

EPSON®

User's
Manual



AP-80 Printer

Digitized by cvxmelody

FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J or part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment.

All right reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, mechanical, photocopying, recording or otherwise, without the prior written permission of Epson America, Inc. No patent liability is assumed with respect to the use of the information contained herein. While every precaution has been taken in the preparation of this book, Epson America, Inc. assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

Apple and Applesoft are trademarks of Apple Computer, Inc.
Macintosh is a trademark of Macintosh Laboratory, Inc.

Copyright © 1985 by Epson America, Inc.
Torrance, California 90505

Y4510991030

CONTENTS

MAIN FEATURES	1
SPECIFICATIONS	2
SWITCHES AND LAMPS	4
PAPER LOADING	6
A. Cut Sheet Paper	6
B. Continuous Forms	10
C. Top of Page Setting	12
RIBBON INSTALLATION/REMOVAL	13
Installation	13
Removal	14
HEAD POSITION ADJUSTMENT	15
CONNECTING THE PRINTER TO MACINTOSH	16
CONNECTING THE PRINTER TO APPLE IIc	17
MARGIN SETTING BY SWITCHES	19
SELF TEST PRINTING FUNCTION	20
AUTOMATIC PRINTING FUNCTION	20
AUTOMATIC PAPER LOADING FUNCTION	20
HEXADECIMAL DUMP LIST FUNCTION	21
ERROR	21
CONTROL CODE EXPLANATIONS	22
• Print Command	22
• Line Feed	22
• Vertical Tab	23
• Form Feed	24
• Character Mode Designation	25
• Bold Print	29
• Double-Width Print	30
• High Quality Character	31
• Italic Character	32
• Superscript/Subscript Character	33
• Underlining	34
• Dot Spacing in Proportional	35
• Backspacing	36
• Horizontal Tab	37
• Margin Setting	39

● Printing Direction	40
● Character Repetition	40
● Line Feed Pitch	41
● Line Feed Direction	43
● VFU Vertical Tabs	44
● Using Vertical Tabs	48
● Vertical Tab Initialization	48
● Multiple Linefeeds	49
● TOF Setting	50
● Download Character	50
● Download Character Loading	51
● Download Character Printing	54
● Graphics	55
● Print Position	57
● Paper-Out Detector	58
● Cancel	58
● Software Reset	59
● LF Function	59
● CR Function	60
● Automatic Printing	60
● Data Length	61
● Zero Font	62
● Print Command	62
● Foreign Characters	63
● Automatic Paper Ejection	64
TROUBLESHOOTING	65
CAUTIONS FOR USE	66
APPENDIX A RS-232C Serial Interface	67
APPENDIX B Printing Specifications	73
APPENDIX C ASCII, Binary, and Hexadecimal Codes	74
APPENDIX D DIP Switches at the Back of the Printer	78
APPENDIX E Control Codes	80

MAIN FEATURES

The AP-80 matrix printer provides the following features:

1. Paper-out detection, automatic paper loading, left and right margin settings (via switches or commands), and automatic paper ejection.
2. Buzzer function
3. A variety of character fonts are possible including Near Letter Quality (N.L.Q.), Proportional, and Graphic printing.
4. Form feed function, provided by a switch or command.
5. Self Test printing
6. Automatic printing
7. Double-Width Character mode
8. Bold Character mode
9. Italic Cursive Character mode
10. Superscript/Subscript Character mode
11. Download function
12. Internal RAM error detection
13. Hexadecimal dump list function
14. 2K bytes communication buffer

SPECIFICATIONS

1. SPECIFICATIONS

- Dimensions W390 × H119 × D266 mm
- Weight Approximately 4.9 kg
- Temperature 5 ~ 35°C, during operation
- Humidity 20 ~ 80%, during operation (No condensation)
- Power Supply USA model: 117 VAC ± 10%
Europe model: 220-240 VAC ± 10%
- Power Consumption 30 watts (Self test printing)
15 watts (Stand-by)

2. PRINTING SPECIFICATIONS

- Print Method Impact Dot Matrix (Bi-directional Logic Seeking)
- Print Head 9 pins
- Character Category ASCII 120 characters
Download 175 characters maximum
- Graphic Printing 8 categories: 576, 640, 768, 856, 960, 1088, 1152, 1280
dot columns/line
- Print Mode Standard:
 - Extended 9 CPI
 - Pica 10 CPI
 - Elite 12 CPI
 - Semicondensed 13.4 CPI
 - Condensed 15 CPI
 - Ultracondensed 17 CPINear Letter Quality:
 - Extended 9 CPI
 - Pica 10 CPI
 - Elite 12 CPI8 categories of graphic printing

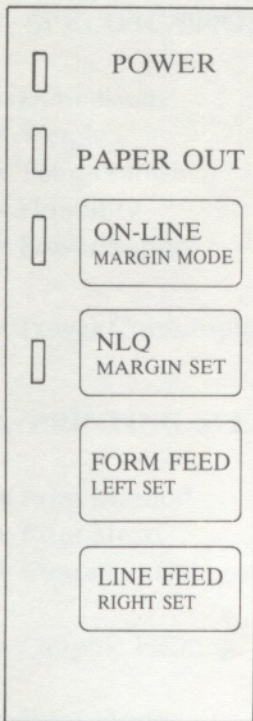
Mixing any of the above modes within a single line is possible.

In addition, this printer is capable of Bold, Double Width, Superscript/Subscript, Proportional, and Italic Character modes.

- Paper Feed Method Friction method
Tractor method
- Line Feed Pitch Minimum of 1/144 inch
- Line Feed Speed 6.7 lines/second (6 lines/inch)
10 lines/second (9 lines/inch)
(during continuous linefeed)

- **Printing Forms**
 - Paper width 4 inches – 10 inches
 - Paper thickness 15 lbs. to 20 lbs. in U.S.A.
(52 g/m² – 76 g/m²)
0.07 mm – 0.1 mm
- **Multiple Copies** Original plus 2, non-carbon, 40 g/m²
Total thickness of less than 0.2 mm
- **Ribbon** Cassette style, single color (Black)

SWITCHES AND LAMPS



A. **POWER switch**

This switch turns the printer ON and OFF.

B. **ON-LINE switch**

This toggle switch puts the printer into the ON-LINE state. In the ON-LINE state, the printer is capable of receiving and printing data. In the OFF-LINE state, a BUSY signal is output. The head moves to the home position when the printer goes from the OFF-LINE state to the ON-LINE state. When the printer goes from the ON-LINE state to the OFF-LINE state, data in the line buffer are printed.

C. **NLQ switch (Near Letter Quality)**

(Valid only while in the OFF-LINE state)

This toggle switch selects the Near Letter Quality or Standard mode.

If the Near Letter Quality mode is selected, the lamp is on. If the Standard mode is selected, the lamp is off.

D. **LINE FEED switch**

(Valid only while in the OFF-LINE state)

Each time this switch is pressed, a 1/6-inch line feed is performed.

E. **FORM FEED switch**

(Valid only while in the OFF-LINE state)

Pressing this switch results in a form feed. The length of each page is determined by a DIP switch or command.

F. **POWER lamp (green)**

Remains on while the power is on.

G. **ON-LINE lamp (green)**

Is on while in the ON-LINE state (capable of receiving data). Is off while in the OFF-LINE state. If in the margin set mode, it flickers every 0.3 seconds.

H. NLQ lamp (green)

Is on while in the Near Letter Quality mode. Is off while in the Standard mode.

I. PAPER OUT lamp (red)

Is on if paper out is detected; the printer then enters the OFF-LINE state and outputs a BUSY signal, and the buzzer sounds for 1 second. If paper is inserted and the ON-LINE switch is pressed, this state is terminated. While in the error state, the lamp flickers.

PAPER LOADING

A. Cut Sheet Paper

Remove the tractor unit when using friction feed for the cut sheet paper.

1. Open the printer cover.

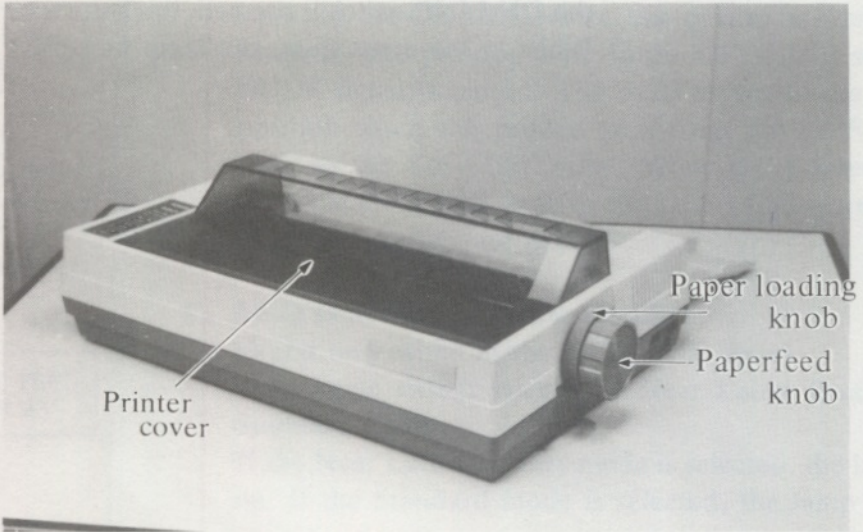


Fig. 1

2. Hold the paper rack upright and place it on the two supporters on both sides. Then insert the folding leg into the hole located on the top of the case.

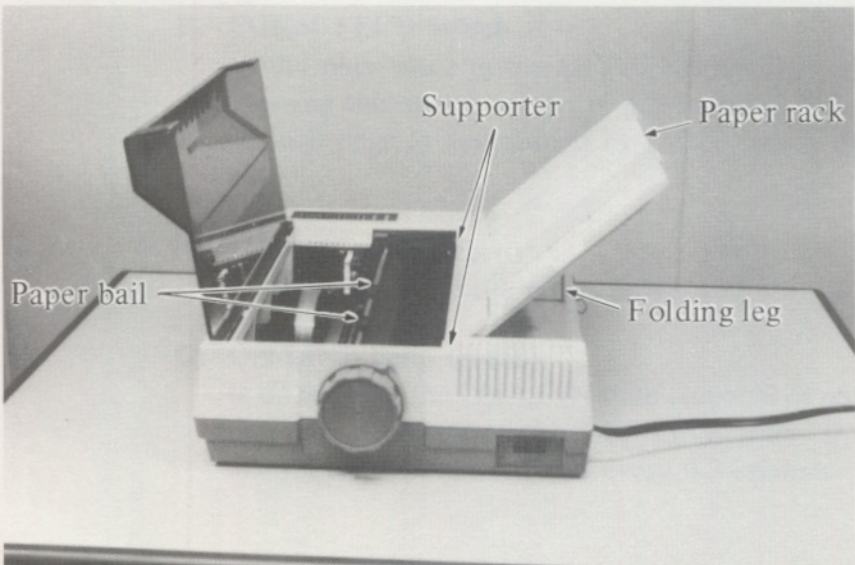


Fig. 2

3. Slide the right paper guide to the extreme right.
4. Position the cut sheet paper at the extreme left of the paper rack, as shown below.

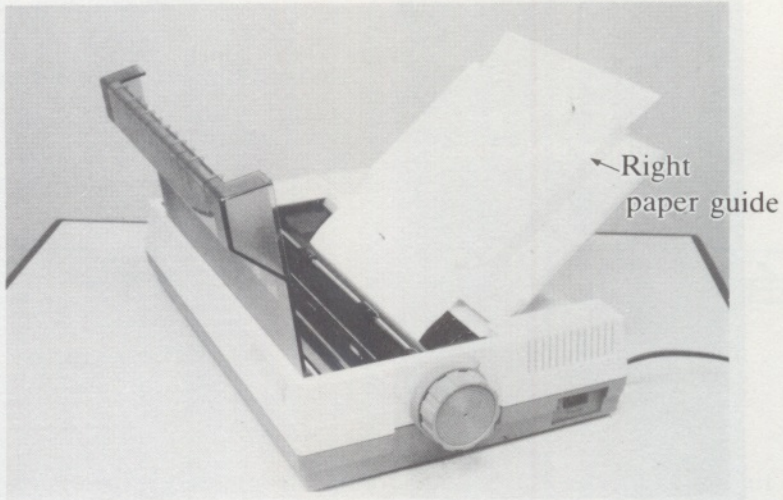


Fig. 3

5. Slide the right paper guide to the left to match the paper width.
6. Apply power to the printer.
7. The paper automatically advances to the TOF (top of form) position if the paper loading knob is turned counterclockwise.

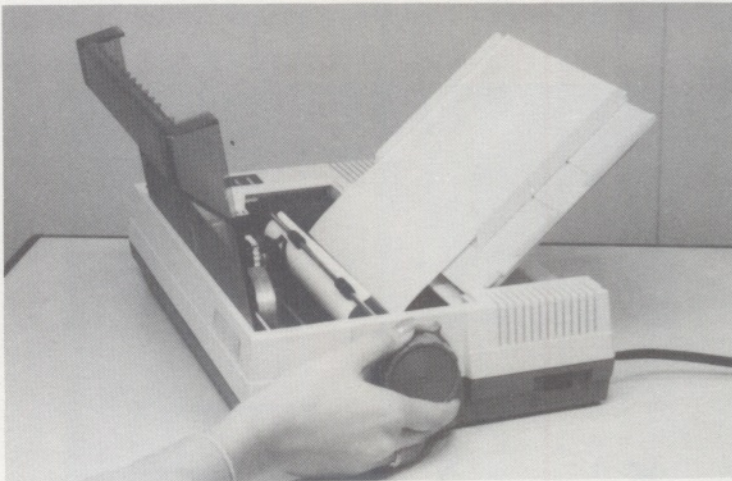


Fig. 4

8. Turn the paper loading knob clockwise to set the paper bail.
9. Close the printer cover.

NOTE 1: To shift the loaded paper to the right or to the left, remove the paper using the paperfeed knob and repeat the process beginning with step 3.

NOTE 2: If a cut sheet is positioned at the leftmost side of the paper rack, printing starts at a position one inch away from the left edge of a form.

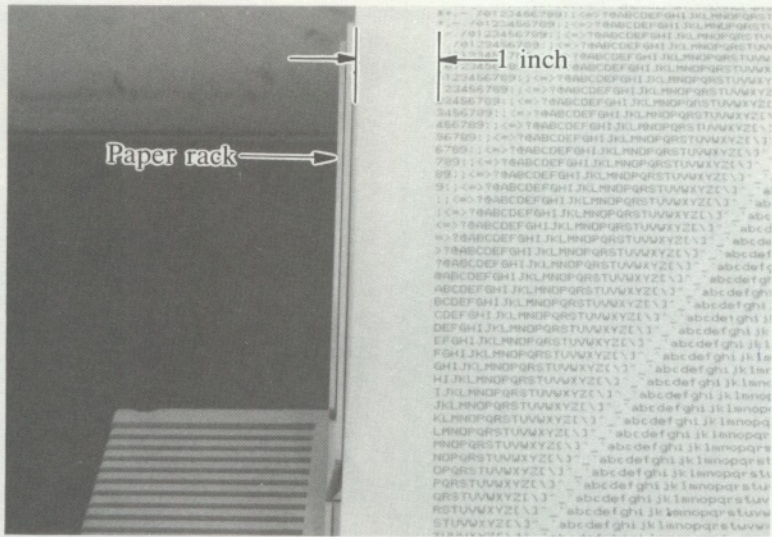


Fig. 5

NOTE 3: The position of the paper guide, which is installed at the leftmost end of the paper rack when shipped, can be adjusted by pulling it upwards and removing it from the paper rack. The user can then position it at any desired location.

