: Emphasized mode
C: Condensed mode
El: Elite mode

ESC !

```
10 'Print Mode Selection
20 LPRINT CHR$(27);"D";CHR$(20);CHR$(0);
30 FOR M=0 TO 63
40 LPRINT CHR$(27);"!";CHR$(0);
50 LPRINT " Mode ";M;CHR$(9);
60 LPRINT CHR$(27);"!";CHR$(M);
70 LPRINT "ABCDEabcde"
80 NEXT
```

```
Mode   0              ABCDEabcde
Mode   1              ABCDEabcde
Mode   2              ABCDEabcde
Mode   3              ABCDEabcde
Mode   4              ABCDEabcde
Mode   5              ABCDEabcde
Mode   6              ABCDEabcde
Mode   7              ABCDEabcde
Mode   8              ABCDEabcde
Mode   9              ABCDEabcde
Mode  10              ABCDEabcde
Mode  11              ABCDEabcde
Mode  12              ABCDEabcde
Mode  13              ABCDEabcde
Mode  14              ABCDEabcde
Mode  15              ABCDEabcde
Mode  16              ABCDEabcde
Mode  17              ABCDEabcde
Mode  18              ABCDEabcde
Mode  19              ABCDEabcde
Mode  20              ABCDEabcde
Mode  21              ABCDEabcde
Mode  22              ABCDEabcde
Mode  23              ABCDEabcde
Mode  24              ABCDEabcde
Mode  25              ABCDEabcde
Mode  26              ABCDEabcde
Mode  27              ABCDEabcde
Mode  28              ABCDEabcde
Mode  29              ABCDEabcde
Mode  30              ABCDEabcde
Mode  31              ABCDEabcde
Mode  32              ABCDEabcde
Mode  33              ABCDEabcde
Mode  34              ABCDEabcde
Mode  35              ABCDEabcde
```

Mode	36	ABCDEabcde
Mode	37	A B C D E a b c d e
Mode	38	ABCDEabcde
Mode	39	A B C D E a b c d e
Mode	40	**ABCDEabcde**
Mode	41	A B C D E a b c d e
Mode	42	**ABCDEabcde**
Mode	43	A B C D E a b c d e
Mode	44	**ABCDEabcde**
Mode	45	A B C D E a b c d e
Mode	46	**ABCDEabcde**
Mode	47	A B C D E a b c d e
Mode	48	**ABCDEabcde**
Mode	49	A B C D E a b c d e
Mode	50	**ABCDEabcde**
Mode	51	A B C D E a b c d e
Mode	52	ABCDEabcde
Mode	53	A B C D E a b c d e
Mode	54	ABCDEabcde
Mode	55	A B C D E a b c d e
Mode	56	**ABCDEabcde**
Mode	57	A B C D E a b c d e
Mode	58	**ABCDEabcde**
Mode	59	A B C D E a b c d e
Mode	60	**ABCDEabcde**
Mode	61	A B C D E a b c d e
Mode	62	**ABCDEabcde**
Mode	63	A B C D E a b c d e

ESC % 0

Name   **ESC % (0)$_D$** — ROM CG selection

Expression   **CHR$(27);"%";CHR$(0);CHR$(0);**

Function   This code selects the CG (Character Generator) in the internal ROM.

See also   ESC % (1)$_D$

ESC % 1

Name   **ESC % (1)$_D$** — Download CG selection

Expression   **CHR$(27);"%";CHR$(1);CHR$(0);**

Function   This code selects the Download character set which has been previously defined.

See also   ESC % (0)$_D$ and ESC &

Example

```
10 'Selects Character Set (France)
20 LPRINT CHR$(27);"R";CHR$(1);
30 '
40 'Defines CG pattern
50 LPRINT CHR$(27);"&";CHR$(0);CHR$(125);CHR$(125);
60 LPRINT CHR$(139);
70 LPRINT CHR$(38);CHR$(11);CHR$(64);CHR$(73);
80 LPRINT CHR$(240);CHR$(137);CHR$(64);CHR$(73);
90 LPRINT CHR$(38);CHR$(0);CHR$(0);
100 '
110 LPRINT "}}}}}"
120 LPRINT CHR$(27);"%";CHR$(1);CHR$(0)
130 LPRINT "}}}}}"
140 LPRINT CHR$(27);"%";CHR$(0);CHR$(0)
150 LPRINT "}}}}}"
160 END
```

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êêêêê

ESC &

Name **ESC &** — Download character definition

Expression CHR$(27);"&";CHR$(0);CHR$(n);CHR$(m);CHR$(a);CHR$(p$_1$);
CHR$(p$_2$);CHR$(p$_3$);...CHR$(P$_{11}$);
(0≤n, m≤255)

Function This code defines a download character into ASCII codes n to m in patterns P$_1$, P$_2$, P$_3$...P$_{11}$.
"a" is an attribute which consists of descender data and proportional data. For details, refer to page 3-39.

If a download character is defined into ASCII n code only, then n = m. That is:
CHR$(27);"&";CHR$(0);CHR$(n);CHR$(n);CHR$(a);CHR$(p$_1$);
CHR$(p$_2$);...CHR$(p$_{11}$)

See also ESC : and ESC %

Example To define download character ô in ASCII code 65 instead of character "A".

<Definition of the character ô>

| Head guide | | Attribute "a" |
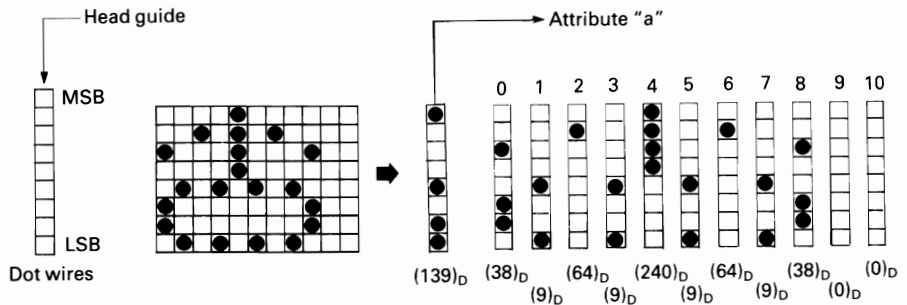
```
Example    10 'Download Character Definition
           20 LPRINT CHR$(27);"&";CHR$(0);"AA";
           30 LPRINT CHR$(139);
           40 LPRINT CHR$(38);CHR$(11);CHR$(64);CHR$(73);
           50 LPRINT CHR$(240);CHR$(137);CHR$(64);CHR$(73);
           60 LPRINT CHR$(38);CHR$(0);CHR$(0);CHR$(0);
           70 LPRINT CHR$(27);"%";CHR$(1);CHR$(0)
           80 LPRINT "AAAAA"
```

ăăăăă

NOTE:
This code will become invalid unless the DIP switch 1-4 is in the OFF position.

\<How to obtain attribute "a"\>

Attribute "a" is obtained in the following manner.
As shown in the figure below, attribute "a" consists of descender data and proportional data. The descender data determines whether or not the 9th dot will be struck, and the proportional data determines the starting and ending positions in the print area.
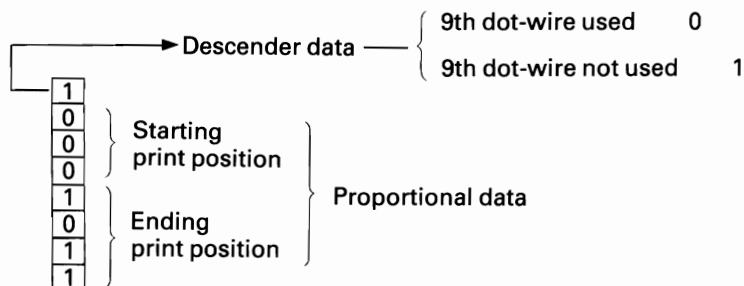
In the above figure, the high-order 3 bits of 7-bit proportional data represent the starting print position and the remaining 4 bits indicate the ending print position. In this example, attribute "a" is:

$$(10001011)_2 = <8B>_H = (139)_D$$

NOTE:
A maximum of 12 horizontal positions can be defined in a download character. However, the 12th position is automatically set to 0. The minimum width of a download character is 5 positions. Example programs are described in the following pages.

<Definition of download characters in Proportional mode>

In Proportional printing, all data will be automatically printed in emphasized characters. At this point, as each dot is printed as shown below, if the print area for the proportional data is specified as 0th to 10th positions, the dot at the 11th position cannot be printed.

Therefore, when defining a download character in Proportional mode, set the ending print position for the download character so that the position value is 1 or greater than the actual position of the last data.

(Print positions)

Normal mode

```
0  1  2  3  4  5  6  7  8  9 10 11
●  ○  ○  ○  ○  ○  ○  ○  ○  ○  ●  ○
```

Enlarged or Emphasized mode

```
0  1  2  3  4  5  6  7  8  9 10 11
●  ●  ○  ○  ○  ○  ○  ○  ○  ○  ●  ●
```

LESSON 1

In this example, a box pattern will be defined in place of "@".

Line No.

60–80	A standard character pattern in the ROM is copied into the RAM area.
90–100	The character pattern is brought from the RAM when it is to be printed.
120–130	Input the character defining command.
150	Defines the character into @.
170	$(139)_D$ is an "attribute" which will be described in detail later.
180–210	Definition of the box pattern.

Example

```
10 'Download Character    LESSON 1
20 'See if DIP SW1-4 is OFF.
30 '
40 'Defines a box
50 '
60 'Copy the original character patterns
70 'into Download Character Set
80 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
90 'Selects Download character set
100 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
110 '
120 'Defines a box pattern
130 LPRINT CHR$(27);"&";CHR$(0);
140 'Defines a box into @ code
150 LPRINT "@@";
160 '139 is the Attribute a
170 LPRINT CHR$(139);
180 'Sends a BOX pattern
190 LPRINT CHR$(255);CHR$(0);CHR$(129);CHR$(0);
200 LPRINT CHR$(129);CHR$(0);CHR$(129);CHR$(0);
210 LPRINT CHR$(129);CHR$(0);CHR$(255);
220 'Ok. Let's use the box.
230 LPRINT "This is a box.------> @"
240 LPRINT "There are boxes.---> @@@@@"
250 END

This is a box.------> □
There are boxes.---> □□□□□
```

NOTE:
Do not define horizontally adjacent dots.

LESSON 2

In this lesson, let's learn how to define a group of characters.

[Character Patterns]
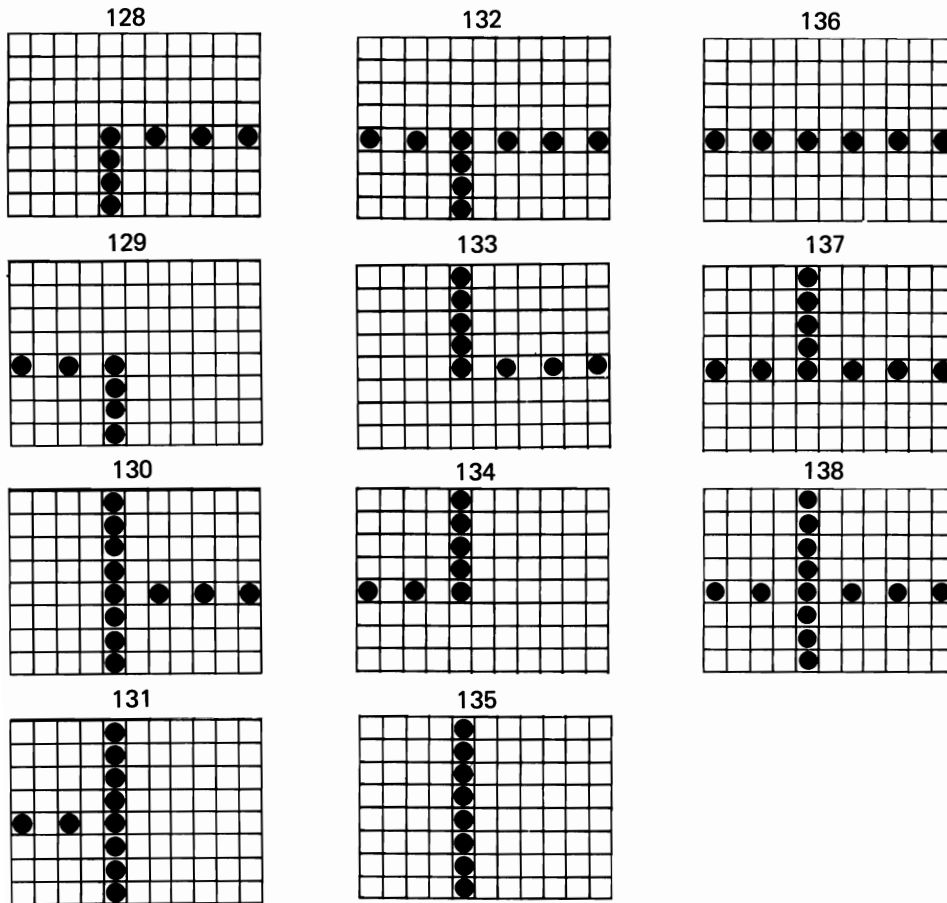
Line No.
10–60	Refer to LESSON 1.
90–100	Selects ASCII codes $(128)_D$ to $(159)_D$ as printable codes.
110	Start of character-defining statements.
120–130	This denotes the definition of $(128)_D$ to $(138)_D$.
140–790	Definition of character patterns.

```
10 ' DOWNLOAD CHARACTER       LESSON 2
20 ' See if DIP SW 1-4 is OFF.
30 ' Defines the box lines
40 ' Copies the original character patterns
50 '     into Download Character Set
60 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
70 ' Selects Download Character set
80 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
90 ' Selects ASCII 128 to 159 as printable code
100 LPRINT CHR$(27):"6";
110 ' Defines Character'into ASCII 128 to 138
120 LPRINT CHR$(27);"&";CHR$(0);
130 LPRINT CHR$(128):CHR$(138);
140 ' Sends pattern for ASCII 128
150 ' 139 is an Attribute a
160 LPRINT CHR$(139);
170 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(15);
180 LPRINT CHR$(0);
190 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
200 ' Sends pattern for ASCII 129
210 ' 139 is an Attribute a
220 LPRINT CHR$(139);
230 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(15);
240 LPRINT CHR$(0);
250 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(0);
260 ' Sends pattern for ASCII 130
270 '139 is an Attribute a
280 LPRINT CHR$(139);
290 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(255);
300 LPRINT CHR$(0);
310 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
320 'sends pattern for ASCII 131
330 '139 is an Attribute a
340 LPRINT CHR$(139);
350 LPRINT CHR$(8);CHR$(0);CHR$(8):CHR$(0);CHR$(255);
360 LPRINT. CHR$(0);
370 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(0);
380 'sends pattern for ASCII 132
390 '139 is an Attribute a
400 LPRINT CHR$(139);
410 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(15);
420 LPRINT CHR$(0);
430 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
440 'Sends pattern for ASCII 133
450 '139 is an Attribute a
460 LPRINT CHR$(139):
470 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(248);
480 LPRINT CHR$(0);
490 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
500 'Sends pattern for ASCII 134
```

```
510 '139 is an Attribute a
520 LPRINT CHR$(139);
530 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(248);
540 LPRINT CHR$(0);
550 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(0);
560 'Sends pattern for ASCII 135
570 '139 is an Attribute a
580 LPRINT CHR$(139);
590 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(255);
600 LPRINT CHR$(0);
610 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(0);
620 'Sends pattern for ASCII 136
630 '139 is an Attribute a
640 LPRINT CHR$(139);
650 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
660 LPRINT CHR$(0);
670 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
680 'Sends pattern for ASCII 137
690 '139 is an Attribute a
700 LPRINT CHR$(139);
710 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(248);
720 LPRINT CHR$(0);
730 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
740 'Sends pattern for ASCII 138
750 '139 is an Attribute a
760 LPRINT CHR$(139);
770 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(255);
780 LPRINT CHR$(0);
790 LPRINT CHR$(8);CHR$(0);CHR$(8);CHR$(0);CHR$(8);
800 'Ok.  Let's use the characters.
810 FOR I=128 TO 138
820 LPRINT "chr$(";I;") is ";CHR$(I)
830 NEXT
840 LPRINT
850 'Sets line spacing to 8 (dots/line)
860 LPRINT CHR$(27);"A";CHR$(8);
870 LPRINT CHR$(128);CHR$(136);CHR$(132);
880 LPRINT CHR$(136);CHR$(129)
890 LPRINT CHR$(135);"1";CHR$(135);"2";CHR$(135)
900 LPRINT CHR$(130);CHR$(136);CHR$(138);
910 LPRINT CHR$(136);CHR$(131)
920 LPRINT CHR$(135);"4";CHR$(135);"3";CHR$(135)
930 LPRINT CHR$(133);CHR$(136);CHR$(137);
940 LPRINT CHR$(136);CHR$(134)
950 'Sets line spacing to 12 (dots/line)
960 LPRINT CHR$(27);"A";CHR$(12)
970 END
```

```
chr$( 128 ) is ⌐
chr$( 129 ) is ¬
chr$( 130 ) is ├
chr$( 131 ) is ┤
chr$( 132 ) is ┬
chr$( 133 ) is └
chr$( 134 ) is ┘
chr$( 135 ) is │
chr$( 136 ) is ─
chr$( 137 ) is ┴
chr$( 138 ) is ┼
```

```
┌─┬─┐
│1│2│
├─┼─┤
│4│3│
└─┴─┘
```

LESSON 3

In this lesson, how to specify descender data is explained.

Line No.

10–70   Refer to LESSON 1.

80–90   Start of character-defining statements.

