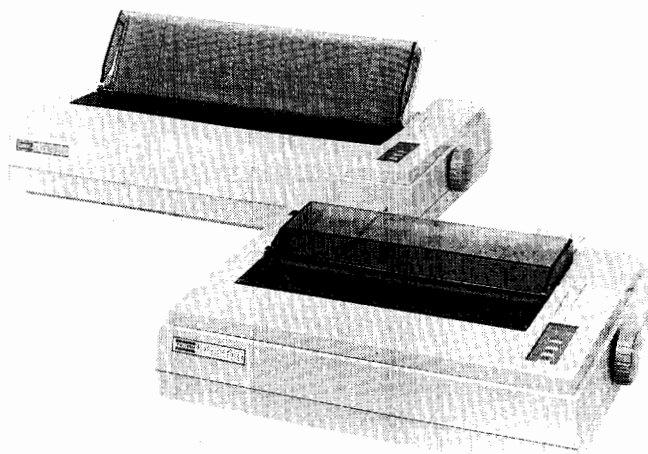


DX2100/2200 User's Manual
Includes 80-column and 136-column
Monochrome and Color Printers
TYPE F/ TYPE I



DX2100/2200
B-69313, F/I, Rev. B

Federal Communications Commission Radio Frequency Interference Statement for United States 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 of 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 with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that 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.

(This equipment has been tested as the M3348A / M3349A of the model number)

NOTE:

The length of power cord must be 3m or less.

NOTE:

An unshielded plug or cable may cause radiation interference.

The printer is designed for use with a properly shielded interface cable. A non-shielded interface cable must not be used. The shield must be connected directly to the chassis of the printer. The cable length must be 3m or less.

Notice for German Users

Dieses Gerät entspricht als Einzelgerät den Funkentstörungsanforderungen der Postverfügung Nr. 1046/1984 bzw. der Grenzfläche B nach VDE 0871/6.78.

Das Kabel muß abgeschirmt und unter 3 Meter lang sein.

***** APPLICATION SOFTWARE SET UP *****

Don't be alarmed if your printer is missing from the list of printer options in the installation instructions for your application software.

Simply instruct your software package that it is working with an Epson FX-80 printer, IBM Proprinter, or IBM Graphics Printer and your printer will perform as specified.

The Tables of Commands in **Section 5** are included for programmers developing custom software packages. A Programmer's Manual is also available.

***** PURPOSE OF MANUAL *****

This Manual is designed to help you install, set up, and use your printer. Our goal is to explain the many features of your printer in a clear, easy to understand manner.

This series includes the 80-column printer and 136-column printer. The 80-column printer has an 8 inch print line and the 136-column printer has a 13.6 inch print line. Except for print line length and minor differences in paper handling, the printers are identical. The material in this manual applies to both versions unless otherwise noted.

This Manual is written for both the novice and the experienced user. We have included procedures, tables and illustrations. Summary information is given in concise terms and you will find a reference to additional detail where applicable.

This Manual is organized to present information in the order that it is most likely to be required. You will also find the Table of Contents helpful when you are trying to locate a particular procedure or specific information.

***** QUICK START CHART *****

Your printer is user friendly. Still you'll find it easier to master if you take just a few moments to review this Manual completely before you try to connect and use your printer.

You may be tempted to connect your printer and learn how to use its many features as you gain experience. You may also be tempted to leave this Manual on a shelf and read it only in an emergency. Please resist these temptations.

The following Quick Start Chart is a summary of the steps we recommend you follow to set up and operate your printer.

QUICK START CHART

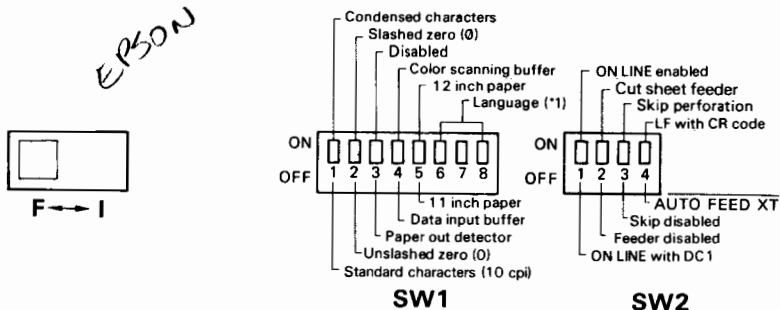
What You Do:	What You Check:	Refer To:
Unpack Printer	Received items	Page 1-2
Open front cover & remove shipping restraints	Print carriage for smooth side to side movement	Page 1-4
Install Memory & Interface Boards	Installation instructions	Page 1-8 and B-1
Prepare printer for host operations	DIP switch settings shown below	Page 1-10 and 3-1

The Quick Start Chart is continued on the next page.

QUICK START CHART (Continued)

DIP SWITCHES ON MEMORY CIRCUIT BOARD

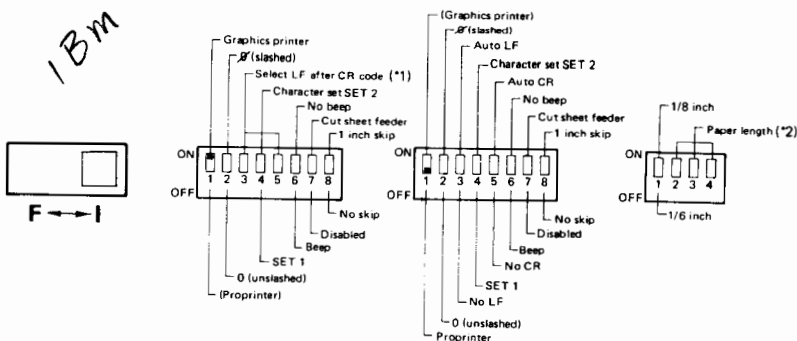
TYPE F PRINTER:



*1

Language	U.S.A.	French	German	English	Danish	Swedish	Italian	Spanish
<input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 ON OFF	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

TYPE I PRINTER:



*1

(Graphics Printer) (Proprinter)

LF after CR code	Done	Not done
<input type="checkbox"/> 3 <input type="checkbox"/> 5 ON OFF	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
AUTO FEED XT	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> High

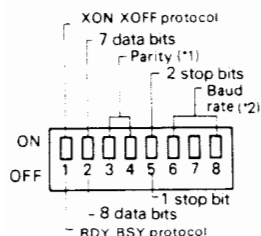
X: Don't care
AUTO FEED XT: Interface signal

*2

Paper length	4	5.5	6	7	8.5	12	14	11
<input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 ON OFF	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

(Unit: inch)

DIP SWITCHES ON RS-232 INTERFACE CIRCUIT BOARD



*1

Parity	Even	Odd	None	None
<input type="checkbox"/> <input type="checkbox"/> ON 3 4 OFF	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

*2

Baud rate	9600	4800	2400	1200	600	300	200
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ON 6 7 8 OFF	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

What You Do:	What You Check:	Refer To:
Install Color Kit (if ordered)	Installation instructions	Page A-1
Install ribbon cassette	Ribbon path between print head and platen	Page 2-10
Attach AC cord	Ensure voltage is OK	Page 1-18
Insert paper	Paper width/position	Page 2-14 or 2-21
Run Self-Test	Printer performance	Page 1-19
Connect interface cable	Type of interface & cable connection	Page 1-22

Use your printer with your host system and check the printer's performance.

Refer to Section 4 for printer Troubleshooting hints.

Refer to computer documentation for system faults.

***** STANDARD FEATURES *****

Thank you for purchasing this high quality printer. You have made a wise selection. Your printer will provide years of high speed, reliable, and versatile printing.

Your new printer has been designed to satisfy most word processing, data processing, and graphic printing requirements when interfaced to a small or medium sized host system.

Features found in your printer are listed in the following Table of Features.

TABLE OF FEATURES

HIGH SPEED & QUIET PRINTING

Up to 220 characters per second with automatic bidirectional printing logic and 4 inches of form feeds per second saves printing time and increases productivity. Printing noise is 55 dB.

MULTI-EMULATION

Three kinds of emulation are available and selected just by setting two switches. Emulation modes are Epson JX-80 (or FX-80), IBM Proprinter and IBM Graphics Printer.

NEAR LETTER QUALITY

Print characters consist of 19 horizontal and 16 vertical dots in Near Letter Quality (NLQ) mode.

COLOR OR MONOCHROME PRINTING

Color printing is achieved when the optional color kit and a four-color ribbon cassette are installed.

PAPER HANDLING

Load paper with the Auto Load function for both cut paper and continuous forms with the 80-column printer, and with the 136-column printer for cut paper within the Auto Load range. A change from continuous forms to cut paper is achieved easily without removing the continuous forms. An optional single bin cut sheet feeder is also available.

OUTSTANDING RELIABILITY

A simplified print mechanism results in outstanding reliability and ease of maintenance.

CHARACTER SETS & GRAPHICS

Select an Epson JX-80 (or FX-80) character set. Character sets are shown in **Appendix G**.

CHARACTER SPACING

Characters per inch (CPI) may be 10, 12, 15, 17.1, 20, proportional, or programmed in increments of 1/120".

on Epson JX-80 (or FX-80) emulation, and may be 10, 12, 17.1 on IBM Graphics printer or proprinter emulation.

LINE SPACING

Line spacing is selected by a command (1/6, 1/8, 7/72, n/72, n/216).

SERIAL & PARALLEL INTERFACES

An RS-232C Serial or Centronics Type Parallel Interface Circuit Board allows easy interfacing to your host system.

EXCHANGEABLE MEMORY BOARDS

Memory Circuit Boards are available with an optional 8K or 16K bytes of additional RAM. Input Buffer is 8K or 16K bytes with the 136-column printer and 10K or 18K with the 80-column printer.

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****** SUPPLIES, OPTIONS AND PUBLICATIONS ******

The following items are available for your printer. Contact your Dealer/Distributor or Fujitsu representative for additional information.

SUPPLIES:

Ribbon Cassettes

Color (D30L-9001-0401)

Monochrome (D30L-2014-0096)

Print Head Mechanism

(D86B-1127-C151)

OPTIONS:

Cut Sheet Feeders

Single Bin for the 80-column Printer
(ASF300-FJ2101)

Single Bin for the 136-column Printer
(ASF300-FJ2201)

Color Kit

Color Kit Assembly (D86B-1144-D001)

Interface Circuit Boards

Parallel Interface (D86B-1144-C011)
RS-232C Serial Interface (D86B-1144-C021)

Memory Circuit Boards

16K RAM Memory Board (D05B-2790-C201)
8K RAM Memory Board (D05B-2790-C202)

PUBLICATIONS:

Programmer's Manual TYPE F (B-69191)
TYPE I (B-69268)

***** TRADEMARK ACKNOWLEDGEMENT *****

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BDT is a trademark of Büro und Datentechnik GmbH.

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****** PREFACE ******

This Manual represents your printer as manufactured at the time of publication. Every effort has been made to ensure that information in this Manual is complete and accurate. We reviewed this Manual but cannot be held responsible for errors and omissions.

We also publish a Maintenance Manual and a Parts Catalog for this printer. Please request additional publications from your dealer.

We reserve the right to make changes and improvements to this product without obligation to incorporate these changes and improvements into units previously shipped.

DX2100/2200 USER'S MANUAL ADDENDUM

This Manual includes:

Installation instructions that allow you to install the Optional Color Kit.

If the color kit was ordered with the printer it has been installed by Fujitsu.

If the color kit was ordered separately, you may have to install it.

Installation instructions that allow you to install the Memory and Interface Circuit Boards.

Boards ordered with the printer have been installed by Fujitsu and you do not need to install them to operate your printer.

If the Memory or Interface Board was ordered separately, you may have to install it.

Installation and operation that allow you to install and operate the Single Bin Cut Sheet Feeder.

Contact your authorized Dealer/Distributor for recent developments.

Section 1
Installation and Self-test

Installation

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Operation

Operation

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Setting Dip Switches

Setting

Section 4
Taking Care of Your Printer

Taking care

Section 5
Command Sets

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SECTION 1

INSTALLATION AND SELF-TEST

1.1 UNPACK THE PRINTER

Follow the unpacking instructions on the shipping carton. See **Figure 1-1**.

Remove the items from vinyl bags.

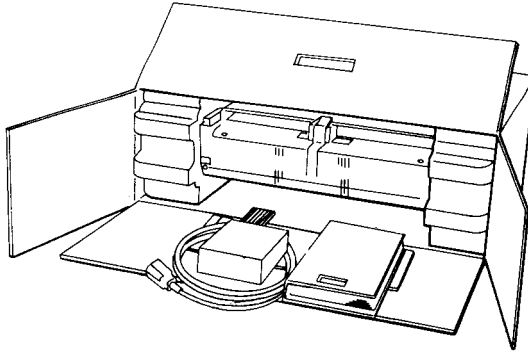
NOTE:

You will find the Color Kit and an Interface Circuit Board in the shipping carton, only if they were ordered with your printer.

Open the printer's soundproof, front, and top covers, by lifting the soundproof and front covers and then pulling the cover assembly upward.

If shipping damage is noticed, immediately notify your dealer/distributor or shipping agent.

Keep all shipping material for reshipment or storage of the printer.

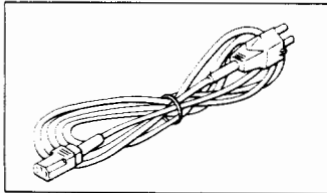


(Accessories removed from bags)

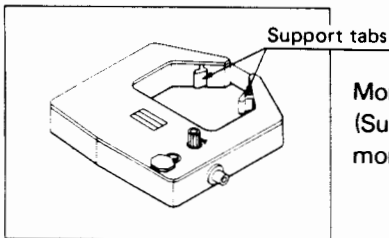
Figure 1-1 Opened Shipping Carton and Accessories

1.2 CHECK ITEMS RECEIVED

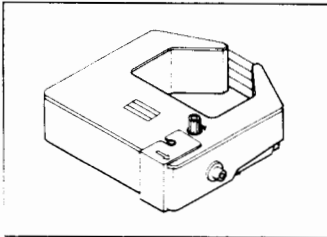
Items normally shipped with each printer are shown below. Circuit Boards may be already set on a printer.



AC Power Cord



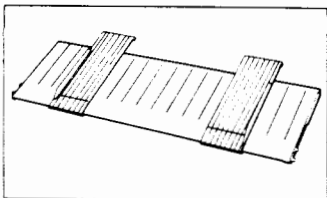
Monochrome Ribbon Cassette
(Support tabs are only on
monochrome ribbon cassette)



Color Ribbon Cassette

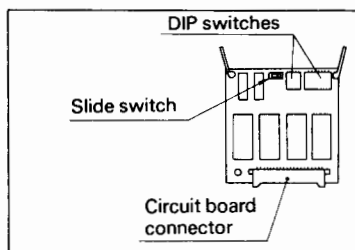


User's Manual

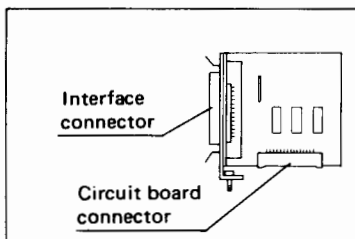


Rear Cover

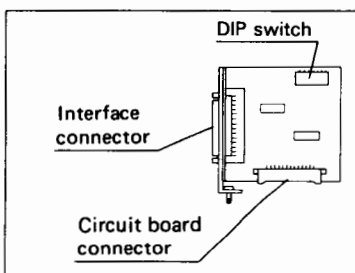
Figure 1-2 Items Shipped With Printer (1 of 2)



Memory Circuit Board



Parallel Interface Circuit Board



Serial Interface Circuit Board

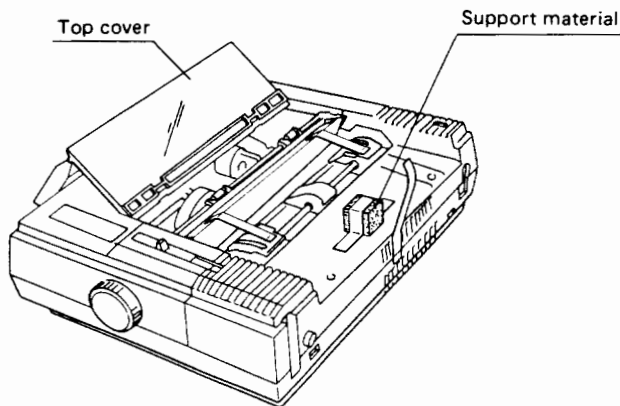
Figure 1-2 Items Shipped With Printer (Continued)

1.3 SHIPPING RESTRAINTS

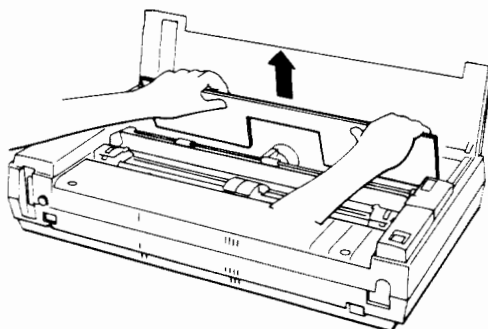
Refer to **Figure 1-3**.