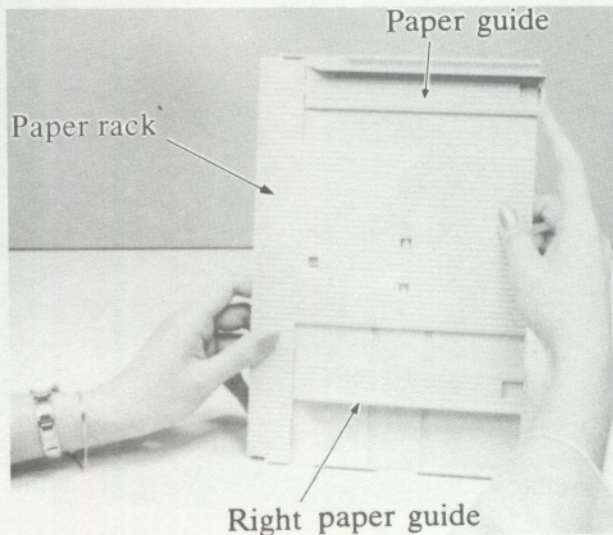
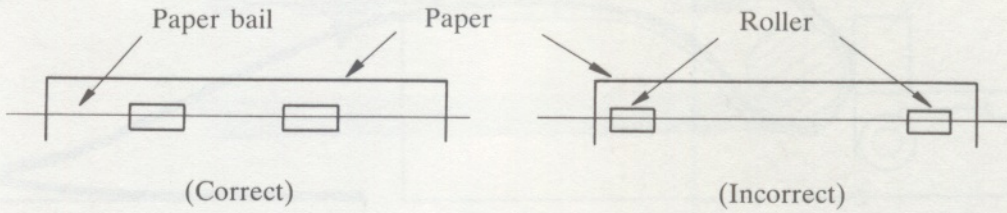


Fig. 6

NOTE 4: When using the paper loading knob to automatically set a form, the ribbon at the print head may be slightly raised. However, the user need not manually reset the ribbon because it automatically returns to its normal position before printing begins.

NOTE 5: Recommended roller position



Reference: The paper-out detection switch is located at a position about six centimeters away from the left edge of the platen. The left edge of a cut sheet should cover the switch to avoid the paper-out condition.

B. Continuous Forms

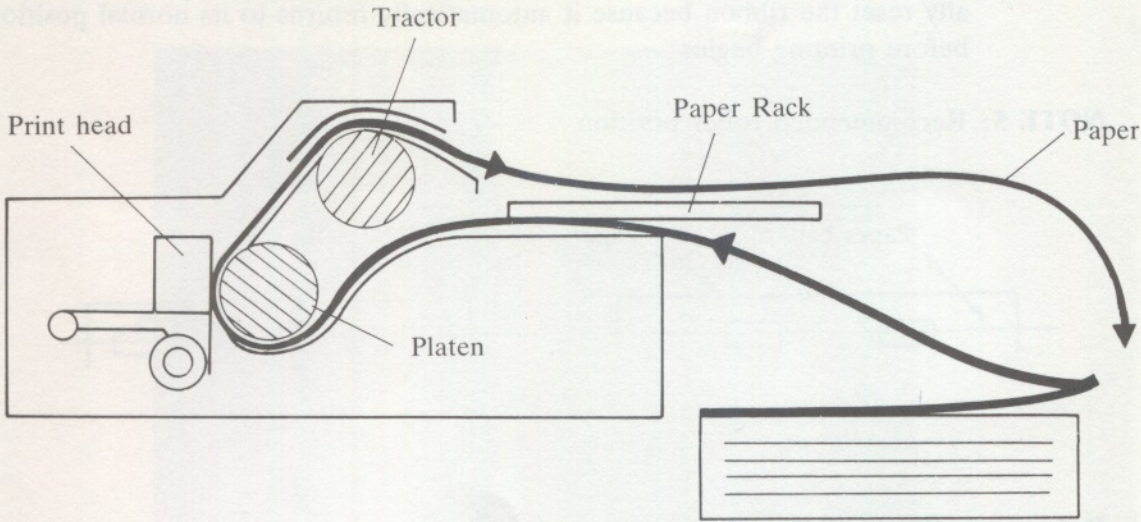


Fig. 7 Paper feed path

1. Remove the paper rack and the printer cover.
Make sure the power is turned OFF.
2. Turn the paper loading knob counterclockwise to move the paper bail toward the front.
3. Use the following method to install the tractor unit on the top of the platen:
 - ① Insert the front hook of the tractor unit into the hole on both sides.
 - ② Push down the rear of the tractor to fit the back hook securely.

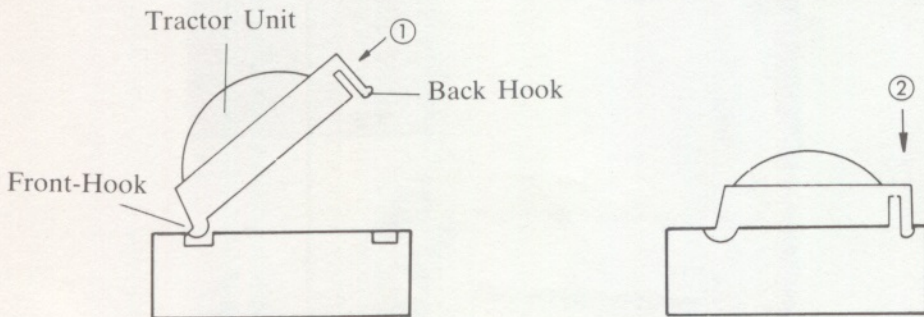


Fig. 8

4. Feed the paper into the printer from the back and then turn the paperfeed knob in a clockwise direction until the paper appears between the platen and the print head.

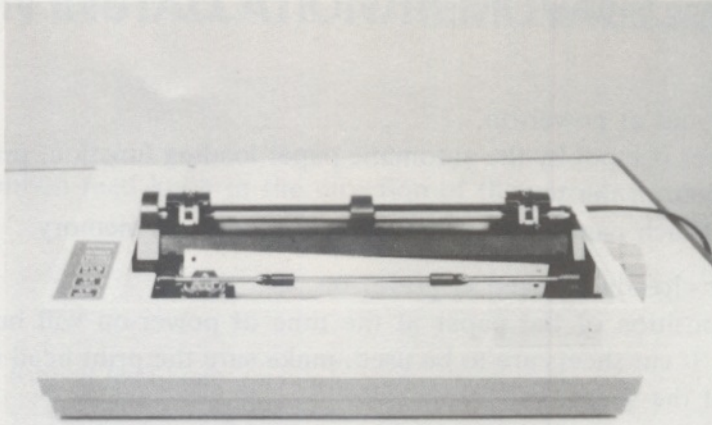


Fig. 9

5. Open the tractor covers on the left and right.
6. Adjust the tractors so that the distance between them matches the holes in the paper.
7. With the holes along both sides of the paper matched up with the paper feed pins on the left and right tractors, close the tractor covers.
8. Turn the paper loading knob clockwise to set the paper bail to the platen side.

NOTE: This is important because it releases the friction roller below the platen, allowing the paper to be advanced by the tractors only. Failing to release the friction roller may cause paper jamming.

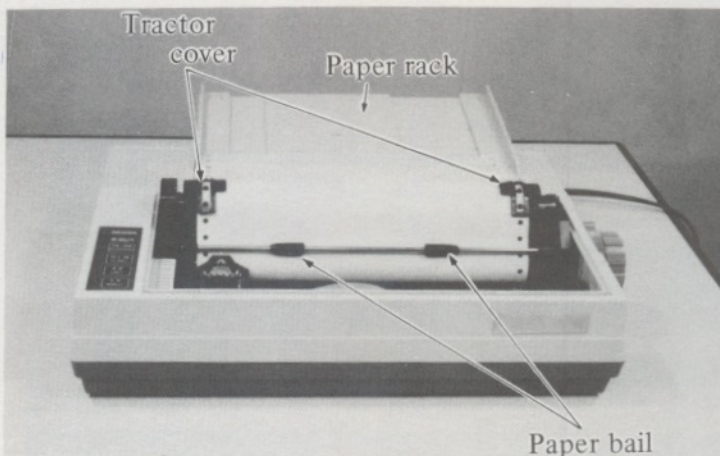


Fig. 10

9. Set the paper rack and the printer cover.
10. Turn the power switch ON.

C. Top of Page Setting

a. Cut Sheet

- i) Paper out at power-on.

If paper is input by the automatic paper loading function, printing is initiated 1 inch from the top.

This 1-inch paper feed is stored in the printer's memory.

- ii) Paper already inserted at power-on.

The position of the paper at the time of power-on will become the top of form. If cut sheets are to be used, make sure the print head is 1 inch from the top of the sheet.

b. Continuous Form

- i) Paper out at power-on.

If paper is input by the automatic paper loading function, use the paperfeed knob to advance the paper so that the perforation is at the top of the print head. The power is then turned on once again to set the top of the page.

- ii) Paper already inserted at power-on.

The position of the paper in front of the print head at the time of power-on becomes the top of form position.

- iii) To start printing at the perforation, use the paperfeed knob to adjust the paper so that the perforation is located directly above the print head.

Then perform one of the following steps:

- 1) Turn the power on once again.
- 2) Perform an `ESC v` command.

RIBBON INSTALLATION/REMOVAL

Installation

1. Turn the ribbon feed knob in the direction of the arrow to remove slack in the ribbon.

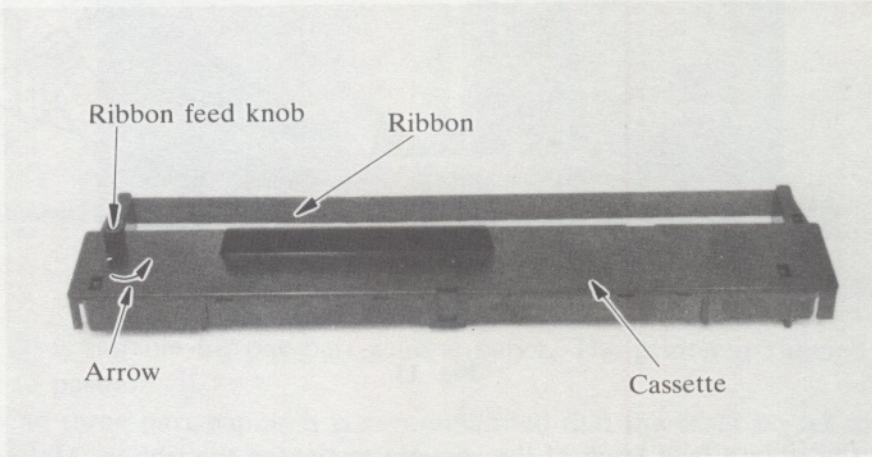


Fig. 11

2. Insert the ribbon between the ribbon mask and the print head, and position the cassette so that ribbon feed shaft is inserted into the hole under the ribbon feed knob.

NOTE: It is easier to insert the ribbon when the print head is at the home position (extreme left).

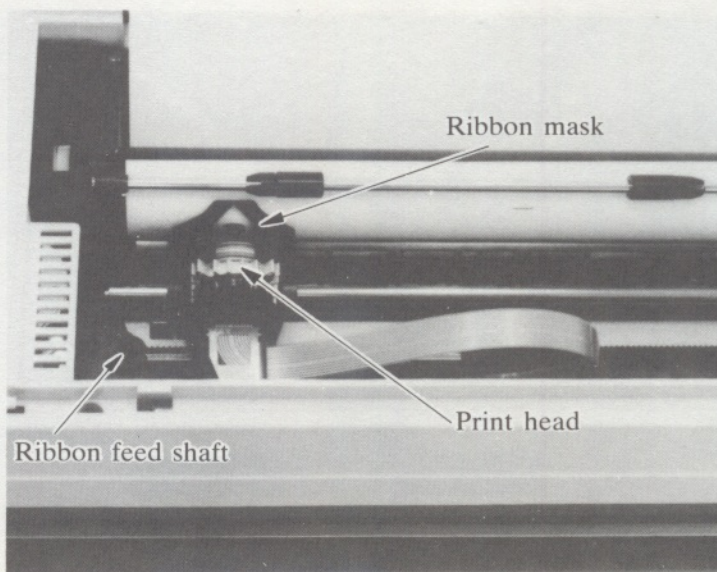


Fig. 12

3. Press on both sides of the cassette.

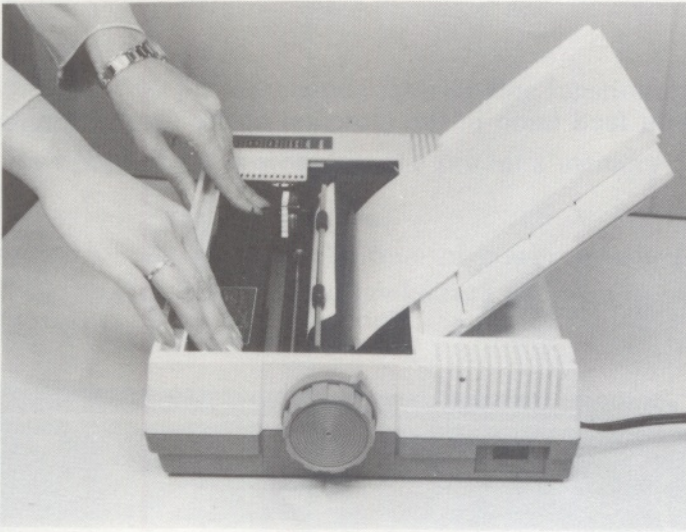


Fig. 13

4. Twist the ribbon feed knob of the cassette to tighten the ribbon. Make sure that the ribbon is properly positioned in front of the print head.

Removal

Holding the fin of the cassette, pull up to remove it.

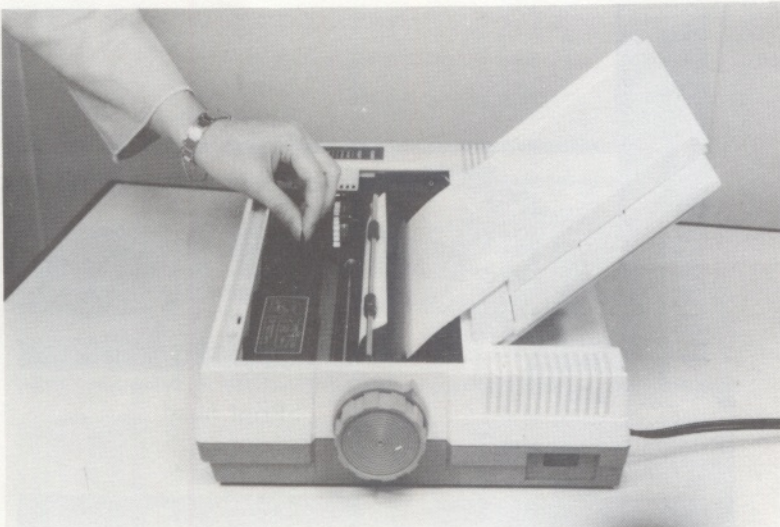


Fig. 14

HEAD POSITION ADJUSTMENT

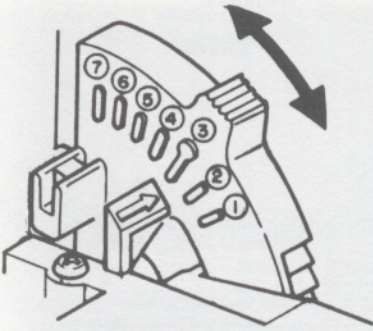


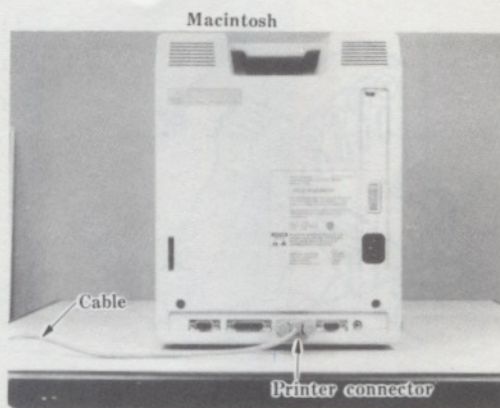
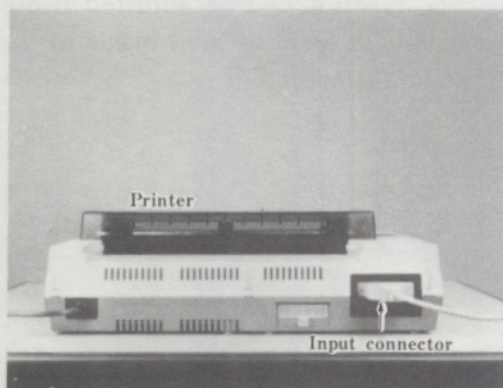
Fig. 15 Internal right-hand side

The print head position can be adjusted using the head adjustment lever located inside of the printer on the right-hand side.

Position ③ is suitable for one-part general paper. The printer is shipped with the lever set to position ③.

When using three-part paper, it is recommended that the lever be set to position ⑤ or ⑥.