140, 200   Since the MSB of the attribute determines whether or not the descender exists, both "1" and "0" are defined. If the MSB of the attribute is "0", the descender exists and the defined pattern will be shifted down one dot and printed.

Example

```
10 ' Download Character      LESSON 3
20 ' See if DIP SW 1-4 is OFF.
30 ' Defines a box
40 ' Copies original character patterns into Download set
50 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
60 ' Selects Download character set
70 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
80 ' Defines a box pattern
90 LPRINT CHR$(27);"&";CHR$(0);
100 'Defines two boxes into @ and A
110 LPRINT "@A";
120 'Sends a box pattern
130 '139 has no DESCENDER Attributes
140 LPRINT CHR$(139);
150 LPRINT CHR$(255);CHR$(0);CHR$(129);CHR$(0);CHR$(129);
160 LPRINT CHR$(0);
170 LPRINT CHR$(129);CHR$(0);CHR$(129);CHR$(0);CHR$(255);
180 'Sends a box pattern
190 '11 has a DESCENDER Attribute
200 LPRINT CHR$(11);
210 LPRINT CHR$(255);CHR$(0);CHR$(129);CHR$(0);CHR$(129);
220 LPRINT CHR$(0);
230 LPRINT CHR$(129);CHR$(0);CHR$(129);CHR$(0);CHR$(255);
240 'Ok. Let's draw the box.
250 LPRINT "This is a box . ---> @"
260 LPRINT "These are boxes.---> @A@A@"
270 LPRINT "    Two of them do have DESCENDERS."
280 END
```

```
This is a box . ---> □
These are boxes.---> □□□□
     Two of them do have DESCENDERS.
```

LESSON 4

The proportional data of the attribute is explained here.

Line No.
10–80   Refer to LESSON 1.
130–240   Let's change only the proportional data of the defined character pattern.
            In line 150, the print area is defined as 0th to 11th positions.
            In line 210, the print area is defined as 0th to 6th positions.
            Proportional data is valid only in Proportional mode.

Attribute (139)$_D$ Attribute (134)$_D$
0 1 2 3 4 5 6 7 8 9 1011   0 1 2 3 4 5 6 7 8 9 1011

Print area   Print area
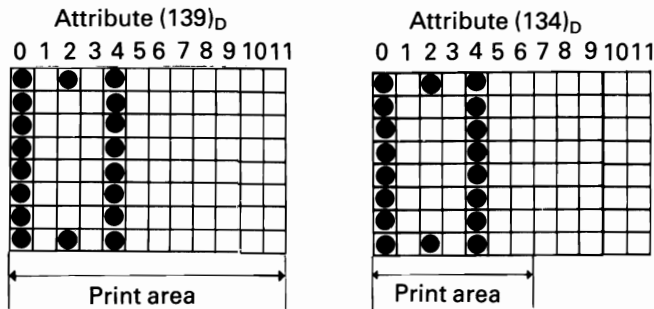
NOTE:
The print area is defined as 0 to 11.

Example

```
10 'Download Character      LESSON 4
20 'See if DIP SW 1-4 is OFF.
30 'Defines Proportional Boxes
40 'Copy original chraracter patterns
50 '      into Download Set
60 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
70 'Selects Download Character Set
80 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
90 'Defines a box pattern
100 LPRINT CHR$(27);"&";CHR$(0);
110 'Defines two boxes into @ and A
120 LPRINT "@A";
130 'Sends a box pattern
140 '139 has DEFAULT proportional attribute
150 LPRINT CHR$(139);
160 LPRINT CHR$(255);CHR$(0);CHR$(129);CHR$(0);CHR$(255);
170 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);
180 LPRINT CHR$(0);CHR$(0);
```

Example (cont'd)

```
190 'Sends a box pattern
200 '134 has a proportional attribute
210 LPRINT CHR$(134);
220 LPRINT CHR$(255);CHR$(0);CHR$(129);CHR$(0);CHR$(255);
230 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);
240 LPRINT CHR$(0);CHR$(0);
250 'Ok. Let's draw a box.
260 LPRINT "Non-proportional Mode"
270 LPRINT "This is a box. ----> @"
280 LPRINT "There are boxes. ----> @A@A@"
290 LPRINT
300 LPRINT "Two of them have proportional attributes."
310 LPRINT CHR$(27);"p";CHR$(1);
320 LPRINT
330 LPRINT "Proportional Mode"
340 LPRINT "This is a box. ---> @"
350 LPRINT "There are boxes. ----> @A@A@"
360 LPRINT
370 LPRINT "Two of them do have"
375 LPRINT "        PROPORTIONAL attributes."
380 LPRINT CHR$(27);"p";CHR$(0);
390 END
```

```
Non-proportional Mode
This is a box. ----> []
There are boxes. ---> [][][][]

Two of them have proportional attributes.
```

Proportional Mode
This is a box. ---> []
There are boxes. ---> [][][][]

Two of them do have
**   PROPORTIONAL attributes.**

ESC *

Name   **ESC *** — 8-pin bit image mode

Expression   **CHR$(27);"*";CHR$(m);CHR$($n_1$);CHR$(n_2)**

Function   This code selects 8-pin bit image mode.

m	Mode	Dots/8"	Head Speed (inch/sec)
0	Normal density	480	16
1	Dual density	960	8
2	Double-speed, Dual-density	960	16
3	Quadruple-density	1920	8
4	CRT Graphics	640	8
5	Plotter Graphics	576	12
6	CRT Graphics II	720	8

For the procedure to obtain n_1 and n_2, refer to ESC K. If the value specified for m is not in the range 0 to 6, the specified number of data will be ignored.

When m is 2 or 3, the horizontally adjacent dots cannot be printed.

```
10 LPRINT CHR$(27);"*";CHR$(0);CHR$(0);CHR$(1);
20 FOR I=1 TO 256: LPRINT "x";: NEXT
30 LPRINT "END"
```

This is the same as the following.

```
10 LPRINT CHR$(27);"K";CHR$(0);CHR$(1);
20 FOR I=1 TO 256: LPRINT "x";:NEXT
30 LPRINT "END"
```

See slso   ESC K, ESC L, ESC Y and ESC Z

NOTE:
ESC K is the same as mode 0.
ESC L is the same as mode 1.
ESC Y is the same as mode 2.
ESC Z is the same as mode 3.

Example 1
```
10 REM Bit Image Variety
20 FOR A=0 TO 6
30 LPRINT CHR$(27);"*";CHR$(A);CHR$(12);CHR$(0);
40 FOR J=1 TO 12
50 READ R
60 LPRINT CHR$(R);
70 NEXT J
80 DATA 1,3,7,15,31,63,63,31,15,7,3,1
90 RESTORE
100 NEXT A
110 END
```

Example 2
```
10 'Bit-image print
20 '480 dots/8" (NORMAL DENSITY)
30 D=200
40 LPRINT CHR$(27);"*";CHR$(0);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128);
80 NEXT
90 END
```
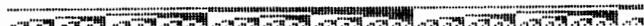
Example 3
```
10 'Bit-image print
20 '960 dots/8" (DUAL DENSITY)
30 D=400
40 LPRINT CHR$(27);"*";CHR$(1);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128):
80 NEXT
90 END
```

Example 4
```
10 'Bit-image print
20 '960 dots/8" (DOUBLE SPEED
30 '              DUAL DENSITY)
40 D=400
50 LPRINT CHR$(27);"*";CHR$(2);
60 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
70 FOR I=1 TO D
80 LPRINT CHR$(I MOD 128 + 128);
90 NEXT
100 END
```

Example 5
```
10 'Bit-image print
20 '1920 dots/8" (QUADRUPLE DENSITY)
30 D=400
40 LPRINT CHR$(27);"*";CHR$(3);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128);
80 NEXT
90 END
```

Example 6
```
10 'Bit-image print
20 '640 dots/8" (CRT graphics)
30 D=400
40 LPRINT CHR$(27);"*";CHR$(4);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128);
80 NEXT
90 END
```

Example 7

```
10 'Bit-image print
20 '576 dots/8" (PLOTTER graphics)
30 D=400
40 LPRINT CHR$(27);"*";CHR$(5);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128);
80 NEXT
90 END
```

Example 8

```
10 'Bit-image print
20 '720 dots/8" (CRT graphics II)
30 D=400
40 LPRINT CHR$(27);"*";CHR$(6);
50 LPRINT CHR$(D MOD 256);CHR$(INT(D/256));
60 FOR I=1 TO D
70 LPRINT CHR$(I MOD 128 + 128);
80 NEXT
90 END
```

ESC Λ

Name **ESC Λ** — 9-pin bit image mode

Expression **CHR\$(27);"Λ";CHR\$(a);CHR\$(n₁);CHR\$(n₂);CHR\$(m₁₁);
CHR\$(m₁₂);CHR\$(m₂₁); CHR\$(m₂₂)...
(a = 0 or 1)**

Function This code sets 9-pin bit image mode.

a	dots/8 inch
0	480 (normal density)
1	960 (dual-density)
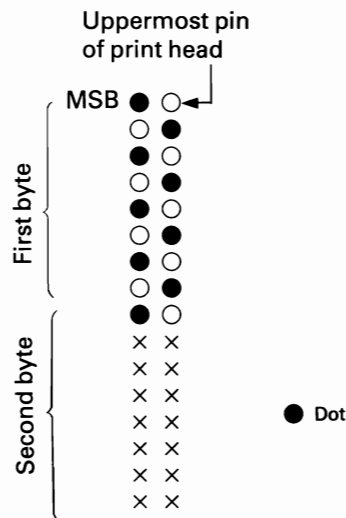
As shown in the figure, the 9 pins in the head are divided into the upper 8 pins and the lowest pin, which print in the order of the first and second bytes. These two bytes together control the pattern for a single dot position.

In the figure, data will be sent in the following order.

CHR\$(170);CHR\$(128);CHR\$(85);CHR\$(0);

Differing from other bit image print codes, the number of dot positions to be printed becomes half of the total number of data sent after n_1 and n_2.
For the procedure to obtain n_1 and n_2, refer to ESC K.

Example

```
10 BIT ON
20 '9-pin Bit Image Print
30 FOR A=1 TO 5
40 FOR M=0 TO 1
50 LPRINT CHR$(27);"^";CHR$(M);CHR$(10);CHR$(0);
60 LPRINT CHR$(0);CHR$(128);CHR$(1);CHR$(128);
70 LPRINT CHR$(2);CHR$(128);CHR$(4);CHR$(128);
80 LPRINT CHR$(8);CHR$(128);CHR$(16);CHR$(128);
90 LPRINT CHR$(32);CHR$(128);CHR$(64);CHR$(128);CHR$(128);
100 LPRINT CHR$(128);CHR$(0);CHR$(0);
110 NEXT M
120 NEXT A
```

∠∠∠∠∠∠∠∠∠

ESC —

Name   **ESC** — — Underlined print mode

Expression   **CHR$(27);"—";CHR$(n);**
(n = 0, 1, 48 or 49)

Function   Input of the ESC — $(1)_D$ or ESC — $(49)_D$ code places the printer in Underlined print mode. All the data following this code will be printed with underline.
The ESC — $(0)_D$ or the ESC — $(48)_D$ code cancels the Underlined print mode.

Example
```
10 ' Underlined Print
20 LPRINT CHR$(27);"-";CHR$(1);
30 LPRINT "Moon River"
40 LPRINT CHR$(27);"-";CHR$(0);
50 LPRINT "  Wider than a mile"


Moon River
   Wider than a mile
```

ESC /

Name   **ESC /** — VFU channel selection

Expression   **CHR$(27);"/";CHR$(n);**
(0 ⩽ n ⩽ 7)

Function   Input of this code causes the printer to execute subsequent vertical TABs in accordance with the format specified by the channel n of VFU.

<VFU—Vertical Format Unit>

Under VFU control, a page can be divided into channels within which vertical TABs can be independently set.
For example, channel 1 can be set for vertical TABs at the 3rd, 5th and 15th lines and channel 2 for the 6th, 10th and 30th lines.

Format of channel 1	Format of channel 2	Mixed format
3 ——————VT 1		3 ——————VT 1
5 ——————VT 1	6 ——————VT 2	5 ——————VT 1 / 6 ——————VT 2
	10 ——————VT 2	10 ——————VT 2
15 ——————VT 1		15 ——————VT 1
	30 ——————VT 2	30 ——————VT 2
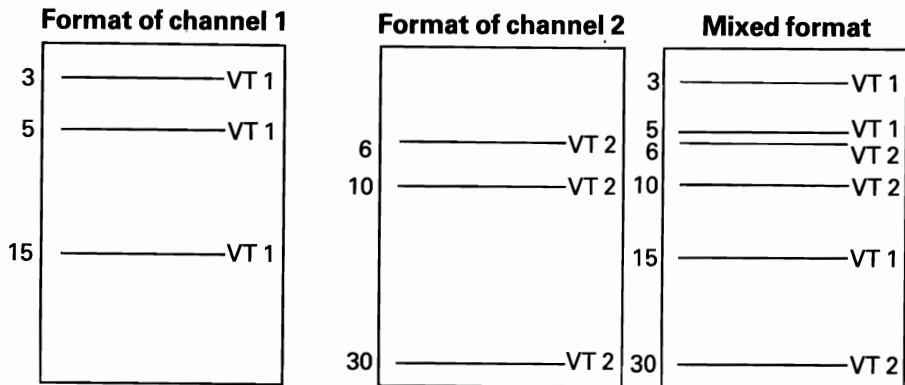
See also   VT, ESC b and ESC B

Example

```
10 'Vertical Format Unit
20 LPRINT CHR$(27);"C";CHR$(10);
30 LPRINT "*---- The first Top of Form ----*"
40 '
50 'VFU channel 1
60 LPRINT CHR$(27);"b";CHR$(1);
70 LPRINT CHR$(2);CHR$(5);CHR$(9);CHR$(0);
80 '
90 'VFU channel 2
100 LPRINT CHR$(27);"b";CHR$(2);
110 LPRINT CHR$(3);CHR$(7);CHR$(10);CHR$(0);
120 '
130 'Selects VFU channel 1
140 LPRINT CHR$(27);"/";CHR$(1);
150 GOSUB 1000
160 '
170 'Selects VFU channel 2
180 LPRINT CHR$(27);"/";CHR$(2);
190 GOSUB 1000
200 END
210 '
1000 'Sub-routine
1010 LPRINT CHR$(12);
1020 LPRINT "* ----- The next Top of form ----*";
1030 FOR I=1 TO 3
1040 LPRINT CHR$(11);"This is TAB   ";I
1050 NEXT
1060 RETURN
```

Line

Line	
0	*---- The first Top of Form ----*
1	
2	
3	
4	
5	
6	
7	
8	
9	
0	* ----- The next Top of form ----*
1	
2	This is TAB 1
3	
4	
5	This is TAB 2
6	
7	
8	
9	This is TAB 3
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
0	* ----- The next Top of form ----*
1	
2	
3	This is TAB 1
4	
5	
6	
7	This is TAB 2
8	
9	
0	This is TAB 3
1	
2	
3	
4	
5	

ESC : 0

Name   **ESC : (0)$_D$** — ROM CG set copy

Expression **CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);**

Function When this code is input, fonts in the ROM CG (Character Generator) set are copied into the Download CG set.

Example

```
10 'Copy from ROM CG to Download CG
20 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
30 '
40 'CG pattern definition
50 LPRINT CHR$(27);"&";CHR$(0);"##";
60 LPRINT CHR$(139);
70 LPRINT CHR$(38);CHR$(11);CHR$(64);CHR$(73);
80 LPRINT CHR$(240);CHR$(137);CHR$(64);CHR$(73);
90 LPRINT CHR$(38);CHR$(0);CHR$(0);
100 '
110 LPRINT CHR$(27);"%";CHR$(1);CHR$(0)
120 FOR I=33 TO 47
130 LPRINT CHR$(I);
140 NEXT
150 LPRINT CHR$(27);"%";CHR$(0);CHR$(0)
160 END
```

!"あ$%&'()*+,-./

ESC <

Name	**ESC** < — Printing from leftmost to right for one line
Expression	**CHR$(27);"<";**
Function	When this code is input, the print head returns to its leftmost position and data is printed unidirectionally from left to right for one line.
See also	ESC U
Example	

```
10    Home Head
20 LPRINT "                        Ah, well."
30 LPRINT CHR$(27);"<";
40 END
```

```
                        Ah, well.
```

NOTE:
The ESC < code minimizes horizontal dot aberrations which may be caused by the printing mechanism. ESC < is the command which causes the print head to return to its leftmost position only once, while ESC U causes all the following data to be printed unidirectionally.
Though usual bidirectional printing causes hardly any horizontal dot aberration, use of these two commands is recommended for greater precision.

ESC =

Name	**ESC =** — MSB = 0 setting

Expression **CHR$(27);"=";**

Function When this code is input, the MSB of an 8-bit data input after this code becomes 0.

See also ESC > and ESC #

ESC >

Name	**ESC >** — MSB = 1 setting
Expression	**CHR$(27);">";**
Function	When this code is input, the MSB of an 8-bit data input after this code becomes 1. MSB control does not work for bit image data.
See also	ESC = and ESC #

Example

```
10 ' Sets MSB to 1
20 LPRINT CHR$(27);">";
30 GOSUB 90
40 ' Sets MSB to 0
50 LPRINT CHR$(27);"=";
60 GOSUB 90
70 END
80 '
90 'Sub-routine
100 LPRINT
110 LPRINT "Oh! Excellent."
120 LPRINT
130 RETURN


Oh! Excellent.


Oh! Excellent.
```

ESC

Name   **ESC #** — MSB control sequence cancel

Expression   **CHR$(27);"#";**

Function   This code cancels the MSB control set by ESC = or ESC >, etc.