Open the soundproof, front and top covers and remove the shipping restraint by lifting it out of the printer.

Slide the print head from side to side, along the print line. The print head must be able to move without binding to allow the printer to operate correctly.



Open the Soundproof, Front and Top Covers



Remove the Shipping Restraint

Figure 1-3 Shipping Restraint Removal

1.4 INSTALLATION PRECAUTIONS

Install your printer on a level surface to avoid excess vibrations.

Do not install your printer in a location where it may become overheated. Avoid locations in direct sunlight and near heaters.

Do not block the ventilation around your printer.

Use a power outlet that is not shared with industrial equipment that may generate electrical noise.

Use only the proper AC voltage.

1.5 PRINTER ELEMENTS

Refer to **Figure 1-4**. Major printer elements are:

- 1) Top Cover — raise for access into printer for ribbon installation, paper thickness adjustment and other operator activities.
- 2) Paper Thickness Lever — move this lever to change the gap between the print head and the platen.
- 3) Bail Roller Unit — holds the paper against the platen.
- 4) Power Switch — initializes the printer and lights the power lamp when turned ON.
- 5) Rear Cover — use to load cut sheets of paper and guide continuous forms. Take out Rear Cover from the vinyl bag and attach it to the printer. Use Guides to position cut sheets of paper.
- 6) Platen — supports the paper when printing.
- 7) Forms Tractor — holds and feeds continuous forms (can be seen with the Rear Cover raised or removed).
- 8) Card Cover — remove for access to the Interface and Memory Circuit Boards.
- 9) Paper Release Lever — sets friction (Cut Sheet) or tractor (Continuous Form) paper feed mode.
- 10) Platen Knob — used to manually feed paper.
- 11) Operator Panel — used by the operator for manual control of the printer. Indicates the present condition of the printer. The panel is shown and explained in **Section 2**.

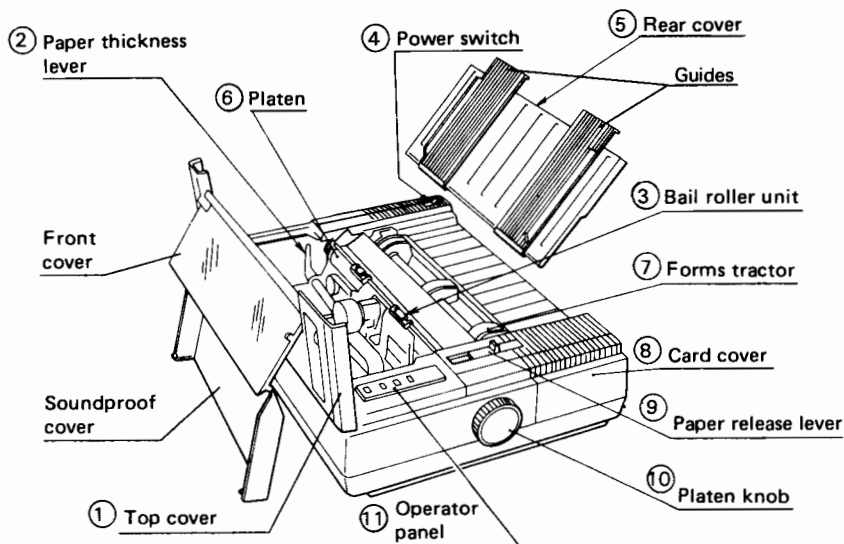


Figure 1-4 Major Printer Elements

1.6 REAR VIEW OF PRINTER

Figure 1-5 identifies the components on the rear of the printer.

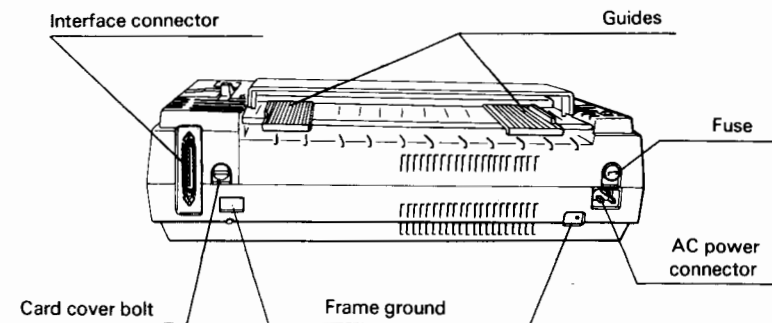


Figure 1-5 Rear View of Printer

1.7 INTERFACE AND MEMORY CIRCUIT BOARDS

The printer is designed to allow the user to install the required Interface and Memory Circuit Boards as a part of the installation process. These circuit boards establish the printer's interface (as Serial or Parallel), printer characteristics and the amount of optional RAM storage.

The Interface Circuit Board contains either the serial or parallel interface circuits and the interface cable connector (at the rear of the printer).

A Serial Interface Circuit Board contains DIP switches, associated with serial interface options, and allows a serial interface cable to be fastened with two screws as explained in **Appendix F**.

A Parallel Interface Circuit Board allows a parallel interface cable to be fastened with clips as explained in **Appendix E** (there are no DIP switches on the Parallel Interface Circuit Board).

The Memory Circuit Board contains control circuits, that establish printer characteristics, and DIP switches that are set by the user to establish default print parameters. Optional RAM memory is also installed on the Memory Circuit Board.

A summary of DIP switch functions is presented in paragraph 1-8. **Section 3** explains these DIP switch functions in greater detail.

Circuit board installation/exchange instructions are summarized in this paragraph and explained in **Appendix B**.

Refer to **Figure 1-6**. The Interface and Memory Circuit Boards are mounted beneath the Card Cover.

Remove the Card Cover to install the circuit boards, gain access to the circuit boards, to set the DIP switches, or install/exchange a circuit board.

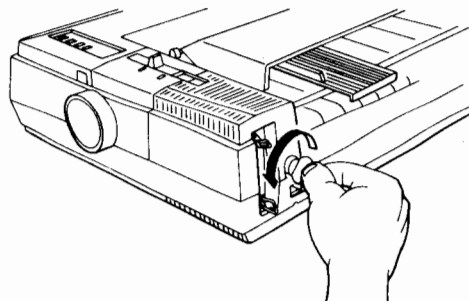
CAUTION

Make sure your computer and printer are turned OFF before installing or removing a circuit board.

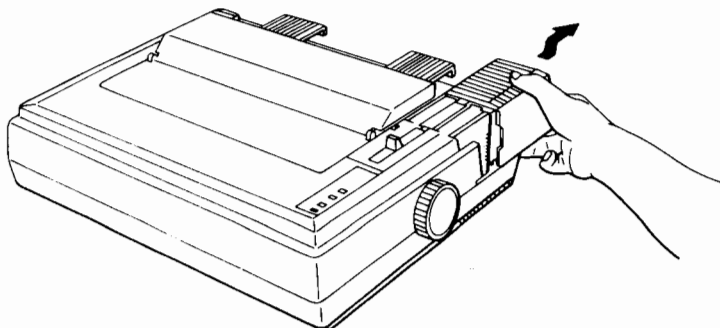
Place the Paper Release Lever towards the front of the printer (Cut Sheet position).

Loosen the Card Cover bolt in the back of the Card Cover using a coin or a screw driver (→).

Slide the Card Cover rearward (of the printer), lift it upward and remove it.



Loosen the Bolt



Remove the Card Cover

Figure 1-6 Access to Circuit Boards & DIP Switches

Refer to **Figure 1-8** to **1-10**.

Install the Memory Circuit Board in the innermost connector, by carefully aligning the connectors along the guide slots and then pressing the board into place.

Install the desired interface circuit board in the outermost connector, by carefully aligning the connectors along the guide slots and then pressing the board into place. Tighten the screw on the interface board, to ensure a good ground connection for the circuits.

CAUTION:

Set the interface board firmly by pushing Printed Circuit Board down.

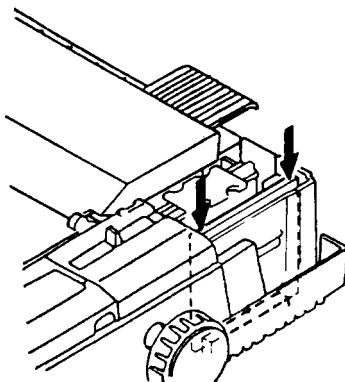


Figure 1-7 Installation of Interface Board

1.8 SUMMARY OF DIP SWITCH SETTINGS

This printer can emulate the Epson FX-80 (or JX-80) Printer, IBM Proprinter, and IBM Graphics Printer without installing any option. The emulation mode is changed by a slide switch and/or DIP switch (Switch-1 position #1) on the Memory Circuit Board. The slide switch selects Epson printers or IBM printers. The mode in which Epson FX-80 (or JX-80) Printers are emulated is called type F. The mode in which IBM Proprinters or IBM Graphics Printers are emulated is called type I. When type I is selected, the DIP switch further divides type I into two modes: IBM Proprinter mode and IBM Graphics Printer mode.

Note that functions assigned to DIP switches differ between type F and type I and between Proprinter mode and Graphics Printer mode.

Select an emulation mode suitable for your program or software package; first, select type F or type I as shown in **Figure 1-8** and, when type I is selected, Proprinter mode or Graphics Printer mode as shown in **Table 1-4**.

WARNING:

Make sure your printer is turned OFF before changing the emulation mode, or the printer may be damaged.

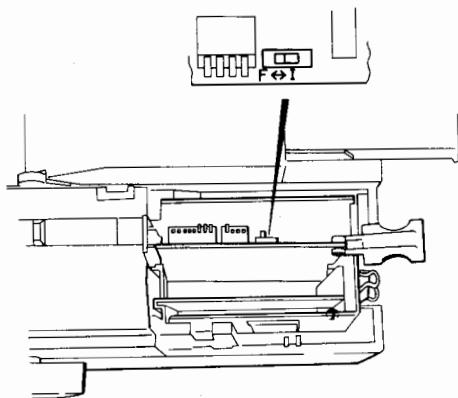
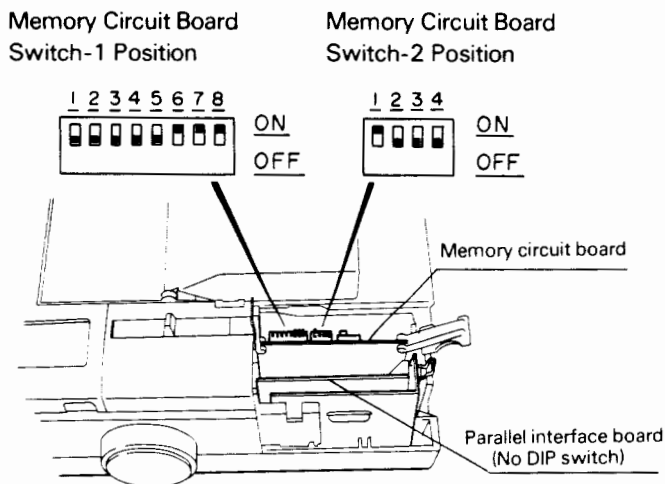


Figure 1-8 Selecting Type F or I

See **Section 3** for a complete description of DIP switch settings. Refer to **Figure 1-9** for the DIP switches installed on the Memory Circuit Board.



**Figure 1-9 Memory Circuit Board DIP Switches
(Factory Setting)**

Memory Circuit Board DIP Switches for Type F

Table 1-1 shows functions selected by DIP Switch-1 on the Memory Circuit Board.

Table 1-1 DIP Switch-1 Functions (for Type F)

#	Function when OFF	Function when ON
1	*Standard characters (10 cpi)	Condensed characters
2	*Unslashed O	Slashed Ø
3	*Paper out detect	No paper out detect
4	*Data input buffer	Color scanning buffer
5	*11" Paper selected	12" Paper selected
6	See Table 1-3	*See Table 1-3
7	See Table 1-3	*See Table 1-3
8	See Table 1-3	*See Table 1-3

* = Factory and most common setting.

Table 1-2 shows functions selected by DIP switch-2 on the Memory Circuit Board.

Table 1-2 DIP Switch-2 Functions (for Type F)

#	Function when OFF	Function when ON
1	ON-Line when SLCT IN is low ON-Line with DC1 when SLCT IN is high	*On-Line with power on
2	*Cut sheet feeder disabled	Cut sheet feeder enabled
3	*Print on perforation	Skip over perforation
4	*LF when AUTO FEED XT is low No LF when AUTO FEED XT is high	LF with CR

* = Factory and most common setting.

DIP Switch-1 on the Memory Circuit Board, positions #6, #7 and #8, select language unique symbols as shown in **Table 1-3**.

**Table 1-3 Language Selection DIP Switch-1
#6, #7, and #8 (for Type F)**

Selected Language	Switch Setting		
	#6	#7	#8
English (U.S.A.)	*ON	*ON	*ON
French	ON	ON	OFF
German	ON	OFF	ON
English (U.K.)	ON	OFF	OFF
Danish	OFF	ON	ON
Swedish	OFF	ON	OFF
Italian	OFF	OFF	ON
Spanish	OFF	OFF	OFF

* = Factory setting.

Memory Circuit Board DIP Switches for Type I

Table 1-4 shows functions selected by DIP Switch-1 on the Memory Circuit Board.

Table 1-4 DIP Switch-1 Functions (for Type I)

#	Function when OFF	Function when ON
1	Proprinter mode	Graphics printer mode
2	Unslashed O	Slashed Ø
3 (Pro)	No LF after CR code	Auto LF after CR code
(Grph)	LF after CR code (See Table 1-6.)	
4	Character set 1	Character set 2
5 (Pro)	No CR after LF, VT, ESC J	Auto CR after LF, VT, ESC J
(Grph)	LF after CR code (See Table 1-6.)	
6	Buzzer enabled	Buzzer disabled
7	Cut sheet feeder disabled	Cut sheet feeder enabled
8	Print on perforation	Skip over perforation

Pro : Proprinter

Grph : Graphics printer

Table 1-5 shows functions selected by DIP switch-2 on the Memory Circuit Board.

Table 1-5 DIP Switch-2 Functions (for Type I)

#	Function when OFF	Function when ON
1	1/6 inch line spacing	1/8 inch line spacing
2	Page length (See Table 1-7.)	
3	Page length (See Table 1-7.)	
4	Page length (See Table 1-7.)	

DIP Switch-1 on the Memory Circuit Board, positions #3 and #5, enables LF after CR code as shown in **Table 1-6**.

Table 1-6 LF after CR Code (Graphics Printer only)

Line feed depends on conditions of SW1-3, SW1-5, and interface signal AUTO FEED XT.