CONNECTING THE PRINTER TO MACINTOSH



1. Purchase the cable used to connect the Apple Imagewriter to the Macintosh.
2. Connect the printer to the Macintosh, as shown above.

Confirming the connection

Make sure the DIP switches located at the back of the printer are set as shown below.

DIP switch	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	2-1	2-2	2-3	2-4
Setting as shipped	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	OFF

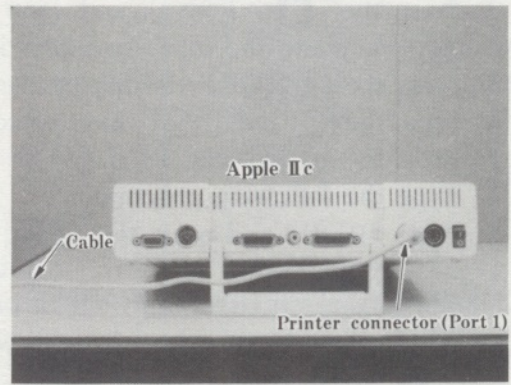
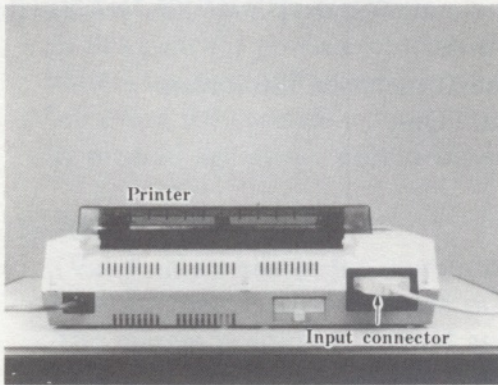
1. Apply power to the printer first and then to the Macintosh.
2. Install the ribbon cassette and load paper.
3. Insert the MACWRITE diskette and wait for the menu to appear.
4. Move the arrow to "MacWrite" on the screen and press the Mouse key twice.
5. Type "This is a nice printer."
6. Move the arrow to "File" on the screen. Press and hold down the Mouse key while moving it to "Print".

This operation prints out:

This is a nice printer.

This printout shows that the connection is correct.

CONNECTING THE PRINTER TO APPLE IIc



1. Purchase the cable used to connect the Apple Imagewriter to the Apple IIc.
2. Connect the printer to the Apple IIc, as shown above.

Confirming the connection

Make sure the DIP switches located at the back of the printer are set as shown below.

DIP switch	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	2-1	2-2	2-3	2-4
Setting as shipped	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	OFF

1. Apply power to the printer, the monitor, and the Apple IIc in this order.
2. Install the ribbon cassette and load paper.
3. Press the **CONTROL** and **RESET** keys simultaneously.
4. Type "HOME" and press the **RETURN** key.
5. Type "PR#1" and press the **RETURN** key.
6. Type "PRINTING TEST" and press the **RETURN** key.


This operation prints out:

```
] PRINTING TEST  
? SYNTAX ERROR
```

This printout shows that the connection is correct.

7. To return the keyboard output to the screen, type "PR #0" and press the **RETURN** key.

Printing from Applesoft BASIC

1. Insert the Applesoft BASIC diskette.
2. Press the , **CONTROL**, and **RESET** keys simultaneously, and then release the **RESET** key and the other two keys in this order.
3. Press the **RETURN** key to display the A/BASIC menu on the screen.
4. Press the **7** and **RETURN** keys to select the "Quit".
5. Press the **RETURN** key.
6. Type the following program.
7. Type "RUN" and press the **RETURN** key.

```
10 HOME :ESC$ = CHR$ (27)
20 PRINT "TEST TO SCREEN"
30 PRINT CHR$ (4); "PR#1": REM OUTPUT TO PRINTER
40 PRINT "PRINTING TEST"
50 PRINT CHR$ (14)
60 RPINT "DOUBLE WIDTH PRINTING"
70 PRINT CHR$ (15)
80 PRINT ESC$; "X"
90 PRINT "UNDERLINE"
100 RPINT ESC$; "Y"
110 PRINT CHR$ (4); "PR#0": REM OUTPUT TO SCREEN
120 END
```

Note: The PRINT command of Applesoft BASIC always outputs data with the 8th bit (MSB) being 1 to the printer.

The printer, however, functions correctly because it ignores the 8th bit.

As shipped from the factory, DIP switch 1-5 at the back of the printer is turned on to ignore the 8th bit of data. There are a few codes the PRINT command does not output to the printer.

Example: PRINT CHR\$(4)

Refer to Applesoft BASIC manuals for further details.

MARGIN SETTING BY SWITCHES

(1) MARGIN MODE switch

If this switch is pressed for more than 1 second in the ON-LINE state, the printer enters the right/left *margin set mode* (shown by the ON-LINE lamp going off and on every 0.3 seconds).

If pressed again, the printer returns to the ON-LINE state.

(2) RIGHT SET switch

(Valid only while in the margin set mode)

Pressing this switch moves the print head to the right of its present position.

The margin position is located at the center of the print head.

(3) LEFT SET switch

(Valid only while in the margin set mode)

Pressing this switch moves the print head to the left of its present position.

The margin position is located at the center of the print head.

(4) MARGIN SET switch

(Valid only while in the margin set mode)

Pressing this switch sets the margin positions.

The margins are set from left to right.

The printer returns to the ON-LINE state as soon as the right margin is set.

If only the left margin is to be set, set it and then press the MARGIN MODE switch.

If only the right margin is to be set, it must be set after the left margin.

The minimum margin setting possible is equivalent to the width of 4 extended characters.

After the margin is set, the buzzer sounds for approximately 0.1 second.

__SELF TEST PRINTING FUNCTION__

If the LINE FEED or NLQ switch is pressed during power-on, a pattern printed repeatedly. If the LINE FEED switch is pressed during power-on, the self test printing is performed alternately in Standard Character mode for five lines and NLQ mode for five lines in a continuous pattern. If the NLQ switch is pressed during power-on, the self test printing is performed in Near Letter Quality Character mode.

The printer is in the OFF-LINE state while performing the self test printing function. To stop the self test printing (and turn on the ON-LINE lamp), press the ON-LINE switch.

If a paper out is detected during the self test printing, the self test printing is terminated. The self test printing does not start in the paper-out state.

__AUTOMATIC PRINTING FUNCTION__

During the data input, if the amount of data exceeds 1 line, printing is automatically performed.

__AUTOMATIC PAPER LOADING FUNCTION__

At paper out, insert a form into the form entrance and turn the paper loading knob counterclockwise to automatically load the form into the printer.

The distance from the top of the form to the first line printed is 1 inch.

After loading, turn the paper loading knob clockwise.

HEXADECIMAL DUMP LIST FUNCTION

The data that is input is printed as 2-digit hexadecimal numbers. This function can be set by pressing the FORM FEED switch during power-on. After printing 2 hexadecimal digits, 2 characters worth of space is left open. This allows 16 bytes of data per line to be printed.

Printing is initiated after 16 bytes of data is input. If the input data is less than 16 bytes, pressing the ON-LINE switch prints the input data. After this printing is done, the OFF-LINE state is set. Pressing the ON-LINE switch once more sets the hexadecimal dump function. The characters to be printed are set to Pica Character mode. Near Letter Quality Character mode can be set by pressing the NLQ switch in the OFF-LINE state.

The hexadecimal dump list function can be terminated by turning the printer off and then on.

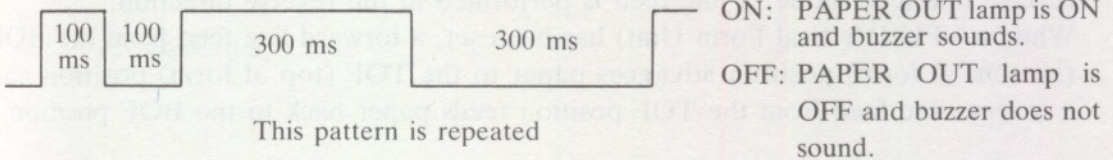
ERROR

The printer enters an error state in the following conditions:

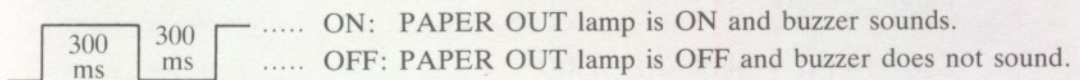
- i) If an internal RAM error is detected during the initialization process.
- ii) If the home position is not detected during the home detection process.

The PAPER OUT lamp then flickers to indicate an error. The flickering cycle is shown below.

• Case i)



• Case ii)



This pattern is repeated.

To end an error state, turn power OFF and ON again.

CONTROL CODE EXPLANATIONS

* The following are Applesoft BASIC program examples.

• Print Command

1. **CR**(CONTROL-M) (0D)Hex (13)Decimal

Input of this code initiates printing. The print data that is input after this code is printed from the left margin. DIP switch 1-8 for the CR function code determines whether a line feed is performed after printing.

Note: The CHR\$(13) command of Applesoft BASIC outputs both the **CR** and **LF** codes to the printer.

```
PROGRAM ONE
PROGRAM TWO

10 PRINT CHR$(4);"PR#1"
20 PRINT "PROGRAM ONE";
30 PRINT CHR$(13);
40 PRINT "PROGRAM TWO"
50 LIST
60 PRINT CHR$(4);"PR#0"
```

• Line Feed

2. **LF**(CONTROL-J) (0A)H (10)D

Input of this code performs a line feed. If this is designated as a print command by DIP switch 2-2, a line feed is performed after printing. When the printer is in the reverse line feed mode, a line feed is performed in the reverse direction.

When a VFU (Vertical Form Unit) has been set, a forward line feed from the BOF (bottom of form) position advances paper to the TOF (top of form) position and a reverse line feed from the TOF position feeds paper back to the BOF position.

```
PROGRAM ONE
PROGRAM TWO

10 PRINT CHR$(4);"PR#1"
20 PRINT "PROGRAM ONE";
30 PRINT CHR$(10);
40 PRINT "PROGRAM TWO"
50 LIST
60 PRINT CHR$(4);"PR#0"
```

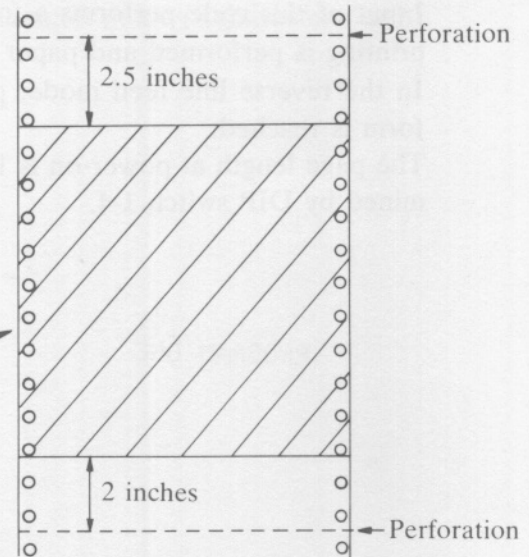
Limited area allowed to perform reverse line feeds.

* Reverse line feed accuracy is not guaranteed.

• Cut Sheet



• Continuous Forms



Note: When using the tractor unit for continuous forms, maximum 2 reverse line feeds can be performed within the above limited area.

• Vertical Tab

3. `VT` (CONTROL-K) (0B)H (11)D

Input of this code performs a paperfeed until the next vertical tab B. If this is designated as a print command, a paperfeed is performed after printing. When the printer is in the reverse line feed mode, a paperfeed is performed in the reverse direction. At power-on, vertical tab Bs are set at every 6th line. For more information about the vertical tab B, refer to "VFU Vertical Tabs".

PROGRAM ONE

PROGRAM TWO

```
10 PRINT CHR# (4); "PR#1"  
20 PRINT "PROGRAM ONE";  
30 PRINT CHR# (11);  
40 PRINT "PROGRAM TWO"  
50 LIST  
60 PRINT CHR# (4); "PR#0"
```


• Form Feed

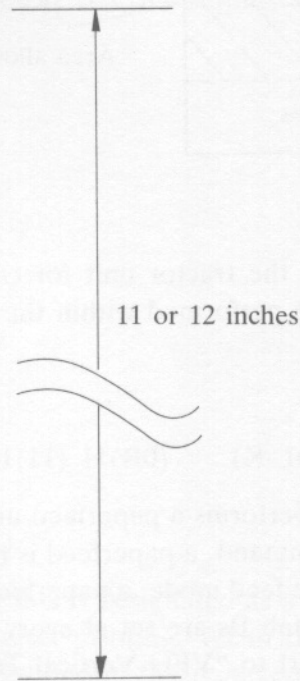
4. **FF**(CONTROL-L) (0C)H (12)D

Input of this code performs a form feed. If this is designated as a print command, printing is performed and paper advances till the next TOF.

In the reverse line feed mode, paper is fed backward until the top of the previous form is reached.

The page length at power-on is 11 inches (66 lines) or 12 inches (72 lines), as determined by DIP switch 1-4.

PROGRAM ONE



PROGRAM TWO

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT "PROGRAM ONE";  
30 PRINT CHR# (12);  
40 PRINT "PROGRAM TWO"  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```

• Character Mode Designation

5. `ESC n` (1B, 6E)H (27, 110)D

Input of this command designates the Extended Character mode (9 characters/inch).

EXTENDED CHARACTER

```
10 PRINT CHR$(4);"PR#1"  
20 PRINT CHR$(27);"n";  
30 PRINT "EXTENDED CHARACTER"  
40 PRINT CHR$(27);"E";  
50 LIST  
60 PRINT CHR$(4);"PR#0"
```

6. `ESC N` (1B, 4E)H (27, 78)D

Input of this command designates the Pica Character mode (10 characters/inch).

PICA CHARACTER

```
10 PRINT CHR$(4);"PR#1"  
20 PRINT CHR$(27);"N";  
30 PRINT "PICA CHARACTER"  
40 PRINT CHR$(27);"E";  
50 LIST  
60 PRINT CHR$(4);"PR#0"
```


7. **ESC E**

(1B, 45)H (27, 69)D

Input of this command designates the Elite Character mode (12 characters/inch).

ELITE CHARACTER

```
10 PRINT CHR$(4);"PR#1"  
20 PRINT CHR$(27);"E";  
30 PRINT "ELITE CHARACTER"  
40 LIST  
50 PRINT CHR$(4);"PR#0"
```

8. **ESC p**

(1B, 70)H (27, 112)D

Input of this command designates the Pica Proportional Character mode (144 dots/inch).

PICA PROPORTIONAL CHARACTER

```
10 PRINT CHR$(4);"PR#1"  
20 PRINT CHR$(27);"p";  
30 PRINT "PICA PROPORTIONAL CHARACTER"  
40 PRINT CHR$(27);"E";  
50 LIST  
60 PRINT CHR$(4);"PR#0"
```

9. **ESC**P

(1B, 50)H (27, 80)D

Input of this command designates the Elite Proportional Character mode (160 dots/inch).

ELITE PROPORTIONAL CHARACTER

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"P";  
30 PRINT "ELITE PROPORTIONAL CHARACTER"  
40 PRINT CHR# (27);"E";  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```

10. **ESC**e

(1B, 65)H (27, 101)D

Input of this command designates the Semicondensed Character mode (13.4 characters/inch).

SEMICONDENSED CHARACTER

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"e";  
30 PRINT "SEMICONDENSED CHARACTER"  
40 PRINT CHR# (27);"E";  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```


11. ESCq

(1B, 71)H (27, 113)D

Input of this command designates the Condensed Character mode (15 characters/inch).

CONDENSED CHARACTER

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"q";  
30 PRINT "CONDENSED CHARACTER"  
40 PRINT CHR# (27);"E";  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```

12. ESCQ

(1B, 51)H (27, 81)D

Input of this command designates the Ultracondensed Character mode (17 characters/inch).