See also ·   ESC = and ESC >

Example
```
10 ' Sets MSB to 1
20 LPRINT CHR$(27);">";
30 GOSUB 90
40 ' Cancels MSB control set by ESC >
50 LPRINT CHR$(27);"#";
60 GOSUB 90
70 END
80 '
90 'Sub-routine
100 LPRINT
110 LPRINT "Take a chance!"
120 LPRINT
130 RETURN


Take a chance/


Take a chance!
```

NOTE:
MSB control does not work for bit image data.

ESC @

Name   **ESC** @ — Printer initialization

Expression   **CHR$(27);"@";**

Function   When this code is input, the printer is initialized, causing all the data in the print buffer to be cleared.

Example
```
10 LPRINT CHR$(27);"4";
20 LPRINT "Walk in the moon."
30 LPRINT
40 LPRINT CHR$(27):"@";
50 LPRINT "Walk in the moon."
60 END
```

Walk in the moon.

Walk in the moon.

ESC A

Name   **ESC A** — Line space setting

Expression   **CHR$(27);"A";CHR$(n);**
(0 ≤ n ≤ 85)

Function   This code sets the amount of line spacing to n/72 inch.

See also   ESC 0, ESC 1, ESC 2 and ESC 3

Example
```
10 ' Line Spacing by dots
15 FOR I=1 TO 8
30 LPRINT CHR$(27);"A";CHR$(I);
40 LPRINT "LINE SPACING ------"
50 NEXT
60 END
```

NOTE:
The ESC A (n)_D code may be input at any position on a line. However, once the code is input, the specified amount of line spacing will remain unchanged until the new line spacing is set.

ESC B

Name	**ESC B** — Vertical TAB
Expression	CHR$(27);"B";CHR$(n$_1$);CHR$(n$_2$);...;CHR$(n$_k$);CHR$(0); (1 ≤ n ≤ 254) (1 ≤ k ≤ 16)
Function	This code sets the vertical TAB positions on the specified lines. Since the current line spacing multiplied by the number of lines is stored as an absolute value for the TAB stop position, the vertical TAB setting will be performed as it has been set in this code even if the amount of the line spacing is changed. Vertical TAB setting is terminated by inputting a CHR$(0) code.
See also	VT, ESC / and ESC b
Example	

```
10 'Vertical TAB
20 FOR I=0 TO 11
30 LPRINT I
40 NEXT
50 LPRINT CHR$(27);"D";CHR$(7);CHR$(0);
60 LPRINT CHR$(27);"B";CHR$(1);CHR$(5);CHR$(9);
70 LPRINT CHR$(0);
80 FOR J=1 TO 2
90 LPRINT CHR$(27);"j";CHR$(216);
100 NEXT
110 FOR J=1 TO 3.
120 LPRINT CHR$(11);CHR$(9);"VERTICAL TAB";
130 NEXT
140 END
```

```
Top of form──►0
              1          VERTICAL TAB
              2
              3
              4
              5          VERTICAL TAB
              6
              7
              8
              9          VERTICAL TAB
              10
              11
```

NOTE:
If TAB positions are not set in an orderly manner, the TAB execution is terminated.
TAB positions set by ESC B are the same as those set by ESC b 0.

ESC C

Name   **ESC C** — Form length setting by number of lines

Expression   **CHR$(27);"C";CHR$(n);**
(1 ≤ n ≤ 127)

Function   This code specifies the form length by number of lines.

Form feed, skip-over perforation, etc., are carried out in accordance with the form length specified by this code.

The form length will be stored as an absolute length with the amount of line spacing multiplied by the specified number of lines. Therefore, the specified form length will not change after it has once been set even if the amount of line spacing is changed.

See also   ESC C

Example   Set the form length to 50 lines.

LPRINT CHR$(27);"C";CHR$(50);

ESC C 0

Name   **ESC C (0)4D** — Form length setting in inches

Expression   **CHR$(27);"C";CHR$(0);CHR$(n);**
(1 ≤ n ≤ 22)

Function   When this code is input, the form length specified in inches is set. Form feed, skip-over perforation, etc., are carried out in accordance with the form length set by this code.

See also   ESC C

Example   The following program shows how to set a form length to 2 inches.

```
10 LPRINT CHR$(27);"C";CHR$(0);CHR$(2);
20 LPRINT ;"Dear Sirs,"
30 LPRINT
40 FOR I=1 TO 3
50 LPRINT "etc."
60 NEXT
70 LPRINT CHR$(12)
80 FOR I=1 TO 3
90 LPRINT "etc."
100 NEXT

Dear Sirs,

etc.
etc.
etc.

   etc.
   etc.
   etc.
```

NOTE:
If the host computer cannot send CHR$(0), send CHR$(128) instead.

ESC D

Name   **ESC D** — Horizontal TAB

Expression   CHR$(27);"D";CHR$(n_1);CHR$($n_2$);...;CHR$(n_k);CHR$(0);
                  ($1 \leq n \leq 137$) ($1 \leq k \leq 32$)

Function   This code specifies the horizontal TAB stop positions.

"n" denotes column position and the horizontal TAB position is stored as a value of the current character width multiplied by the specified number of lines.

The TAB stop positions can be specified up to 80 columns in Normal mode and 132 columns in Condensed mode.

The excess TAB positions set by this code will be ignored. Input of the HT code causes the horizontal TAB position to skip to the subsequent position and printing restarts from the next column on that line.

CHR$(0) should be input to terminate the TAB setting, and the lack of this code will cause incorrect data printout.

See also   HT

Example

```
10 'Horizontal TAB
20 LPRINT "01234567890123456789012345.67890"
30 LPRINT CHR$(27);"D";CHR$(6);CHR$(13);CHR$(20);CHR$(0);
35 FOR I=1 TO 3
40 LPRINT CHR$(9);"STOP!";
50 NEXT
60 END
```

```
01234567890123456789012345.67890
      STOP!   STOP!   STOP!
```

NOTE:
The default TAB setting is every 8 columns.

ESC E

Name	**ESC E** — Emphasized mode setting
Expression	**CHR$(27);"E";**
Function	When this code is input, all the data stored in the print buffer is printed out and then the data following this code is printed in emphasized characters. Emphasized printing gives each character a stronger impression.

This code can be input at any column position on a line. The speed of the head carriage reduces to 80 CPS while printing emphasized characters.

This print mode can be cancelled by input of an ESC F code or ESC ! code.

See also	ESC F and ESC !

ESC F

Name	**ESC E** — Emphasized mode setting
Expression	**CHR$(27);"E";**
Function	When this code is input, all the data stored in the print buffer is printed out and then the data following this code is printed in emphasized characters. Emphasized printing gives each character a stronger impression.

This code can be input at any column position on a line. The speed of the head carriage reduces to 80 CPS while printing emphasized characters.

This print mode can be cancelled by the input of an ESC F code or ESC ! code.

See also	ESC F and ESC !

ESC G

Name   **ESC G** — Double-strike mode setting

Expression   **CHR$(27);"G";**

Function   When this code input, all the data stored in the printer buffer is printed out and then the data following this code is printed in Double-strike mode.

In this mode, the printer will complete one line of printing by two passes of the print head while advancing the paper by about 1/216 inch between the first pass and the second pass. For this reason, the printer performs paper feeding adjustment to maintain the absolute length and number of lines of a page.
This eliminates the vertical gap between dots, thereby enabling high-quality printing.

See also   ESC H

ESC H

Name   **ESC H** — Double-strike mode cancel

Expression   **CHR$(27);"H";**

Function   The ESC H code cancels the Double-strike mode set by the ESC G code.

See also   ESC G

Example
```
10 'Double Print
20 LPRINT CHR$(27);"G";
30 LPRINT "Double Print";
40 LPRINT CHR$(27);"H";
50 LPRINT "   Normal Print"
60 END
```

```
Double Print   Normal Print
```

ESC I

Name	ESC I — Control code selection

Expression	CHR$(27);"I";CHR$(n);
	(n = 0, 1, 48 or 49)

Function	This code is used to select the undefined codes in $(0)_D$ to $(31)_D$ and $(128)_D$ to $(159)_D$ as either control codes or printable characters.

n = 1 or 49 Printable characters
n = 0 or 48 Control codes (Undefined codes are ignored.)

Example 1	

```
10 'Selects control code
20 LPRINT CHR$(7):' BEL code
30 LPRINT CHR$(0):' NUL code
40 LPRINT CHR$(27);"I";CHR$(1);
50 LPRINT CHR$(7):' Printable Code
60 LPRINT CHR$(0):' Printable Code
70 LPRINT CHR$(27);"I";CHR$(0);
80 END
```

<beep>
<beep>
à

NOTES:
1. This command is not influenced by control codes such as CR, LF, etc.
2. In the FX-80, international characters are provided in ASCII $(0)_D$ to $(31)_D$ and $(128)_D$ to $(159)_D$ which are usually set as unprintable codes. These codes become printable upon input of the ESC I code.

International Character Table

Dec code		Dec code		Dec code		Dec code		Dec code		Dec code	
0	à	13	CR	26	ä	128	à	141	CR	154	ä
1	è	14	SO	27	ESC	129	è	142	SO	155	ESC
2	ù	15	SI	28	ü	130	ù	143	SI	156	ü
3	ò	16	§	29	É	131	ò	144	§	157	É
4	ì	17	ß	30	é	132	ì	145	ß	158	é
5	°	18	DC2	31	¥	133	°	146	DC2	159	¥
6	£	19	DC3			134	£	147	DC3		
7	BEL	20	DC4			135	BEL	148	DC4		
8	BS	21	ø			136	BS	149	ø		
9	HT	22	¨			137	HT	150	¨		
10	LF	23	Ä			138	LF	151	Ä		
11	VT	24	Ö			139	VT	152	Ö		
12	FF	25	Ü			140	FF	153	Ü		

Example 2

```
10 'International Characters
20 '        in codes 1 to 6
30 LPRINT CHR$(27);"I";CHR$(1);
40 FOR I=1 TO 6
50 LPRINT CHR$(I);
60 NEXT
70 END
```

èùòì°£

ESC J

Name   **ESC J** — Paper feed execution

Expression   **CHR$(27);"J";CHR$(n);**
(0 ≤ n ≤ 255)

Function   This code causes the printer to print the data in the print buffer and executes n/216 inch paper feed. The set value of n will be cancelled by line feed.

See also   ESC j and ESC 3

Example   To execute 113/216 inch line spacing

```
10 LPRINT "          FREE INFORMATION!"
20 LPRINT CHR$(27);"J";CHR$(113)
30 LPRINT "User Inquiry Service"
40 LPRINT "    from EPSON"
```

```
          FREE INFORMATION!




User Inquiry Service
     from EPSON
```

NOTE:
With n = 1 and n = 2, paper feeding accuracy is not guaranteed. If the value of n is set as 0, no paper feeding will be executed.

ESC K

Name   **ESC K** — Normal-density bit image (8-pin)

Expression   **CHR$(27);"K";CHR$(n₁);CHR$(n₂);CHR$(m);...**

Function   This code sets Normal-density bit image mode. When this code is input, the data following ESC K code is printed out as dot pattern(s).

After the completion of the bit image printing, the printer will automatically return to Text mode.

See also   ESC L, ESC Y, ESC Z and ESC *

<How to obtain n_1 and n_2>

The number of bit image data will be sent in hexadecimal or decimal numbers n_1 and n_2.

If the number of bit image data is 300, then n_1 and n_2 may be derived as follows;

$$n_1 = \text{(Number of data) MOD 256}$$
$$= 300 \text{ MOD } 256$$
$$= (44)_D$$
$$= <2C>_H$$

$$n_2 = \text{INT (Number of data/256)}$$
$$= \text{INT (300/256)}$$
$$= (1)_D$$
$$= <01>_H$$

n_1 is the remainder of (Number of data) over 256, and n_2 is the quotient of (Number of data) over 256.

In the Normal-density bit image mode, the maximum number of dot positions printable per line is 480. Therefore, the values of n_1 and n_2 specified in excess of 480 dot positions are ignored and printing of the bit image data after the 480th dot position is not guaranteed. Mixing of text data and bit image data is possible on the same line.

(Ex.1) Input data

Text (20 characters)	ESC	K	n=480 Bit-image data	Next data

20 characters in Text mode correspond to 120 bit image positions ($20 \times 6 = 120$). Therefore, the remaining printable positions in Bit image mode becomes 360 (480 − 120 = 360). If 480 data are input as bit image data, the first 360 data can be printed but the remaining 120 data are ignored and thus not printed.

(Ex. 2) Input data

					n2, n1					n'2, n'1	
Data A	ESC	K	n1	n2	Data B	Data C	ESC	K	n'1	n'2	Data D
Text data					Bit-image data	Text data					Bit-image data

480 bit-image positions

Printing

Text data A	Bit-image data B	Text data C	Bit-image data D

480 bit-image positions
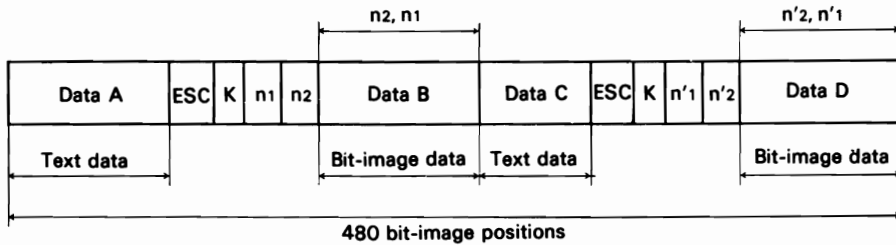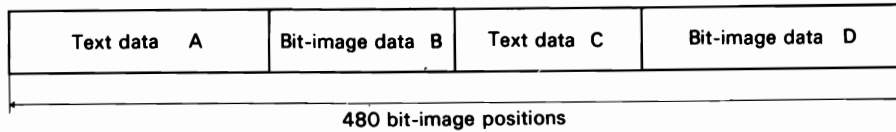
(Ex. 3) Bit image data transfer by standard BASIC program
To check for proper conversion to the Normal-density bit image mode, execute the following program.

```
10 ' Bit Image Print (Nomal Density)
20 FOR I=1 TO 5
30 LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
40 FOR N=1 TO 80
50 LPRINT CHR$(255);
60 NEXT N
70 LPRINT
80 NEXT I
90 END
```

<Relationship between data and dot wires>
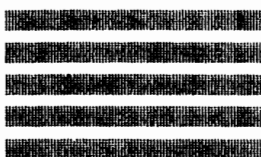
The figure below shows the relationship between the bit image data and the dot wires in the print head.
You can arbitrarily control the 8 dot wires in the print head.

NOTE:
In the Bit Image mode, the 9th dot wire cannot be used.

Relationship between Data and Dot Wires
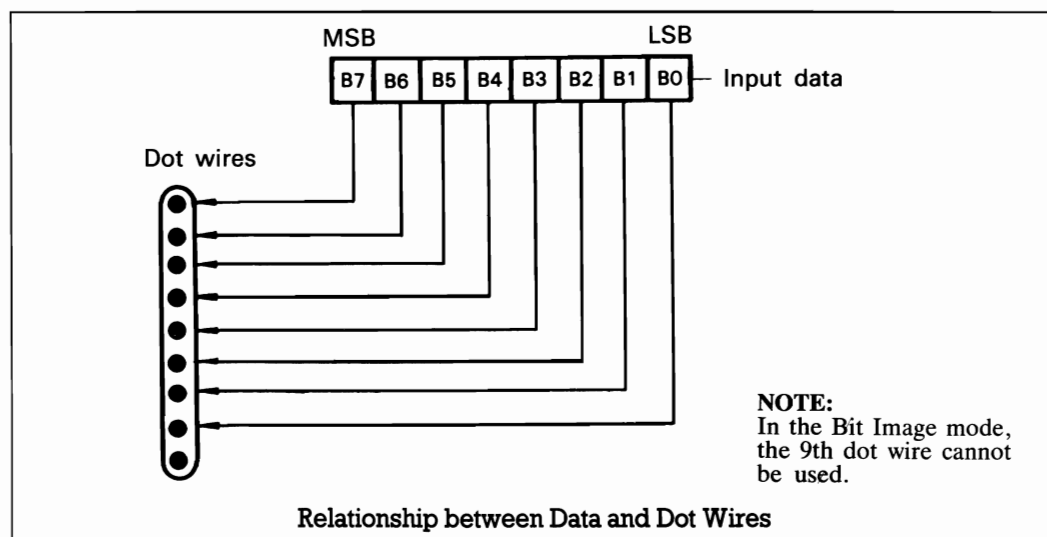
If a bit is 1, the print head fires. If a bit is 0, the print head does not fire. For example, assume that data are given as follows;

	B7=0
	B6=0
●	B5=1
	B4=0
	B3=0
	B2=0
●	B1=1
	B0=0

(34)D

	B7=0
●	B6=1
	B5=0
●	B4=1
	B3=0
	B2=0
	B1=0
	B0=0

(80)D
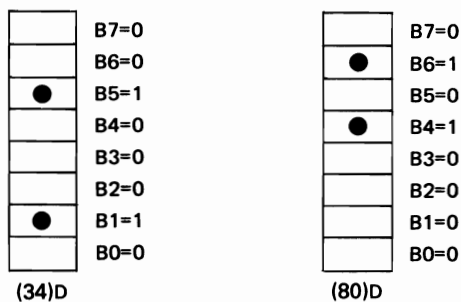
where a box with "●" denotes the bit 1 and a blank box denotes the bit 0. According to Appendix F, Code Tables, you can define $(00100010)_2$ as $(34)_D$ and $(01010000)_2$ as $(80)_D$.
As you can see, the first 4 bits are defined from column and the second 4 bits are defined from row. Namely,

$(0101)_2 = (5)_D$ and $(0000)_2 = (0)_D$.