Line feed	SW1-3	SW1-5	<u>AUTO FEED XT</u>
Done	ON	OFF	Don't care
Done	Don't care	ON	Don't care
Done	OFF	OFF	Low
Not done	OFF	OFF	High

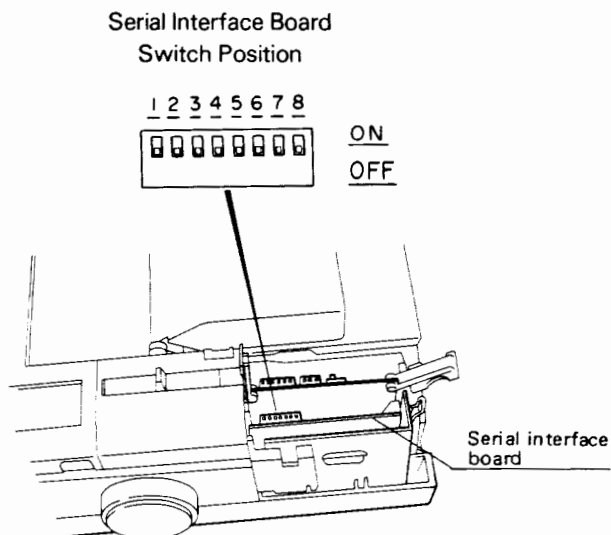
DIP Switch-2 on the Memory Circuit Board, position #2, #3, and #4, select a page length as shown in **Table 1-7**.

Table 1-7 Page Length (for Type I only)

Page length (inch)	SW2-2	SW2-3	SW2-4
11	OFF	OFF	OFF
4	ON	ON	ON
5.5	OFF	ON	ON
6	ON	OFF	ON
7	OFF	OFF	ON
8.5	ON	ON	OFF
12	OFF	ON	OFF
14	ON	OFF	OFF

Serial Interface Circuit Board DIP Switch

Refer to **Figure 1-10** for DIP switch installed on the Serial Interface Circuit Board.



**Figure 1-10 Serial Interface DIP Switch
(Factory Setting)**

Table 1-8 shows the functions selected by the DIP switch on the Serial Interface Circuit Board.

**Table 1-8 Serial Interface Circuit Board
DIP Switch Functions**

#	Function when OFF	Function when ON
1	*PRT RDY/BUSY Protocol	XON/XOFF Protocol
2	*8-Bit Data Length	7-Bit Data Length
3	*Parity OFF	Parity ON
4	*Parity ODD	Parity EVEN
5	*1-Stop bit	2-Stop bits
6	*See Baud Rate Table 1-9	See Table 1-9
7	*See Baud Rate Table 1-9	See Table 1-9
8	*See Baud Rate Table 1-9	See Table 1-9

* = Factory and most common setting.

Table 1-9 shows DIP switch positions #6, #7 and #8 on the Serial Interface Circuit Board, used to select a Baud Rate that is compatible with the host system.

**Table 1-9 Baud Rate Selection Serial Interface
Circuit Board DIP Switch #6, #7, and #8**

Selected Baud Rate	Switch Setting		
	#6	#7	#8
Undefined	ON	ON	ON
9600	ON	ON	OFF
4800	ON	OFF	ON
2400	ON	OFF	OFF
1200	OFF	ON	ON
600	OFF	ON	OFF
300	OFF	OFF	ON
200	*OFF	*OFF	*OFF

* = Factory setting.

1.9 ATTACH THE AC POWER CORD

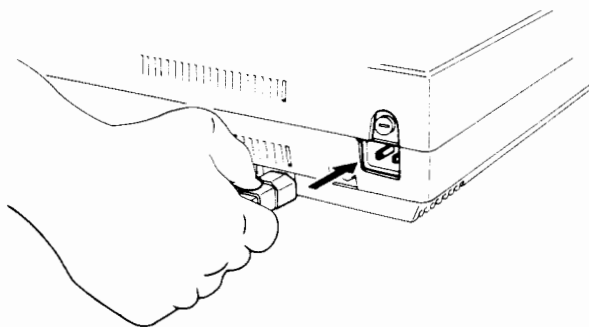
Refer to **Figure 1-11**.

Your printer normally operates from any standard wall outlet (115-120 Volts AC or 220-240 Volts AC). The required power is printed on the printer's nameplate on the rear of your printer (see **Figure 1-5**).

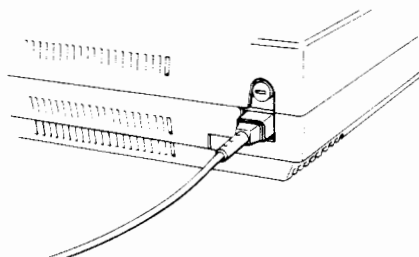
Carefully check the power requirements for your printer before attaching the AC cord and turning power ON.

For safety reasons ensure that the ground pin in the power cord is connected to electrical ground in your power outlet.

Do not turn on the power switch (to run Self-Test) until paper and a ribbon cassette are installed.



Align the Power Cord



Correctly Installed Power Cord

Figure 1-11 Attaching the AC Power Cord

1.10 SELF-TEST

Before running Self-Test, ensure that paper and a ribbon cassette are installed. See **Section 2** for paper loading and ribbon cassette installation instructions.

Check for a normal printer initialization cycle by turning the Power Switch OFF and then ON, before starting Self-Test.

During a normal printer initialization cycle, when power is turned ON:

The power lamp lights.

If the print head is on the left side, it moves toward the center of the print line and then back to the left side. Otherwise it moves only to the left side.

The On-Line lamp lights (if paper is inserted).

See the Troubleshooting hints, in **Section 4**, if you have different results.

Start the Self-Test print pattern as follows:

We recommend that you use continuous forms (more than 9" wide for the 80-column printer and more than 15" wide for the 136-column printer). The Self-Test prints the maximum characters per print line and if printing occurs off the paper the print head and Platen may be damaged.

Load paper into the printer (refer to paragraphs 2.6 and 2.7) and then turn power OFF.

While pressing the LF (Line Feed) switch (on the Operator Panel) turn power ON — continue pressing the LF switch until the initialization cycle is complete and Self-Test printing starts.

Release the LF switch when Self-Test printing starts.

Self-Test continues until power is turned OFF.

The Self-Test print-out consists of repeated printing, and character stepping, of the character set selected by the DIP switch settings.

If the color option is installed, each color is repeated after seven (7) lines of print.

We suggest you retain a copy of the Self-Test print pattern for reference.

```

! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H
! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H
" # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J
# $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K
$ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L
% & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M
& ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N
' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
* + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
+ , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
, - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O
- . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P
. / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q
/ 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R
0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T
1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V
2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W
3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y
4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ]
6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^
7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _
8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ `
9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a
: ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a
; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a
< = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a
= > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b
> ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b r
? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c d
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c d e
B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c d e f

```

Figure 1-12 Self-Test Print Pattern (Type F)