ULTRACONDENSED CHARACTER

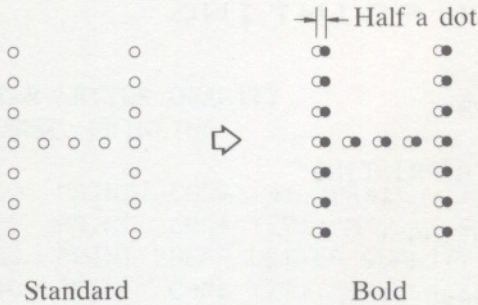
```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"Q";  
30 PRINT "ULTRACONDENSED CHARACTER"  
40 PRINT CHR# (27);"E";  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```

• **Bold Print**

13. `[ESC][!]` (1B, 21)H (27, 33)D

Input of this command designates the Bold print mode.

In this mode, the print head moves half a dot to the right to re-print the same character. The bold mode is valid in all print modes, such as double-width, graphics, and underlining.



BOLD PRINTING
NORMAL PRINTING

```

10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"!";
30 PRINT "BOLD PRINTING"
40 PRINT CHR$(27); CHR$(34);
50 PRINT "NORMAL PRINTING"
60 LIST
70 PRINT CHR$(4);"PR#0"

```

14. `[ESC]"` (1B, 22)H (27, 34)D

This command terminates the Bold print mode.

Refer to 13.

• **Double-Width Print**

15. **SO**(CONTROL-N) (0E)H (14)D

Input of this command designates the Double-Width print mode, which is valid for all modes including graphics. The number of characters per inch is reduced to a half in this mode.

```
DOUBLE WIDTH PRINTING
NORMAL PRINTING
```

```
10 PRINT CHR# (4);"PR#1"
20 PRINT CHR# (14);
30 PRINT "DOUBLE WIDTH PRINTING"
40 PRINT CHR# (15);
50 PRINT "NORMAL PRINTING"
60 LIST
70 PRINT CHR# (4);"PR#0"
```

16. **SI**(CONTROL-O) (0F)H (15)D

This command terminates the Double Width print mode.

Refer to 15.

• Near Letter Quality Character

17. `ESC H` (1B, 48)H (27, 72)D

Input of this command designates the Near Letter Quality Character mode (NLQ), which is valid for only the Extended, Pica, Elite, Pica Proportional, and Elite Proportional character modes. This mode has double dot-density in both vertical and horizontal directions when compared with standard characters.

This command is invalid in the Superscript/Subscript and Graphics modes.

```
NEAR LETTER QUALITY
NORMAL PRINTING
```

```
10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"H";
30 PRINT "NEAR LETTER QUALITY"
40 PRINT CHR$(27);"h";
50 PRINT "NORMAL PRINTING"
60 LIST
70 PRINT CHR$(4);"PR#0"
```

18. `ESC h` (1B, 68)H (27, 104)D

This command terminates the Near Letter Quality Character mode.

Refer to 17.

• Italic Character

19. `ESC i 1` (1B, 69, 31)H (17, 105, 49)D

Input of this command selects the Italic Character mode, which is valid for all modes except the Graphics and Superscript/Subscript Character modes.

When the Superscript/Subscript and Italic Character modes are set simultaneously the last mode set is given priority. If the mode set last is terminated, the other becomes valid.

```
ITALIC CHARACTER  
NORMAL PRINTING
```

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"i1";  
30 PRINT "ITALIC CHARACTER"  
40 PRINT CHR# (27);"i0";  
50 PRINT "NORMAL PRINTING"  
60 LIST  
70 PRINT CHR# (4);"PR#0"
```

20. `ESC i 0` (1B, 69, 30)H (27, 105, 48)D

This command terminates the Italic Character mode.

Refer to 19

• **Superscript/Subscript Character**

21. `ESC b 0` (1B, 62, 30)H (27, 98, 48)D

This command terminates the Superscript/Subscript Character mode. The Superscript/Subscript Character mode condenses a character to 1/2 its original height. The Superscript/Subscript designation is valid for all the modes except the Near Letter Quality, Italic, and Graphics print modes. In the Near Letter Quality Character mode, the Superscript/Subscript Character mode is given priority if it is input.

22. `ESC b 1` (1B, 62, 31)H (27, 98, 49)D

Input of this command designates the Superscript Character mode.

$X^2+X=Y$

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT "X";  
30 PRINT CHR# (27);"b1";  
40 PRINT "2";  
50 PRINT CHR# (27);"b0";  
60 PRINT "+X=Y"  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```

23. `ESC b 2` (1B, 62, 32)H (27, 98, 50)D

Input of this command designates the Subscript Character mode.

H_2O

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT "H";  
30 PRINT CHR# (27);"b2";  
40 PRINT "2";  
50 PRINT CHR# (27);"b0";  
60 PRINT "O"  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```


• **Underlining**

24. **ESC X** (1B, 58)H (27, 88)D

Input of this command starts underlining that is valid for all the modes, including the Graphics mode.

AAAABBBBBCCCCC

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT "AAAAA";  
30 PRINT CHR# (27);"X";  
40 PRINT "BBBBB";  
50 PRINT CHR# (27);"Y";  
60 PRINT "CCCCC"  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```

25. **ESC Y** (1B, 59)H (27, 89)D

Input of this command terminates underlining.

Refer to 24.

• Dot Spacing in Proportional

26. `ESC n` (1B, 31~36)H (27, 49~54)D

Input of this command leaves an additional *n* dots of space between given proportional characters. *n* is in the range of 1 to 6 dots. In the Proportional Character mode, the default dot spacing between characters is 1 dot. If the Double Width Character mode is specified, the number of dot spacing is doubled. This command works only in the Proportional Character mode. Thus, if this command is used in other modes, specify the Proportional Character mode, use this command, and return to the previous mode.

```
DOTSPACE 1
DOTSPACE 2
DOTSPACE 3
DOTSPACE 4
DOTSPACE 5
DOTSPACE 6
```

```
10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"P";
30 FOR I = 1 TO 6
40 PRINT "DOT"; CHR$(27);I;
50 PRINT "SPACE"; CHR$(27);I;
60 PRINT I
70 NEXT I
80 PRINT CHR$(27);"E";
90 LIST
100 PRINT CHR$(4);"PR#0"
```


27. `ESC s n` (1B, 73, 30~39)H (27, 115, 48~57)D

Input of this command leaves an additional n dots of space between all proportional characters.

n is in the range of 0 to 9 dots.

The rest is the same as the `ESC n` command.

```
DOT SPACE0
DOT SPACE1
DOT SPACE2
DOT SPACE3
DOT SPACE4
DOT SPACE5
DOT SPACE6
DOT SPACE7
DOT SPACE8
DOT SPACE9
```

```
10 PRINT CHR# (4);"PR#1"
20 PRINT CHR# (27);"P";
30 FOR I = 0 TO 9
40 PRINT CHR# (27);"#";I;
50 PRINT "DOT SPACE";I
60 NEXT I
70 PRINT CHR# (27);"E";
80 LIST
90 PRINT CHR# (4);"PR#0"
```

• Backspacing

28. `BS`(CONTROL-H) (08)H (8)D

This command enables overlapped printing of characters such as \pm and ϵ . This command is valid for only one character and cannot be used continuously.

```
-----+|||||||
```

```
10 PRINT CHR# (4);"PR#1"
20 PRINT "-----";
30 PRINT CHR# (8);
40 PRINT "|||||||"
50 PRINT CHR# (27);"E";
60 LIST
70 PRINT CHR# (4);"PR#0"
```

• **Horizontal Tab**

29. `HT`(CONTROL-I) (09)H (9)D

This command moves the print head to the next tab position. No tab is set at power-on, or by the input of software reset command.

This command is ignored when there is no tab position between the current print position and the end of the line.

When performing a horizontal tab, the printer prints out the data already received.

30. `ESC (n n n , ... , m m m .` (1B, 28)H (27, 40)D

This command sets the horizontal tab. The maximum number of horizontal tab settings is 32.

`n n n` and `m m m` are 3-digit ASCII numerals separated by commas. The numbers specify the tab positions in character units, starting from the left margin. The command ends with a period.

The character pitch determines the maximum tab position that can be specified.

Character	Maximum Tab Position
Extended	72
Pica	80
Elite	96
Pica Proportional	72
Elite Proportional	80
Semicondensed	107
Condensed	120
Ultracondensed	136

Tab positions are based on the current character pitch.

If the character pitch or the left margin is changed, the absolute tab positions already set remain unchanged.

31. `ESCunnn` (1B, 75)H (27, 117)D

This command adds only one tab at a time to the original tab setup. `nnn` is a 3-digit ASCII numeral.

32. `ESC)n nn, ... , mmm.` (1B, 29)H (27, 41)D

This command clears the horizontal tabs individually. The rest is the same as the `ESC(` command.

33. `ESC0` (1B, 30)H (27, 48)D

This command clears all horizontal tabs.

Maximum Tab Position	Character
15	Extended
80	Tab
95	Tab
15	Tab
40	Tab
100	Tab

• Margin Setting

34. `ESC L n n n` (1B, 4C)H (27, 76)D

This command sets the left margin to character position `n n n` in the present character width units. When in the Elite Proportional or Pica Proportional mode, 1/10" or 1/9" are, respectively, used as the character width to set margin positions. `n n n` is a 3-digit ASCII numeral. At power-on, the print head stays at the home position (called position 0).

For example, the code `ESC L 0 0 4` sets the left margin to the 5th character position.

```
LEFT MARGIN SETTING
5TH CHARACTER POSITION
```

```
10 PRINT CHR# (4);"PR#1"
20 PRINT "LEFT MARGIN SETTING"
30 PRINT CHR# (27);"L004";
40 PRINT "5TH CHARACTER POSITION"
50 PRINT CHR# (27);"L000";
60 LIST
70 PRINT CHR# (4);"PR#0"
```

35. `ESC / n n n` (1B, 2F)H (27, 47)D

Input of this command sets the right margin to character position `n n n`.

The left and right margin positions remain unchanged until either another command is input or the power is turned off. Changing the character pitch does not alter the margin positions already set.

The margin set command is ignored when the distance between the left and right margins is less than the width of 4 Extended characters.

```
RIGHT MARGIN SETTING
0123456789012345678901234
```

```
10 PRINT CHR# (4);"PR#1"
20 PRINT "RIGHT MARGIN SETTING"
30 PRINT CHR# (27);"/025";
40 PRINT "01234567890123456789012345"
50 PRINT CHR# (27);"/096";
60 LIST
70 PRINT CHR# (4);"PR#0"
```


• **Printing Direction**

36. `[ESC]>` (1B, 3E)H (27, 62)D

Input of this command prints all subsequent data from left to right. Slight vertical misalignment can be avoided by using this unidirectional print function.

```

UNIDIRECTIONAL PRINTING
----->
----->
----->
----->
BIDIRECTIONAL PRINTING
----->
<----->
----->

10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);">";
30 PRINT "UNIDIRECTIONAL PRINTING"
40 PRINT "----->"
50 PRINT "----->"
60 PRINT "----->"
70 PRINT CHR$(27);"<";
80 PRINT "BIDIRECTIONAL PRINTING"
90 PRINT "----->"
100 PRINT "<-----"
110 PRINT "----->"
120 LIST
130 PRINT CHR$(4);"PR#0"

```

37. `[ESC]<` (1B, 3C)H (27, 60)D

Input of this command designates the bidirectional print function. This function remains in effect until terminated.

Refer to 36.

• **Character Repetition**

38. `[ESC]R[n][n][n]C` (1B, 52)H (27, 82)D

This command prints a given character designated by C `[n][n][n]` times continuously. `[n][n][n]` is a 3-digit ASCII numeral (maximum number is 999).

```

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"R035"; CHR$(33)
30 LIST
40 PRINT CHR$(4);"PR#0"

```

• **Line Feed Pitch**

39. **ESC A** (1B, 41)H (27, 65)D

Input of this command designates a line feed value of 1/6 inch. Line feed pitch is automatically selected at power-on.

```
LINE FEED1  
LINE FEED2  
LINE FEED3  
LINE FEED4  
LINE FEED5  
LINE FEED6
```

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"A";  
30 FOR I = 1 TO 6  
40 PRINT "LINE FEED";I  
50 NEXT I  
60 LIST  
70 PRINT CHR# (4);"PR#0"
```

40. **ESC B** (1B, 42)H (27, 66)D

The line feed value is designated as 1/8 inch.

```
LINE FEED1  
LINE FEED2  
LINE FEED3  
LINE FEED4  
LINE FEED5  
LINE FEED6
```

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"B";  
30 FOR I = 1 TO 6  
40 PRINT "LINE FEED";I  
50 NEXT I  
60 PRINT CHR# (27);"A";  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```


41. `ESC T n n` (1B, 54)H (27, 84)D
 $1 \leq n \leq 99$

Input of this command designates a line feed value of $nn/144$ inch. The vertical dot pitch is $1/72$ of an inch, so this command allows line feeding of half a dot pitch. In graphics printing, the `ESC T I 6` command draws a continuous vertical line. The line feed pitch remains unchanged until either another line feed pitch command is input or the power is turned off.

```
LINE FEED19/144INCHES  
LINE FEED32/144INCHES  
LINE FEED45/144INCHES
```

```
LINE FEED58/144INCHES
```

```
LINE FEED71/144INCHES
```

```
LINE FEED84/144INCHES
```

```
LINE FEED97/144INCHES
```

```
10 PRINT CHR$(4);"PR#1"  
20 FOR I = 19 TO 99 STEP 13  
30 PRINT CHR$(27);"T";I;  
40 PRINT "LINE FEED";I"/144INCHES"  
50 NEXT I  
60 PRINT CHR$(27);"A";  
70 LIST  
80 PRINT CHR$(4);"PR#0"
```

• **Line Feed Direction**

42. **ESC f** (1B, 66)H (27, 102)D

Input of this command designates forward (normal) line feeding. Forward line feeding is automatically selected at power-on.