Example 1
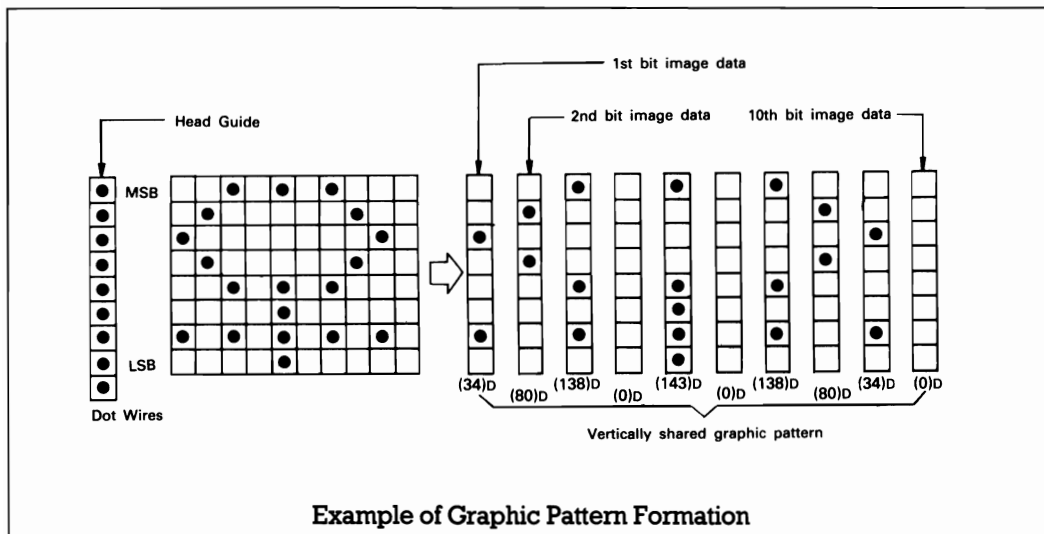
Example of Graphic Pattern Formation

NOTE:
The most significant bit (MSB) of the bit image data corresponds to the dot wire at the uppermost position.

For example, to print a graphic data as above, a program such as shown below must be executed.

```
10 ' Bit Image Printing (Normal Density)
20 LPRINT CHR$(27);"K";CHR$(10);CHR$(0);
30 FOR I=1 TO 10
40 READ R
50 LPRINT CHR$(R);
60 NEXT
70 LPRINT
80 DATA 34,80,138,0,143,0,138,80,34,0
90 END
```

This program has been developed using standard BASIC language. If extended BASIC is to be used, the program must be changed according to the features of the language.

In addition, if data is to be transferred through an interpreter of BASIC, etc., the data transfer rate becomes extremely slow. In such a case, it is recommended to effect the data transfer through machine language, etc.

Example 2
```
10 ' Bit Image Print (Normal Density)
20 LPRINT CHR$(27);"K";CHR$(12);CHR$(0);
30 FOR J=1 TO 12
40 READ R
50 LPRINT CHR$(R);
60 NEXT J
70 LPRINT
80 DATA 4,10,26,58,103,231
90 DATA 231,103,58,26,10,4
100 END
```
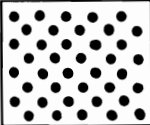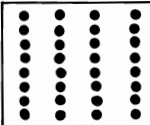
Example of expression of brightness using the Bit image mode
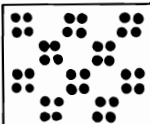
(Ex.) Expression of brightness

1   2   3

4   5   6
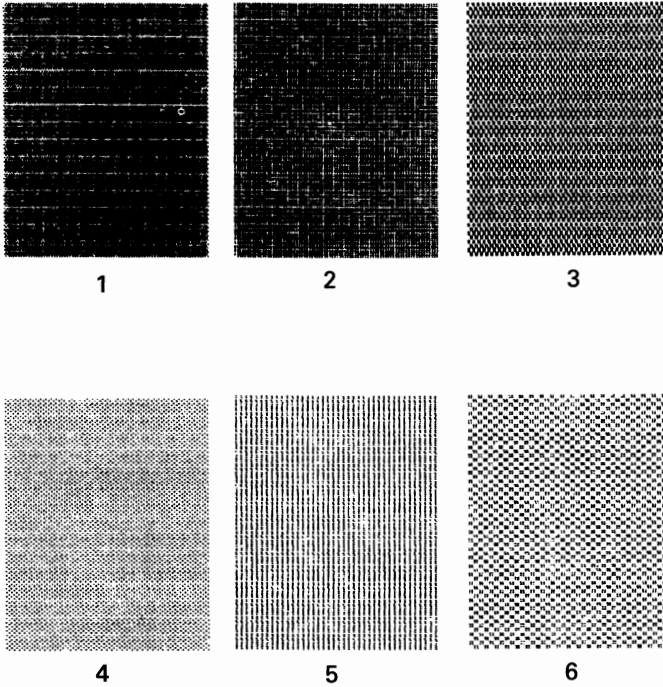
(Ex.) Expression of dot density

A:
Data will be transmitted in order of $(170)_D$ and then $(85)_D$
(8-dot line spacing)

B:
Data will be transmitted in order of $(255)_D$ and then $(0)_D$
(8-dot line spacing)

C:
Data will be transmitted in order of two $(204)_D$ and then two $(51)_D$
(8-dot line spacing)

Examples of Expression of Brightness

ESC L

Name   **ESC L** — Dual-density bit image (8-pin)

Expression   **CHR$(27);"L";CHR$(n_1);CHR$($n_2$);CHR$(m);...**

Function   This code sets the Dual-density bit image mode. The dot pattern indicated by n_1 and n_2 following ESC L will be printed in dual density.
Refer to the description of ESC K code for detailed information as to how to obtain the values of n_1 and n_2.

The transfer sequence of bit image data is the same as with the ESC K (normal-density bit image printing), but bit image printing can be performed in twice the dot density in the horizontal direction as with the ESC K. In other words, bit image data can be printed in 960 dot positions per line, thus permitting to produce denser graphic data.

If data exceeding this amount is specified, the excess will be ignored. After the completion of the bit image printing, the printer will automatically return to Text mode.

Mixing of normal-density bit image with dual-density bit image on a line is at your option, as well as mixing with the characters in Text mode.

See also   ESC K

<Difference between ESC K and ESC L>

The Normal-density mode is accessed with ESC K. The Dual-density mode is accessed with ESC L.

MSB →

Direction of print head movement

LSB →

The print head fires space between normal dot positions.

a) Normal density b) Dual density

Normal-Density and Dual-Density Modes
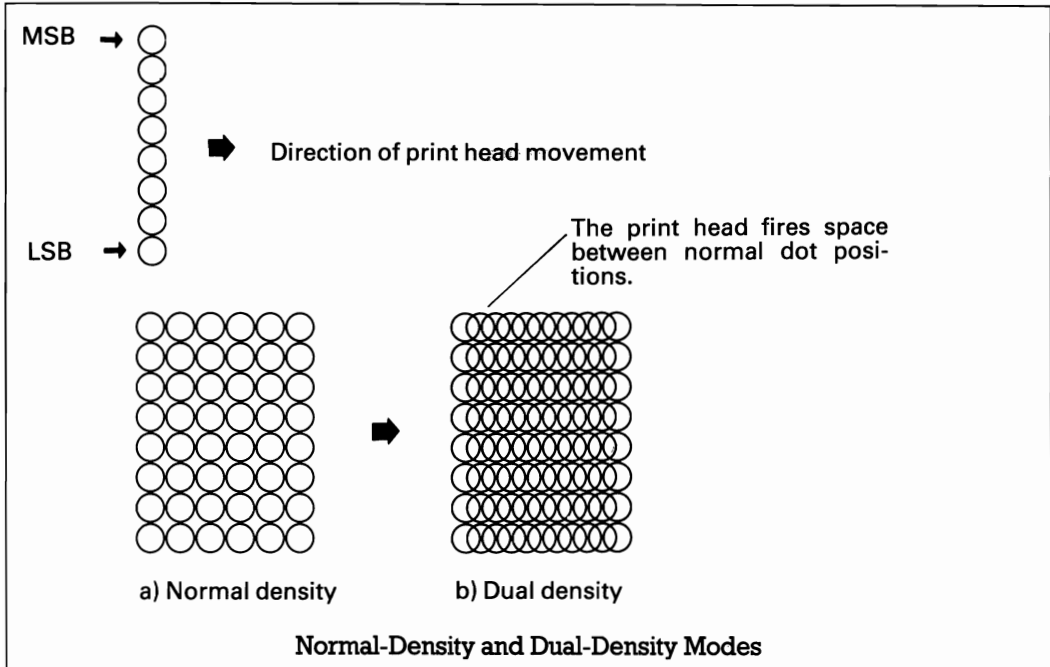
NOTE:
Avoid bit image printing with roll paper, or paper feeding accuracy is not guaranteed.

Example 1
```
10 ' Bit Image Print (Dual Density)
20 FOR I=1 TO 5
30 LPRINT CHR$(27);"L";CHR$(80);CHR$(0);
40 FOR N=1 TO 80
50 LPRINT CHR$(255);
60 NEXT N
70 LPRINT
80 NEXT I
90 END
```

Example 2
```
10 ' Bit Image Print (Dual Density)
20 LPRINT CHR$(27);"L";CHR$(10);CHR$(0);
30 FOR J=1 TO 10
40 READ R
50 LPRINT CHR$(R);
60 NEXT J
70 LPRINT
80 DATA 34,80,138,0,143,0,138,80,34,0
90 END
```

ESC M

Name   **ESC M** — Elite-sized mode setting

Expression   **CHR$(27);"M";**

Function   Input of ESC M code causes the data following this code to be printed in Elite size (12 characters per inch).
In this mode, Emphasized or Condensed mode setting, etc., is ignored.

See also   ESC P and ESC !

Example

```
10 'Elite-sized Print
20 LPRINT "Normal";
30 LPRINT CHR$(27);"M";
40 LPRINT "  Elite";
50 LPRINT CHR$(27);"!";CHR$(0)
60 END


Normal  Elite
```

ESC N

Name	**ESC N** — Skip-over perforation setting
Expression	**CHR$(27);"N";CHR$(n);** **(1 ≤ n ≤ 127)**

Function   The ESC N $(n)_D$ code is used to set the skip-over perforation function, which specifies the number of lines "n" to be skipped at the bottom of a page.

For example, if the last three lines of a page is to be skipped, the value of n must be entered as 3.

When the current form length is changed by the input of the ESC C $(n)_D$ or ESC C $(0)_D$ m code again, the specified amount of skip-over perforation is cancelled. In this case, therefore, the ESC N $(n)_D$ code must be input again to set the amount of skip-over perforation. When the DIP switch pin 2-3 is ON, 1-inch skip-over perforation is executed.

See also   ESC O, ESC C and ESC C 0

Example
```
10 ' Skip-over Perforation
20 LPRINT CHR$(27);"C";CHR$(5);
30 LPRINT CHR$(27);"N";CHR$(2);
40 FOR I=1 TO 9
50 LPRINT "Let's count ";I
60 NEXT
70 END


Let's count   1
Let's count   2
Let's count   3


Let's count   4
Let's count   5
Let's count   6


Let's count   7
Let's count   8
Let's count   9
```

<Skip-Over Perforation>

For example, if you are using 11-inch paper and you set a skip-over perforation of 6 lines, the printer will print 60 lines from the top of form position, feed for 6 lines and then continue printing from the 61st line of data at the top of form position of the next page.

The top of form position is the position of the first print line on the form when the power switch is turned ON, or the position when the form length is set by an ESC C or ESC C $(0)_D$ code.

ESC O

Name   **ESC O** — Skip-over perforation cancel

Expression   **CHR$(27);"O";**

Function   This code cancels the skip-over perforation set by the ESC N code.

See also   ESC N

Example
```
10 ' Skip-over Perforation
20 LPRINT CHR$(27);"C";CHR$(4):
30 LPRINT CHR$(27);"N";CHR$(2):
40 LPRINT "Twinkle twinkle little stars"
50 LPRINT "        *! *! *! *! *! *!"
60 LPRINT CHR$(27);"O":
70 FOR I=1 TO 2
80 LPRINT "Twinkle twinkle little stars"
90 LPRINT "        *! *! *! *! *! *!"
100 NEXT
```

```
Twinkle twinkle little stars
        *! *! *! *! *! *!


Twinkle twinkle little stars
        *! *! *! *! *! *!
Twinkle twinkle little stars
        *! *! *! *! *! *!
```

ESC P

Name   **ESC P** — Pica-sized mode setting

Expression   **CHR$(27);"P";**

Function   When the ESC P code is input, all the data following this code is printed out in normal (i.e., pica-sized) characters.
This code cancels the Elite-sized mode set by the ESC M code.

See also   ESC ! and ESC M

Example

```
10 'Pica-sized Print
20 LPRINT CHR$(27);"P";
30 LPRINT "ABCDEFG"
40 FOR N=1 TO 3
50 LPRINT CHR$(27);"!";CHR$(N);
60 LPRINT "ABCDEFG"
70 NEXT
80 END


ABCDEFG
ABCDEFG
ABCDEFG
ABCDEFG
```

ESC Q

Name	**ESC Q** — Right margin setting
Expression	**CHR$(27);"Q";CHR$(n);**
Function	This code specifies the print column width in the current character size. "n" represents the number of columns. This command must be specified at the head of a line. There is a maximum value for n in each print mode and if this value is exceeded, n will be ignored and the previous setting will remain in effect.

If data greater than the value set in this code is input, the printer will automatically perform a line feed.

$$2 \leq n \leq 80 \qquad \text{Normal mode and Emphasized mode}$$
$$4 \leq n \leq 137 \qquad \text{Condensed mode}$$
$$1 \leq n \leq 40 \qquad \text{Enlarged mode}$$
$$2 \leq n \leq 68 \qquad \text{Enlarged condensed mode}$$

In Proportional mode, the print column width is set in normal character size.

The difference between the functions of ESC Q and ESC l is that ESC Q sets the column end and ESC l the column head.

See also	ESC l

Example	

```
10 LPRINT CHR$(27);"Q";CHR$(15);
20 LPRINT "123456789012345678901234567890"
30 END
```

```
123456789012345
678901234567890
```

NOTE:
If the right or left margin is not specified, the buffer full position in Condensed mode is set to 132 columns which is 5 characters less than that in Normal mode.
However, when the right or left margin is set by the ESC Q or ESC l code, condensed characters are printed up to the specified print column width in the same manner as in Normal mode.
For details, refer to "Buffer-Full Print" on page 3-2.

ESC R

Name   **ESC R** — International character set selection

Expression   **CHR$(27);"R";CHR$(n);**
(0 ≤ n ≤ 8)

Function   When the "ESC R (n)$_D$" code is input, all data following this code is printed out in characters of the country specified by n.
The specified country character set will be valid until specified by other "ESC R (n)$_D$" code.

"n" represents one of the following country character sets.

n	Country
0	U.S.A.
1	France
2	Germany
3	England
4	Denmark

n	Country
5	Sweden
6	Italy
7	Spain
8	Japan

As for the specific code tables and character fonts, refer to Appendixes F and G.

(Normal mode)

HEX	DEC	U.S.A.	FRANCE	GERMANY	U.K.	DENMARK	SWEDEN	ITALY	SPAIN	JAPAN
23H	35	#	#	#	£	#	#	#	₧	#
24H	36	$	$	$	$	$	Ö	$	$	$
40H	64	@	à	§	@	@	É	@	@	@
5BH	91	[	°	Ä	[	Æ	Ä	°	¡	[
5CH	92	\	ç	Ö	\	Ø	Ö	\	Ñ	¥
5DH	93	]	§	Ü	]	Å	Å	é	¿	]
5EH	94	^	^	^	^	^	Ü	^	^	^
60H	96	`	`	`	`	`	é	ù	`	`
7BH	123	{	é	ä	{	æ	ä	à	¨	{
7CH	124	|	ù	ö	|	ø	ö	ò	ñ	|
7DH	125	}	è	ü	}	å	å	è	}	}
7EH	126	~	¨	ß	~	~	ü	ì	~	~

(Alternate mode)

HEX	DEC	U.S.A.	FRANCE	GERMANY	U.K.	DENMARK	SWEDEN	ITALY	SPAIN	JAPAN
23H	35	#	#	#	£	#	#	#	₧	#
24H	36	$	$	$	$	$	ŏ	$	$	$
40H	64	@	à	§	@	@	É	@	@	@
5BH	91	[	°	Ä	[	Æ	Ä	°	i	[
5CH	92	\	ç	Ö	\	Ø	Ö	\	ñ	¥
5DH	93	]	§	Ü	]	Å	Å	é	¿	]
5EH	94	^	^	^	^	^	Ü	^	^	^
60H	96	`	`	`	`	`	é	ù	`	`
7BH	123	{	é	ä	{	æ	ä	à	¨	{
7CH	124	|	ù	ö	|	ø	ö	ò	ñ	|
7DH	125	}	è	ü	}	å	å	è	}	}
7EH	126	~	¨	ß	~	~	ü	ì	~	~

Example

```
10 'International Character Sets
20 LPRINT CHR$(15);
30 FOR I=0 TO 8
40 LPRINT CHR$(27);"R";CHR$(I);
50 FOR J=33 TO 126
60 LPRINT CHR$(J);
70 NEXT
80 LPRINT
90 NEXT
100 END
```

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?àABCDEFGHIJKLMNOPQRSTUVWXYZ°ç§^_`abcdefghijklmnopqrstuvwxyzèùé¨
!"#$%&'()*+,-./0123456789:;<=>?§ABCDEFGHIJKLMNOPQRSTUVWXYZÄÖÜ^_`abcdefghijklmnopqrstuvwxyzäöüß
!"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZÆØÅ^_`abcdefghijklmnopqrstuvwxyzæøå¨
!"#$%&'()*+,-./0123456789:;<=>?ÉABCDEFGHIJKLMNOPQRSTUVWXYZÄÖÅÜ_êabcdefghijklmnopqrstuvwxyzäöåü
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ°\è^_ùabcdefghijklmnopqrstuvwxyzàòèì
!"₧$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ;ñ¿^_`abcdefghijklmnopqrstuvwxyz¨ñ)~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

ESC S 0

Name | ESC S (0)$_D$/ESC S (48)$_D$ — Superscript mode setting

Expression | CHR$(27);"S";CHR$(0); or CHR$(27);"S";CHR$(48);

Function | When the ESC S (0)$_D$ or ESC S (48)$_D$ code is input, all the data following this code is printed in Superscript mode. In this mode, a character measuring 2.10 mm (W)×1.60 mm (H) is printed on the upper half of a line.