EPSON

DIPSWITCH SETTING

SW1-1	OFF	PRO MODE
SW1-2	OFF	0
SW1-3	OFF	NO LF BY CR
SW1-4	OFF	CGSET1
SW1-5	ON	AUTOOCR BY LF
SW1-6	OFF	Beep
SW1-7	OFF	NO Cut Sheet Feeder
SW1-8	OFF	NO Skip PFR
SW2-1	OFF	1/6 inch LF
SW2-2	OFF	11 inch Page Length
SW2-3	OFF	
SW2-4	OFF	
Parallel Interface		

```
"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJ  
!"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJ  
"#%&'()*+,-./0123456789; <=>?@ABCDEFGHIJK  
"%&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLM  
"&'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMN  
'()*+,-./0123456789; <=>?@ABCDEFGHIJKLMNO  
()**+, -./0123456789; <=>?@ABCDEFGHIJKLMNO  
)**+, -./0123456789; <=>?@ABCDEFGHIJKLMNOP  
**+, -./0123456789; <=>?@ABCDEFGHIJKLMNOPQR  
+,-./0123456789; <=>?@ABCDEFGHIJKLMNOPQRST  
, -./0123456789; <=>?@ABCDEFGHIJKLMNOPQRSTU  
-./0123456789; <=>?@ABCDEFGHIJKLMNOPQRSTUV  
. /0123456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ  
/0123456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ  
0123456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ  
123456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ  
23456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ  
3456789; <=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

Proprinter

Figure 1-13 Self-Test Print Pattern (Type I)

FRM

1.11 CONNECTING AN INTERFACE CABLE

Refer to your system documentation to determine the type of interface required for your system.

A 36-pin interface cable receptacle will be exposed at the rear of your printer when a Parallel Interface Circuit Board is installed.

A 25-pin interface cable receptacle will be exposed at the rear of the printer when a RS-232C Serial Interface Circuit Board is installed.

Interface circuit boards are available from your Dealer/Distributor.

Interface cables are available from most dealers, independent cable manufacturers and others.

CAUTION

Make sure your computer and printer are turned OFF before connecting an interface cable.

Connect one end of the interface cable to the Interface Circuit Board receptacle at the rear of your printer and the other end into your system.

Refer to **Figure 1-14** if connecting a Parallel Interface.

Refer to **Figure 1-15** if connecting a Serial Interface.

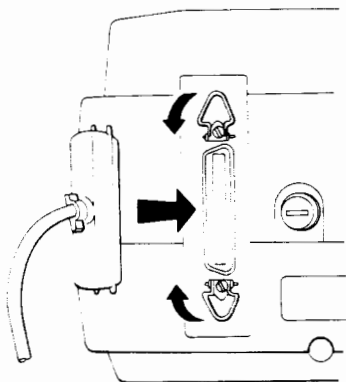


Figure 1-14 Parallel Interface Cable Connector

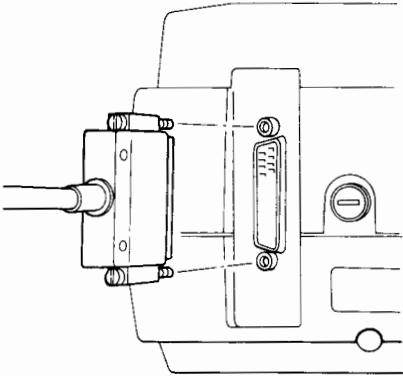


Figure 1-15 Serial Interface Cable Connector

1

2

3

4

5

SECTION 2 OPERATION

This section describes the Operator Panel, Ribbon Cassette installation, the Paper Thickness Adjustment and Loading/Exchanging Paper.

2.1 OPERATOR PANEL

Refer to **Figure 2-1** and paragraphs 2.2 (Lamps) and 2.3 (Switches). There are four lamps and four switches on the Operator Panel.

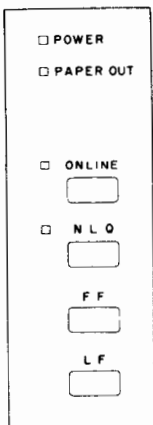
Operator panel	Functions
	<p>POWER Lamp (Green) Lit when Power Switch is ON.</p> <p>PAPER OUT Lamp (Amber) Lit when Out-of-Paper detected. Flashes when Operator Setup mode is selected (see paragraph 2.3.3).</p> <p>ON LINE Lamp (Green) Lit when the printer is ON LINE with the host system.</p> <p>ON LINE Switch Sets ON LINE or OFF LINE mode.</p> <p>NLQ Lamp (Green) Lit when Near Letter Quality print mode is set.</p> <p>NLQ Switch Sets NLQ or Selected print mode.</p> <p>FF and LF Switches Explained in paragraph 2.3.</p>

Figure 2-1 Operator Panel

2.2 OPERATOR PANEL LAMPS

POWER Lamp (Green)

Lit when the Power Switch is turned ON and power is applied to the printer.

PAPER OUT Lamp (Amber)

Lit when Out-of-Paper is detected (or when a Cut Sheet Feeder is installed and the bin is out of paper).

Flashes when the printer is in the Operator Setup mode (see paragraph 2.3.3).

ON LINE Lamp (Green)

Lit when the printer is ON LINE with the host system.

NLQ Lamp (Green)

Lit when Near Letter Quality print mode is selected. See NLQ Switch.

2.3 OPERATOR PANEL SWITCHES

ON LINE Switch

Sets ON LINE or OFF LINE mode.

Press this switch, in ON LINE mode, to place the printer in OFF LINE mode. In OFF LINE mode, the ON LINE lamp is off and printing from the host system is stopped. Use OFF LINE mode to change the ribbon cassette or load paper.

Press this switch, in OFF LINE mode, to place the printer in ON LINE mode and allow it to communicate with your host system (Power must be ON before the printer enters ON LINE mode).

When the printer is OFF LINE, any Print data transferred by your computer and waiting to be printed, is stored in the printer's data buffer. If power remains ON, this stored print data is printed when the printer is returned ON LINE.

NLQ (Near Letter Quality) Switch

Sets NLQ or selected print quality mode.

Press the NLQ switch to change from the present print quality to Near Letter Quality printing.

Press this switch a second time to return to the selected print quality.

If you press this switch while printing, print quality changes on the next print line.

FF (Form Feed) Switch

Function depends on:

1. ON LINE/OFF LINE status of the printer.
2. Position of the Paper Release Lever.
3. Paper loaded/unloaded status.

When the printer is OFF LINE, Paper Release Lever is set toward the front of the printer, if paper is not loaded, when using cut sheet paper less than 8.5" wide with the 80-column or the 136-column printer – Press this switch to automatically load the paper onto the Platen.

NOTE:

With the 136-column printer, load cut sheet paper more than 8.5" wide manually.

When the printer is OFF LINE, Paper Release Lever is set toward the rear of the printer, if the paper is not loaded – With the 80-column printer, press this switch to automatically load the paper onto the Platen. With the 136-column printer, this switch will have no effect.

When the printer is ON LINE, Paper Release Lever is set toward the front of the printer, if the paper is loaded – Press this switch to eject the paper. The PAPER OUT lamp will light.

When the printer is ON LINE, Paper Release Lever is set toward the rear of the printer, and continuous form is loaded – Press this switch to retract the continuous form by 15" or off the Platen, but still in the forms tractor, in preparation for cut sheet paper operations.

When the printer is OFF LINE, Paper Release Lever is set toward the front of the printer, if the paper is loaded — Press this switch to eject the paper. The PAPER OUT lamp will light.

When the printer is OFF LINE, Paper Release Lever is set toward the rear of the printer, and continuous form is loaded — Press this switch to feed the form by one page depending on the setting of DIP switch 1-5 for Type F or DIP switches 2-2 to 2-4 for Type I and Operator Setup.

NOTE:

Make sure that DIP switch 1-5 for Type F or DIP switches 2-2 to 2-4 for Type I is properly set according to the length of paper being used.

LF (Line Feed) Switch

Regardless of the Paper Release Lever setting, when the printer is OFF LINE, press this switch momentarily to move the paper one line forward. Hold this switch down to move paper continuously.

When the printer is OFF LINE, press the FF switch while holding the LF switch down to move the paper continuously in the backward direction until the Power Switch is turned off or the paper end is detected.

When the printer is ON LINE, pressing this switch will have no effect.

2.3.1 Self-Test

Start the Self-Test print pattern by turning the Power Switch ON while holding the LF switch down. Turn the Power Switch OFF to stop Self-Test. See paragraph 1.10 for more Self-Test information.

2.3.2 Hexadecimal-Dump

Turning the Power Switch ON while holding both the LF and FF switches down sets the Hexadecimal-Dump mode. This mode causes print data from the host system to print in hexadecimal (rather than ASCII). This mode is helpful when analyzing a suspected printer malfunction. Turn the Power Switch OFF to stop the Hexadecimal-Dump mode.

2.3.3 Operator Setup Mode

When the printer is ON LINE, enter Operator Setup mode by pressing the ON LINE and FF switches at the same time. The PAPER OUT lamp will flash and a buzzer will sound twice when the printer is in the Operator Setup mode.

Operator Setup mode allows you to set the functions listed in **Table 2-1**. Note that you cannot change a function if data is loaded in the buffer.

1. Press the ON LINE and FF switches at the same time to enter Operator Setup mode in ON LINE mode.
2. Press the ON LINE switch to select a function. A buzzer will sound each time of press. For example, press the ON LINE switch twice to select the function — Double-width Characters.
3. Press the FF switch to set the selected function. A buzzer will sound. In the above example, pressing the FF switch would cause Double-width Characters to be set.

You may set more than one function by pressing the ON LINE switch at the times of the function and then pressing the FF switch. For example, after setting — Double-width Characters, press ON LINE two more times (total of four times) to select Unidirectional Print mode, then press FF to set it into the printer.

4. Press the LF switch to terminate the Operator Setup mode. PAPER OUT lamp will go off.
5. Press the ON LINE switch to return to the ON LINE mode.

Table 2-1 Operator Setup Mode Functions

Press ON LINE	Function Selected
0	All Functions are Reset if FF is pressed
1	Condensed Characters
2	Double-width Characters
3	12 CPI Characters
4	Unidirectional Print mode
5	Disable (Type I) or Disable or Enable (Type F) Paper Out Detector*
6	Change Form Length to 11" or 12" as opposed to the current setting by DIP switch 1-5 (for type F) or to 12" (for type I)
7	Set Form Length to 8.5"
8	Enable Skip Over Perforations
9	Set line spacing at 8 lines per inch
10	Use only the Blue Ribbon
11	Use only the Red Ribbon
12	Half speed Print mode
13	View Print mode (Type F only)

- * A function of Disable or Enable Paper Out Detector will be performed as opposed to the setting of DIP switch 1-3.

2.3.4 Buzzer

A buzzer will sound when a Paper-Out condition is detected in ON LINE mode and also when the Operator Setup mode is set.

2.3.5 Summary of Switch Functions

Figure 2-2 gives a summary of the switch functions.



	POSITION OF PAPER RELEASE LEVER	
	FORWARD (Cut Sheet Paper) 	BACKWARD (Continuous Form) 
SWITCH PRESSED	When printer is ON LINE	
ON LINE	Changes to OFF LINE.	Changes to OFF LINE.
NLQ	Changes print quality from Selected to Near Letter Quality, vice versa.	Changes print quality from Selected to Near Letter Quality, vice versa.
FF	Form Feed.	Retracts form by 15" or off the Platen, but form remains in tractors.
LF	No response when ON LINE	No response when ON LINE
SWITCH PRESSED	When printer is OFF LINE	
ON LINE	Changes to ON LINE.	Changes to ON LINE.
NLQ	Changes print quality from Selected to Near Letter Quality, vice versa.	Changes print quality from Selected to Near Letter Quality, vice versa.
FF	If paper is <u>loaded</u> , Form Feed is performed. If paper is <u>not loaded</u> , with less than 8.5" paper, a Paper Auto Load is performed.	If paper is <u>loaded</u> , form is advanced depending on DIP switch 1-5 (type F) or switches 2-2 to 2-4 (type I) and Operator Setup. If paper is <u>not loaded</u> , in the 80-column printer only, a Paper Auto Load is performed.
LF	Line Feed is performed. Press the FF switch while holding the LF switch down to perform Line Feed in the backward direction.	Line Feed is performed. Press the FF switch while holding the LF switch down to perform Line Feed in the backward direction.

Figure 2-2 Summary of Operator Panel Switches

2.4 INSTALLING/REMOVING A RIBBON CASSETTE

Your printer uses either a monochrome or four-color ribbon cassette. The monochrome ribbon must have support tabs as shown in **Figure 1-2**. The optional color kit must be installed to print in color.

RIBBON CASSETTE NOTES:

Do not try to move the print head if power is ON. Power should remain ON if print data is in the printer waiting to be printed. If power is OFF, slide the print head from side to side to ensure the ribbon advances.

2.4.1 Removing a Ribbon Cassette

Refer to **Figure 2-3**.

1. Open the soundproof, front and top covers. If power is OFF, move the print head to the center of the print line.
2. Remove the ribbon cassette by pulling one of the ribbon release levers towards the front of the printer.
3. Lift the cassette out of the printer.

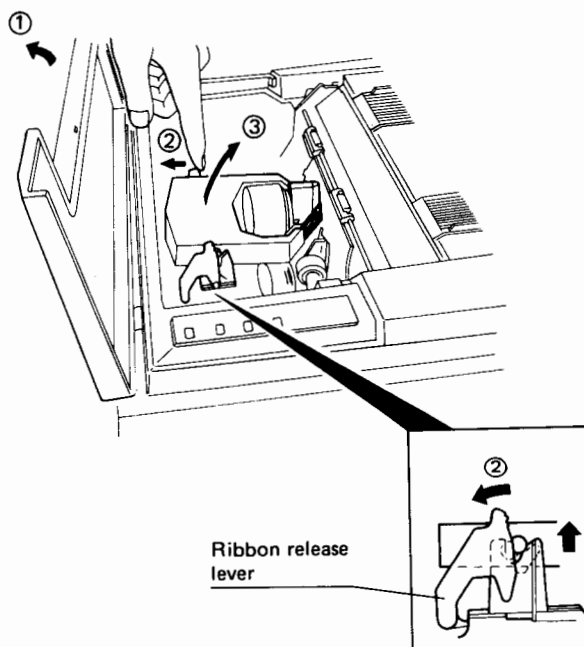


Figure 2-3 Removal of Ribbon Cassette

2.4.2 Installing a Ribbon Cassette

Take the ribbon cassette out of its package and remove the ribbon stop as shown in **Figure 2-4**.

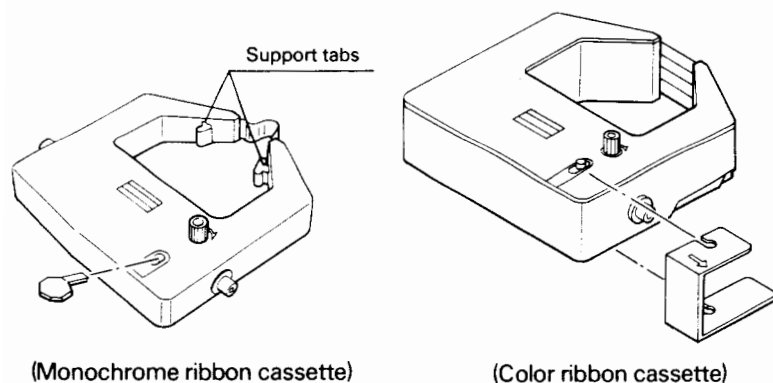


Figure 2-4 Removing the Ribbon Stop

If using a monochrome ribbon, ensure the support tabs are present on the cassette, as shown in **Figure 2-4**.

Rotate the Ribbon Advance Knob, on the ribbon cassette, in the direction indicated by the arrow. This is done to remove ribbon slack.

Refer to **Figure 2-5**.

1. With the top cover open, insert the pins sticking out on both sides of the cassette into the gaps between the ribbon release levers and the carriers.