```
+++++
-----
-----+

10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"r";
30 PRINT "-----"
40 PRINT "-----"
50 PRINT "-----"
60 PRINT CHR$(27);"f"
70 PRINT "+++++"
80 PRINT "  +++++  "
90 PRINT "    +++++    "
100 LIST
110 PRINT CHR$(4);"PR#0"
```

43. **ESC r** (1B, 72)H (27, 114)D

This command selects reverse line feeding.
Pressing the LF and FF switches advances paper only in the forward direction, even when this command has been input.
Refer to the "Limited area allowed to perform reverse line feeds" on page 23.

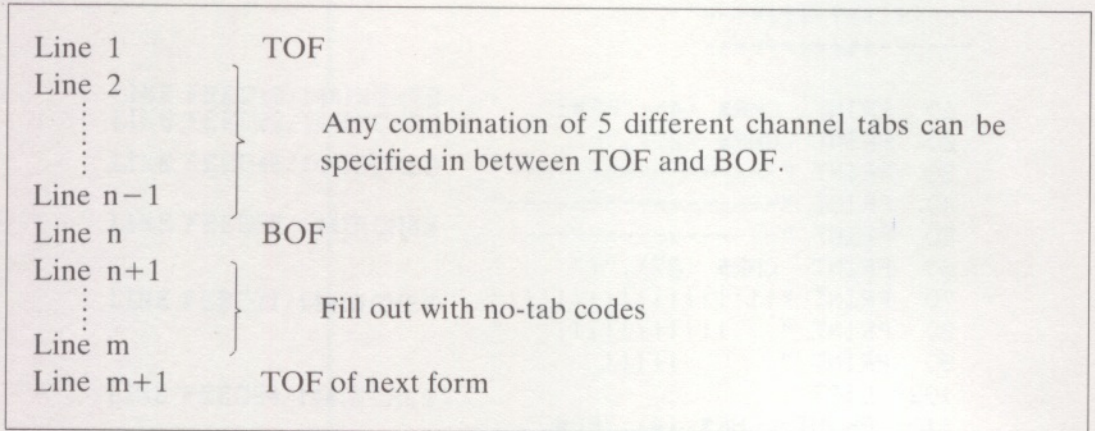
Refer to 42.

• VFU Vertical Tabs

Under Vertical Form Unit (VFU) control, up to 96 vertical tab positions can be set on a page.

Vertical tabs can be set on each line for 5 different channels B, C, D, E, and F. Thus, 5 separate vertical tab patterns can be used simultaneously. A 2-character code is needed to set vertical tabs on one line.

A structure of vertical tab settings follows:



The page length also changes accordingly if VFU vertical tabs are set.

45. **C@** (43, 40)H (67, 64)D

Input of this command sets bottom of form (BOF).

Refer to 44.

46. **A@RS** (CONTROL-^) (41, 40, 1E)H (65, 64, 30)D

Input of this command terminates vertical tab settings, or sets TOF of next form.

Refer to 44.

The following 2-character codes are used to set any combination of tab stops for the 5 channels.

Code	Hex	Decimal	Function
@@	40 40	64 64	Sets no tabs
B@	42 40	66 64	Sets tab B
D@	44 40	68 64	Sets tab C
H@	48 40	72 64	Sets tab D
P@	50 40	80 64	Sets tab E
,@	60 40	96 64	Sets tab F
F@	46 40	70 64	Sets tabs B, C
J@	4A 40	74 64	Sets tabs B, D
R@	52 40	82 64	Sets tabs B, E
b@	62 40	98 64	Sets tabs B, F
L@	4C 40	76 64	Sets tabs C, D
T@	54 40	84 64	Sets tabs C, E
d@	64 40	100 64	Sets tabs C, F
X@	58 40	88 64	Sets tabs D, E
h@	68 40	104 64	Sets tabs D, F
p@	70 40	112 64	Sets tabs E, F
N@	4E 40	78 64	Sets tabs B, C, D
V@	56 40	86 64	Sets tabs B, C, E
f@	66 40	102 64	Sets tabs B, C, F
Z@	5A 40	90 64	Sets tabs B, D, E
j@	6A 40	106 64	Sets tabs B, D, F
r@	72 40	114 64	Sets tabs B, E, F
\@	5C 40	92 64	Sets tabs C, D, E
ℓ@	6C 40	108 64	Sets tabs C, D, F
t@	74 40	116 64	Sets tabs C, E, F
x@	78 40	120 64	Sets tabs D, E, F
^@	5E 40	94 64	Sets tabs B, C, D, E
n@	6E 40	110 64	Sets tabs B, C, D, F
v@	76 40	118 64	Sets tabs B, C, E, F
z@	7A 40	122 64	Sets tabs B, D, E, F
|@	7C 40	124 64	Sets tabs C, D, E, F
~@	7E 40	126 64	Sets tabs B, C, D, E, F

● Using Vertical Tabs

47. $\boxed{\text{US}}$ (CONTROL- $\underline{\quad}$) $\boxed{\text{A}}\sim\boxed{\text{F}}$ (1F, 41~46)H (31, 65~70)D

Note that CONTROL- $\underline{\quad}$ is CONTROL-underline.

US	A	Moves to next BOF or TOF
US	B	Moves to next tab B position (Same as the $\boxed{\text{VT}}$ code, (0B)H)
US	C	Moves to next tab C position
US	D	Moves to next tab D position
US	E	Moves to next tab E position
US	F	Moves to next tab F position

These commands perform printing if DIP switch 2-2 is set to on.

If the line feed direction is reversed, the vertical tab structure is reversed with respect to the paper. If the line feed pitch is changed after the tabs have been set, the entire format also changes accordingly because vertical tabs are counted in line units. When there is no tab setting in the remaining part of a form, a paperfeed is performed until the next TOF.

Refer to 44.

● Vertical Tab Initialization

48. $\boxed{\text{GS}}\boxed{0}$ (1D, 30)H (29, 48)D

Input of this command sets vertical tabs to power-on state and sets the TOF at the current position.

At power-on, the page length is either 66 or 72 lines, depending on DIP switch 1-4. B tabs are automatically set for every 6th line. No other tabs are set.

Refer to 44.

• Multiple Linefeeds

49. `US n` (1F)H (31)D

Input of this command advances paper by n (1 ~ 15) lines in the current line feed direction.

The following ASCII numerals and symbols designate a number of lines:

n (Hex)	1 (31)	2 (32)	3 (33)	4 (34)	5 (35)	6 (36)	7 (37)	8 (38)	9 (39)	: (3A)	; (3B)	< (3C)	= (3D)	> (3E)	? (3F)
Number of lines	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

1ST LINE

8TH LINE

```

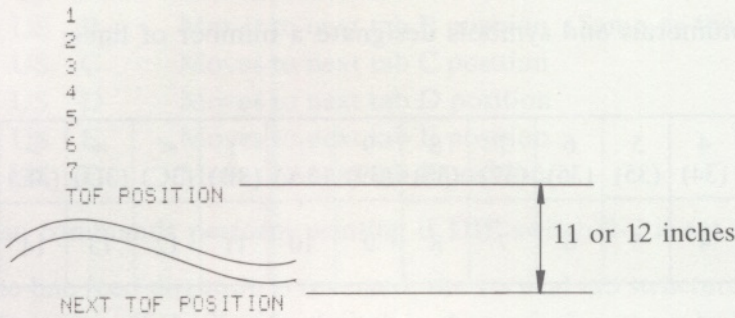
10 PRINT CHR# (4);"PR#1"
20 PRINT "1ST LINE";
30 PRINT CHR# (31);"7";
40 PRINT "8TH LINE"
50 LIST
60 PRINT CHR# (4);"PR#0"

```


• TOF Setting

50. `[ESC][v]` (1B, 76)H (27, 118)D

Input of this command sets the TOF at the current print head position.



```

10 PRINT CHR# (4);"PR#1"
20 FOR I = 1 TO 7
30 PRINT I
40 NEXT I
50 PRINT CHR# (27);"v";
60 PRINT "TOF POSITION"; CHR# (12);
70 PRINT "NEXT TOF POSITION"
80 LIST
90 PRINT CHR# (4);"PR#0"

```

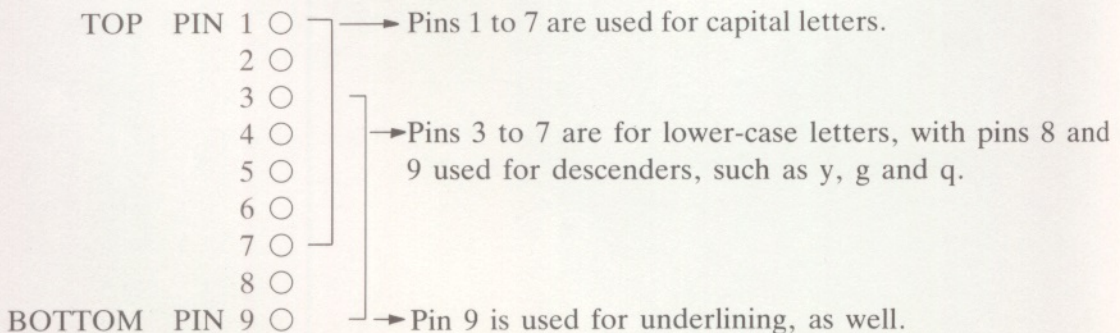
• Download Character

Special characters defined by the user are called Download characters.

A maximum of 175 download characters can be defined and stored in the RAM area. The contents of the RAM are lost if the power is turned off.

To use the Download characters, change from the normal character set in the ROM to the Download character set in the RAM by inputting a control code. Download characters, as well as normal characters, can be expanded, contracted, underlined, and printed in the bold and double width modes.

Print Head Pins (Vertically spaced 1/72" apart)



• Download Character Loading

51. `ESC-` (1B, 2D)H (27, 45)D

This command specifies that the maximum horizontal width is 8 dots.

52. `ESC+` (1B, 2B)H (27, 43)D

This command specifies that the maximum horizontal width is 16 dots.

53. `ESC I` (1B, 49)H (27, 73)D

Input of this command starts loading new download characters.

54. `EOT`(CONTROL-D) (04)H (4)D

This command terminates new characters loading.

Note: Applesoft Basic for the Apple IIc does not output this code to the printer with the `CHR$(4)` command.

55. `A~P` (41, 42, ..., 50)H (65, 66, ..., 80)D

This code is the width code to designate a number of horizontal dots when using the top 8 pins.

(A = 1, B = 2, ..., P = 16)

56. [a]~[p] (61, 62, ..., 70)H (97, 98, ..., 112)D

This code is the width code to designate a number of horizontal dots when using the bottom 8 pins.

(a = 1, b = 2, ..., p = 16)

Follow the steps below to store Download characters into the RAM:

Step 1. Input the [ESC-] or [ESC+] to select a maximum width of 8 or 16 dots. The RAM can store fewer characters if a maximum of 16 dots is selected.

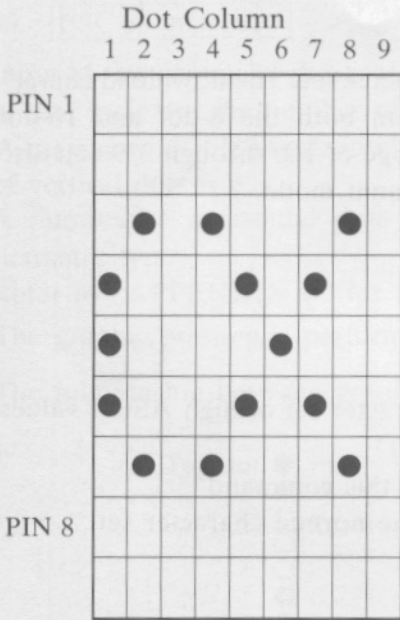
Step 2. Input the [ESC I] to the printer to start new characters loading.

Step 3. Input the following information for EACH new character.

- i. Send the regular character code to be assigned as a new character. When the maximum width of 16 dots is selected, the codes that can be assigned are in the range of (20)H to (7E)H, or 32 to 126. When the width up to 8 dots is selected, the codes in the range of (A0)H to (EF)H, or 160 to 239, can also be assigned in addition to the above codes.
- ii. Send a width code. If the new character is 8 dots wide and uses the top 8 pins, send "H"; if it is 14 dots wide and uses the top 8 pins, send "N"; if it is 7 dots wide and uses the bottom 8 pins, send "g".
- iii. Send the specified number of binary character data in the order from the left to the right dot column. The least-significant bit (bit 0) of each number corresponds to the top pin, and the most-significant bit (bit 7) corresponds to the bottom pin. Refer to Appendix C for ASCII characters that correspond to binary numbers.

Step 4. After repeating step 3 above for each new character, send the [EOT](CONTROL-D) to terminate the loading.

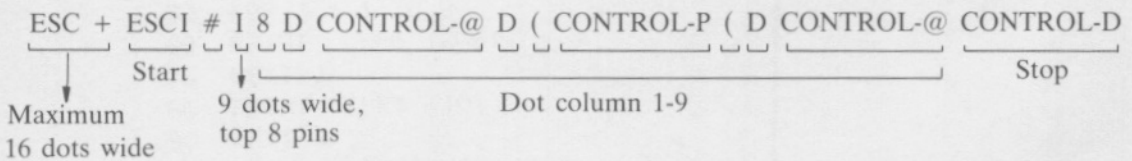
Here is an example to load character α :



Dot Column	Binary	ASCII Character
1	00111000	8
2	01000100	D
3	00000000	NUL (CONTROL-@)
4	01000100	D
5	00101000	(
6	00010000	(CONTROL-P)
7	00101000	(
8	01000100	D
9	00000000	NUL (CONTROL-@)

Assume that character “#” indicates the above new character ‘ α ’.

The loading sequence is:



• Download Character Printing

57. `ESC'` (1B, 27)H (27, 39)D

Input of this command switches to the download character set. The download characters in the range of 32 through 126 can be used in both the 8-dot and 16-dot maximum modes. The download characters in the range of 160 through 239 can also be used if they have been loaded in the 8-dot maximum mode.

58. `ESC*` (1B, 2A)H (27, 42)D

Input of this command switches to the download character set of high ASCII values (160-239) that are reassigned to ASCII 32 through 111.

The 7-bit mode must have been set before inputting this command.

In the 8-bit mode, this command switches back to the normal character set.

59. `ESC$` (1B, 24)H (27, 36)D

Input of this command switches back to the normal character set.

• Graphics

60. `ESC G n n n n` (1B, 47)H (27, 71)D

Input of this command designates the graphic printing. `n n n n` are ASCII numeral that indicates the number of bytes of graphic data that follow.

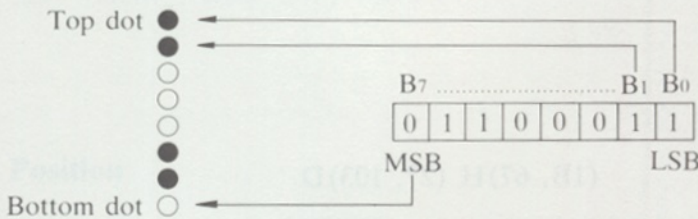
A maximum of 1280 horizontal dots per line is permitted and the maximum number of vertical dots is 8.

A number of horizontal dots per line varies, according to the current standard character type.

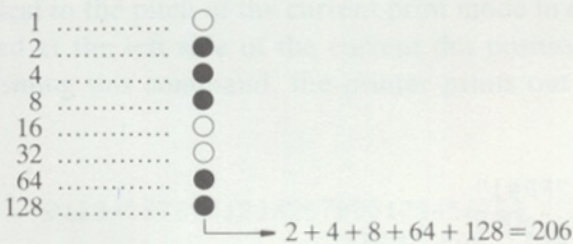
Refer to "APPENDIX B" for maximum dot columns.

The graphic printing is performed unidirectionally from left to right.

The relationship between graphic data and the printed dots is shown below.



Since the vertical dot pitch is 1/72 inch, specify a line feed pitch of 8/72 (16/144) inches so that horizontal lines appear vertically connected.



```

10 PRINT CHR$(4);"PR#1"
20 PRINT CHR$(27);"T16";
30 FOR I = 1 TO 3
40 PRINT CHR$(27);"G0020";
50 FOR J = 1 TO 20
60 PRINT CHR$(206);
70 NEXT J
80 PRINT CHR$(10);
90 NEXT I
100 PRINT CHR$(27);"A";

```


61.

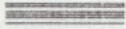
ESC	S	n	n	n	n
-----	---	---	---	---	---

 (1B, 53)H (27, 83)D

Same as the

ESC	G
-----	---

 command.



```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"50060";  
30 FOR I = 1 TO 60  
40 PRINT CHR# (187);  
50 NEXT I  
60 PRINT CHR# (10);  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```

62.

ESC	g	n	n	n
-----	---	---	---	---

 (1B, 67)H (27, 103)D

n	n	n
---	---	---

 are ASCII numeral indicating that (

n	n	n
---	---	---

 × 8) bytes of graphic data are following

ESC	g
-----	---

.

The rest is the same as

ESC	G
-----	---

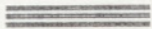
.

ESC	g	0	1	0
-----	---	---	---	---

 is identical to

ESC	G	0	0	8	0
-----	---	---	---	---	---

.

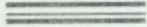


```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"g009";  
30 FOR I = 1 TO 72  
40 PRINT CHR# (91);  
50 NEXT I  
60 PRINT CHR# (10);  
70 LIST  
80 PRINT CHR# (4);"PR#0"
```

63. `ESC V n n n n C` (1B, 56)H (27, 86)D

Input of this command prints `n n n n` repetitions of the graphic dot column specified by `C`.

The rest is the same as `ESC G`.



```
10 PRINT CHR# (4); "PR#1"
20 PRINT CHR# (27); "U0070";
30 PRINT CHR# (83);
40 PRINT CHR# (10);
50 LIST
60 PRINT CHR# (4); "PR#0"
```

• Print Position

64. `ESC F n n n n` (1B, 46)H (27, 70)D

Input of this command begins printing at the dot column `n n n n` away from the left margin position. `n n n n` are ASCII numerals. The horizontal dot pitch is identical to the pitch of the current print mode in effect. If the dot position specified is located at the left side of the current dot position, this command is ignored. When performing this command, the printer prints out the data already received.

```
012345678901234567890123456789
          PRINT POSITION
```

```
10 PRINT CHR# (4); "PR#1"
20 PRINT "012345678901234567890123456789"
30 PRINT CHR# (27); "FO148";
40 PRINT "PRINT POSITION"
50 LIST
60 PRINT CHR# (4); "PR#0"
```


• Paper-Out Detector

65. `[ESC][O]` (1B, 4F)H (27, 79)D

Input of this command disables the paper-out detector and allows the printer to continue printing, even after it runs out of paper.

66. `[ESC][o]` (1B, 6F)H (27, 111)D

This command enables the paper-out detector.

When the automatic paper ejection is disabled by turning DIP switch 2-4 off and less than 1 inch of paper remains, the PAPER OUT lamp lights, the ON₇-LINE lamp goes off, and the printer is deselected.

Pressing the ON-LINE switch turns on the ON-LINE lamp and prepares the printer to receive data. The printer enters the paper-out state again after a print and line feed.

When the automatic paper ejection is enabled by the `[ESC][D][00][08]` command, the printer enters the paper-out state after ejecting the paper.