This code can be cancelled by input of the ESC T code.

See also | ESC S 1 and ESC T

Example
```
10 'Super-script Mode
20 LPRINT CHR$(27);"E";
30 LPRINT "Y=aX";CHR$(27);"F";
40 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
50 LPRINT "3";
60 LPRINT CHR$(27);"T";CHR$(18);
70 LPRINT CHR$(27);"E";
80 LPRINT "+bX";CHR$(27);"F";
90 LPRINT CHR$(27);"S";CHR$(0);CHR$(15);
100 LPRINT "2";
110 LPRINT CHR$(27);"T";CHR$(18);
120 LPRINT CHR$(27);"E";
130 LPRINT "+cX+d"
```

$Y=aX^3+bX^2+cX+d$

ESC S 1

Name	**ESC S (1)$_D$/ESC S (49)$_D$** — Subscript mode setting
Expression	**CHR$(27);"S";CHR$(1);** or **CHR$(27);"S";CHR$(49);**
Function	When the ESC S (1)$_D$ or ESC S (49)$_D$ code is input, the data following this code is printed in Subscript mode. In this mode, a character measuring 2.10 mm (W)×1.60 mm (H) is printed on the lower half of a line.

This code can be cancelled by input of the ESC T code. |
| **See also** | ESC S 0 and ESC T |
| **Example** | |

```
10 'Sub-script Mode
20 LPRINT CHR$(27);"E";
30 LPRINT "H";CHR$(27);"F";
40 LPRINT CHR$(27);"S";CHR$(1);CHR$(15);
50 LPRINT "2";
60 LPRINT CHR$(27);"T";CHR$(18);
70 LPRINT CHR$(27);"E";
80 LPRINT "O";CHR$(27);"F";
90 LPRINT CHR$(27);"T";CHR$(18);
100 END
```

H_2O

NOTE:
In both the Superscript and Subscript modes, the printer will perform unidirectional, double-strike printing. After the first pass of the print head, the paper will be advanced by 1/216 inch and a character will be formed on completion of the second pass. For this reason, the printer will perform paper feeding adjustment to maintain the absolute length and number of lines of a page. Because of this adjustment, subscript or superscript characters may, in the worst case, be printed improperly.

ESC T

Name   **ESC T** — Superscript/Subscript mode cancel

Expression   **CHR$(27);"T";**

Function   The ESC T code cancels the Superscript or Subscript mode set by the ESC S 0 or ESC S 1 code, respectively.

See also   ESC S 0 and ESC S 1

ESC U

Name   **ESC U** — Unidirectional print

Expression   **CHR$(27);"U";CHR$(n);**
(n = 0, 1, 48 or 49)

Function   This code specifies whether or not printing should be performed unidirectionally.

n = 1 or 49   Unidirectional printing
n = 0 or 48   Bidirectional printing (except in Bit image mode)

See also   ESC <

Example
```
10  LPRINT "Let's see."
20 LPRINT CHR$(27);"U";CHR$(1);
30 LPRINT "Let's see."
40 LPRINT CHR$(27);"U";CHR$(0);
50 LPRINT "Let's see."
60 END


Let's see.
Let's see.
Let's see.
```

ESC W

Name **ESC W** — Enlarged mode setting

Expression **CHR$(27);"W";CHR$(n);**
(n = 0, 1, 48 or 49)

Function When the ESC W $(1)_D$ or ESC W $(49)_D$ code is input, all the data following this code is printed out in enlarged characters. This code is cancelled upon input of the ESC W $(0)_D$ or ESC W $(48)_D$.

The ESC W $(0)_D$ or ESC W $(48)_D$ code also cancels the Enlarged mode set by the SO code.

See also SO, ESC ! and DC 4

Example
```
10 'Sets Enlarged Mode by ESC W
20 LPRINT CHR$(27);"W";CHR$(1);
30 LPRINT "Enlarged Mode"
40 LPRINT CHR$(27);"W";CHR$(0);
50 LPRINT "Normal Mode"
60 END
```

Enlarged Mode
Normal Mode

ESC Y

Name **ESC Y** — Double-speed, dual-density bit image (8-pin)

Expression CHR$(27);"Y";CHR$(n_1);CHR$($n_2$);CHR$(m);...

Function When this code is input, the printer performs high-speed (16 inch per sec.), bit image printing in 960 positions/8 inch.

This mode is called "double-speed, dual-density bit image mode". However, adjacent dots cannot be printed in this mode.
For the procedure to obtain the values of n_1, n_2 and m, refer to ESC K.

See also ESC K, ESC L, ESC Z and ESC *

ESC Z

Name **ESC Z** — Quadruple-density bit image (8-pin)

Expression CHR$(27);"Z";CHR$(n_1);CHR$($n_2$);CHR$(m);...

Function When this code is input, the printer performs quadruple-density bit image printing. However, adjacent dots cannot be printed in this mode.

In this mode, bit image data will be printed in 1,920 positions/8 inch.
For the procedure to obtain the values of n_1, n_2 and m, refer to ESC K.

See also ESC K, ESC L, ESC Y and ESC *

ESC b

Name | **ESC b** — VFU position setting

Expression | CHR$(27);"b";CHR$(n);CHR$(m$_1$);...CHR$(m$_k$);CHR$(0);
(0 ≤ n ≤ 7) (1 ≤ k ≤ 16)

Function | This code sets the VFU (Vertical Format Unit) position for channel n. For details of VFU, refer to ESC / code.
The specified TAB positions must be terminated with CHR$(0).

The VFU has 8 channels (0 to 7), and for each channel, up to 16 positions can be set within the page length.

Channel is set to 0 at power ON.

See also | ESC B, VT and ESC /

NOTE:
TAB positions in channel 0 can be also set by ESC B.

Example   To set the vertical TABs at the 5th, 10th and 13th lines in channel 2.

```
10 ' Sets vertical TABs
20 LPRINT CHR$(27);"b";
30 LPRINT CHR$(2);CHR$(5);CHR$(10);CHR$(13);
40 LPRINT CHR$(0);
45 '
50 ' Selects channel 2
60 LPRINT CHR$(27);"/";CHR$(2);
70 LPRINT "Start!";CHR$(11);"BB";CHR$(11);
80 LPRINT "CC";CHR$(11);"DD"
90 END
```

Start!   ◄── 0th line

BB   ◄── 5th line

CC   ◄── 10th line

DD   ◄── 13th line

ESC i

Name   **ESC i** — Incremental and view print

Expression   **CHR$(27);"i";CHR$(n);**
(n = 0, 1, 48 or 49)

Function   ESC i $(1)_D$ or ESC i $(49)_D$ code causes the printer to print each character every time it is input.

If the data is input at intervals of less than approx. 0.1 sec, printout will be performed continuously.

When n = 0 or 48, the printer returns to normal operation.
Printing is unidirectional in the Incremental mode.
When the Incremental mode is cancelled, the printer will return to the bidirectional printing.

ESC j

Name	**ESC j** — Reverse feed
Expression	**CHR$(27);"j";CHR$(n);** **(0 ≤ n ≤ 255)**
Function	When this code is input, n/216 inch line spacing is executed in the reverse direction after the data in the print buffer has been printed out. The set value of n will be cancelled by line feed. The accuracy of paper feed is guaranteed up to 9/108 inch.
See also	ESC J and ESC 3
Example	

```
10 ' Reverse Feed
20 LPRINT "Reverse Feed"
30 LPRINT
40 LPRINT "Keep a watch!"
50 LPRINT CHR$(27);"j";CHR$(140);
60 LPRINT "_____"
```

Reverse Feed

Keep a watch!

NOTE:
The reverse feed cannot be executed when the Optional Tractor Unit is in use.

<Cautions for Reverse Feed>

Do not attempt Reverse feed in the shaded areas in the figures below to avoid damage or paper jam in the printer.

(1) Cut Sheet

Top edge

Within 25.4 mm from the top edge

Within 72 mm from the bottom edge

Bottom edge

(2) Pin-feed Paper

Perforation →

Within 25.4 mm below the perforation

Within 27 mm above the perforation

Within 72 mm of the bottom edge

Bottom edge

ESC l
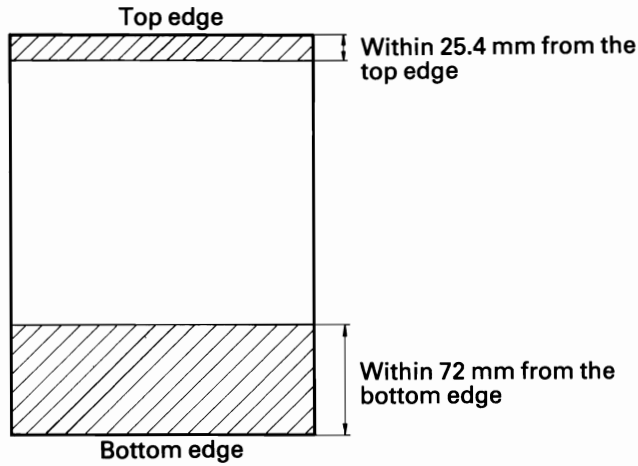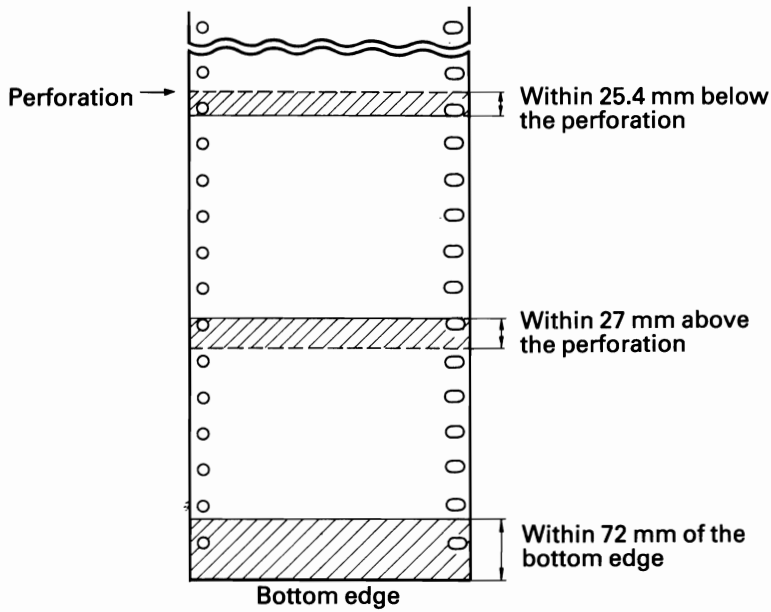
Name   **ESC** l — Left margin setting

Expression   **CHR$(27);"l";CHR$(n);**

Function   This code sets the left margin in the current character size.
There is a maximum value for "n" in each character size and if the
excess value for "n" is set, it will be ignored.
For "n", refer to ESC Q.

See also   ESC Q

Example 1   To set the left margin to the 8th column.

```
10  'Sets left margin
20  LPRINT "01234567890123456789Ø"
30  LPRINT CHR$(27);"l";CHR$(8);
40  LPRINT
50  LPRINT "The message from EPSON."
```

```
Ø1234567890123456789Ø

          The message from EPSON.
```

Example 2

```
10  'Horizontal TAB & ESC l
20  LPRINT "Ø1234567890123456789Ø"
30  LPRINT CHR$(27);"D";CHR$(2);CHR$(8);CHR$(15);
40  LPRINT CHR$(Ø);
50  LPRINT "A";CHR$(9);"B";CHR$(9);"C";CHR$(9);"D"
60  LPRINT CHR$(27);"l";CHR$(15);
70  LPRINT "Ø1234567890123456789Ø"
80  LPRINT CHR$(27);"D";CHR$(3);CHR$(9);CHR$(14);
90  LPRINT CHR$(Ø);
100 LPRINT "E";CHR$(9);"F";CHR$(9);"G";CHR$(9);"H"
110 END
```

```
Ø1234567890123456789Ø
A B        C         D
               Ø1234567890123456789Ø
               E    F     G    H
```

NOTES:

1. Setting of the left margin is performed in normal character size in Proportional mode.

2. When the left margin is set by inputting the ESC l code, the right margin in Condensed mode will be at the same position as that in Normal mode.

3. Input of the ESC l code causes the horizontal TAB positions previously set to be cleared and the subsequent horizontal TAB setting is carried out assuming the start column position set by the ESC l as position 0.

ESC p

Name   **ESC p** — Proportional spacing mode

Expression   **CHR$(27);"p";CHR$(n);**
(n = 0, 1, 48 or 49)

Function   This code is used to select Proportional spacing mode.

n = 1 or 49   Proportional spacing
n = 0 or 48   Normal spacing

In Proportional spacing mode, BS and DEL are not accepted. Also, printing is always performed in Emphasized mode.

Example

```
10 'Proportional Spacing Mode
20 LPRINT "     [Normal Print Mode]"
30 GOSUB 1000
60 LPRINT
70 LPRINT "     [Proportional Spacing Mode]"
80 LPRINT CHR$(27);"p";CHR$(1);
90 GOSUB 1000
100 LPRINT CHR$(27);"p";CHR$(0);
110 END
1000 'Sub-routine
1010 LPRINT "The Earth, our planet, is located at"
1020 LPRINT "an average distance of 93 million miles"
1030 LPRINT "from the Sun."
1040 RETURN
```

```
     [Normal Print Mode]
The Earth, our planet, is located at
an average distance of 93 million miles
from the Sun.

     [Proportional Spacing Mode]
The Earth, our planet, is located at
an average distance of 93 million miles
from the Sun.
```

Proportional Spacing

ASCII code	Char.	Width (unit: 1/2 dot)	ASCII code	Char.	Width (unit: 1/2 dot)	ASCII code	Char.	Width (unit: 1/2 dot)
0	à	12	53	5.	12	106	j	9
1	è	12	54	6	12	107	k	10
2	ù	11	55	7	12	108	l	8
3	ò	10	56	8	12	109	m	12
4	ì	6	57	9	12	110	n	11
5	°	8	58	:	6	111	o	12
6	£	12	59	;	6	112	p	11
7	¡	5	60	<	10	113	q	11
8	¿	12	61	=	12	114	r	11
9	Ñ	12	62	>	10	115	s	12
10	ñ	11	63	?	12	116	t	11
11	¤	12	64	@	12	117	u	12
12	Pt	12	65	A	12	118	v	12
13	Å	12	66	B	12	119	w	12
14	å	12	67	C	12	120	x	10
15	ç	11	68	D	12	121	y	12
16	§	10	69	E	12	122	z	10
17	ß	11	70	F	12	123	{	9
18	Æ	12	71	G	12	124			5
19	æ	12	72	H	12	125	}	9
20	Ø	12	73	I	8	126	~	12
21	ø	12	74	J	11	127	Ø	12
22	¨	8	75	K	12	128	à	11
23	Ä	12	76	L	12	129	è	11
24	Ö	12	77	M	12	130	ù	11
25	Ü	12	78	N	12	131	ò	11
26	ä	12	79	O	12	132	ì	8
27	ö	10	80	P	12	133	°	8
28	ü	11	81	Q	12	134	£	12
29	É	12	82	R	12	135	¡	10
30	é	12	83	S	12	136	¿	11
31	¥	12	84	T	12	137	Ñ	12
32	SPACE	12	85	U	12	138	ñ	12
33	!	5	86	V	12	139	¤	12
34	"	8	87	W	12	140	Pt	12
35	#	12	88	X	10	141	Å	12
36	$	12	89	Y	12	142	å	11
37	%	12	90	Z	10	143	ç	11
38	&	12	91	[	8	144	§	12
39	'	5	92	\	10	145	ß	11
40	(	6	93	]	8	146	Æ	12
41	)	6	94	^	12	147	æ	12
42	*	12	95	_	12	148	Ø	12
43	+	12	96	`	5	149	ø	11
44	,	7	97	a	12	150	¨	9
45	–	12	98	b	11	151	Ä	12
46	.	6	99	c	11	152	Ö	12
47	/	10	100	d	11	153	Ü	12
48	0	12	101	e	12	154	ä	11
49	1	8	102	f	10	155	ö	11
50	2	12	103	g	11	156	ü	12
51	3	12	104	h	11	157	É	12
52	4	12	105	i	8	158	é	11

NOTE:
This table also contains the widths of the international characters defined in internal
codes.