NOTE:

Make sure that the ribbon is set between the print head and the card guide without folded.

2. Press down lightly on the ribbon cassette while rotating the Ribbon Advance Knob, until you hear the cassette pins click into a locked position.

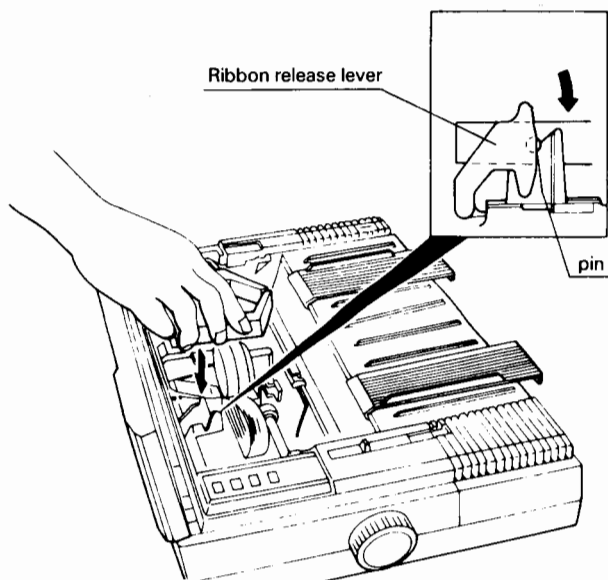


Figure 2-5 Installation of Ribbon Cassette

NOTE:

When the Cut Sheet Feeder is equipped, move the print head to the left end.

2.5 ADJUSTING PAPER THICKNESS

You can use up to 3-part paper (include the original) in your printer. Adjust the Paper Thickness Lever to change the gap between the print head and the Platen to correspond to the number of copies and the thickness of paper you are using.

The print head moves about 0.07mm (0.0027"), towards or away from the Platen, for each notch position of the Paper Thickness Lever.

One notch difference corresponds to about one sheet of paper.

Set the Paper Thickness Lever before loading paper.

Adjust the Paper Thickness Lever as follows:

Refer to **Figure 2-6**.

Locate the Paper Thickness Lever at the left side frame of the printer.

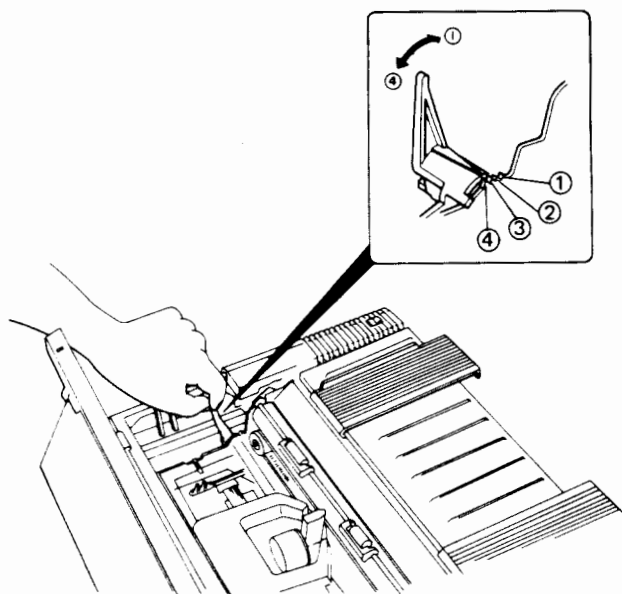


Figure 2-6 Paper Thickness Lever

Select an initial Paper Thickness Lever setting, using the values shown in **Table 2-2** as a guide. The first notch position is the one nearest the Platen.

Table 2-2 Paper Thickness Lever Settings

Type of Paper	Notch Position
Single part	1 or 2
Two part	2 or 3
Three part	3 or 4

When using thick paper, use a higher notch position number to allow for a wider gap, regardless of the number of sheets.

Total paper thickness may vary with the thickness of carbon paper and glue.

Adjust the Paper Thickness Lever to obtain the best print quality for the paper you are currently using.

If the printed characters appear faint, due to a wide gap, use a lower notch position number to decrease the size of the gap.

If the setting of the Paper Thickness Lever is too narrow:

The ribbon may smear the paper as it is advanced.

If the setting of the Paper Thickness Lever is too wide:

The images may be printed too light to read.

2.6 LOADING CUT SHEET PAPER

If you have been printing on continuous forms, refer to paragraph 2.8 for the procedure to change to cut sheet paper.

If you plan to run Self-Test, we recommend that you use continuous forms (more than 9" wide for the 80-column printer and more than 15" wide for the 136-column printer). Self-Test prints the maximum characters per print line and if printing occurs off the paper the print head and Platen may be damaged.

2.6.1 Procedures for Loading Cut Sheet Paper with the Auto Load Function

The following procedures apply to both the 80-column and 136-column printers. When using the 136-column printer, use paper less than 8.5" wide.

1. Open the soundproof cover and the front cover.

2. Lift the Rear Cover to the vertical position as shown in **Figure 2-7**.

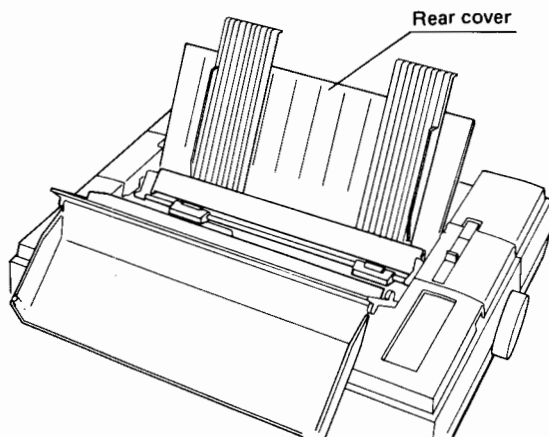


Figure 2-7 Setting the Rear Cover

3. Move the Guides (on the Rear Cover) to help align the paper to the desired position and set the bail rollers 1" in from the edges of the paper being loaded as shown in **Figure 2-8**.

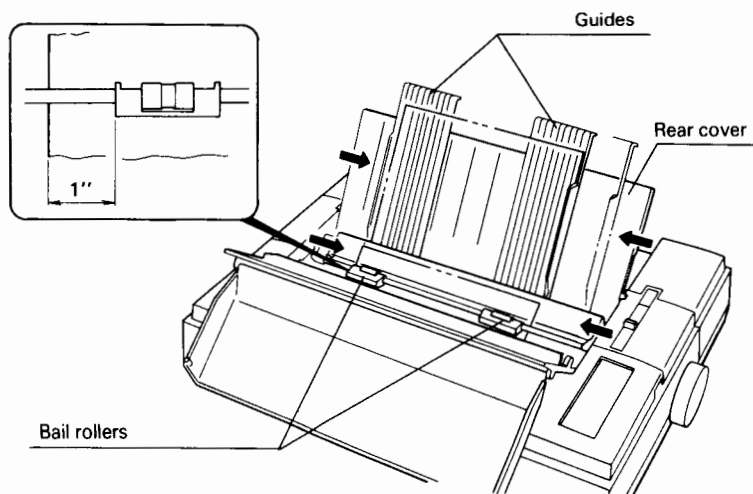


Figure 2-8 Setting the Bail Rollers and Guides

4. If required, adjust the Paper Thickness Lever to correspond to paper being loaded according to paragraph 2.5.

5. Close the covers. The soundproof cover should be put against the Rear Cover as shown in **Figure 2-9**.
6. Pull the Paper Release Lever towards the front of the printer (cut sheet paper mode) as shown in **Figure 2-9**.

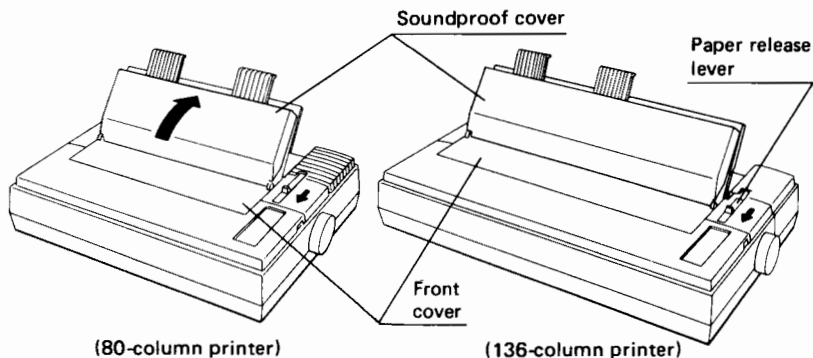


Figure 2-9 Closing the Covers

7. Turn the Power Switch ON. Place a sheet of paper into the Rear Cover. It will slide behind the Platen as shown in **Figure 2-10**. If the paper is not inserted correctly, a paper feed error or skewed feeding may occur.

NOTE:

Make sure that the cut sheet paper is neither curled nor damaged, because it may cause a paper jam or misfeed.

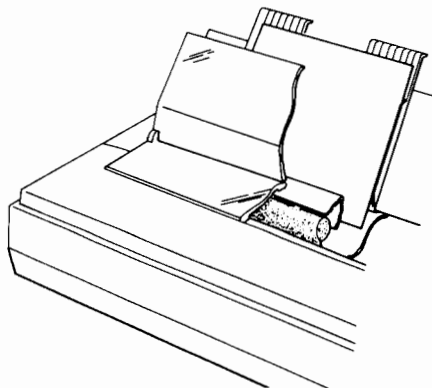


Figure 2-10 Placing the Paper

8. Press the FF switch. The print head moves into its paper load position, and the sheet of paper is automatically fed into the printer and advanced 1/6 of an inch below the leading edge of the form.
9. Press the ON LINE switch to set the printer to ON LINE mode.

2.6.2 Procedures for Manual Loading of Cut Sheet Paper

When using paper more than 8.5" wide with the 136-column printer, apply the following procedures.

1. Open the soundproof cover and the front cover.
2. Lift the Rear Cover to the vertical position and move the Guides (on the Rear Cover) to help align the paper to the desired position as shown in **Figure 2-11**.

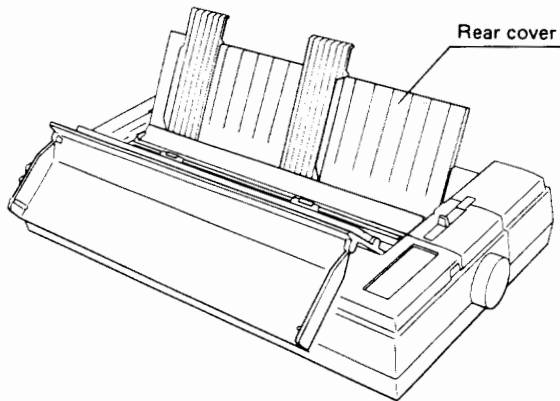


Figure 2-11 Setting the Rear Cover

3. If required, adjust the Paper Thickness Lever to correspond to paper being loaded according to paragraph 2.5.
4. Pull the Paper Release Lever towards the front of the printer (cut sheet paper mode).

5. Place a sheet of paper into the Rear Cover. It will slide behind the Platen. Lift the bail lever to open bail rollers as shown in **Figure 2-12**.

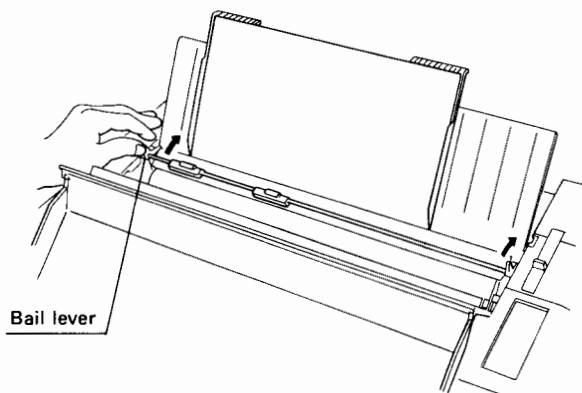


Figure 2-12 Loading the Paper and Opening the Bail Rollers

6. Turn the Platen Knob manually in the direction of the arrow in **Figure 2-13** until the paper is held between the Platen and the bail rollers.

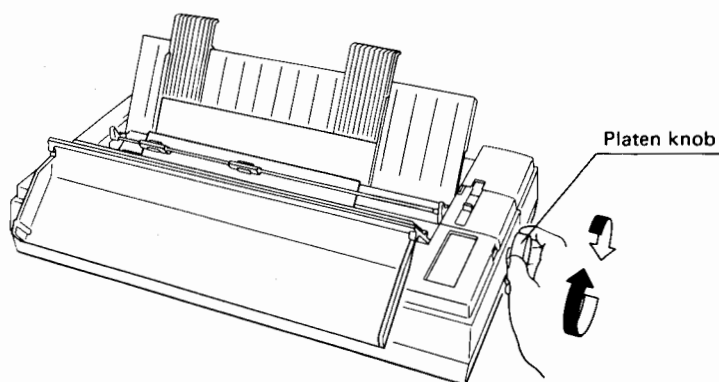


Figure 2-13 Loading the Paper

7. Push down the bail lever to close the bail rollers. Set the left roller and the right roller 1" in from the left and right edge of the paper as shown in **Figure 2-14**.

NOTE:

Make sure that the paper is set between the Platen and the rollers.

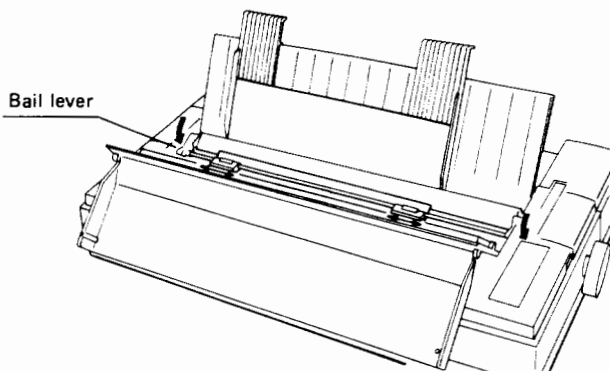


Figure 2-14 Setting the Bail Rollers

8. Close the covers. The soundproof cover should be put against the Rear Cover as shown in **Figure 2-15**.

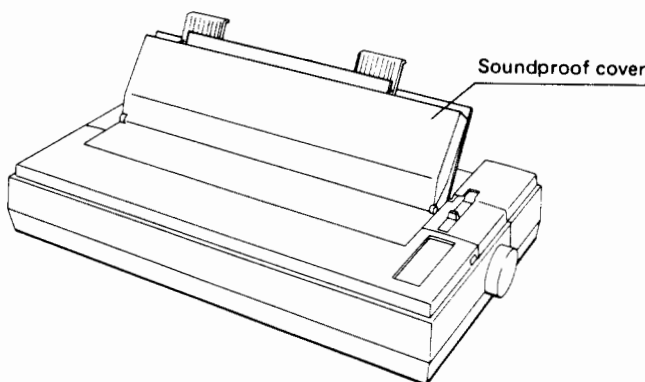


Figure 2-15 Closing the Covers

9. Press the ON LINE switch to set the printer to ON LINE mode.

2.7 LOADING CONTINUOUS FORMS

If you plan to run Self-Test, we recommend that you use continuous forms (more than 9" wide for the 80-column printer and more than 15" wide for the 136-column printer). Self-Test prints the maximum characters per print line and if printing occurs off the paper the print head and Platen may be damaged.

Once you load continuous forms into the printer, your printer makes it easy for you to change between cut sheets and continuous forms. See paragraph 2.8 if continuous forms are loaded in the forms tractors.

NOTE:

Set continuous forms as shown in Figure 2-16.

If forms are set on the same face as the printer, paper jam might occur.

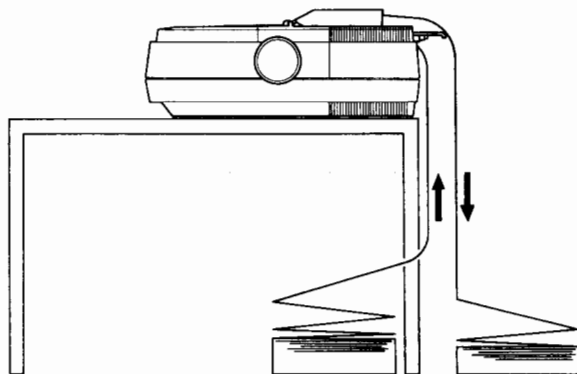


Figure 2-16 Setting Continuous Forms

The following procedures apply to both the 80-column and 136-column printers.

1. Open the soundproof cover and remove the rear cover as shown in Figure 2-17.

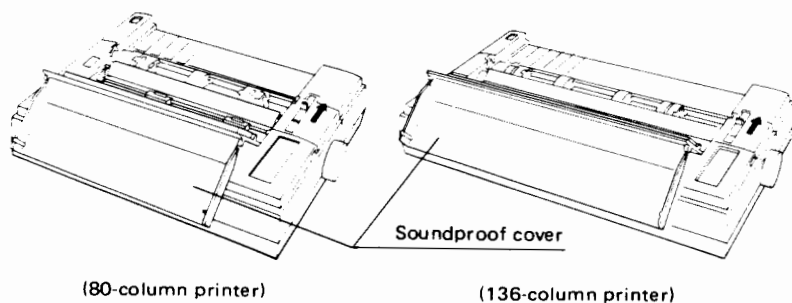
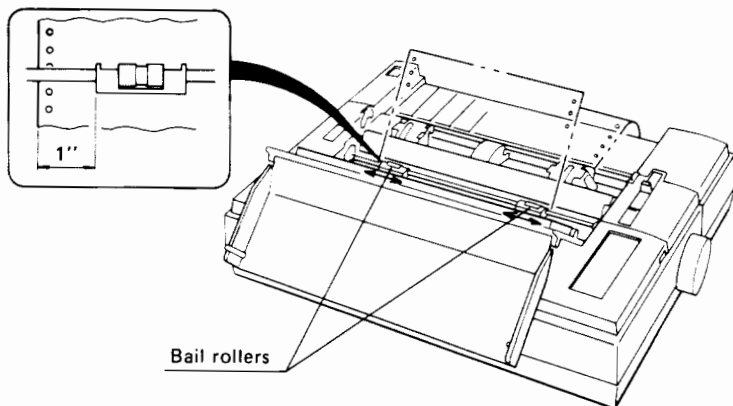


Figure 2-17 Loading Continuous Forms (1)

2. If required, adjust the Paper Thickness Lever to correspond to the forms being loaded according to paragraph 2.5.
3. Push the Paper Release Lever towards the rear of the printer (continuous form mode).
4. With the 80-column printer, set the bail rollers 1" in from the edges of the paper being loaded as shown in **Figure 2-18**.

NOTE:

With the 136-column printer, it is not necessary to set the bail rollers here.



**Figure 2-18 Setting Bail Rollers
(for the 80-column printer)**

5. Before trying to move a forms tractor, set the forms tractor lock lever towards the rear of the printer (into its unlocked position) as shown in **Figure 2-19**. Slide the right forms tractor towards the right side of the printer (just to get it out of the way).

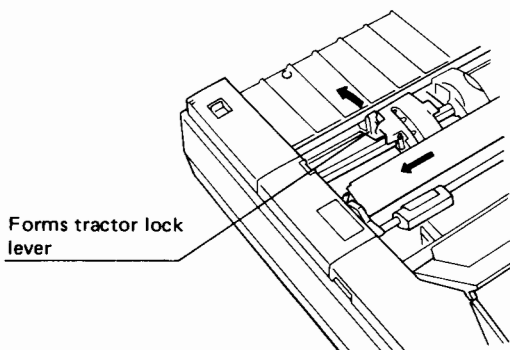


Figure 2-19 Unlocking the Forms Tractor

6. Place the left forms tractor at the approximate position for printing the left margin.
7. Lock the left forms tractor into position by setting the lock lever towards the front of the printer as shown in **Figure 2-20**.

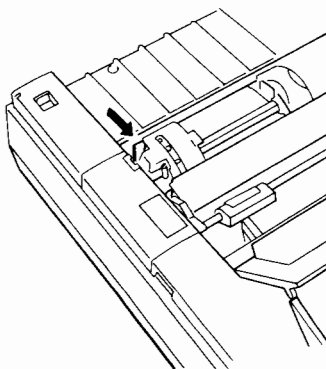


Figure 2-20 Loading Continuous Forms (2)

8. Open the paper holders on both tractors as shown in **Figure 2-21**.

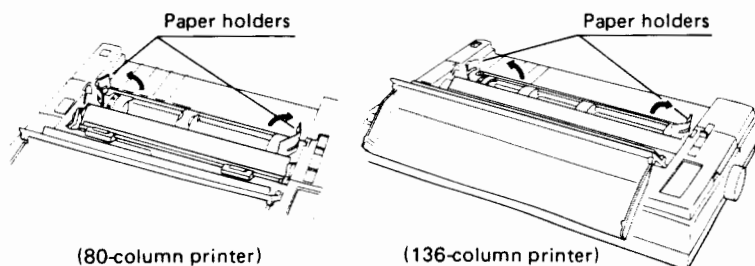


Figure 2-21 Opening the Tractor Paper Holders

9. Place the holes (down the left side of the form) over the pins on the left tractor and close the paper holder.
10. Move the right tractor under the paper. Place the holes (down the right side of the form) over the pins in the right tractor and close the paper holder. After moving the right tractor (and installed form) to remove slack from the paper, lock it by setting the lock lever towards the front of the printer.

NOTE:

Make sure that the leading edge of the form is neither curled nor damaged, because it may cause a paper jam.

11. [With the 80-column printer]

Confirm that the Power Switch is ON and then press the FF switch. The print head moves into its form load position and the form is automatically fed into the printer and advanced to about 1 inch below the leading edge of the form.

11. [With the 136-column printer]

- (a) Lift up the bail lever to open the bail rollers as shown in **Figure 2-22**.

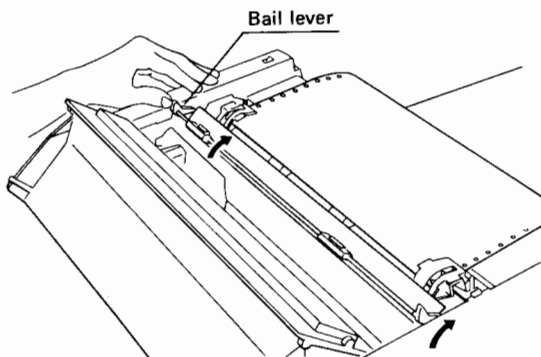


Figure 2-22 Opening the Bail Rollers

- (b) Turn the Platen Knob manually in the direction of the arrow in **Figure 2-23** until the paper is held between the Platen and the bail rollers.

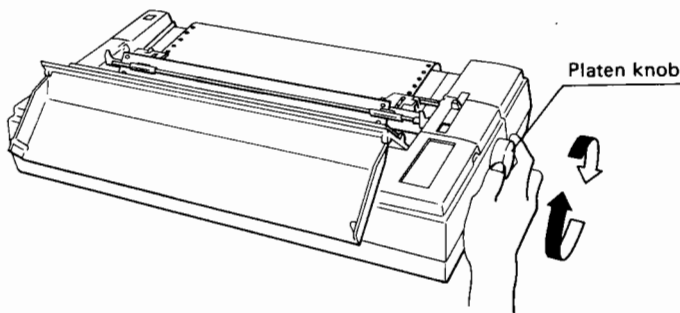


Figure 2-23 Loading the Continuous Forms

- (c) Push down the bail lever to close the bail rollers and set the bail rollers as follows.

Set the left roller 1" in from the left edge of the form, and the right roller 1" in from the right edge of the form as shown in **Figure 2-24**.

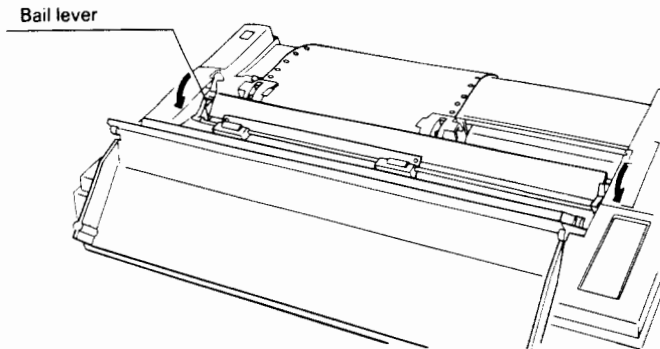


Figure 2-24 Setting Bail Rollers

NOTE:

When using light weight continuous forms, the bail rollers should be placed so that they straddle the left and right edges of the paper respectively. See Figure 2-25.

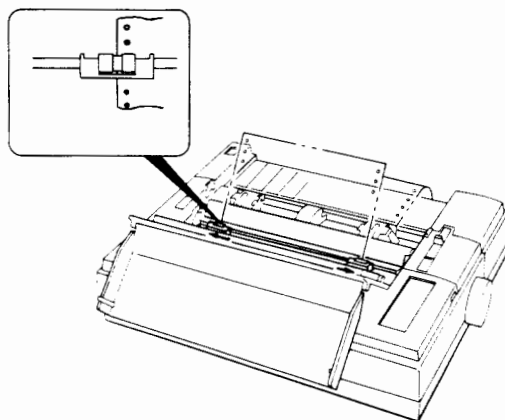


Figure 2-25 Setting Bail Rollers

NOTE:

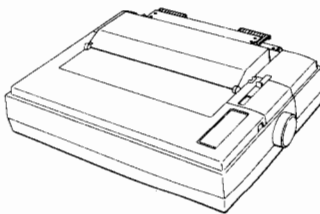
Make sure that the paper is between the Platen and the rollers.

12. Replace the Rear Cover and close the front cover and soundproof cover.

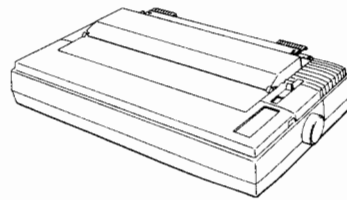
NOTE:

The Guides (on the Rear Cover) should be adjusted for the form width.

13. Press the ON LINE switch to set the printer ON LINE.
14. Continuous forms feed through the printer as shown in **Figure 2-26**.



(80-column printer)



(136-column printer)

Figure 2-26 Feeding Continuous Forms

2.8 CHANGING FROM CONTINUOUS FORMS TO CUT SHEETS

When continuous forms are in the printer, change to cut sheet paper as follows:

1. Retract the continuous form out of the Platen, with the printer ON LINE and the Paper Release Lever pushed toward the rear of the printer, by pressing the FF switch (or by turning the Platen Knob manually).
2. After pulling the Paper Release Lever toward the front of the printer and placing the Rear Cover in its vertical position, load cut sheet paper into the printer as in paragraph 2.6.

NOTE:

The continuous form remains in the form tractors but does not move as long as the Paper Release Lever is in the forward (Cut Sheet) position.

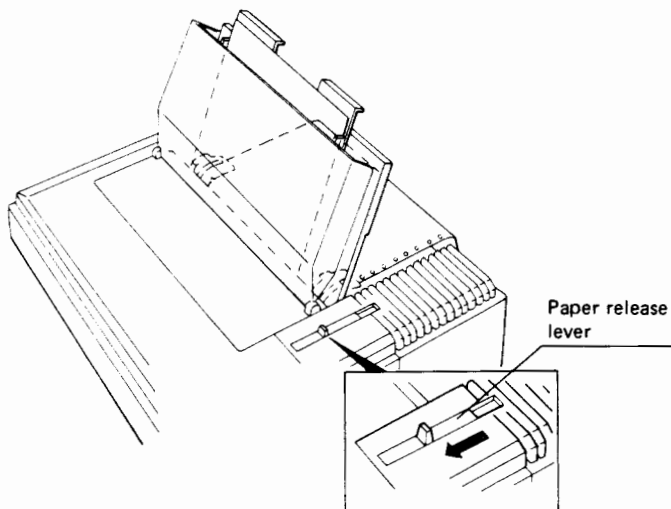


Figure 2-27 Changing from Continuous Forms to Cut Sheet Paper

2.9 CHANGE BACK TO CONTINUOUS FORMS

2.9.1 For the 80-column printer

When you have finished printing with cut sheet paper, change back to continuous forms by placing the Paper Release Lever in its backward position and pressing the FF switch as in paragraph 2.7. The continuous forms will re-load automatically.

2.9.2 For the 136-column printer

When you have finished printing with cut sheet paper, change back to continuous forms by placing the Paper Release Lever in its backward position and turning the Platen Knob manually to re-load the continuous forms as in paragraph 2.7.

NOTE:

Make sure that the paper is between the Platen and bail rollers.

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SECTION 3

DIP SWITCH FUNCTIONS

This section provides additional information on the default print functions selected by the DIP switches installed on the Memory Circuit Board and the Serial Interface Circuit Board. The Parallel Interface Circuit Board does not have DIP switches.

The printer has three emulation modes, which change functions of the DIP switches. The emulation modes are for Epson FX-80 (or JX-80) Printer, IBM Proprinter, and IBM Graphics Printer. The first one is available with Type F setting and the latter two are available with Type I setting. This setting can be changed by the slide switch on the Memory Circuit Board. So, confirm the setting of the slide switch before selecting DIP switch functions. Be sure that the slide switch must be changed with power turned OFF to avoid possible damage on the printer.