• Cancel

67. `[CAN]` (18)H (24)D

This command cancels all the print data in the buffer. However, the control codes are still valid.

```
1234567890
```

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT "ABCDEFGHIJKL";  
30 PRINT CHR# (24);  
40 PRINT "1234567890"  
50 LIST  
60 PRINT CHR# (4);"PR#0"
```

• Software Reset

68. `ESC c` (1B, 63)H (27, 99)D

Input of this command prints out all the data that has already been input and resets the printer, except the vertical tab settings.

• LF Function

69. `ESC l 1` (1B, 6C, 31)H (27, 108, 49)D

After the input of this command, an LF code performs a line feed only. The next line of printing starts directly below where the previous line left off. If the LF code has not been designated by DIP switch 2-2 as a print command, the LF code input will be ignored.

```
LINE FEED
```

```
LF 1
```

```
LF 2
```

```
10 PRINT CHR# (4); "PR#1"
20 PRINT "LINE FEED";
30 PRINT CHR# (27); "11"; CHR# (10);
40 PRINT "LF 1";
50 PRINT CHR# (27); "10"; CHR# (10);
60 PRINT "LF 2"
70 LIST
80 PRINT CHR# (4); "PR#0"
```

70. `ESC l 0` (1B, 6C, 30)H (27, 108, 48)D

After the input of this command, an LF code performs a line feed and carriage return. The next line of printing starts at the left margin positions.

If the LF code has not been designated by DIP switch 2-2 as a print command, the LF code input will be ignored.

Refer to 69.

• CR Function

At power-on, DIP switch 1-8 selects this function.

SWITCH	Function
ON	CR + LF
OFF	CR only

71. `ESC Z 80 00` (1B, 5A, 80, 00)H (27, 90, 128, 0)D

After the input of this command, a CR code performs a carriage return only.
Turning DIP switch 1-8 off is identical to this command.

72. `ESC D 80 00` (1B, 44, 80,00)H (27, 68, 128, 0)D

After the input of this command, a CR code performs a carriage return and line feed.
Turning DIP switch 1-8 on is identical to this command.

• Automatic Printing

When the print position exceeds the right margin, the contents in the buffer are automatically printed out.

This is called the automatic printing.

73. `ESC Z 20 00` (1B, 5A, 20, 00)H (27, 90, 32, 0)D

After the input of this command, a line feed is not added to the automatic printing.
Turning DIP switch 2-3 off is identical to this command.

74. `ESC D 20 00` (1B, 44, 20, 00)H (27, 68, 32,0)D

After the input of this command, a line feed is added to the automatic printing.
Turning DIP switch 2-3 on is identical to this command.

• Data length

Control codes like the CR function need the 8th bit (MSB) data.

To use Applesoft Basic, which always outputs "1" for the 8th bit of data, DIP switch 1-5 at the back of the printer must be turned on to ignore the MSB. This is the default setting as shipped.

75.

ESC	Z	00	20
-----	---	----	----

 (1B, 5A, 00, 20)H (27, 90, 0, 32)D

This command recognizes the 8th bit (MSB) of data and is identical to DIP switch 1-5 being off.

76.

ESC	D	00	20
-----	---	----	----

 (1B, 44, 00, 20)H (27, 68, 0, 32)D

This command ignores the 8th bit of data and is identical to turning on DIP switch 1-5.

• Zero Font

77.

ESC	Z	00	01
-----	---	----	----

 (1B, 5A, 00, 01)H (27, 90, 0, 1)D

After this command, the numeral zero is printed without a slash (0).
Turning DIP switch 2-1 off is identical to this command.

```
000000  
000000
```

```
10 PRINT CHR# (4);"PR#1"  
20 PRINT CHR# (27);"D"; CHR# (0); CHR# (1);  
30 PRINT "00000"  
40 PRINT CHR# (27);"Z"; CHR# (0); CHR# (1);  
50 PRINT "00000"  
60 LIST  
70 PRINT CHR# (4);"PR#0"
```

78.

ESC	D	00	01
-----	---	----	----

 (1B, 44, 00, 01)H (27, 68, 0, 1)D

After this command, the numeral zero is printed with a slash (0).
Turning DIP switch 2-1 on is identical to this command.

Refer to 77.

• Print Command

DIP switch 2-2 is identical to the following commands.

79.

ESC	Z	40	00
-----	---	----	----

 (1B, 5A, 40, 00)H (27, 90, 64, 0)D

This command designates that only the CR code is a print command.

80.

ESC	D	40	00
-----	---	----	----

 (1B, 44, 40, 00)H (27, 68, 64, 0)D

This command designates that the CR, LF, VT, and FF codes are all print commands.

• Foreign Characters

Input of the following commands select alternate foreign characters among 7 different language fonts.

- | | | | |
|-----|--------------------------------------|--|---------------|
| 81. | <code>ESC Z 07 00</code> | (1B, 5A, 07, 00)H
(27, 90, 7, 0,)D | USA |
| 82. | <code>ESC Z 04 00 ESC D 03 00</code> | (1B, 5A, 04, 00, 1B, 44, 03, 00)H
(27, 90, 4, 0, 27, 68, 3, 0)D | British |
| 83. | <code>ESC Z 03 00 ESC D 04 00</code> | (1B, 5A, 03, 00, 1B, 44, 04, 00)H
(27, 90, 3, 0, 27, 68, 4, 0)D | German |
| 84. | <code>ESC Z 01 00 ESC D 06 00</code> | (1B, 5A, 01, 00, 1B, 44, 06, 00)H
(27, 90, 1, 0, 27, 68, 6, 0)D | French |
| 85. | <code>ESC Z 02 00 ESC D 05 00</code> | (1B, 5A, 02, 00, 1B, 44, 05, 00)H
(27, 90, 2, 0, 27, 68, 5, 0)D | Swedish |
| 86. | <code>ESC Z 06 00 ESC D 01 00</code> | (1B, 5A, 06, 00, 1B, 44, 01, 00)H
(27, 90, 6, 0, 27, 68, 1, 0)D | Italian |
| 87. | <code>ESC D 07 00</code> | (1B, 44, 07, 00)H
(27, 68, 7, 0)D | Spanish |
| 88. | <code>ESC Z 05 00 ESC D 02 00</code> | (1B, 5A, 05, 00, 1B, 44, 02, 00)H
(27, 90, 5, 0, 27, 68, 2, 0)D | USA |

The table below shows the characters in each language font.

Code Language	Alternate Characters									
	(35)D (23)H	(64)D (40)H	(91)D (5B)H	(92)D (5C)H	(93)D (5D)H	(96)D (60)H	(123)D (7B)H	(124)D (7C)H	(125)D (7D)H	(126)D (7E)H
USA	#	@	[	\	\]	`	{	|	}	~
British	£	@	[	\	\]	`	{	|	}	~
German	#	§	Ä	Ö	Ü	`	ä	ö	ü	ß
French	£	à	°	ç	§	`	é	ù	è	¨
Swedish	#	@	Ä	Ö	Å	`	ä	ö	å	~
Italian	£	§	°	ç	é	ù	à	ò	è	ì
Spanish	£	§	i	Ñ	¿	`	°	ñ	ç	~

Note: DIP switches 1-1, 1-2, and 1-3 work the same as the above commands.