ASCII code	Char.	Width (unit: 1/2 dot)	ASCII code	Char.	Width (unit: 1/2 dot)
159	¥	12	211	S	12
160	SPACE	12	212	T	12
161	!	10	213	U	12
162	"	10	214	V	11
163	#	12	215	W	12
164	$	11	216	X	12
165	%	12	217	Y	12
166	&	12	218	Z	12
167	'	5	219	[	11
168	(	8	220	\	7
169	)	8	221	]	11
170	*	12	222	∧	10
171	+	12	223	—	12
172	,	8	224	'	5
173	—	12	225	a	11
174	.	7	226	b	11
175	/	10	227	c	11
176	0	12	228	d	12
177	1	9	229	e	11
178	2	12	230	f	12
179	3	12	231	g	11
180	4	12	232	h	11
181	5	12	233	i	9
182	6	11	234	j	10
183	7	12	235	k	11
184	8	12	236	l	9
185	9	11	237	m	11
186	:	8	238	n	10
187	;	9	239	o	11
188	<	10	240	p	11
189	=	11	241	q	11
190	>	9	242	r	10
191	?	11	243	s	11
192	@	12	244	t	10
193	A	12	245	u	11
194	B	12	246	v	10
195	C	12	247	w	12
196	D	12	248	x	12
197	E	12	249	y	11
198	F	12	250	z	12
199	G	12	251	{	10
200	H	12	252	¦	9
201	I	10	253	}	10
202	J	12	254	~	12
203	K	12	255	Ø	12
204	L	10			
205	M	12			
206	N	12			
207	O	12			
208	P	12			
209	Q	12			
210	R	12			

ESC s

Name   **ESC s** — Half speed print

Expression   **CHR$(27);"s";CHR$(n);**
(n = 0, 1, 48 or 49)

Function   Input of this code causes the print speed at 16 inch/sec. in Normal mode to be changed to 8 inch/sec., thereby reducing the noise generated during the printing operation.

n = 1 or 49 Half speed printing
n = 0 or 48 Normal speed printing

Example
```
10 'Sets Half Speed
20 LPRINT CHR$(27);"s";CHR$(1);
30 LPRINT CHR$(27);"p";CHR$(1);
40 LPRINT "Do! Re! Mi! Fa! Sol! La! Ti! Do!"
50 LPRINT
60 LPRINT CHR$(27);"s";CHR$(0);
70 LPRINT "Do! Re! Mi! Fa! Sol! La! Ti! Do!"
80 END
```

Do! Re! Mi! Fa! Sol! La! Ti! Do!

Do! Re! Mi! Fa! Sol! La! Ti! Do!

Chapter 4   MAINTENANCE

4.1 Preventive Maintenance

Preventive maintenance for the FX-80 consists basically of cleaning. The printer should be cleaned with a soft brush to remove paper dust and particles after every three months of use. The exterior surface of the printer can be cleaned by using a mild detergent and water solution.

NOTE:
Do not use hard cloth or volatile solvents such as thinner or alcohol when cleaning around the print head. Otherwise, printed characters may not be impressed on the paper or may become dim, or a break may occur in the printed character.

4.2 Parts Replacement

(1) General
Owing to the sophisticated nature of the circuitry and mechanisms utilized in the printer, operator's troubleshooting is logically obliged to be limited to certain easily recognizable symptoms and cures.
If a printer malfunction other than the print head unit should occur, the operator should contact the store from which the printer was purchased.

(2) Print head
In case of a print head trouble or a worn dot wire, replace the print head unit as described below. (See figure on the next page.)
NOTE:
Be sure to replace the print head after it has cooled.
1. *Disconnect the power cord from the AC outlet.*
2. *Take off the printer lid, printer cover and cartridge ribbon.*
3. *Turn the head lock lever clockwise and remove the print head.*
4. *Pull the head cable out straight while steadying the head connector on the terminal board.*
5. *Put a new head on the carriage assembly and replace the head lock lever.*

6. Insert the head cable into the head connector carefully.

   NOTES:
   1. *Inadequate connection may cause malfunctioning of the head.*
   2. *The carriage assembly should not be moved without the print head mounted on the carriage.*

Print head ⎫
Head cable ⎬ Print head unit

Terminal board

Head lock lever

Carriage assembly

Head connector
*Be sure to hold this con-
nector firmly to pull the
head cable out straight.

Replacement of Print Head
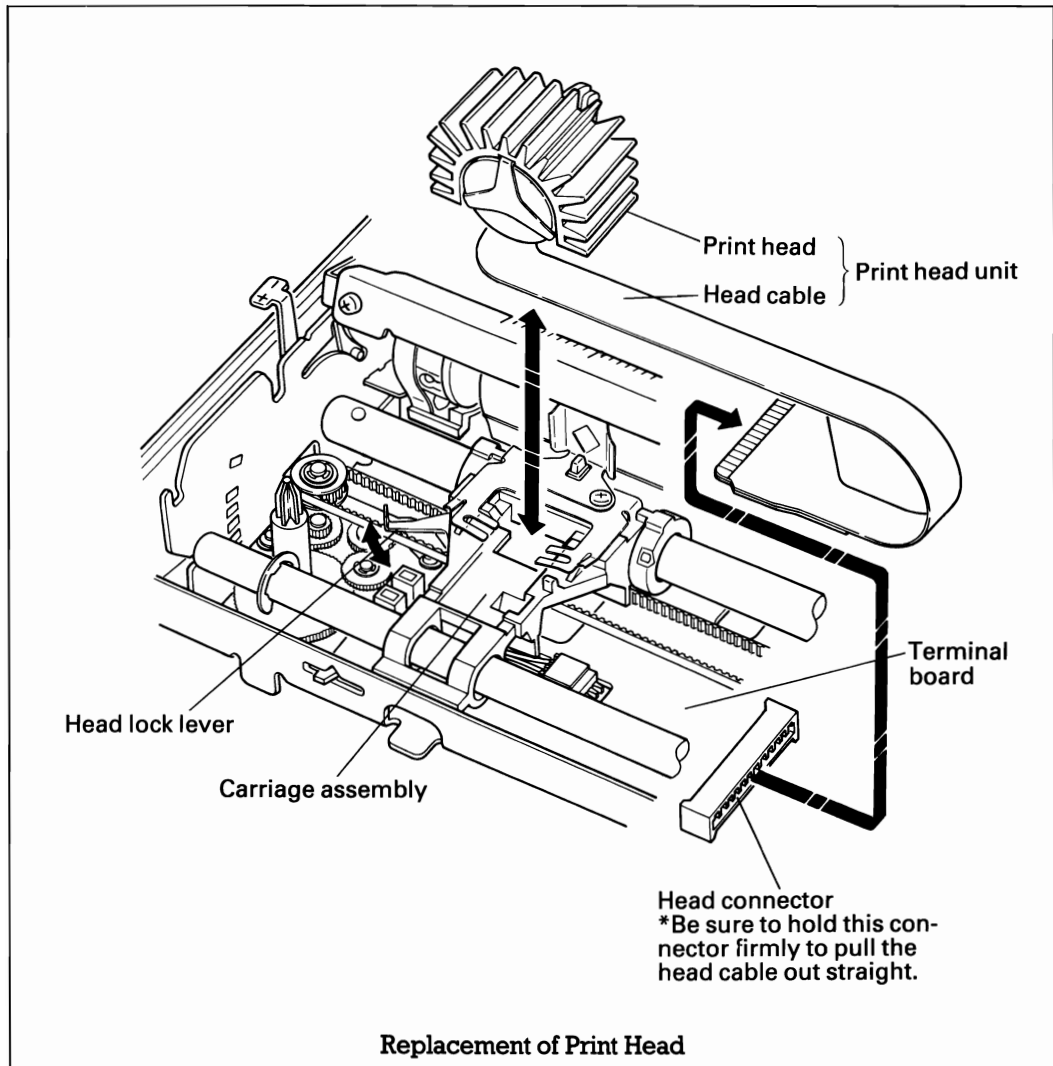
APPENDIXES

A. Specifications

(1)	PRINT METHOD	: Impact dot matrix
(2)	PRINT SPEED	: 160 CPS
(3)	PRINT DIRECTION	: Bidirectional with logic seeking in the text mode Unidirectional in the bit image mode, Superscript/subscript mode, or when programmed.
(4)	NUMBER OF PINS IN HEAD	: 9
(5)	LINE SPACING	: 1/6″ or programmable
(6)	PRINTING CHARACTERISTICS	
	Matrix	: 11×9
	Character Set	: ASCII 96 Characters, 9 International Character Sets and 96 Italic Characters
(7)	CHARACTER SIZE	
		: 2.1 mm (W)×3.1 mm (H) (Normal)
		: 1.05 mm (W)×3.1 mm (H) (Normal Condensed)
		: 4.2 mm (W)×3.1 mm (H) (Normal Enlarged)
		: 1.4 mm (W)×3.1 mm (H) (Elite)
		: 2.8 mm (W)×3.1 mm (H) (Elite Enlarged)
		: 2.1 mm (W)×1.6 mm (H) (Super/Subscript)
(8)	COLUMN WIDTH	Selectable by DIP SW, or programmable

Maximum characters per line

Normal/Emphasized	:	80
Enlarged	:	40
Condensed	:	137
Condensed Enlarge	:	68
Elite	:	96
Elite Enlarged	:	48

(9) MEDIA HANDLING

	Paper Width	Paper Feed
Fanfold Paper	: 9.5″ to 10″ 4″ to 9″	Adjustable sprocket pin feed Tractor Feed with optional tractor unit
Cut Sheet	: 7.25″ to 8.5″	Friction Feed
Roll Paper	: 8.5″	Friction Feed with optional roll paper holder
Copies	: One original plus two carbon copies—total thickness not to exceed 0.3 mm (0.012″)	
Paper Path	: Rear	

(10) INTERFACES
  Standard   : Centronics-style 8-bit Parallel
  Optional   : RS-232C, IEEE 488, etc.
(11) INK RIBBON
  Color   : Black
  Type   : Exclusive cartridge
  Life Expectancy   : 3 million characters
(12) MTBF   : 5×10^6 lines (excluding print head)
(13) ENVIRONMENTAL CONDITIONS
  Operating Temperature : 5 to 35°C (41 to 95°F)
  Operating Humidity : 10 to 80% (No condensation)
(14) POWER REQUIREMENT
  Voltage   : AC 120V ±10%
            AC 220/240V ±10%
  Frequency   : 49.5 to 60.5 Hz
  Power Consumption : 70 VA maximum
(15) PHYSICAL CHARACTERISTICS
  Height   : 100 mm
  Width   : 420 mm without Paper Feed knob
  Depth   : 347 mm
  Weight   : 7.5 kg

Specifications subject to change without notice.

B. Mounting and Dismounting the Tractor Unit

EPSON provides the Tractor Unit as an option. With the Tractor Unit, the printer can accommodate Pin-feed Paper from 4″ to 9″ in width. To install the Tractor Unit, follow the procedure listed below.

1. Open the printer cover and pull the scale out to detach it from the platen.
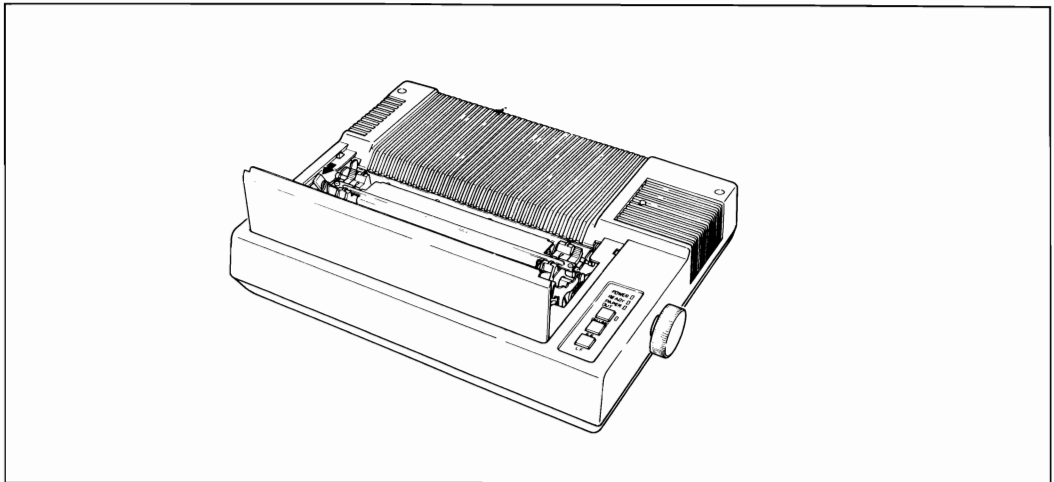
2. Slide both sprockets outward to the sides, and lock the sprocket lock levers.
3. Hook the notches of the tractor frames onto the shaft while pushing the lock lever of the tractor unit.
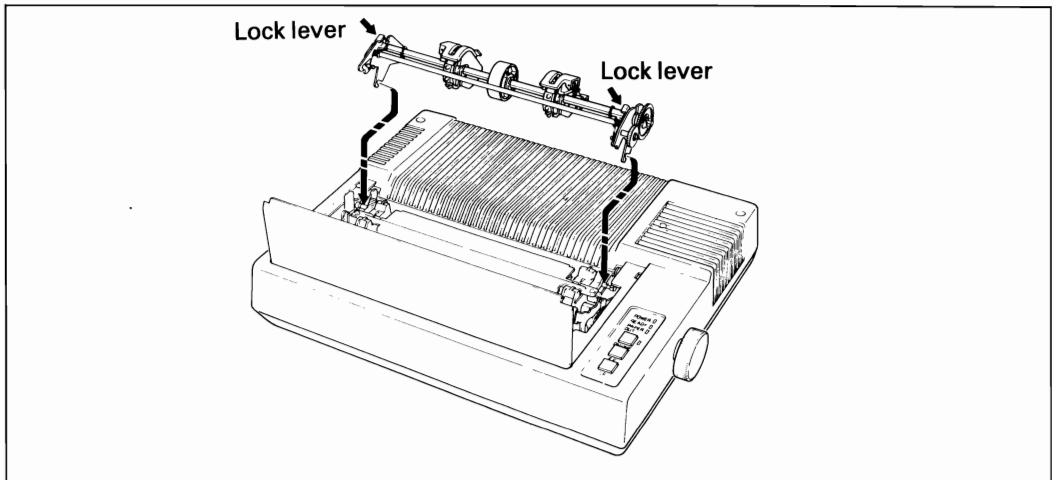
4. Detach the hands from the lock lever and confirm that Tractor Unit is installed correctly.

<Paper Loading>
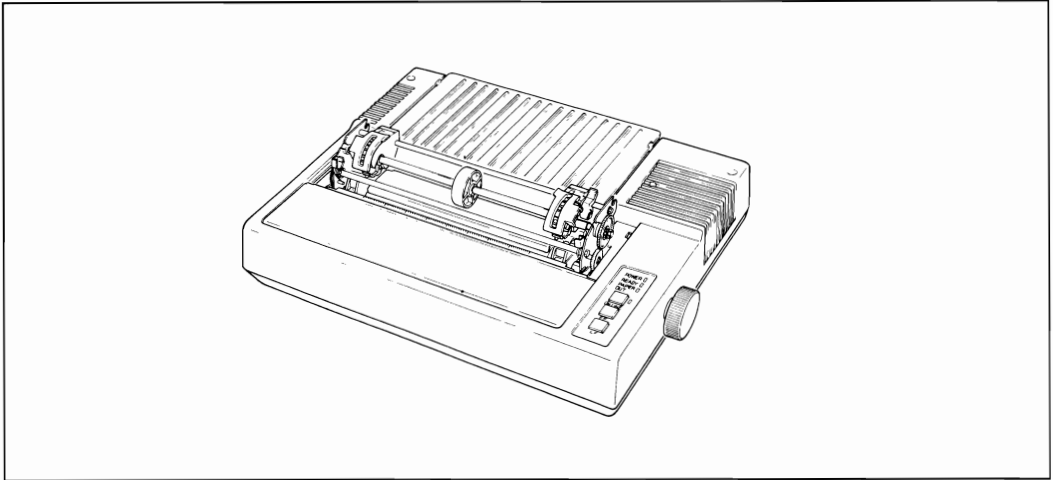
To load pin-feed paper, take the following steps.
1. Widen the feeding pins max. position and open the paper holding covers.
2. Raise the printer cover.
3. Pull the scale toward the front of the printer to detach it from the platen.
4. Unlock the release lever.
5. Set the paper guide roller at the center of the sprocket shaft. This contributes to smooth paper feeding.