Refer to paragraph 1.7 for information on how to access these switches.

Use a pointed object, like the tip of a mechanical pencil, to push a DIP switch ON or OFF.

If you change a DIP switch setting while power is turned ON there will be no change to the selected function until power has been turned OFF and then turned ON, or until an INIT command is received from the host system.

Functions selected by DIP switches may be overridden by your application software.

We suggest you record the DIP switch settings that provide the best performance with your applications.

The functions set by the DIP switches on the Memory Circuit Board are described in paragraphs 3.1.1 (for Type F) and 3.1.2 (for Type I).

The functions set by the DIP switches on the Serial Interface Circuit Board are described in paragraph 3.2. These functions are only used when a Serial Interface Circuit Board is installed in the printer.

3.1 MEMORY CIRCUIT BOARD DIP SWITCHES

Refer to one of the following two paragraphs according to your necessary emulation mode.

3.1.1 DIP Switches for Type F

Switch-1

Memory Circuit Board DIP switch-1 position #1 selects Character Size as shown in **Table 3-1**.

Table 3-1 DIP Switch-1 #1

Position	Character Size
OFF	Standard Character Size (Defined as 10 CPI)
ON	Condensed Character Size (Defined as 17.1 CPI)

Memory Circuit Board DIP switch-1 position #2 selects slashed or unslashed zero as shown in **Table 3-2**.

Table 3-2 DIP Switch-1 #2

Position	Zero Font
OFF	Unslashed Zero — 0
ON	Slashed Zero — Ø

Memory Circuit Board DIP switch-1 position #3 enables or disables the Paper Out Detector as shown in **Table 3-3**. This switch is useful for continuous forms.

Table 3-3 DIP Switch-1 #3

Position	Paper Out Detector
OFF	Enable Paper Out Detector
ON	Disable Paper Out Detector

With the Paper Out Detector disabled, when the paper runs out:

- The PAPER OUT lamp lights
- *The printer stays in ON LINE mode
- Buzzer does not sound
- *Printing continues

The operations marked "*" occurs when continuous forms are used.

Memory Circuit Board DIP switch-1 position #4 selects RAM storage usage as shown in **Table 3-4**.

Table 3-4 DIP Switch-1 #4

Position	RAM Storage Usage
OFF	All RAM storage is used for Data Input Buffer
ON	RAM storage is used for Scanning Buffer of four colors and Data Input Buffer.

When Switch 4 is Off, the RAM is selected as a Data Input Buffer. Print data from the host is loaded into the RAM and data transfer time is minimized.

When Switch 4 is On, the RAM is selected as the Color Scanning Buffer and Data Input Buffer.

Memory Circuit Board DIP switch-1 position #5 selects Paper Length as shown in **Table 3-5**.

Table 3-5 DIP Switch-1 #5

Position	Paper Length
OFF	11 inch Paper
ON	12 inch Paper

Memory Circuit Board DIP switch-1 positions #6, #7 and #8 select an international character set as shown in **Table 3-6**. This allows the unique symbols in the selected language to be printed.

Table 3-6 DIP Switch-1 #6, #7 and #8

Selected Language	Switch-1 Setting		
	#6	#7	#8
English (U.S.A)	ON	ON	ON
French	ON	ON	OFF
German	ON	OFF	ON
English (U.K.)	ON	OFF	OFF
Danish	OFF	ON	ON
Swedish	OFF	ON	OFF
Italian	OFF	OFF	ON
Spanish	OFF	OFF	OFF

Switch-2

Memory Circuit Board DIP switch-2 position #1 determines when the Printer's ON LINE operations are enabled.

See **Table 3-7**.

When this switch is ON, the printer's ON LINE operations are enabled as soon as power is turned ON.

When this switch is OFF and if $\overline{\text{SLCT IN}}$ signal is high, the printer's ON LINE operations are disabled until the first DC1 Control Code is received.

When this switch is OFF and if $\overline{\text{SLCT IN}}$ signal is low, the printer's ON LINE operations are enabled as soon as power is turned ON.

Table 3-7 DIP Switch-2 #1

Position	Mode when Power is Turned ON
OFF	Depends on $\overline{\text{SLCT IN}}$ signals (see above)
ON	ON LINE operations enabled

Set this switch OFF if your host system issues a DC1/DC3 to select/deselect the printer.

Memory Circuit Board DIP switch-2 position #2 enables the optional Cut Sheet Feeder (if a Sheet Feeder is installed) as shown in **Table 3-8**.

Table 3-8 DIP Switch-2 #2

Position	Cut Sheet Feeder
OFF	Disabled (Feeder not installed)
ON	Enabled (Feeder installed)

Memory Circuit Board DIP switch-2 position #3 selects skipping 1" or printing at the perforations at the end of each form (when continuous forms are used), as shown in **Table 3-9**.

Table 3-9 DIP Switch-2 #3

Position	Skip Over Perforation
OFF	Disabled (Print over perforation)
ON	Enabled (Skip 1" at perforation)

Set this switch OFF if your host system or software causes a skip over the perforation.

Memory Circuit Board DIP switch-2 position #4 enables or disables a Line Feed with each CR code.

When this switch is set ON, a line feed is performed automatically following a CR code.

When this switch is set OFF and if $\overline{\text{AUTO FEED XT}}$ signal is low, a line feed is performed following a CR code.

When this switch is set OFF and if $\overline{\text{AUTO FEED XT}}$ signal is high, a line feed is not performed.

Table 3-10 DIP Switch-2 #4

Position	Line Feed with Carriage Return
OFF	Depends on $\overline{\text{AUTO FEED XT}}$ signals (see above)
ON	Enabled (LF with CR)

Set this switch OFF if your host system or software causes an LF (Line Feed) code to be issued with each CR (Carriage Return) code.

3.1.2 DIP Switches for Type I

Switch-1

Memory Circuit Board DIP switch-1 position #1 selects a printer mode for emulation of IBM printers as shown in **Table 3-11**.

Table 3-11 DIP Switch-1 #1

Position	Printer Mode
OFF	IBM Proprinter
ON	IBM Graphics Printer

Memory Circuit Board DIP switch-1 position #2 selects slashed or unslashed zero as shown in **Table 3-12**.

Table 3-12 DIP Switch-1 #2

Position	Zero Font
OFF	Unslashed Zero — 0
ON	Slashed Zero — Ø

Memory Circuit Board DIP switch-1 position #3 has two functions as shown in **Tables 3-13** and **3-14** depending on the setting of Switch-1 #1 (printer mode).

When the Proprietary Mode is selected, this switch enables or disables an automatic line feed (Auto LF) after each CR (Carriage Return) code.

Table 3-13 DIP Switch-1 #3 (Proprietary Mode)

Position	Auto LF after CR Code
OFF	Disabled (No automatic line feed)
ON	Enabled (Automatic line feed)

When the Graphics Printer Mode is selected, this switch, in cooperation with Switch-1 #5 and interface signal AUTO FEED XT, enables or disables a line feed after each CR code.

Table 3-14 DIP Switch-1 #3 and #5 (Graphics Printer Mode)

Switch and Signal Conditions			Line feed after CR code
#3	#5	<u>AUTO FEED XT</u>	
ON	OFF	Don't care	Enabled
Don't care	ON	Don't care	Enabled
OFF	OFF	Low	Enabled
OFF	OFF	High	Disabled

Memory Circuit Board DIP switch-1 position #4 selects a character set as shown in **Table 3-15**.

Table 3-15 DIP Switch-1 #4

Position	Character Set
OFF	SET 1
ON	SET 2

Memory Circuit Board DIP switch-1 position #5 has two functions as shown in **Table 3-16** and **3-14** depending on the setting of Switch-1 #1 (printer mode).

When the Proprinter Mode is selected, this switch enables or disables an automatic carriage return (Auto CR) after each LF code, VT code, or ESC J command.

Table 3-16 DIP Switch-1 #5 (Proprinter Mode)

Position	Auto CR after LF Code
OFF	Disabled (No automatic carriage return)
ON	Enabled (Automatic carriage return)

When the Graphics Printer Mode is selected, this switch, in operation with Switch-1 #3 and interface signal AUTO FEED XT, enables or disables a line feed after each CR code. See **Table 3-14**.

Memory Circuit Board DIP switch-1 position #6 enables or disables the buzzer as shown in **Table 3-17**.

Table 3-17 DIP Switch-1 #6

Position	Buzzer
OFF	Enabled (Buzzer sounds)
ON	Disabled (No sound)

Memory Circuit Board DIP switch-1 position #7 enables or disables the optional cut sheet feeder as shown in **Table 3-18**. It must be ON when you install a cut sheet feeder on your printer.

Table 3-18 DIP Switch-1 #7

Position	Cut Sheet Feeder
OFF	Disabled
ON	Enabled

Memory Circuit Board DIP switch-1 position #8 determines whether printing is done in the one-inch area before and after each perforation. If the switch is ON, the printer skips each perforation. If the switch is OFF, it does not skip each perforation, See **Figure 3-1**.

Table 3-19 DIP Switch-1 #8

Position	Skip Perforation
OFF	Disabled
ON	Enabled

NOTE:

The setting of this DIP switch depends on whether your program or software package instructs the printer to skip perforation.

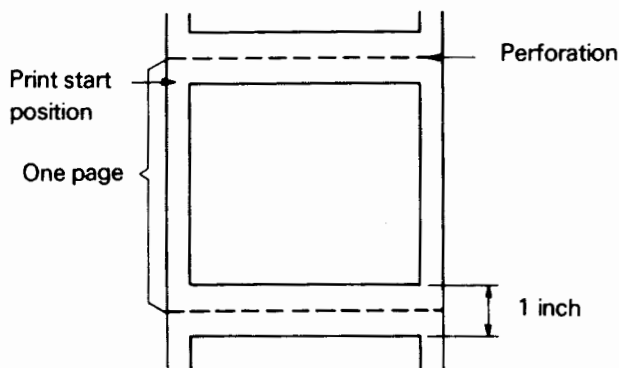


Figure 3-1 Skip Perforation

Switch-2

Memory Circuit Board DIP switch-2 position #1 selects a line spacing as shown in **Table 3-20**.

Table 3-20 DIP Switch-2 #1

Position	Line Spacing
OFF	1/6 inch per line
ON	1/8 inch per line

Memory Circuit Board DIP switch-2 positions #2, #3, and #4 select a page length as shown in **Table 3-21**.

Table 3-21 DIP Switch-2 #2, #3, and #4

Setting			Page Length (inch)
#2	#3	#4	
OFF	OFF	OFF	11
ON	ON	ON	4
OFF	ON	ON	5.5
ON	OFF	ON	6
OFF	OFF	ON	7
ON	ON	OFF	8.5
OFF	ON	OFF	12
ON	OFF	OFF	14

3.2 SERIAL INTERFACE BOARD DIP SWITCH

Serial Interface Circuit Board DIP switch position #1 selects Protocol as Printer READY/BUSY or XON/XOFF, as shown in **Table 3-22**.

Table 3-22 Serial Interface DIP Switch #1

Position	Data Protocol
OFF	Printer Ready/Busy Protocol
ON	XON/XOFF Protocol

Serial Interface Circuit Board DIP switch position #2 selects a 7-bit or an 8-bit data word length, as shown in **Table 3-23**.

Table 3-23 Serial Interface DIP Switch #2

Position	Data Length
OFF	8-bit Data Word Length
ON	7-bit Data Word Length

Serial Interface Circuit Board DIP switch position #3 selects parity checking or no-parity checking, as shown in **Table 3-24**.

Table 3-24 Serial Interface DIP Switch #3

Position	Parity Checking
OFF	No-Parity Check
ON	Parity Check

If parity checking is enabled (DIP switch #3 ON), Serial Interface Circuit Board DIP switch position #4 selects even or odd parity, as shown in **Table 3-25**.

Table 3-25 Serial Interface DIP Switch #4

Position	Even or Odd Parity
OFF	Odd Parity
ON	Even Parity

Serial Interface Circuit Board DIP switch position #5 selects 1-stop bit or 2-stop bits in the data stream, as shown in **Table 3-26**.

Table 3-26 Serial Interface DIP Switch #5

Position	Number of Stop Bits
OFF	1-Stop Bit
ON	2-Stop Bits

CAUTION

The data must consist of 10 or 11 bits, i.e., a start bit, 7 or 8 data bits, a parity bit or without a parity bit, and 1 or 2 stop bits.

Serial Interface Circuit Board DIP switch positions #6, #7 and #8 select the Baud Rate (Data transmission rate) between the host system and the printer, as shown in **Table 3-27**.

**Table 3-27 Serial Interface DIP Switch
#6, #7 and #8**

Selected Baud Rate	SI Switch Setting		
	#6	#7	#8
Undefined	ON	ON	ON
9600	ON	ON	OFF
4800	ON	OFF	ON
2400	ON	OFF	OFF
1200	OFF	ON	ON
600	OFF	ON	OFF
300	OFF	OFF	ON
200	OFF	OFF	OFF

SECTION 4

PRINTER CARE

This section describes the printer's initialization cycle, gives basic troubleshooting hints, explains the cleaning and lubrication procedures, and describes how to repack the printer for storage or transport.

4.1 PRINTER INITIALIZATION

A printer initialization cycle occurs:

1. Each time the Power Switch is turned ON
2. When an INIT signal is received from the host system
3. When an ESC @ (Escape Code Sequence) is received from the host system. (Type-F & Type-I Graphics Printer)

A normal initialization cycle causes the printer to:

Perform a basic internal check on its circuits.

Light the POWER lamp.

Move the print head to column one.

Enter the ON LINE mode (if paper is inserted) and light the ON LINE lamp.

Read the DIP switch settings and set the default print parameters.

Set the current print line as Top of Form.

Set the left margin at print position 1.

Clear previously stored download and data buffer information.

Self-Test will start if the LF (Line Feed) switch is held down when the Power Switch is turned ON.

4.2 REMOVING A PAPER JAM

See **Figure 4-1**.

1. Turn power OFF and open the soundproof, front and top covers. If using continuous forms, cut the form where it passes the Card Guide.
2. Push the Paper Release Lever towards the rear of the printer.
3. Place the Paper Thickness Lever into position 4.
4. Place the print head at either end of the print line or at a place where it does not interfere with removing forms.
5. If using continuous forms, open the tractor's paper holder, remove the forms, and close the paper holder. Carefully pull the jammed paper or forms from the feed path. Try to avoid tearing the paper. While turning the Platen Knob, remove all scraps of paper from beneath the Platen.
6. Move the print head to the center of the print line.
7. Put the Paper Release Lever and the Paper Thickness Lever into their operating positions.