```
#@[\\]'{ }~
£@[\\]'{ }~
#§ÅÜ'äöüß
£à°ç§'éùè¨
#@ÅÜÅ'äö&~
£§°çéùàòèì
£§;Ñ¿''ñç~
#@[\\]'{ }~
```


• **Automatic Paper Ejection**

89. `ESC Z 00 08` (1B, 5A, 00, 08)H (27, 90, 0, 8)D

This command disables the automatic paper ejection that ejects the paper if a paper-out condition is detected. Turning DIP switch 2-4 off is identical to this command.

90. `ESC D 00 08` (1B, 44, 00, 08)H (27, 68, 0, 8)D

This command enables the automatic paper ejection.
Turning DIP switch 2-4 on is identical to this command.

TROUBLESHOOTING

Use the table below to diagnose any problems that may occur. If you cannot solve the problem, try to decide what part of your system is not working properly and consult your dealer.

PROBLEM	CAUSE AND REMEDY
The printer does not print. The POWER lamp does not light.	1) Power is not getting to the printer. ● Check the power cord and power switch.
The printer does not print. The POWER lamp is lit.	1) The connection to the computer is not correct. ● Check that the cable connecting the printer and computer is correctly connected. 2) The ribbon cassette is not properly installed. ● Properly install it.
The printer is operating properly, but the paper is not feeding through properly.	1) The paper is jammed in the printer. ● Remove the paper and reinsert it properly.
The print is light or smeared.	1) The print head position is not correct. ● Move the head adjustment lever to match the paper being used. 2) The ribbon cassette is not properly installed. ● Properly install the cassette. 3) The ink ribbon is old or is worn out. ● Replace the old ribbon cassette with a new one.
The PAPER OUT lamp is blinking.	1) An error condition has been detected. ● Turn power off and then back on again.

CAUTIONS FOR USE

- Do not use a power supply voltage that is out of the specified range.
- Do not touch the print head immediately after printing because it is too hot.
- Be careful not to twist the ribbon while installing it.
- Wait at least two seconds after turning power off before turning it back on again. The initialization process may not be performed correctly if this is not done.
- The printer should be used when the humidity is low, when there is little dust, and where the printer is not in direct sunlight.
- Do not perform printing without the ribbon cassette and paper properly installed.
- Never install the tractor unit when using friction feed for cut sheet paper.
- When using continuous forms, the paper bail must be set to the platen side; otherwise, a paper jam may occur.

APPENDIX A

RS-232C Serial Interface

Transmission Speed:

110, 300, 600, 1200, 2400, 4800, 9600, or 19200 baud

Data Input Form:

Start bit	1 bit
Data length	7 or 8 bits
Parity bit	Odd, even or no
Stop bit(s)	1 bit or more (when data length is 7 bits, 2 bits or more are needed)

Signal Polarity:

Signal lines	Mark = logical '1', -3 ~ -24V Space = logical '0', +3 ~ +24V
Control lines	ON, +3 ~ +24V OFF, -3 ~ -24V

Handshake Protocol:

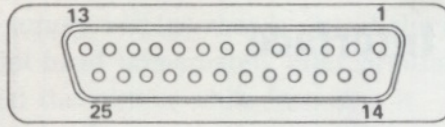
BUSY/READY protocol (Pin nos. 11 and 20)

ON	The printer can receive data (READY).
OFF	The printer cannot receive data (BUSY).

X-ON/X-OFF protocol (Pin no. 2)

Output X-ON (11 Hex)	The printer can receive data.
Output X-OFF (13 Hex)	The printer cannot receive data.

INPUT CONNECTOR: 25-PIN, D-SUB



PIN	SIGNAL	DIRECTION	DESCRIPTION
1	F. GND	—	Frame ground
2	TXD	Output	Mark state in BUSY/READY protocol Output X-ON/X-OFF in X-ON/X-OFF protocol
3	RXD	Input	Receive data
4	RTS *	Output	Request to send in ON state
5	CTS *	Input	Clear to send in ON state
6	DSR *	Input	Data set ready in ON state
7	S. GND	—	Signal ground
8	CD *	Input	Computer is ready to send data (Carrier detected)
11	SRTS	Output	Ready to receive data in ON state (Secondary request to send)
20	DTR	Output	Ready to receive data in ON state (Data terminal ready)

Table 1

* If DSR is to be used, cut J3 and jumper J4 on the serial circuit board in the printer.

If CD is to be used, cut J3 and jumper J2.

If CTS is to be used, cut J5 and jumper J6 because RTS and CTS are connected on the circuit board.

DIP SWITCH SETTINGS ON THE SERIAL INTERFACE BOARD

Note: To connect the printer to a Macintosh or Apple IIc, do not change the DIP switch settings.

Switch	Function	ON	OFF	Setting as shipped
1-1	Baud rate selection	See Table 3		ON
1-2				OFF
1-3				OFF
1-4	Data length	7 bits	8 bits	OFF
1-5	8th bit control (MSB)	See Table 4		OFF
1-6				OFF
1-7	Parity bit used	Yes	No	OFF
1-8	Parity bit selection	Odd	Even	OFF
2-1	Protocol	X-ON/X-OFF	BUSY/READY	OFF
2-2	Remaining buffer space to go busy*	512 bytes	128 bytes	ON

Table 2

*: Refer to 'Remaining buffer space'.

SWITCH			Baud rate (BPS)
1-3	1-2	1-1	
ON	ON	ON	110
ON	ON	OFF	300
ON	OFF	ON	600
ON	OFF	OFF	1200
OFF	ON	ON	2400
OFF	ON	OFF	4800
OFF	OFF	ON	9600
OFF	OFF	OFF	19200

Table 3

SWITCH		Input data's 8th-bit control (MSB)
1-6	1-5	
ON	ON	D ₈ is always '0'
ON	OFF	D ₈ is always '1'
OFF	ON	Change the D ₈ bit
OFF	OFF	Receive data as it is

Table 4

* D₈ is the Most-Significant Bit (MSB).

JUMPERS

Jumper	Setting as shipped	Description
J 1 J 2	ON OFF	To use the CD control line, cut J1 and jumper J2.
J 3 J 4	ON OFF	To use the DSR control line, cut J3 and jumper J4.
J 5 J 6	ON OFF	To use the CTS control line, cut J5 and jumper J6.
J 7	OFF	To connect F. GND to S. GND, jumper J7.
J18	OFF	To change DTR signal polarity, jumper J18.

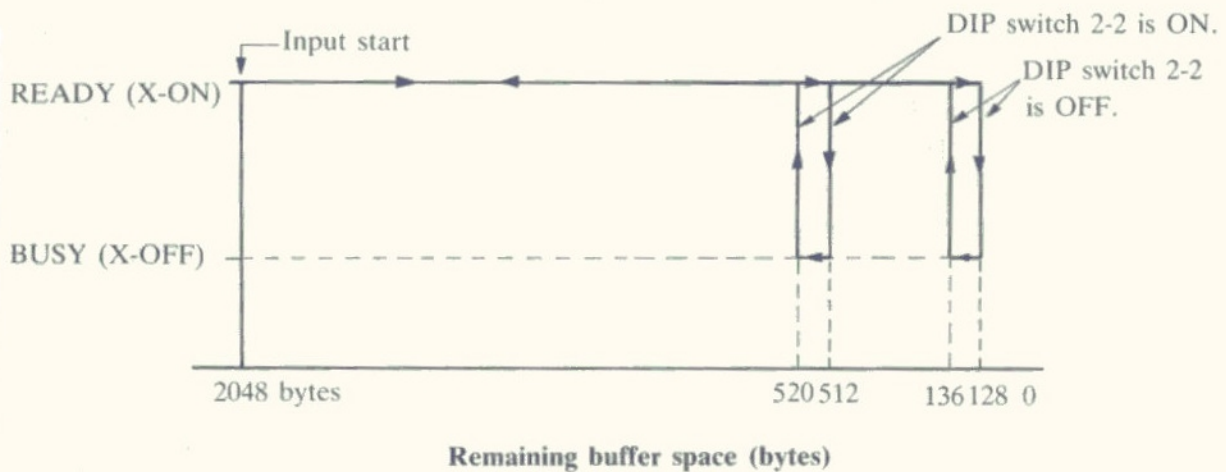
ERROR DURING INPUTTING DATA

If an error, such as a parity error, occurs while receiving data, one "*" (2A code in hexadecimal) per one data error is transmitted to the printer.

Input data that exceed the communication buffer capacity (2K) are ignored.

REMAINING BUFFER SPACE

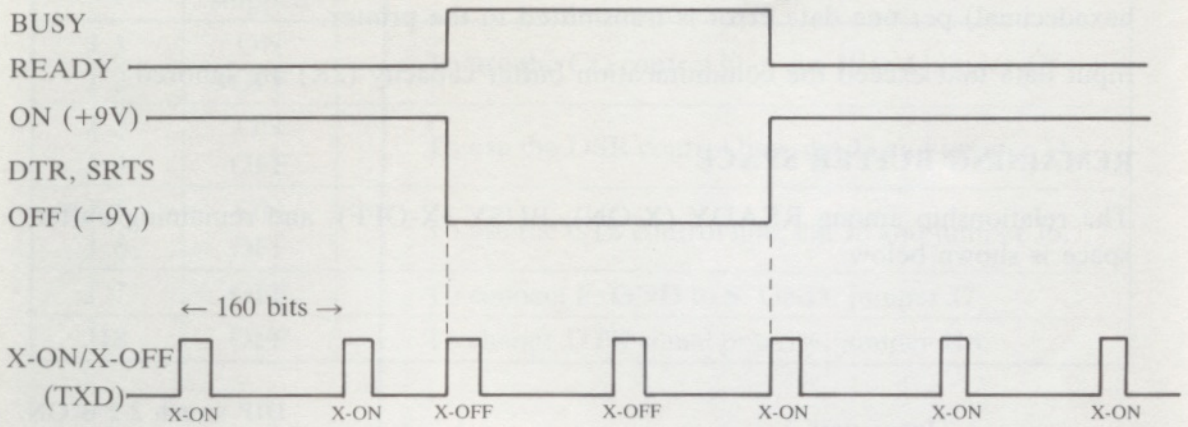
The relationship among READY (X-ON), BUSY (X-OFF), and remaining buffer space is shown below.



At power-on, the printer is in the READY (X-ON) state since the communication buffer is empty.

When the remaining space of the buffer goes below 128 bytes or 512 bytes (selected by DIP switch 2-2), the printer enters the BUSY (X-OFF) state. The printer can receive up to 128 or 512 bytes more after it enters the BUSY (X-OFF) state. When the remaining buffer space increases by 8 bytes or more, the printer returns to the READY (X-ON) state.

BUSY/READY, X-ON/X-OFF, DTR, and SRTS Timing Chart



X-ON (11 HEX) and X-OFF (13 HEX) are transmitted every 160 bits of the present data transfer rate (baud rate).

These signals are output through the TXD line.

The data format is the same as the input data structure.

APPENDIX B

Printing Specifications

	Type	Character or dot spacing	Maximum character column	Maximum dot column	Print speed
STANDARD CHARACTER	Extended	9 cpi	72	576	68 cps
	Pica	10 cpi	80	640	75 cps
	Elite	12 cpi	96	768	37 cps
	Semicondensed	13.4 cpi	107	856	41 cps
	Condensed	15 cpi	120	960	46 cps
	Ultra-condensed	17 cpi	136	1088	52 cps
	Pica Proportional	1/144"	—	1152	441 dots/s
	Elite Proportional	1/160"	—	1280	490 dots/s
NEAR LETTER QUALITY (N.L.Q.) CHARACTER	Extended	9 cpi	72	1152	14 cps
	Pica	10 cpi	80	1280	15 cps
	Elite	12 cpi	96	1536	18 cps
GRAPHICS	576	1/72"	—	576	544 dots/s
	640	1/80"	—	640	600 dots/s
	768	1/96"	—	768	294 dots/s
	856	1/107"	—	856	328 dots/s
	960	1/120"	—	960	368 dots/s
	1088	1/136"	—	1088	416 dots/s
	1152	1/144"	—	1152	441 dots/s
	1280	1/160"	—	1280	490 dots/s

APPENDIX C

ASCII, Binary, and Hexadecimal Codes

The first 32 codes are control characters set by pressing the CONTROL key simultaneously with the desired character key.

ASCII	Dec	Hex	76543210	Dot-column width for proportional	Dec	Hex	76543210
CONTROL-@	0	00	00000000		128	80	10000000
CONTROL-A	1	01	00000001		129	81	10000001
CONTROL-B	2	02	00000010		130	82	10000010
CONTROL-C	3	03	00000011		131	83	10000011
CONTROL-D EOT	4	04	00000100		132	84	10000100
CONTROL-E	5	05	00000101		133	85	10000101
CONTROL-F	6	06	00000110		134	86	10000110
CONTROL-G	7	07	00000111		135	87	10000111
CONTROL-H BS	8	08	00001000		136	88	10001000
CONTROL-I HT	9	09	00001001		137	89	10001001
CONTROL-J LF	10	0A	00001010		138	8A	10001010
CONTROL-K VT	11	0B	00001011		139	8B	10001011
CONTROL-L FF	12	0C	00001100		140	8C	10001100
CONTROL-M CR	13	0D	00001101		141	8D	10001101
CONTROL-N SO	14	0E	00001110		142	8E	10001110
CONTROL-O SI	15	0F	00001111		143	8F	10001111
CONTROL-P	16	10	00010000		144	90	10010000
CONTROL-Q	17	11	00010001		145	91	10010001
CONTROL-R	18	12	00010010		146	92	10010010
CONTROL-S	19	13	00010011		147	93	10010011
CONTROL-T	20	14	00010100		148	94	10010100
CONTROL-U	21	15	00010101		149	95	10010101
CONTROL-V	22	16	00010110		150	96	10010110
CONTROL-W	23	17	00010111		151	97	10010111
CONTROL-X CAN	24	18	00011000		152	98	10011000
CONTROL-Y	25	19	00011001		153	99	10011001
CONTROL-Z	26	1A	00011010		154	9A	10011010
CONTROL-[ESC	27	1B	00011011		155	9B	10011011
CONTROL-\	28	1C	00011100		156	9C	10011100
CONTROL-] GS	29	1D	00011101		157	9D	10011101
CONTROL-^ RS	30	1E	00011110		158	9E	10011110
CONTROL-_ US	31	1F	00011111		159	9F	10011111
SP	32	20	00100000	7	160	A0	10100000
!	33	21	00100001	7	161	A1	10100001
"	34	22	00100010	10	162	A2	10100010
#	35	23	00100011	14*	163	A3	10100011

* Valid when the USA language is selected.

ASCII	Dec	Hex	76543210	Dot-column width for proportional	Dec	Hex	76543210
\$	36	24	00100100	12	164	A4	10100100
%	37	25	00100101	16	165	A5	10100101
&	38	26	00100110	13	166	A6	10100110
'	39	27	00100111	7	167	A7	10100111
(	40	28	00101000	7	168	A8	10101000
)	41	29	00101001	7	169	A9	10101001
*	42	2A	00101010	12	170	AA	10101010
+	43	2B	00101011	12	171	AB	10101011
,	44	2C	00101100	7	172	AC	10101100
-	45	2D	00101101	12	173	AD	10101101
.	46	2E	00101110	7	174	AE	10101110
/	47	2F	00101111	12	175	AF	10101111
0	48	30	00110000	12	176	B0	10110000
1	49	31	00110001	12	177	B1	10110001
2	50	32	00110010	12	178	B2	10110010
3	51	33	00110011	12	179	B3	10110011
4	52	34	00110100	12	180	B4	10110100
5	53	35	00110101	12	181	B5	10110101
6	54	36	00110110	12	182	B6	10110110
7	55	37	00110111	12	183	B7	10110111
8	56	38	00111000	12	184	B8	10111000
9	57	39	00111001	12	185	B9	10111001
:	58	3A	00111010	7	186	BA	10111010
;	59	3B	00111011	7	187	BB	10111011
<	60	3C	00111100	12	188	BC	10111100
=	61	3D	00111101	12	189	BD	10111101
>	62	3E	00111110	12	190	BE	10111110
?	63	3F	00111111	12	191	BF	10111111
@	64	40	01000000	14*	192	C0	11000000
A	65	41	01000001	16	193	C1	11000001
B	66	42	01000010	15	194	C2	11000010
C	67	43	01000011	14	195	C3	11000011
D	68	44	01000100	15	196	C4	11000100
E	69	45	01000101	15	197	C5	11000101
F	70	46	01000110	15	198	C6	11000110
G	71	47	01000111	14	199	C7	11000111

* Valid when the USA language is selected.

ASCII	Dec	Hex	76543210	Dot-column width for proportional	Dec	Hex	76543210
H	72	48	01001000	15	200	C8	11001000
I	73	49	01001001	9	201	C9	11001001
J	74	4A	01001010	13	202	CA	11001010
K	75	4B	01001011	12	203	CB	11001011
L	76	4C	01001100	13	204	CC	11001100
M	77	4D	01001101	17	205	CD	11001101
N	78	4E	01001110	16	206	CE	11001110
O	79	4F	01001111	15	207	CF	11001111
P	80	50	01010000	13	208	D0	11010000
Q	81	51	01010001	16	209	D1	11010001
R	82	52	01010010	15	210	D2	11010010
S	83	53	01010011	12	211	D3	11010011
T	84	54	01010100	14	212	D4	11010100
U	85	55	01010101	15	213	D5	11010101
V	86	56	01010110	16	214	D6	11010110
W	87	57	01010111	17	215	D7	11010111
X	88	58	01011000	11	216	D8	11011000
Y	89	59	01011001	14	217	D9	11011001
Z	90	5A	01011010	11	218	DA	11011010
[	91	5B	01011011	12*	219	DB	11011011
\	92	5C	01011100	12*	220	DC	11011100
]	93	5D	01011101	12*	221	DD	11011101
^	94	5E	01011110	12	222	DE	11011110
_	95	5F	01011111	17	223	DF	11011111
`	96	60	01100000	7*	224	E0	11100000
a	97	61	01100001	12	225	E1	11100001
b	98	62	01100010	12	226	E2	11100010
c	99	63	01100011	10	227	E3	11100011
d	100	64	01100100	12	228	E4	11100100
e	101	65	01100101	12	229	E5	11100101
f	102	66	01100110	10	230	E6	11100110
g	103	67	01100111	12	231	E7	11100111
h	104	68	01101000	12	232	E8	11101000
i	105	69	01101001	8	233	E9	11101001
j	106	6A	01101010	7	234	EA	11101010
k	107	6B	01101011	10	235	EB	11101011

* Valid when the USA language is selected.

ASCII	Dec	Hex	76543210	Dot-column width for proportional	Dec	Hex	76543210
l	108	6C	01101100	8	236	EC	11101100
m	109	6D	01101101	16	237	ED	11101101
n	110	6E	01101110	12	238	EE	11101110
o	111	6F	01101111	12	239	EF	11101111
p	112	70	01110000	12	240	F0	11110000
q	113	71	01110001	12	241	F1	11110001
r	114	72	01110010	10	242	F2	11110010
s	115	73	01110011	12	243	F3	11110011
t	116	74	01110100	10	244	F4	11110100
u	117	75	01110101	12	245	F5	11110101
v	118	76	01110110	12	246	F6	11110110
w	119	77	01110111	16	247	F7	11110111
x	120	78	01111000	12	248	F8	11111000
y	121	79	01111001	12	249	F9	11111001
z	122	7A	01111010	10	250	FA	11111010
{	123	7B	01111011	10*	251	FB	11111011
|	124	7C	01111100	7*	252	FC	11111100
}	125	7D	01111101	10*	253	FD	11111101
-	126	7E	01111110	13*	254	FE	11111110
	127	7F	01111111		255	FF	11111111

* Valid when the USA language is selected.

The table below shows dot-column width of Proportional characters

Code Language	Alternate Characters									
	(35)D (23)H	(64)D (40)H	(91)D (5B)H	(92)D (5C)H	(93)D (5D)H	(96)D (60)H	(123)D (7B)H	(124)D (7C)H	(125)D (7D)H	(126)D (7E)H
USA	# (14)	@ (14)	[(12)	\ (12)	] (12)	^ (7)	{ (10)	| (7)	} (10)	~ (13)
British	£ (13)	@ (14)	[(12)	\ (12)	] (12)	^ (7)	{ (10)	| (7)	} (10)	~ (13)
German	# (14)	§ (12)	Ä (16)	Ö (15)	Ü (15)	^ (7)	ä (12)	ö (12)	ü (12)	ß (14)
French	£ (13)	à (12)	° (13)	ç (10)	§ (12)	^ (7)	é (12)	ù (12)	è (12)	¨ (13)
Swedish	# (14)	@ (14)	Ä (16)	Ö (15)	Å (16)	^ (7)	ä (12)	ö (12)	å (12)	~ (13)
Italian	£ (13)	§ (12)	° (13)	ç (10)	é (12)	ù (12)	à (12)	ò (12)	è (12)	ì (8)
Spanish	£ (13)	§ (12)	í (7)	Ñ (16)	¿ (12)	^ (7)	° (13)	ñ (12)	ç (10)	~ (13)

APPENDIX D

DIP Switches at the Back of the Printer

The DIP switches are located at the rear of the printer and covered with the plastic lid. The DIP switches are read after the initialization process either by turning the power switch on or inputting an `[ESC]c` command.

DIP Switch	Function	ON	OFF	Setting as shipped
1-1	Language fonts selection	See below		OFF
1-2				OFF
1-3				OFF
1-4	Page length	72 lines	66 lines	OFF
1-5	Data length	7 bits*	8 bits	ON
1-6	Print character mode selected at power-on	See below		ON
1-7				OFF
1-8	CR function	CR+LF	CR only	OFF
2-1	Zero font	∅	0	OFF
2-2	Print command	CR,LF,VT,FF	CR	ON
2-3	Automatic printing	CR+LF	CR only	OFF
2-4	Automatic paper ejection	Enabled	Disabled	OFF

*: When 7-bit data length is selected, the printer ignores the 8th bit (MSB) of data within the printer.

Language Fonts Setting Table

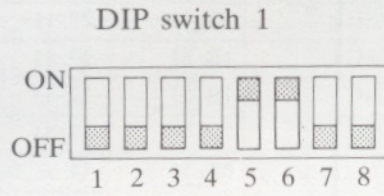
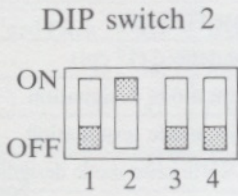
DIP switch			Language	Print character code									
1-1	1-2	1-3		35D 23H	64D 40H	91D 5BH	92D 5CH	93D 5DH	96D 60H	123D 7BH	124D 7CH	125D 7DH	126D 7EH
OFF	OFF	OFF	USA	#	@	[	\	\]	^	{	|	}	-
ON	ON	OFF	British	£	@	[	\	\]	^	{	|	}	-
OFF	OFF	ON	German	#	§	Ä	Ö	Ü	^	ä	ö	ü	ß
OFF	ON	ON	French	£	à	°	ç	§	^	é	ù	è	..
ON	OFF	ON	Swedish	#	@	Ä	Ö	Å	^	ä	ö	å	-
ON	OFF	OFF	Italian	£	§	°	ç	é	ù	à	ò	è	ì
ON	ON	ON	Spanish	£	§	ì	Ñ	¿	^	°	ñ	ç	-
OFF	ON	OFF	USA	Same as the USA fonts above									

* USA fonts are selected when shipped from the factory.

Print Character Mode

DIP switch		Print character
1-6	1-7	
OFF	OFF	Pica
ON	OFF	Elite
OFF	ON	Ultracondensed
ON	ON	Elite Proportional

* Elite is selected when shipped from the factory.



Remove the plastic cover to change DIP switch settings.

APPENDIX E

Control Codes

Category	Item	Code	Hex	Decimal	Function	Page
Print Command	1	CR (CONTROL-M)	0D	13	Carriage return after printing	22
Line Feed	2	LF (CONTROL-J)	0A	10	Line feed only	22
Vertical Tab	3	VT (CONTROL-K)	0B	11	Goes to next vertical tab B	23
Form Feed	4	FF (CONTROL-L)	0C	12	Form feed	24
Character Mode Designation	5	ESC n	1B, 6E	27, 110	Extended (9 cpi)	25
	6	ESC N	1B, 4E	27, 78	Pica (10 cpi)	25
	7	ESC E	1B, 45	27, 69	Elite (12 cpi)	26
	8	ESC p	1B, 70	27, 112	Pica proportional	26
	9	ESC P	1B, 50	27, 80	Elite proportional	27
	10	ESC e	1B, 65	27, 101	Semicondensed (13.4 cpi)	27
	11	ESC q	1B, 71	27, 113	Condensed (15 cpi)	28
Bold Print	12	ESC Q	1B, 51	27, 81	Ultracondensed (17 cpi)	28
	13	ESC !	1B, 21	27, 33	Bold print mode designation	29
Double Width Print	14	ESC "	1B, 22	27, 34	Bold print mode termination	29
	15	SO (CONTROL-N)	0E	14	Double width print mode designation	30
Near Letter Quality Character	16	SI (CONTROL-O)	0F	15	Double width print mode termination	30
	17	ESC H	1B, 48	27, 72	Near Letter Quality character mode designation	31
Italic Character	18	ESC h	1B, 68	27, 104	Near Letter Quality character mode termination	31
	19	ESC i 1	1B, 69, 31	27, 105, 49	Italic character mode designation	32
Superscript/ Subscript Character	20	ESC i 0	1B, 69, 30	27, 105, 48	Italic character mode termination	32
	21	ESC b 0	1B, 62, 30	27, 98, 48	Superscript/Subscript character termination	33
	22	ESC b 1	1B, 62, 31	27, 98, 49	Superscript character mode designation	33
Underlining	23	ESC b 2	1B, 62, 32	27, 98, 50	Subscript character mode designation	33
	24	ESC X	1B, 58	27, 88	Starts underlining	34
Dot Spacing in Proportional	25	ESC Y	1B, 59	27, 89	Stops underlining	34
	26	ESC n	1B, 31~36	27, 49~54	Takes n dots of space between given proportional characters (n = 1 ~ 6)	35
Backspacing	27	ESC s n	1B, 73, 30~39	27, 115, 48~57	Takes n-dot spacing between all proportional characters (n = 0~9)	36
	28	BS (CONTROL-H)	08	8	Backspaces one character	36

Category	Item	Code	Hex	Decimal	Function	Page
Horizontal Tab	29	HT (CONTROL-I)	09	9	Goes to next tab	37
	30	ESC (	1B, 28	27, 40	Sets horizontal tabs	37
	31	ESC u	1B, 75	27, 117	Adds horizontal tab	38
	32	ESC)	1B, 29	27, 41	Clears selected horizontal tabs	38
	33	ESC 0	1B, 30	27, 48	Clears all tabs	38
Margin Setting	34	ESC L nnn	1B, 4C	27, 76	Sets left margin to position nnn	39
	35	ESC / nnn	1B, 2F	27, 47	Sets right margin to position nnn	39
Printing Direction	36	ESC >	1B, 3E	27, 62	Unidirectional printing from left to right	40
	37	ESC <	1B, 3C	27, 60	Bidirectional printing	40
Character Repetition	38	ESC R nnn C	1B, 52	27, 82	Prints nnn repetitions of a given character C	40
Line Feed Pitch	39	ESC A	1B, 41	27, 65	6 lines per inch	41
	40	ESC B	1B, 42	27, 66	8 lines per inch	41
	41	ESC T nn	1B, 54	27, 84	Distance between lines to be nn/144 inch (nn = 01 to 99)	42
Line Feed Direction	42	ESC f	1B, 66	27, 102	Forward line feeding	43
	43	ESC r	1B, 72	27, 114	Reverse line feeding	43
VFU Vertical Tabs	44	GS (CONTROL-]) A @	1D, 41, 40	29, 65, 64	Starts vertical tab settings (Sets TOF)	45
	45	C @	43, 40	67, 64	Sets BOF	46
	46	A @ RS (CONTROL-^)	41, 40, 1E	65, 64, 30	Ends vertical tab settings (Sets next TOF)	46
	47	US A~F	1F	31	Performs vertical tab	48
Vertical Tab Initialization	48	GS 0	1D, 30	29, 48	Sets vertical tabs to power-on state	48
Multiple Linefeeds	49	US (CONTROL-_) n	1F	31	Feeds n lines of blank paper [n=1, 2, 3, 4, 5, 6, 7, 8, 9, :(10);(11), <(12), =(13), >(14), ?(15)]	49
TOF Setting	50	ESC v	1B, 76	27, 118	Sets TOF at current position	50
Download Character Loading	51	ESC -	1B, 2D	27, 45	Maximum horizontal width is 8 dots	51
	52	ESC +	1B, 2B	27, 43	Maximum horizontal width is 16 dots	51
	53	ESC I	1B, 49	27, 73	Starts loading	51
	54	EOT (CONTROL-D)	04	4	End loading	51
	55	A ... P	41 ... 50	65 ... 80	Designates width for top 8 wires (A = 1 ... P = 16)	51
	56	a ... p	61 ... 70	97 ... 112	Designates width for bottom 8 wires (a = 1 ... p = 16)	52

Category	Item	Code	Hex	Decimal	Function	Page
Download Character Printing	57	ESC '	1B, 27	27, 39	Switches to download character set (32 ~ 126, 160 ~ 239)	54
	58	ESC *	1B, 2A	27, 42	Switches to download character set of high ASCII values (160-239) for 7-bit mode	54
	59	ESC \$	1B, 24	27, 36	Switches back to normal character set	54
Graphics	60	ESC G nnnn	1B, 47	27, 71	Prints line of nnnn data bytes that follow	55
	61	ESC S nnnn	1B, 53	27, 83	Same as ESC G	56
	62	ESC g nnn	1B, 67	27, 103	Prints line of (nnn×8) data bytes that follow	56
	63	ESC V nnnn C	1B, 56	27, 86	Prints nnnn repetitions of the dot column specified by C	57
Print Position	64	ESC F nnnn	1B, 46	27, 70	Designates the print position away from left margin in dot units specified by nnnn	57
Paper-Out Detector	65	ESC O	1B, 4F	27, 79	Paper out detector off	58
	66	ESC o	1B, 6F	27, 111	Paper out detector on	58
Cancel	67	CAN	18	24	Cancels all unprinted character in the buffer	58
Software Reset	68	ESC c	1B, 63	27, 99	Prints out all data and resets the printer	59
LF Function	69	ESC ℓ 1	1B, 6C, 31	27, 108, 49	LF code performs a line feed only	59
	70	ESC ℓ 0	1B, 6C, 30	27, 108, 48	LF code performs a line feed plus carriage return	59
CR Function	71	ESC Z 80 00	1B, 5A, 80, 00	27, 90, 128, 0	CR code performs a carriage return only	60
	72	ESC D 80 00	1B, 44, 80, 00	27, 68, 128, 0	CR code performs a carriage return plus line feed	60
Automatic Printing	73	ESC Z 20 00	1B, 5A, 20, 00	27, 90, 32, 0	No linefeed performed after automatic printing	60
	74	ESC D 20 00	1B, 44, 20, 00	27, 68, 32, 0	Performs line feed after automatic printing	60
Data Length	75	ESC Z 00 20	1B, 5A, 00, 20	27, 90, 0, 32	Recognizes 8th bit (MSB) of data	61
	76	ESC D 00 20	1B, 44, 00, 20	27, 68, 0, 32	Ignores 8th bit of data (7-bit mode)	61
Zero Font	77	ESC Z 00 01	1B, 5A, 00, 01	27, 90, 0, 1	0: unslashed zero	62
	78	ESC D 00 01	1B, 44, 00, 01	27, 68, 0, 1	∅: slashed zero	62
Print Command	79	ESC Z 40 00	1B, 5A, 40, 00	27, 90, 64, 0	Only CR Code is a print command	62
	80	ESC D 40 00	1B, 44, 40, 00	27, 68, 64, 0	CR, LF, VT, and FF codes are print commands	62

Category	Item	Code	Hex	Decimal	Function	Page
Foreign Characters	81	ESC Z 07 00	1B, 5A, 07, 00	27, 90, 7, 0	USA	63
	82	ESC Z 04 00	1B, 5A, 04, 00	27, 90, 4, 0	British	63
		ESC D 03 00	1B, 44, 03, 00	27, 68, 3, 0		
	83	ESC Z 03 00	1B, 5A, 03, 00	27, 90, 3, 0	German	63
		ESC D 04 00	1B, 44, 04, 00	27, 68, 4, 0		
	84	ESC Z 01 00	1B, 5A, 01, 00	27, 90, 1, 0	French	63
		ESC D 06 00	1B, 44, 06, 00	27, 68, 6, 0		
	85	ESC Z 02 00	1B, 5A, 02, 00	27, 90, 2, 0	Swedish	63
ESC D 05 00		1B, 44, 05, 00	27, 68, 5, 0			
86	ESC Z 06 00	1B, 5A, 06, 00	27, 90, 6, 0	Italian	63	
	ESC D 01 00	1B, 44, 01, 00	27, 68, 1, 0			
87	ESC D 07 00	1B, 44, 07, 00	27, 68, 7, 0	Spanish	63	
88	ESC Z 05 00	1B, 5A, 05, 00	27, 90, 5, 0	USA	63	
	ESC D 02 00	1B, 44, 02, 00	27, 68, 2, 0			
Automatic Paper Ejection	89	ESC Z 00 08	1B, 5A, 00, 08	27, 90, 0, 8	Disables automatic paper ejection	64
	90	ESC D 00 08	1B, 44, 00, 08	27, 68, 0, 8	Enables automatic paper ejection	64

EPSON AMERICA, INC. LIMITED WARRANTY

Epson America, Inc. hereby warrants that it will repair or replace, at its option, any part of the Epson product with which this warranty is enclosed which proves defective by reason of improper workmanship and/or material, without charge for parts or labor, for a period of one (1) year. This warranty period commences on the date of original purchase by the buyer other than for purposes of resale, and this warranty applies only if such original purchase by the buyer was made in the United States.

To obtain service under this warranty you must return your Epson product, properly packaged in its original container or an equivalent, to the nearest authorized Epson Service Center or the Dealer from whom the product was purchased. Any postage, insurance and shipping costs incurred in presenting or sending your Epson product for service are your responsibility.

The Dealer's original bill of sale or other satisfactory proof of the date of the original buyer purchase of your Epson product must be made available to obtain service under this warranty.

This warranty applies only if your Epson product fails to function properly under normal use and within the manufacturer's specifications. Batteries, as well as optional software packages (ROMs) not contained in the original container of your Epson product, are excluded from coverage under this warranty. This warranty does not apply if the Epson label or logo, or the rating label or serial number, has been removed from your Epson product, or if, in the sole opinion of Epson, your Epson product has been damaged by faulty or leaking batteries not supplied by Epson, or by accident, misuse, neglect, or improper packing, shipping, modification or servicing, by other than Epson or an authorized Epson Service Center.

SOME EPSON PRODUCTS HAVE A COMPARTMENT CONTAINING STATIC-SENSITIVE ELECTRONIC CIRCUITRY. THIS COMPARTMENT IS CLEARLY LABELED. DO NOT OPEN IT! THIS WARRANTY WILL BECOME VOID IF YOU ATTEMPT TO MODIFY OR ADJUST ANY ROM OR OTHER PART OR DEVICE IN SUCH A COMPARTMENT, OR IF YOU ATTEMPT TO ADD OR INSERT ANY ROM OR OTHER PART OR DEVICE. IF ANY OF THESE STEPS IS REQUIRED, BRING YOUR EPSON PRODUCT TO AN AUTHORIZED EPSON DEALER.

THE DURATION OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, ON YOUR EPSON PRODUCT SHALL BE LIMITED TO THE DURATION OF THE EXPRESS WARRANTY SET FORTH ABOVE. IN NO EVENT SHALL EPSON AMERICA, INC. OR ITS AFFILIATES BE LIABLE FOR ANY LOSS, INCONVENIENCE OR DAMAGE WHETHER DIRECT, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE, OR WHETHER CAUSED BY NEGLIGENCE OR OTHER FAULT RESULTING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, WITH RESPECT TO YOUR EPSON PRODUCT, EXCEPT AS SET FORTH HEREIN. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS AND SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS AND EXCLUSIONS MAY NOT APPLY TO YOU.

You may request information on how to obtain service under this warranty by contacting the Dealer from whom your Epson product was purchased, or by contacting Epson America, Inc. at the address printed below:

Epson America, Inc.
Service Division
23610 Telo Street
Torrance, CA 90505
(213) 534-4234

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

EPSON[®]

AP-80 Printer

**User's
Manual**

Chapters include:

Setup instructions
Troubleshooting hints
Printer commands
Specifications

EPSON AMERICA, INC.
2780 Lomita Boulevard
Torrance, California 90505

New Hardware, Software and Peripherals

Apple II

The Review

\$6.40 Publication
Spring 1986, \$5.00 U.S.



Megabytes Of Memory: A RAM Card Buyer's Guide

More Than 50 New Product Reviews
Home Finance Software Revisited
Managing A Portfolio With AppleWorks
Speed Demons For The Apple IIe



Printer Cards

Review

Uniprint

Inexpensive Graphics

When the Apple first came out, there was no way to dump a graphics screen to a printer. In fact, there was no way to print anything, since there were very few printers with graphics capabilities and no printer interface for the Apple. When Apple released the parallel interface card in 1978, it came with text capabilities, but it still could not print graphics. To this day, there is no printer graphics standard for the Apple II.

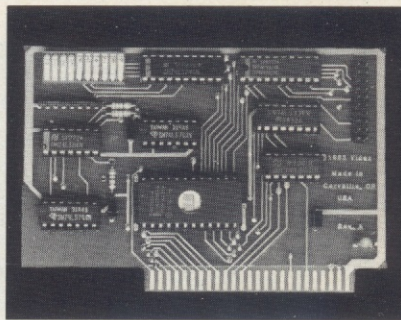
Several third party manufacturers, starting with Interactive Structures, made their own interface cards and customized them for various printers. If you had an Anadex printer with graphics, you would buy a special card customized for that printer; if you got an Okidata, you'd need a different card and so on.

On newer, more advanced graphics interface cards (usually referred to as "smart" interfaces), a set of switches determines which printer you are using. The Videx Uniprint is such a card. It's an inexpensive smart parallel interface card with built-in graphics commands.

To dump hi-res graphics on the Uniprint from a BASIC program, you simply send a Control-I G to the interface card and the picture will be dumped. Double, triple size, inverse, upside down and other modes can be selected easily. For example, putting the following command into an Applesoft BASIC program will tell the Uniprint to dump a triple size, inverse picture in the double hi-res graphics mode, on its side:

```
PRINT CHR$(9);"GTIXR"
```

The CHR\$(9) is a Control-I that tells the Uniprint that a command is coming. The "G" indicates that the user wants a graphics dump. "T" indicates triple size, "I" indicates inverse (white dots on the screen



Uniprint

will show up as white dots on the page), "X" indicates extended (double) hi-res graphics mode, and "R" tells the Uniprint to rotate the picture 90 degrees. The printout will appear as a double hi-res screen sideways, and will fill an 8½ by 11-inch page.

The Uniprint is an excellent, low cost parallel graphics interface card. It is inexpensive, but not a cheap card. It comes with an excellent manual and full support from Videx. Many different printers are supported and the card even supports color graphics on the color Epson and Dataproducts printers.

Although Videx's official warranty period is 90 days, the company has always had excellent in and out of warranty support. Out of warranty upgrades are usually handled for a nominal charge and repairs are generally free, as long as the customer hasn't abused the unit.

If you want a printer interface for a parallel printer that can dump graphics with ease, then check out Uniprint.

Product: Uniprint

Price: \$89

Company: Videx, Inc., 897 N.W. Grant Ave., Corvallis, Ore. 97330, 503-758-0521

Requirements: Apple II, II+, IIe

Supports: Many printers, including Epson, Gemini, Okidata, Dataproducts, Apple DMP, Anadex, Gorilla, Centronics and similar graphics printers. Epson JX-80 and Dataproducts Prism are also supported in color modes. Special cable required for Dataproducts printers.

Warranty: 90 days

Printers

Epson AP-80

An Imagewriter Alternative

The Epson AP-80 is an 80-column dot matrix printer that features hardware and software compatibility with the original Apple Imagewriter. According to the manufacturer, it provides Apple IIc and IIe users with high-resolution graphics as well as draft-quality and near-letter-quality output.

The Epson AP-80 weighs almost 10 pounds less than the Imagewriter, is smaller and offers the following features: selectable near-letter-quality (NLQ) printing capability and software-selectable italics, boldface, double-width printing, proportional spacing, superscripts and subscripts. All of these features can be set from the printer's front panel.

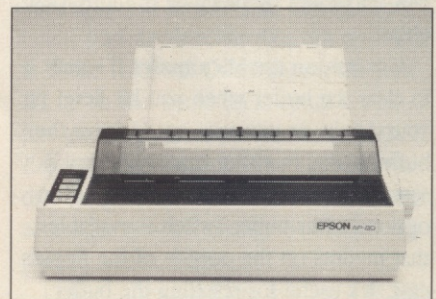
The AP-80 prints draft documents at 75 characters per second (CPS). In NLQ mode, it prints business letters at 15 CPS. It also prints bidirectionally and unidirectionally, under software control.

The manufacturer states that the AP-80 printer is equipped with both friction and adjustable tractor feeds. A built-in, single-sheet loading feature facilitates the handling of single-sheet paper without requiring the user to line up the paper once it is inserted.

Product: Epson AP-80

Price: \$379

Company: Epson America, Computer Products Division, 2780 Lomita Blvd., Tor-



Epson AP-80