Paper holding covers

Printer cover
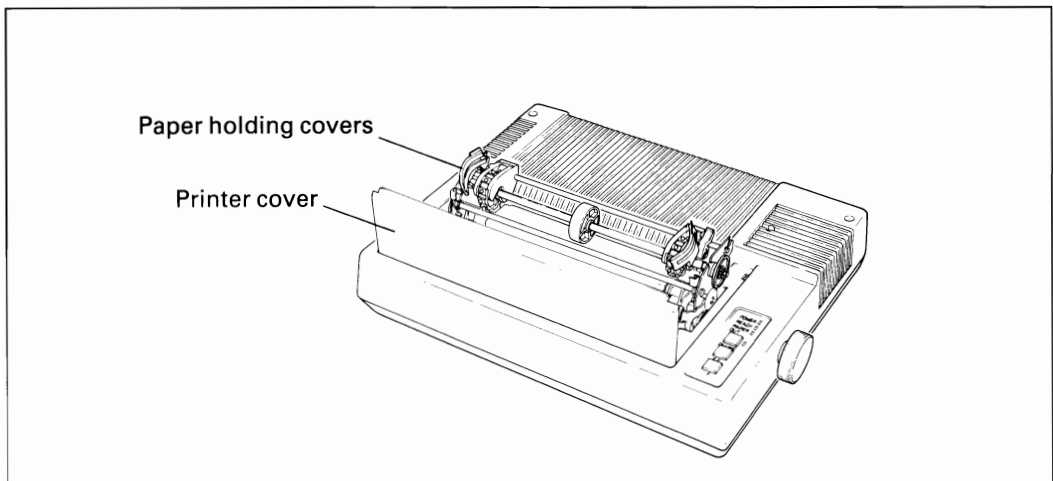
6. Insert the pin-feed paper folded in half as shown below. This way it can be inserted more smoothly inserted.
7. Engage the paper feed holes of the paper on the feeding pins, push the scale back into position, and adjust the tension of the paper. Then push the paper holding covers.
8. Lock the release lever.
9. Advance the paper while turning the manual paper feed knob clockwise.
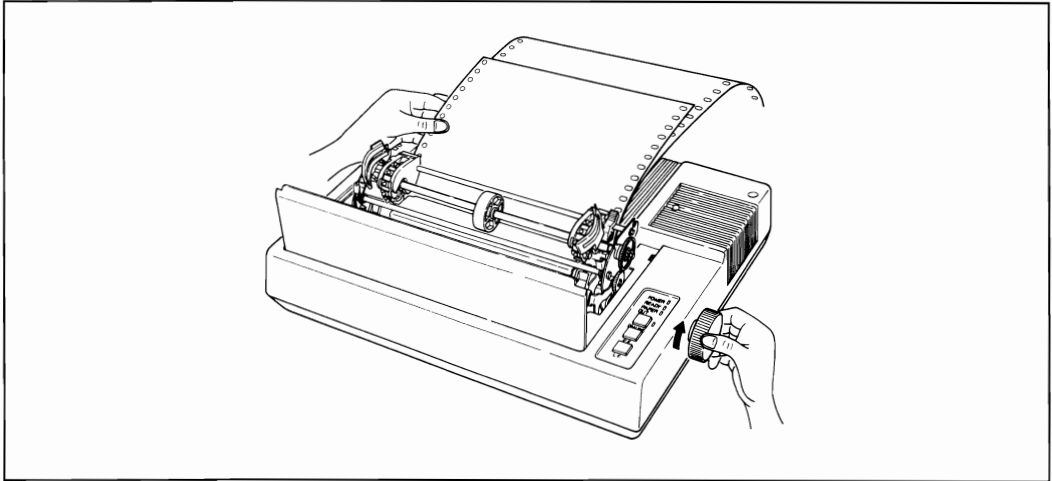
10. Set the tractor unit cover and separator on the printer.
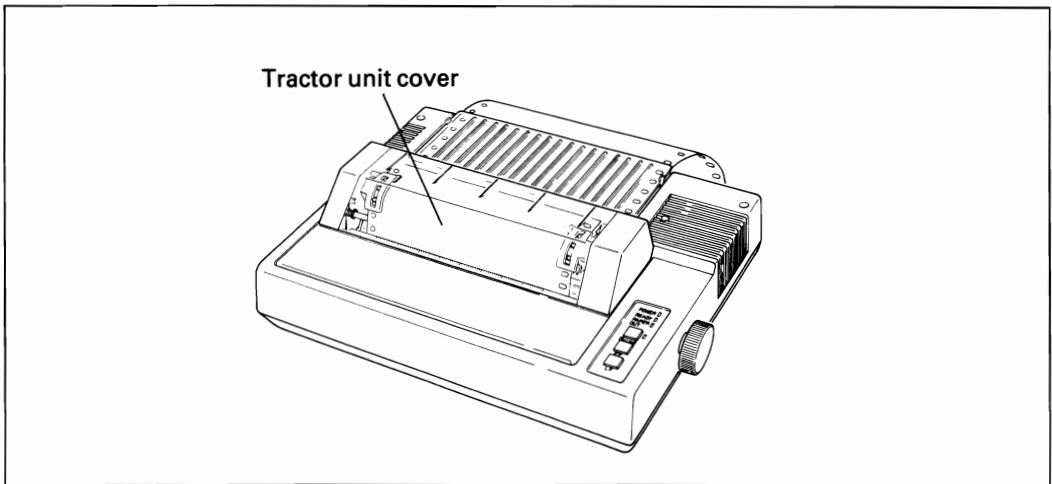
Tractor unit cover

NOTE:
When using the optional tractor unit, set the left margin (e.g., set the left margin so that printing will begin consistently from the 5th column).
The valid print colunm width with tractor uint is 75 characters in normal mode.

C. Parallel Interface

The FX-80 includes as standard equipment a parallel interface, which is described below.

(1) Specifications
(a) Synchronization: By externally supplied $\overline{\text{STROBE}}$ pulses.
(b) Handshaking: By $\overline{\text{ACKNLG}}$ or BUSY signals.
(c) Logic level: Input data and all interface control signals are compatible with the TTL level.

(2) Connector
Plug: 57-30360 (AMPHENOL)
It is recommended that interface cables be kept as short as possible.

(3) Connector pin assignment and descriptions of signals.
Connector pin assignment and descriptions of respective interface signals are provided in Table C-1.

Table C-1   Connector Pin Assignment and Descriptions of Interface Signals

Signal Pin No.	Return Pin No.	Signal	Direction	Description
1	19	$\overline{\text{STROBE}}$	In	$\overline{\text{STROBE}}$ pulse to read data in. Pulse width must be more than 0.5 μs at receiving terminal.
2	20	DATA 1	In	These signals represent information of the 1st to 8th bits of parallel data respectively. Each signal is at "HIGH" level when data is logical "1" and "LOW" when logical "0".
3	21	DATA 2	In	
4	22	DATA 3	In	
5	23	DATA 4	In	
6	24	DATA 5	In	
7	25	DATA 6	In	
8	26	DATA 7	In	
9	27	DATA 8	In	
10	28	$\overline{\text{ACKNLG}}$	Out	Approx. 12 μs pulse. "LOW" indicates that data has been received and that the printer is ready to accept other data.
11	29	BUSY	Out	A "HIGH" signal indicates that the printer cannot receive data. The signal becomes "HIGH" in the following cases: 1. During data entry 2. During printing operation 3. In OFF-LINE state 4. During printer error status.

Signal Pin No.	Return Pin No.	Signal	Direction	Description
12	30	PE	Out	A "HIGH" signal indicates that the printer is out of paper.
13	—	—	—	Pulled up to +5V through 3.3 kΩ resistance
14	—	AUTO FEED XT	In	With this signal being at "LOW" level, the paper is automatically fed one line after printing. (The signal level can be fixed to "LOW" with DIP SW pin 2-4 provided on the control circuit board.)
15	—	NC	—	Not used.
16	—	0V	—	Logic GND level.
17	—	CHASSIS GND	—	Printer chassis GND. In the printer, the chassis GND and the logic GND are isolated from each other.
18	—	NC	—	Not used.
19 to 30	—	GND	—	TWISTED-PAIR RETURN signal GND level.
31	—	INIT	In	When the level of this signal becomes "LOW", the printer controller is reset to its initial state and the print buffer is cleared. This signal is normally at "HIGH" level, and its pulse width must be more than 50 μs at the receiving terminal.
32	—	ERROR	Out	The level of this signal becomes "LOW" when the printer is in— 1. PAPER END state 2. OFF-LINE state 3. Error state
33	—	GND	—	Same as with Pin Nos. 19 to 30.
34	—	NC	—	Not used.
35	—	—	—	Pulled up to +5V through 3.3 kΩ resistance.
36	—	SLCT IN	In	The DC1/DC3 code is only valid when this signal is "HIGH" level. (Internal fixing can be carried out with DIP SW pin 2-1. The level of this signal is factory-set to "LOW".)

NOTES:

1. "Direction" refers to the direction of signal flow as viewed from the printer.
2. "Return" denotes "TWISTED PAIR RETURN" and is to be connected at signal ground level.
   As to the wiring for the interface, be sure to use a twisted-pair cable for each signal and never fail to complete connection on the Return side. To prevent noise effectively, these cables should be shielded and connected to the chassis of the host computer and the printer, respectively.
3. All interface conditions are based on TTL level. Both the rise and fall times of each signal must be less than 0.2 μs.
4. Data transfer must not be carried out by ignoring the $\overline{ACKNLG}$ or BUSY signal. (Data transfer to this printer can be carried out only after confirming the $\overline{ACKNLG}$ signal or when the level of the BUSY signal is "LOW".)
5. Under normal conditions, printer cable pins 11, 12 and 32 are activated when out of paper is detected.
   ESC 8 code disable pins 11 and 32 from the PE (Paper-End) signal, but it does not disable pin 12.
   Although most computers do not monitor pin 12, those which do (e.g. TRS-80) will halt printing when the paper is out. Therefore, ESC 8 code is ineffective with these computers.

(4) Data transfer sequence

The figure below shows the sequence for data transmission.

Parallel Interface Timing
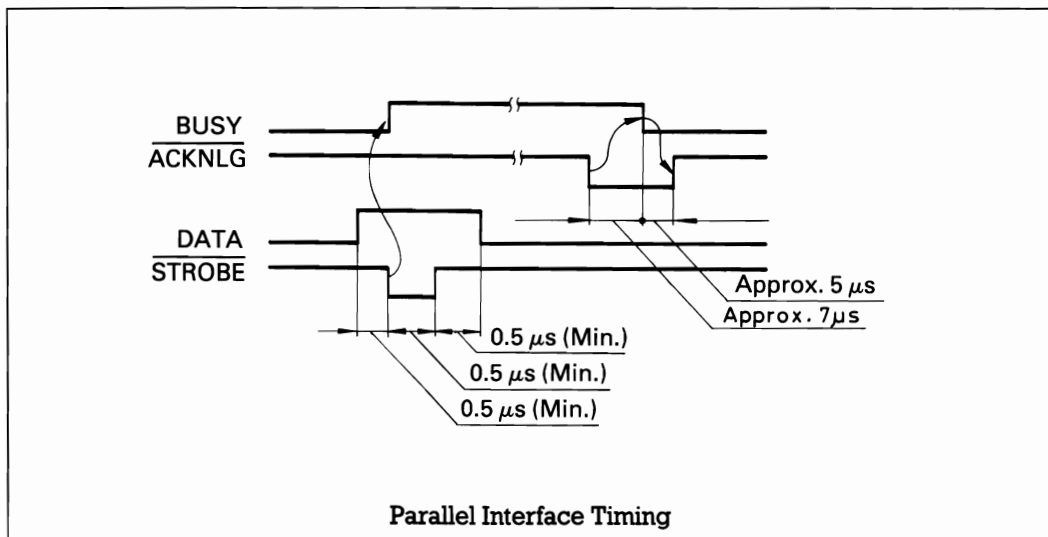
D. Control Circuit Diagram

The control circuit diagram is as shown below.

MASTER CPU
7811
(ROM 4K)

ALE

ADDRESS
LATCH

ROM 8K

RAM 4K

SW 1

SLAVE CPU
8042
(ROM 2K)

CR
MOTOR

ADDRESS / DATA BUS

CONTOROL BUS

SW 2

PC 4
PC 5

M-3510
PRINTER
MECHANISM

T0
T1

HOME
MTS

DRIVER

PRINT
HEAD

DRIVER

LF
MOTOR

I / O

SWITCHES INDICATORS

PARALLEL

SERIAL

HOST COMPUTER
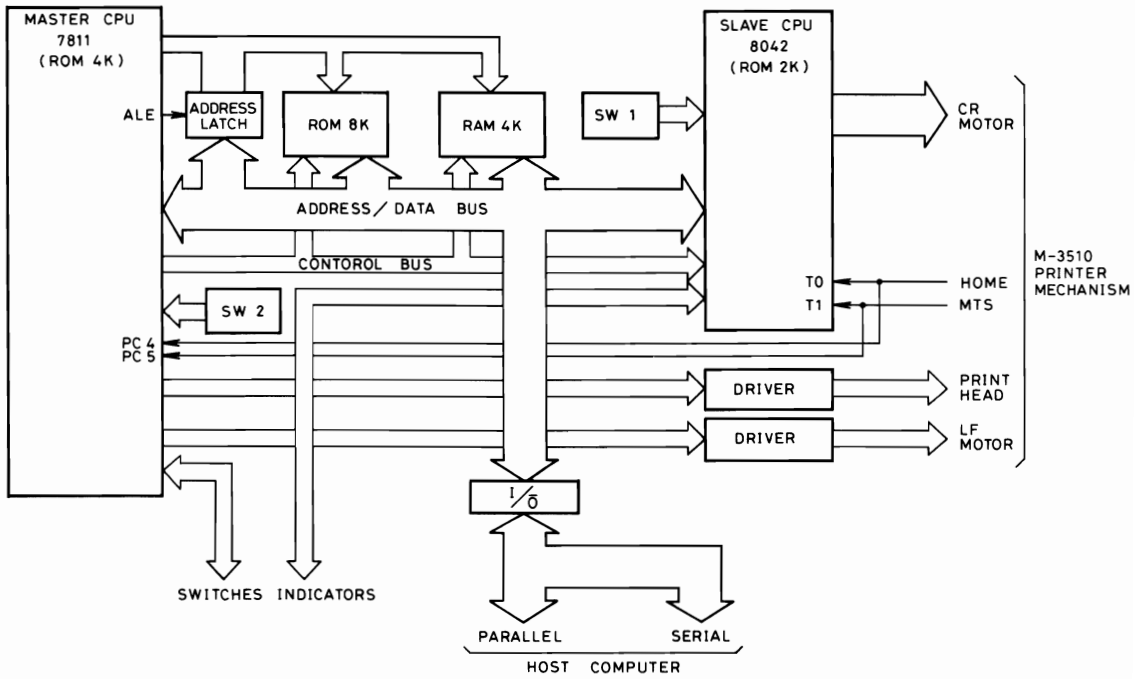
E. Mixed Use of Printing Modes

In the Table below, ○ denotes that mixed print mode is available.

Mode Pitch	En-larged	Empha-sized	Super/Sub-script	Con-densed	Dou-bled	Under lined	Propor-tional	Italic	Uni-direc-tional
Pica-sized	○	○	○	○	○	○	○	○	○
Elite-sized	○	×	○	×	○	○	×	○	○

Please note that the above are subject to the following conditions.

- × indicates that pitch takes priority and mixed print mode is not available.

- Emphasized characters are always printed in Proportional mode.

- Emphasized mode takes priority over Condensed mode.

- Characters are always double-striked in Superscript/Subscript mode.

- Proportional mode takes priority over Superscript/Subscript mode. (Therefore, superscript/subscript characters cannot be printed in Proportional mode.)

F. Character Code Tables

(Normal Mode)

1. U.S.A

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0 (0000)	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	Ø 176	@ 192	P 208	` 224	p 240
1 (0001)	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 (0010)	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 (0011)	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4 (0100)	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5 (0101)	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 (0110)	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 (0111)	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8 (1000)	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9 (1001)	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A (1010)	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B (1011)	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C (1100)	FF 12	28	, 44	< 60	L 76	\ 92	l 108		124	FF 140	156	, 172	< 188	L 204	\ 220	l 236		252
D (1101)	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E (1110)	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F (1111)	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	223	o 239	DEL 255

2. FRANCE

Hex No. / Binary	0 / 0000	1 / 0001	2 / 0010	3 / 0011	4 / 0100	5 / 0101	6 / 0110	7 / 0111	8 / 1000	9 / 1001	A / 1010	B / 1011	C / 1100	D / 1101	E / 1110	F / 1111
0 / 0000	(0)	(16)	SP (32)	0 (48)	à (64)	P (80)	` (96)	p (112)	(128)	DC1 (144)	SP (160)	0 (176)	â (192)	P (208)	` (224)	p (240)
1 / 0001	(1)	DC1 (17)	! (33)	1 (49)	A (65)	Q (81)	a (97)	q (113)	(129)	(145)	! (161)	1 (177)	A (193)	Q (209)	a (225)	q (241)
2 / 0010	(2)	DC2 (18)	" (34)	2 (50)	B (66)	R (82)	b (98)	r (114)	(130)	DC2 (146)	" (162)	2 (178)	B (194)	R (210)	b (226)	r (242)
3 / 0011	(3)	DC3 (19)	# (35)	3 (51)	C (67)	S (83)	c (99)	s (115)	(131)	DC3 (147)	# (163)	3 (179)	C (195)	S (211)	c (227)	s (243)
4 / 0100	(4)	DC4 (20)	$ (36)	4 (52)	D (68)	T (84)	d (100)	t (116)	(132)	DC4 (148)	$ (164)	4 (180)	D (196)	T (212)	d (228)	t (244)
5 / 0101	(5)	(21)	% (37)	5 (53)	E (69)	U (85)	e (101)	u (117)	(133)	(149)	% (165)	5 (181)	E (197)	U (213)	e (229)	u (245)
6 / 0110	(6)	(22)	& (38)	6 (54)	F (70)	V (86)	f (102)	v (118)	(134)	(150)	& (166)	6 (182)	F (198)	V (214)	f (230)	v (246)
7 / 0111	BEL (7)	CAN (23)	' (39)	7 (55)	G (71)	W (87)	g (103)	w (119)	BEL (135)	CAN (151)	' (167)	7 (183)	G (199)	W (215)	g (231)	w (247)
8 / 1000	BS (8)	(24)	((40)	8 (56)	H (72)	X (88)	h (104)	x (120)	BS (136)	(152)	((168)	8 (184)	H (200)	X (216)	h (232)	x (248)
9 / 1001	HT (9)	(25)	) (41)	9 (57)	I (73)	Y (89)	i (105)	y (121)	HT (137)	(153)	) (169)	9 (185)	I (201)	Y (217)	i (233)	y (249)
A / 1010	LF (10)	ESC (26)	* (42)	: (58)	J (74)	Z (90)	j (106)	z (122)	LF (138)	ESC (154)	* (170)	: (186)	J (202)	Z (218)	j (234)	z (250)
B / 1011	VT (11)	(27)	+ (43)	; (59)	K (75)	° (91)	k (107)	é (123)	VT (139)	(155)	+ (171)	; (187)	K (203)	° (219)	k (235)	é (251)
C / 1100	FF (12)	(28)	, (44)	< (60)	L (76)	ç (92)	l (108)	ù (124)	FF (140)	(156)	, (172)	< (188)	L (204)	ç (220)	l (236)	ù (252)
D / 1101	CR (13)	(29)	- (45)	= (61)	M (77)	§ (93)	m (109)	è (125)	CR (141)	(157)	- (173)	= (189)	M (205)	§ (221)	m (237)	è (253)
E / 1110	SO (14)	(30)	. (46)	> (62)	N (78)	^ (94)	n (110)	¨ (126)	SO (142)	(158)	. (174)	> (190)	N (206)	^ (222)	n (238)	¨ (254)
F / 1111	SI (15)	(31)	/ (47)	? (63)	O (79)	_ (95)	o (111)	DEL (127)	SI (143)	(159)	/ (175)	? (191)	O (207)	_ (223)	o (239)	DEL (255)

Hex No.	Binary No.	0 (0000)	1 (0001)	2 (0010)	3 (0011)	4 (0100)	5 (0101)	6 (0110)	7 (0111)	8 (1000)	9 (1001)	A (1010)	B (1011)	C (1100)	D (1101)	E (1110)	F (1111)
0	0000	0	16	SP 32	0 48	§ 64	P 80	` 96	p 112	128	144	SP 160	Ø 176	§ 192	P 208	` 224	p 240
1	0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2	0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3	0011	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4	0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5	0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6	0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7	0111	BEL 7	CAN 23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8	1000	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9	1001	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A	1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B	1011	VT 11	ESC 27	+ 43	; 59	K 75	Ä 91	k 107	ä 123	VT 139	ESC 155	+ 171	; 187	K 203	Ä 219	k 235	ä 251
C	1100	FF 12	28	, 44	< 60	L 76	Ö 92	l 108	ö 124	FF 140	156	, 172	< 188	L 204	Ö 220	l 236	ö 252
D	1101	CR 13	29	- 45	= 61	M 77	Ü 93	m 109	ü 125	CR 141	157	- 173	= 189	M 205	Ü 221	m 237	ü 253
E	1110	SO 14	30	. 46	> 62	N 78	^ 94	n 110	ß 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	ß 254
F	1111	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

4. ENGLAND

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0 / 0000	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	Ø 176	@ 192	P 208	224	p 240
1 / 0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 / 0010	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 / 0011	3	DC3 19	£ 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	£ 163	3 179	C 195	S 211	c 227	s 243
4 / 0100	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5 / 0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 / 0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 / 0111	BEL 7	CAN 23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	CAN 151	' 167	7 183	G 199	W 215	g 231	w 247
8 / 1000	BS 8	24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	152	(168	8 184	H 200	X 216	h 232	x 248
9 / 1001	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A / 1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B / 1011	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C / 1100	FF 12	28	, 44	< 60	L 76	/ 92	l 108		124	FF 140	156	, 172	< 188	L 204	/ 220	l 236		252
D / 1101	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E / 1110	SO 14	30	. 46	^ 62	N 78	^ 94	n 110	126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F / 1111	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

F-4

Hex No.	Binary No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	(0)	(16)	SP (32)	0 (48)	@ (64)	P (80)	` (96)	p (112)	(128)	(144)	SP (160)	0 (176)	@ (192)	P (208)	` (224)	p (240)
1	0001	(1)	DC1 (17)	! (33)	1 (49)	A (65)	Q (81)	a (97)	q (113)	(129)	DC1 (145)	¡ (161)	1 (177)	A (193)	Q (209)	a (225)	q (241)
2	0010	(2)	DC2 (18)	" (34)	2 (50)	B (66)	R (82)	b (98)	r (114)	(130)	DC2 (146)	" (162)	2 (178)	B (194)	R (210)	b (226)	r (242)
3	0011	(3)	DC3 (19)	# (35)	3 (51)	C (67)	S (83)	c (99)	s (115)	(131)	DC3 (147)	# (163)	3 (179)	C (195)	S (211)	c (227)	s (243)
4	0100	(4)	DC4 (20)	$ (36)	4 (52)	D (68)	T (84)	d (100)	t (116)	(132)	DC4 (148)	$ (164)	4 (180)	D (196)	T (212)	d (228)	t (244)
5	0101	(5)	(21)	% (37)	5 (53)	E (69)	U (85)	e (101)	u (117)	(133)	(149)	% (165)	5 (181)	E (197)	U (213)	e (229)	u (245)
6	0110	(6)	(22)	& (38)	6 (54)	F (70)	V (86)	f (102)	v (118)	(134)	(150)	& (166)	6 (182)	F (198)	V (214)	f (230)	v (246)
7	0111	BEL (7)	(23)	' (39)	7 (55)	G (71)	W (87)	g (103)	w (119)	BEL (135)	(151)	' (167)	7 (183)	G (199)	W (215)	g (231)	w (247)
8	1000	BS (8)	CAN (24)	((40)	8 (56)	H (72)	X (88)	h (104)	x (120)	BS (136)	CAN (152)	((168)	8 (184)	H (200)	X (216)	h (232)	x (248)
9	1001	HT (9)	(25)	) (41)	9 (57)	I (73)	Y (89)	i (105)	y (121)	HT (137)	(153)	) (169)	9 (185)	I (201)	Y (217)	i (233)	y (249)
A	1010	LF (10)	(26)	* (42)	: (58)	J (74)	Z (90)	j (106)	z (122)	LF (138)	(154)	* (170)	: (186)	J (202)	Z (218)	j (234)	z (250)
B	1011	VT (11)	ESC (27)	+ (43)	; (59)	K (75)	Æ (91)	k (107)	æ (123)	VT (139)	ESC (155)	+ (171)	; (187)	K (203)	Æ (219)	k (235)	æ (251)
C	1100	FF (12)	(28)	, (44)	< (60)	L (76)	Ø (92)	l (108)	ø (124)	FF (140)	(156)	, (172)	< (188)	L (204)	Ø (220)	l (236)	ø (252)
D	1101	CR (13)	(29)	- (45)	= (61)	M (77)	Å (93)	m (109)	å (125)	CR (141)	(157)	- (173)	= (189)	M (205)	Å (221)	m (237)	å (253)
E	1110	SO (14)	(30)	. (46)	> (62)	N (78)	^ (94)	n (110)	ü (126)	SO (142)	(158)	. (174)	> (190)	N (206)	^ (222)	n (238)	ü (254)
F	1111	SI (15)	(31)	/ (47)	? (63)	O (79)	_ (95)	o (111)	DEL (127)	SI (143)	(159)	/ (175)	? (191)	O (207)	_ (223)	o (239)	DEL (255)

6. SWEDEN

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0 (0000)	0	16	SP 32	0 48	É 64	P 80	é 96	p 112	128	144	SP 160	0 176	É 192	P 208	é 224	p 240
1 (0001)	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 (0010)	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 (0011)	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4 (0100)	4	DC4 20	¤ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	¤ 164	4 180	D 196	T 212	d 228	t 244
5 (0101)	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 (0110)	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 (0111)	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8 (1000)	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9 (1001)	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A (1010)	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B (1011)	VT 11	ESC 27	+ 43	; 59	K 75	Ä 91	k 107	ä 123	VT 139	ESC 155	+ 171	; 187	K 203	Ä 219	k 235	ä 251
C (1100)	FF 12	28	, 44	< 60	L 76	Ö 92	l 108	ö 124	FF 140	156	, 172	< 188	L 204	Ö 220	l 236	ö 252
D (1101)	CR 13	29	- 45	= 61	M 77	Å 93	m 109	å 125	CR 141	157	- 173	= 189	M 205	Å 221	m 237	å 253
E (1110)	SO 14	30	. 46	> 62	N 78	Ü 94	n 110	ü 126	SO 142	158	. 174	> 190	N 206	Ü 222	n 238	ü 254
F (1111)	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

Hex No. →	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary No. →	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0 (0000)	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	0 176	@ 192	P 208	` 224	p 240
1 (0001)	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2 (0010)	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3 (0011)	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4 (0100)	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5 (0101)	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6 (0110)	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7 (0111)	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8 (1000)	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9 (1001)	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A (1010)	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B (1011)	VT 11	ESC 27	+ 43	; 59	K 75	° 91	k 107	à 123	VT 139	ESC 155	+ 171	; 187	K 203	° 219	k 235	à 251
C (1100)	FF 12	28	, 44	< 60	L 76	ç 92	l 108	ò 124	FF 140	156	, 172	< 188	L 204	ç 220	l 236	ò 252
D (1101)	CR 13	29	- 45	= 61	M 77	é 93	m 109	è 125	CR 141	157	- 173	= 189	M 205	é 221	m 237	è 253
E (1110)	SO 14	30	. 46	> 62	N 78	^ 94	n 110	ì 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	ì 254
F (1111)	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

8. SPAIN

Hex. No.		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Hex. No.	**Binary No.**	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	(0)	(16)	SP (32)	0 (48)	@ (64)	P (80)	` (96)	p (112)	(128)	(144)	SP (160)	0 (176)	@ (192)	P (208)	` (224)	p (240)
1	0001	(1)	DC1 (17)	! (33)	1 (49)	A (65)	Q (81)	a (97)	q (113)	(129)	DC1 (145)	! (161)	1 (177)	A (193)	Q (209)	a (225)	q (241)
2	0010	(2)	DC2 (18)	" (34)	2 (50)	B (66)	R (82)	b (98)	r (114)	(130)	DC2 (146)	" (162)	2 (178)	B (194)	R (210)	b (226)	r (242)
3	0011	(3)	DC3 (19)	Ft (35)	3 (51)	C (67)	S (83)	c (99)	s (115)	(131)	DC3 (147)	Ft (163)	3 (179)	C (195)	S (211)	c (227)	s (243)
4	0100	(4)	DC4 (20)	$ (36)	4 (52)	D (68)	T (84)	d (100)	t (116)	(132)	DC4 (148)	$ (164)	4 (180)	D (196)	T (212)	d (228)	t (244)
5	0101	(5)	(21)	% (37)	5 (53)	E (69)	U (85)	e (101)	u (117)	(133)	(149)	% (165)	5 (181)	E (197)	U (213)	e (229)	u (245)
6	0110	(6)	(22)	& (38)	6 (54)	F (70)	V (86)	f (102)	v (118)	(134)	(150)	& (166)	6 (182)	F (198)	V (214)	f (230)	v (246)
7	0111	BEL (7)	CAN (23)	' (39)	7 (55)	G (71)	W (87)	g (103)	w (119)	BEL (135)	CAN (151)	' (167)	7 (183)	G (199)	W (215)	g (231)	w (247)
8	1000	BS (8)	(24)	((40)	8 (56)	H (72)	X (88)	h (104)	x (120)	BS (136)	(152)	((168)	8 (184)	H (200)	X (216)	h (232)	x (248)
9	1001	HT (9)	(25)	) (41)	9 (57)	I (73)	Y (89)	i (105)	y (121)	HT (137)	(153)	) (169)	9 (185)	I (201)	Y (217)	i (233)	y (249)
A	1010	LF (10)	ESC (26)	* (42)	: (58)	J (74)	Z (90)	j (106)	z (122)	LF (138)	ESC (154)	* (170)	: (186)	J (202)	Z (218)	j (234)	z (250)
B	1011	VT (11)	(27)	+ (43)	; (59)	K (75)	— (91)	k (107)	: (123)	VT (139)	(155)	+ (171)	; (187)	K (203)	— (219)	k (235)	(251)
C	1100	FF (12)	(28)	, (44)	< (60)	L (76)	Ñ (92)	l (108)	Ñ (124)	FF (140)	(156)	, (172)	< (188)	L (204)	Ñ (220)	l (236)	(252)
D	1101	CR (13)	(29)	- (45)	= (61)	M (77)	¿ (93)	m (109)	(125)	CR (141)	(157)	- (173)	= (189)	M (205)	¿ (221)	m (237)	(253)
E	1110	SO (14)	(30)	. (46)	> (62)	N (78)	< (94)	n (110)	(126)	SO (142)	(158)	. (174)	> (190)	N (206)	< (222)	n (238)	(254)
F	1111	SI (15)	(31)	/ (47)	? (63)	O (79)	_ (95)	o (111)	DEL (127)	SI (143)	(159)	/ (175)	? (191)	O (207)	_ (223)	o (239)	DEL (255)

9. JAPAN

Hex. No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Binary No.	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	144	SP 160	0 176	@ 192	P 208	` 224	p 240
1	1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
2	2	DC2 18	" 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
3	3	DC3 19	# 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
4	4	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	$ 164	4 180	D 196	T 212	d 228	t 244
5	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	% 165	5 181	E 197	U 213	e 229	u 245
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	& 166	6 182	F 198	V 214	f 230	v 246
7	BEL 7	23	' 39	7 55	G 71	W 87	g 103	w 119	BEL 135	151	' 167	7 183	G 199	W 215	g 231	w 247
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
9	HT 9	25	) 41	9 57	I 73	Y 89	i 105	y 121	HT 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
A	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	LF 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
B	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
C	FF 12	28	, 44	< 60	L 76	¥ 92	l 108	| 124	FF 140	156	, 172	< 188	L 204	¥ 220	l 236	| 252
D	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	CR 141	157	- 173	= 189	M 205	] 221	m 237	} 253
E	SO 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	SO 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F	SI 15	31	/ 47	? 63	O 79	_ 95	o 111	DEL 127	SI 143	159	/ 175	? 191	O 207	_ 223	o 239	DEL 255

G. Character Fonts

NOTE: Numbers represent Decimal code.

88 89 90 91 92 93 94 95

96 97 98 99 100 101 102 103

104 105 106 107 108 109 110 111

112 113 114 115 116 117 118 119

120 121 122 123 124 125 126

127

160 161 162 163 164 165 166 167

168 169 170 171 172 173 174 175

176 177 178 179 180 181 182 183

184 185 186 187 188 189 190 191

192 193 194 195 196 197 198 199

200 201 202 203 204 205 206 207

208 209 210 211 212 213 214 215

216 217 218 219 220 221 222 223

224 225 226 227 228 229 230 231

232 233 234 235 236 237 238 239

240 241 242 243 244 245 246 247

248 249 250 251 252 253 254 255

Country	Character patterns
France	64, 91, 92, 93, 123, 124, 125, 126
Germany	64, 91, 92, 93, 123, 124, 125, 126
England	35
Denmark	91, 92, 93, 123, 124, 125
Sweden	36, 64, 91, 92, 93, 94, 96, 123
	124, 125, 126
Italy	91, 93, 96, 123, 124, 125, 126

Sweden — 164, 192, 219, 220, 221, 222, 224, 251, 252, 253, 254

Italy — 219, 221, 224, 251, 252, 253, 254

Spain — 163, 219, 220, 221, 251, 252

Japan — 220

H. Control Codes Summary

Print mode   Ref. page

SO	Sets Enlarged mode.	3-13
SI	Sets Condensed mode.	3-14
DC2	Cancels Condensed mode.	3-16
DC4	Cancels Enlarged mode.	3-18
ESC SO	Sets Enlarged mode.	3-20
ESC SI	Sets Condensed mode.	3-20
ESC 4	Selects Alternate mode.	3-25
ESC 5	Deselects Alternate mode.	3-28
ESC !	Selects print mode.	3-32
ESC −	Sets or cancels Underlined mode.	3-55
ESC E	Sets Emphasized mode.	3-70
ESC F	Cancels Emphasized mode.	3-70
ESC G	Sets Double-strike mode.	3-71
ESC H	Cancels Double-strike mode.	3-71
ESC M	Selects Elite-sized mode.	3-84
ESC P	Selects Normal (Pica-sized) mode.	3-88
ESC S 0	Sets Superscript mode.	3-92
ESC S 1	Sets Subscript mode.	3-93
ESC T	Cancels Superscript or Subscript mode.	3-94
ESC W	Sets or cancels Enlarged mode.	3-96
ESC p	Sets or cancels Proportional spacing.	3-104

Bit image

ESC *	Selects 8-pin bit image mode.	3-49
ESC ∧	Selects 9-pin bit image mode.	3-53
ESC K	Sets Normal-density bit image mode. (480-dot, 8-pin)	3-75
ESC L	Sets Dual-density bit image mode. (960-dot, 8-pin)	3-81
ESC Y	Sets the Double-speed, dual-density bit image mode. (960-dot, 8-pin)	3-97
ESC Z	Sets Quadruple-density bit image mode. (1,920-dot, 8-pin)	3-99

Line spacing

Paper feed execution

Format control

Input data control

Input data control

Download character

Miscellaneous

Non-command sequence

NOTES:
1. *When the printer is connected to the TRS-80 computer, statements CHR$(0), CHR$(10), CHR$(11) and CHR$(12) are not applicable.*
2. *When using the printer connected to the APPLE II computer.*

   To select the printer..........PR#1
   To deselect the printer.......PR#0

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