8. Insert fresh paper into printer and rotate the Platen Knob to advance the paper through the printer. (Do not use Auto Load function.)
9. Close the covers and turn power ON.

CAUTION:

Do not use tools try to remove scraps of paper. Paper path is damaged easily.

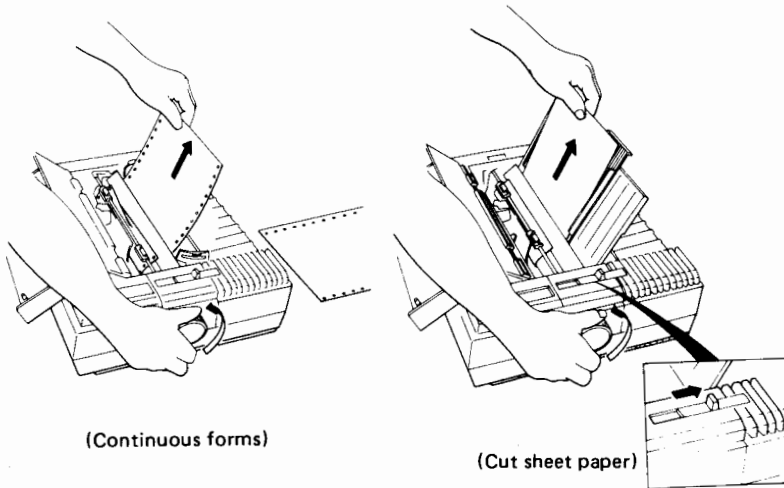


Figure 4-1 Removing a Paper Jam

4.3 CLEANING AND LUBRICATION

CLEANING AND LUBRICATION NOTES:

Printer lubrication is generally not required and is best performed by a service technician. But if lubrication is done, use specified oil.

Lubrication oil: FLOIL 947P (D98L-1020-0616: 50cc)

Do not use alcohol to clean rubber parts (Platen, rollers, etc.). Alcohol may cause the rubber to harden.

Taking care

Operator maintenance is limited to cleaning the printer, ensuring there is lubrication on the print head guide shaft, and cleaning the Platen as follows:

Ensure power is OFF and the AC power cord is disconnected before cleaning or lubricating the printer.

1. Clean the outer surfaces of the printer with a soft cloth dampened with a mild detergent.
2. With a small vacuum cleaner, the operator may remove accumulations of paper dust and particles from inside the printer.
3. Clean the Platen by applying a dry cloth to the Platen.

4.4 BASIC TROUBLESHOOTING

Your printer is designed to provide reliable operation. If it happens to malfunction use **Table 4-1** to help identify and resolve the difficulty.

Check your computer and application software manual for additional suggestions. If Self-Test performs correctly, you should check the interface connection and other elements in the system.

Table 4-1 Troubleshooting Hints

Symptom	Check
Power Lamp fails to light.	Power cord and connection. Fuse, replace if bad.
Printer fails to operate.	Circuit boards are installed, refer to paragraph 1.7.
Interface cable fails to connect.	Interface cable and circuit board, refer to paragraph 1.7 or 1.11.
Printer will not initialize.	Carriage for easy side to side movement. Power cord and connection. Memory Circuit Board.
Paper feed problem.	Paper path for obstruction. Forms tractor for correct side to side settings. Paper Release Lever for correct location.
Print is light.	Ribbon, replace if worn. Paper Thickness Lever.
Printed characters have voids or vary in darkness.	Paper, ribbon and Platen. Paper Thickness Lever. Print head wear causing missing dots.
Poor print quality.	Paper Thickness Lever and ribbon cassette.

Table 4-1 Troubleshooting Hints (Continued)

Symptom	Check
Will not print.	<p>If the PAPER OUT lamp is lit, check the paper path and sensor.</p> <p>If the ribbon is correctly installed between the print head and Platen.</p> <p>If ON LINE lamp is lit.</p> <p>A setting of DIP switch 2-1 (Type F only).</p> <p>Print head connector cable.</p> <p>Also check the interface connector and cable.</p>
Incorrect characters printed.	DIP switch settings. Host system Control Code or Data Code may not agree with the printer's DIP switch settings.
Ribbon breaks or jams.	Installation of ribbon and Paper Thickness Lever.
Extra line feed, or no line feed.	DIP Switch-2 #4 for Type F and Switch-1 #3 for Type I (Line Feed with Carriage Return) see Section 3 .
Paper jam.	<p>Turn the Power Switch OFF, push the Paper Release Lever towards the rear of the printer, and carefully pull the paper out of the paper path.</p> <p>Confirm that the paper satisfies the paper specifications.</p>

4.5 REPLACING FUSE

The replacement procedure is as follows:

1. Unplug the power cord. (Turning the Power Switch to OFF is not sufficient.)
2. Turn the fuse holder counterclockwise while pushing it with screwdriver to spring out the fuse holder, and remove the holder together with the blown fuse.
3. Put a same type and rating of fuse into the fuse holder.
4. Turn the fuse holder into the socket.

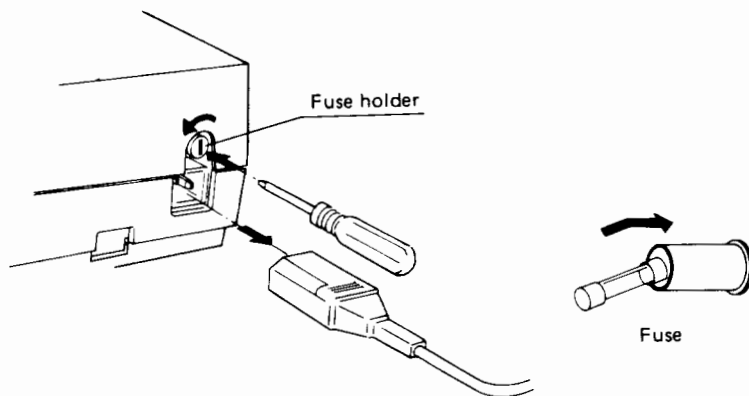


Figure 4-2 Replacing Fuse

(For German users)

Austausch der Sicherung

Die Sicherung wird wie folgt ausgetauscht;

1. Das Netzkabel aus der Steckdose ziehen (einfaches Ausschalten des Gerätes reicht nicht aus).
2. Den Sicherungshalter drücken und gleichzeitig mit einem Schraubenzieher gegen den Uhrzeigersinn drehen und den Halter zusammen mit der durchgebrannten Sicherung entnehmen.
3. Eine neue Sicherung mit gleichem Typ und Nennwert einlegen.
4. Die Sicherung in die Halterung einstecken.

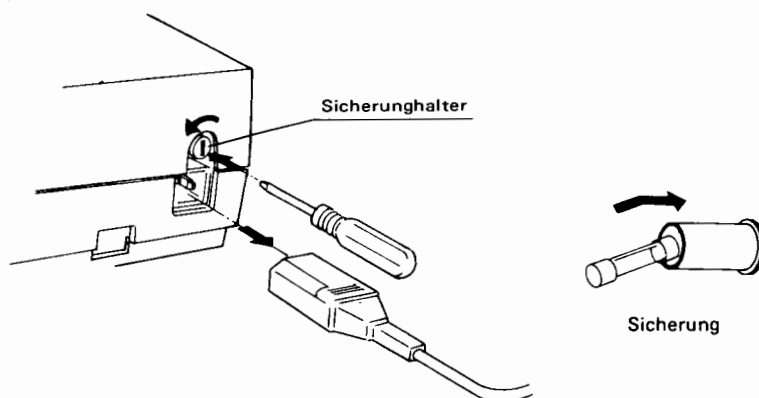


Abb. 4-2 Austausch der Sicherung

Taking care

4.6 REPACKING YOUR PRINTER

Refer to **Figure 1-1** and the instructions on the shipping carton.

Use the carton and packing material supplied with the printer if you have to store or transport your printer.

Turn computer and printer power OFF.

Remove the interface cable, power cord, ribbon cassette and Rear Cover. Place these items in plastic bags.

Clean the printer, if required.

Position the print head at the center of the print line and install the shipping restraint to prevent the print head from moving. See paragraph 1.3.

Close the front and top covers. Insert the support material into the soundproof cover and tape it to the printer as shown in **Figure 4-3**.

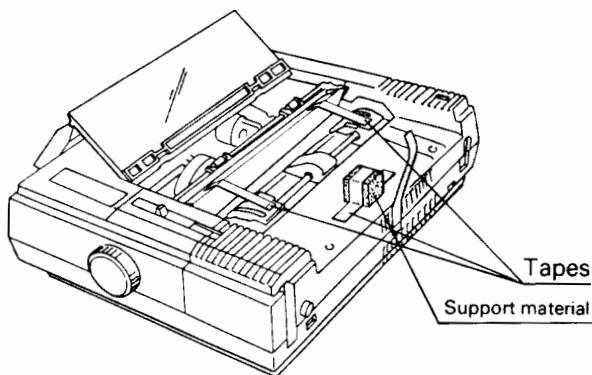


Figure 4-3 Taping the Support Material

Put the printer into its plastic bag.

Install the polystyrol pads on each side of the printer and slide it into the shipping carton.

Place the printer accessories into open spaces between the printer and the shipping carton.

Close the flaps on the shipping carton and secure the flaps by putting the tags into the respective slits.

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SECTION 5

COMMAND SETS

5.1 COMMAND OVERVIEW

This section is written for reference. A programmers manual with additional information is available. Consult your authorized Dealer for availability.

Most users will operate with application software and will not use the information in this section.

Specify your printer as an Epson FX-80 or JX-80 (Type F) or as IBM Graphics Printer or IBM Proprinter (Type I) in your application software installation procedure and your printer will interact correctly with your system. Refer to paragraph 5.2 for Type F and paragraph 5.3 for Type I.

Commands, in the form of Control Codes or Escape Code sequences, cause the printer to:

- Exchange, store and print data
- Establish and reset different print modes (Double-Width, Condensed, Emphasized, Underscore, etc.)
- Format the printer's output
- Control other functions performed by the printer

When a command specifies a change to a DIP switch setting, the DIP switch setting is over-ridden.

The host computer sends commands (and data) to the printer via the interface, under software control. For example an LPRINT statement (in BASIC) allows entry of a command. The LPRINT statement can use the following formats to send information to the printer:

LPRINT "w"	ASCII Character
LPRINT CHR\$(119)	Decimal character
LPRINT CHR\$(&H77)	Two digit Hexadecimal character

Refer to your programmer or computer manual for additional information.

5.2 COMMAND SET FOR TYPE F

5.2.1 Print Mode Commands

Printing mode is changed with one of the commands in **Table 5-1**. Each print mode is effective until another print mode command is received. The print mode set by the DIP switches (when power is turned ON) is used until a print mode command is received.

Table 5-1 Print Mode Commands

Function	Set	Reset
Double Width Print Until reset	ESC W (1)	ESC W (0) ESC ! (n)
Double Width Print by print line	SO ESC SO	DC4, LF, FF, VT, ESC ! (n) ESC W (0)
Condensed Printing	ESC SI or SI	DC2 or ESC ! (n)
Double Strike	ESC G	ESC H
Emphasized	ESC E	ESC F
Underline	ESC - (1)	ESC - (0)
Superscript	ESC S (0)	ESC T
Subscript	ESC S (1)	ESC T
Italics	ESC 4	ESC 5
Proportional spacing	ESC p (1)	ESC p (0)
Various Print Modes	ESC ! (n)	ESC ! (n)

Hexadecimal A0 to FE are always printed in Italics.

Condensed printing is not supported with 15 CPI.

Emphasized and Proportional Spacing are used only with Pica Pitch (10 CPI).

Emphasized printing always sets Proportional spacing, which can be reset with ESC F.

Print Example:

Double-width Printing

Condensed Printing

Double-strike Printing

Emphasized Printing

Underline printing

^{Superscript} _{Subscript}

Italic ABCDEFGHIJKLMNOPQRSTUVWXYZ

Proportional

Proportional (Reset Emphasized Mode)

5.2.2 Horizontal Movement Commands

The print head is controlled and positioned with the Horizontal Movement Command shown in **Table 5-2**. Pitch is changed when a new pitch command is received.

Table 5-2 Horizontal Movement Commands

Function	Set	Reset
Space	SP	None
Backspace	BS	None
Carriage Return	CR	None
Elite Pitch (12 CPI)	ESC M	By New Pitch
Pica Pitch (10 CPI)	ESC P	By New Pitch
15 CPI (Pitch)	ESC m	By New Pitch
Absolute Print Position	ESC \$ (n1) (n2)	None
Relative Print Position	ESC \ (n1) (n2)	None
Character Spacing	ESC SP (n)	None

Backspace (BS) cannot be used with Proportional Space.

Carriage Return (CR) causes a Line Feed if DIP Switch-2 #4 is ON, or if AUTO FEED XT signal is set true.

Absolute Print Position (ESC \$) is specified from the left margin as $(256 \times (n2) + (n1)) \times 1/60''$.

Relative Print Position (ESC \) is specified from the current position as $(256 \times (n2) + (n1)) \times 1/120''$.

Character Spacing (ESC SP) does not support 12 and 15 pitch in the draft mode, it is supported in NLQ mode.

Print Example:

Pica-pitch printing

Elite-pitch printing

15 CPI-pitch printing

5.2.3 Vertical Movement Commands

Paper movement is controlled and positioned with the Vertical Movement Commands in **Table 5-3**. Line Spacing is changed when a New Line Spacing command is received.

Table 5-3 Vertical Movement Commands

Function	Set	Reset
Form Feed	FF	None
Line Feed	LF	None
Line Feed of (n)/216"	ESC J (n)	None
Negative Line Feed of (n)/216"	ESC j (n)	None
1/8" Line Spacing	ESC 0	By New Line Space
7/72" Line Spacing	ESC 1	By New Line Space
1/6" Line Spacing	ESC 2	By New Line Space
(n)/216" Line Space	ESC 3 (n)	By New Line Space
(n1)/72" Line Space	ESC A (n1)	By New Line Space

(n) is an ASCII character with a binary value between 0 and 255.

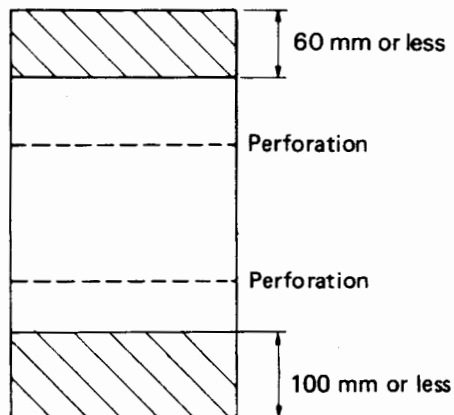
(n1) is an ASCII character with a binary value between 0 and 85.

Do not perform an ESC j (n) (Negative Line Feed) as shown in **Figure 5-1**:

- Within 60mm at start of form
- Within 100mm at end of form
- Within 60mm of leading edge of cut sheet paper
- Within 40mm of trailing edge of cut sheet paper

With fanfold paper

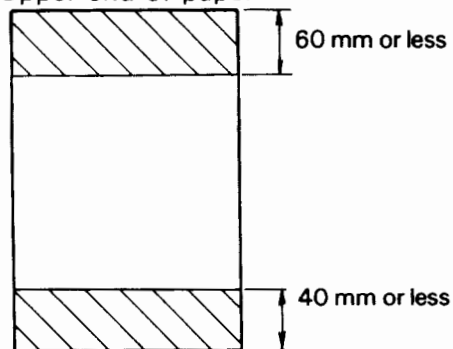
Upper end of paper



Lower end of paper

With cut-sheet paper

Upper end of paper



Lower end of paper

Figure 5-1 Reverse-feed-prohibited Area

5.2.4 Horizontal Tabbing Commands

Absolute and relative Horizontal Tab Stops are controlled with the commands given in **Table 5-4**. Horizontal Tab Stops can be set in up to 32 ascending positions, with position 1 as the left margin.

Table 5-4 Horizontal Tab Stop Commands

Function	Set	Reset
Set Horizontal Tab Stops	ESC D (n1) ... (nk) (0)	ESC ℓ (n)
Horizontal Tab Execution	HT	None

5.2.5 Vertical Tabbing Commands

Vertical Tab Stops are controlled with the commands given in **Table 5-5**. Up to 16 Vertical Tab Stops can be set, and up to 8 Channels, from 0-7, can be selected.

Table 5-5 Vertical Tab Stop Commands

Function	Set	Reset
Set Vertical Tab Stops	ESC B (n1) ... (nk) (0)	ESC C
Vertical Tab Execution	VT	None
Set Vertical Tabs in VFU	ESC b (n1) ... (nk) (0)	ESC C
Set VFU Channel	ESC / (n)	None

5.2.6 Page Formatting Commands

Commands shown in **Table 5-6** set the Left, Right, Top and Bottom margins.

Table 5-6 Page Formatting Commands

Function	Set	Reset
Set Right Margin	ESC Q (n)	New Margin
Set Left Margin	ESC L (n)	New Margin
Set Skip over Perforation	ESC N (n)	—
Set Page Length to (n) Lines	ESC C (n)	New Length
Set Page Length to (n) Inches	ESC C (0) (n)	New Length

Left and right margins vary with pitch and printer model number as indicated in **Table 5-7**.

Table 5-7 Left and Right Margins

Margin	Pitch	From:	To:
Right	PICA (10)	Left Margin +2	80 — 80-column printer 136 — 136-column printer
Right	ELITE (12)	Left Margin +3	96 — 80-column printer 163 — 136-column printer
Right	Condensed	Left Margin +4	*137 — 80-column printer 233 — 136-column printer
Left	PICA (10)	Column 0	Right Margin -2
Left	ELITE (12)	Column 0	Right Margin -3
Left	Condensed	Column 0	Right Margin -4

*: 132 characters can be printed in condensed mode when the printer first turned on.

5.2.7 Language Selection Commands

The language selected by Memory Circuit Board DIP switch 1 positions #6, #7 and #8 is changed with the command shown in **Table 5-8**.

Table 5-8 Language Selection Command

Function	Set	Reset
Set Language Designated by (n)	ESC R (n)	New Language Selection

Table language designated by (n) is shown in **Table 5-9**.

Table 5-9 Language Selected by (n)

Selected Language	Value of (n)
English (U.S.A)	0
French	1
German	2
English (U.K.)	3
Danish	4
Swedish	5
Italian	6
Spanish	7
Japanese	8
Norwegian	9
Danish II	A

Print Example:

```

n= 0
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~
n= 1
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ*ç$^_
`abcdefghijklmnopqrstuvwxyzéùè
n= 2
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZæöü^_
`abcdefghijklmnopqrstuvwxyzäöüß
n= 3
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[ ]^_
`abcdefghijklmnopqrstuvwxyz{|}~
n= 4
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZE@A^_
`abcdefghijklmnopqrstuvwxyzæä
n= 5
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZæöü_
`abcdefghijklmnopqrstuvwxyzäöüß
n= 6
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ*\é^_
`abcdefghijklmnopqrstuvwxyzàèì
n= 7
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ;ñ¿^_
`abcdefghijklmnopqrstuvwxyz~ñ
n= 8
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[?]^_
`abcdefghijklmnopqrstuvwxyz{|}~
n= 9
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZE@AÜ_
`abcdefghijklmnopqrstuvwxyzæäü
n= A
! "%$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZE@AÜ_
`abcdefghijklmnopqrstuvwxyzæäü

```


5.2.8 Bit Image Graphics Commands

Bit images are structured by dots arranged in rows and columns. Eight dots arranged in a column is a pattern byte. The smallest unit of the bit image (one column) is called a pattern element. There are 8-dot and 9-dot pattern elements.

Refer to the Programmer's Manual for details on Bit Image Graphics.

Bit Image Graphic commands are shown in **Table 5-10**.

Table 5-10 Bit Image Graphics Commands

Function	Set
8-dot Image Mode	ESC * (m) (n1) (n2) (p1) (p2) ... (pk)
9-dot Image Mode	ESC ^ (m) (n1) (n2) (p1) (p2) ... (pk)
Single Density Image	ESC K (n1) (n2) (p1) (p2) ... (pk)
Double Density Image	ESC L (n1) (n2) (p1) (p2) ... (pk)
Double Density & Double Speed Image	ESC Y (n1) (n2) (p1) (p2) ... (pk)
Quadruple Density Image	ESC Z (n1) (n2) (p1) (p2) ... (pk)
Convert Image Mode	ESC ? (n) (m)

Values of (m) for 8-dot and 9-dot image modes are shown in **Tables 5-11** and **5-12**.

Table 5-11 8-Dot Image (m) Values

(m)	Mode
0	Single Density
1	Double Density
2	Double Density & Double Speed
3	Quadruple Density
4	CRT I
5	Plotter
6	CRT II
7	Double Density Plotter
8	Triple Density

Table 5-12 9-Dot Image (m) Values

(m)	Mode
0	Single Density
1	Double Density

Image Elements are shown in **Table 5-13**.

Table 5-13 Dot Image Elements

	8-Dot Image Elements	9-Dot Image Elements
Consists of:	8 dots	9 dots
Represented by:	1 byte of data	2 bytes of data

Print Example:**8-dot image mode**

m= 0



m= 1



m= 2



m= 3



m= 4



m= 5



m= 6



m= 7



m= 8

**9-dot image mode**

m= 0



m= 1



5.2.9 Download Commands

Download commands are shown in **Table 5-14**.

Refer to the Programmer's Manual for details on how to design and print downloaded symbols and characters.

Table 5-14 Download Commands

Function	Set
Select Internal Character Set	ESC % (0)(0)
Select Download Character Set	ESC % (1)(0)
Select NLQ Character Set	ESC % (2)(0) or ESC x (1)
Reset NLQ Character Set	ESC x (0) (to reset NLQ)
Copy Character Set	ESC: (0)(0)(0)
Define Download Characters	ESC & (0) (n) (m) (a) (p1) (p2) to (p11)
Define NLQ Download Characters	ESC & (0) (n) (m) (a) (p1) (p2) to (p48)

Print Example:

Internal character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

NLQ character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

5.2.10 Color Selection Commands

When power is turned ON, the default color is black. If the color option and a color ribbon is installed when a color selection command is received the ribbon is shifted and subsequent images are printed in the color specified by (n).

If the color option and a black ribbon (with ribbon cassette support tabs) is installed each color selection command will cause the ribbon motor to rotate but the ribbon will not shift and all images will be printed in black.

The selected color is changed when a Color Selection command, shown in **Table 5-15**, is received.

Table 5-15 Color Selection Command

Function	Set
Select Ribbon Color	ESC r (n)

The color selected by (n) is shown in **Table 5-16**. Additional colors, not shown in **Table 5-16**, may be blended in unidirectional print mode (ESC U (1)).

Table 5-16 Ribbon Color Selected by (n)

Value of (n)	Color	First Pass	Second Pass
0	Black	Black	—
1	Magenta	Magenta	—
2	Cyan	Cyan	—
3	Violet	Magenta	Cyan
4	Yellow	Yellow	—
5	Orange	Yellow	Magenta
6	Green	Yellow	Cyan

5.2.11 Miscellaneous Commands

Miscellaneous commands are shown in **Table 5-17**.

Refer to the Programmer's Manual for details on these commands.

Table 5-17 Miscellaneous Commands

Function	Set	Reset
Select Printer*	DC1	DC3
Sound Bell	BEL	None
Cancel Data on Print Line	CAN	None
Delete (not used with PS)	DEL	None
Move Head to Home position	ESC <	—
Set MSB to "0"	ESC =	ESC #
Set MSB to "1"	ESC >	ESC #
Enable Paper-End Sensor	ESC 9	ESC 8
Set Typewriter mode	ESC i (1)	ESC i (0)
Print Code Area Expansion	ESC 6	ESC 7
Print Undefined Codes	ESC I (1)	ESC I (0)
Half Speed Printing	ESC s (1)	ESC s (0)
Reset Printer	—	ESC @
Unidirectional Printing	ESC U (1)	ESC U (0)
Repeat Data	ESC V (n) (d1) (d2) to (dm) ESC V (0)	—

* DC1/DC3 enabled if DIP switch-2 #1 is OFF and the interface signal SLCT IN is high when power is turned ON. (Parallel interface)

Table 5-18 indicates Undefined Control Characters (in the ESC I (1) command) with an *.

Table 5-18 Undefined Control Characters

Hex Value	ASCII Code	Printer Code	Binary Value
00 80	NUL	*	x000 0000
01 81	SOH	*	x000 0001
02 82	STX	*	x000 0010
03 83	ETX	*	x000 0011
04 84	EOT	*	x000 0100
05 85	ENQ	*	x000 0101
06 86	ACK	*	x000 0110
07 87	BEL	BEL	x000 0111
08 88	BS	BS	x000 1000
09 89	HT	HT	x000 1001
0A 8A	LF	LF	x000 1010
0B 8B	VT	VT	x000 1011
0C 8C	FF	FF	x000 1100
0D 8D	CR	CR	x000 1101
0E 8E	SO	SO	x000 1110
0F 8F	SI	SI	x000 1111
10 90	DEL	*	x001 0000
11 91	DC1	DC1	x001 0001
12 92	DC2	DC2	x001 0010
13 93	DC3	DC3	x001 0011
14 94	DC4	DC4	x001 0100
15 95	NAK	*	x001 0101
16 96	SYN	*	x001 0110
17 97	ETB	*	x001 0111
18 98	CAN	CAN	x001 1000
19 99	EM	*	x001 1001
1A 9A	SUB	*	x001 1010
1B 9B	ESC	ESC	x001 1011
1C 9C	FS	*	x001 1100
1D 9D	GS	*	x001 1101
1E 9E	RS	*	x001 1110
1F 9F	US	*	x001 1111

x: 0, when 00 to 1F

1, when 80 to 9F

5.3 COMMAND SET FOR TYPE I

Type I has two printer modes. They are the Graphics Printer mode and the Proprinter mode. These modes have some commands in common and some commands for exclusive use. Graphics mode exclusive use commands are expressed as (G). Proprinter mode exclusive use commands are expressed as (P).

5.3.1 Print Mode Commands

The print mode is changed with the commands listed below. The default print mode is set by DIP switches, and is enabled when power is turned ON or when a selected print mode is reset.

Tables 5.19 and 5.20 list the print mode commands and their functions. Each function below is effective until reset with another command.

**Table 5.19 Print mode commands
(Graphics printer mode)**

Function	Set	Reset
Double-width Print	SO ESC SO	DC4, LF, FF VT, ESC W (0)
Double-width Print	ESC W (1)	ESC W (0)
Condensed Printing	SI ESC SI	DC2
Double-strike	ESC G	ESC H
Emphasized	ESC E	ESC F
Underline	ESC - (1)	ESC - (0)
Superscript	ESC S (0)	ESC T
Subscript	ESC S (1)	ESC T

**Table 5.20 Print mode commands
(Proprinter mode)**

Function	Set	Reset
Double-width Print	SO ESC SO	DC4, LF, FF, CR, CAN, VT, ESC W (0)
Double-width Print	ESC W (1)	ESC W (0)
Condensed Printing	SI ESC SI	DC2
Emphasized	ESC E	ESC F
Underline	ESC - (1)	ESC - (0)
Superscript	ESC S (0)	ESC T
Subscript	ESC S (1)	ESC T
Overscore	ESC _ (1)	ESC _ (0)

Note for Tables 5.19 and 5.20:

Emphasized printing is not effective in condensed printing.

Print Example:

Do**b**l**e**-w**i**d**t**h P**r**i**n**t**i**n**g**

C**o**n**d**e**n**s**e**d P**r**i**n**t**i**n**g**

D**o**u**b**l**e**-s**t**r**i**k**e** P**r**i**n**t**i**n**g**

E**m**p**h**a**s**i**z**e**d** P**r**i**n**t**i**n**g**

U**n**d**e**r**l**i**n**e p**r**i**n**t**i**n**g**

S**u**p**e**r**s**c**r**i**p**t S**u**b**s**c**r**i**p**t

5.3.2 Horizontal Movement Commands

The print head is controlled with the commands listed below. The pitch is changed with another pitch command.

**Table 5.21 Horizontal movement commands
(Graphics printer mode)**

Function	Set	Reset
Carriage Return	CR	
Elite Pitch (12 CPI)	ESC M	ESC P with another pitch command
Pica Pitch (10 CPI)	ESC P	
Absolute Print Position	ESC \$ (n1) (n2)	

**Table 5.22 Horizontal movement commands
(Proprinter mode)**

Function	Set	Reset
Backspace	BS	
Carriage Return	CR	
Elite Pitch (12 CPI)	ESC :	DC2
Absolute Print Position	ESC \$ (n1) (n2)	

Note for Tables 5.21 and 5.22:

The horizontal print position is specified with the ESC \$ command at $(256 \times n2 + n1) \times 1/60$ inches from the left margin.

(It is effective for one line only.)

Print Example:

Pica-pitch printing

Elite-pitch printing

5.3.3 Horizontal Tabbing Commands

Absolute and relative horizontal tab stops are controlled with the commands listed below.

Table 5.23 Horizontal tabbing commands

Function	Set
Execute horizontal tab	HT
Horizontal tab stops	ESC D (n1) ... (nk) (0)
Reset Horizontal tab to power on state (P)	ESC R
Clear Horizontal tab	ESC D (0)

Note:

Up to 28 horizontal tab positions can be set, with the first print position as 1.

5.3.4 Vertical Movement Commands

Paper motion is controlled with the commands listed below.

Table 5.24 Vertical movement commands

Function	Set	Reset
Form feed	FF	
Line feed	LF	
Line feed of (n)/216" (0 to 255/216)	ESC J (n)	
Negative line feed of (n)/216" (0 to 255/216)	ESC j (n)	
Line spacing to 1/8"	ESC 0	By New Line Space
Line spacing to (n)/216" (1/216 to 255/216)	ESC 3 (n)	By New Line Space
Line spacing to 7/72"	ESC 1	By New Line Space
Line spacing to (n)/72" (0 to 85/72)	ESC 2 after ESC A (n)	
Line spacing to ESC A (n)	ESC 2	By New Line Space
Auto line feed (P)	ESC (5) (1)	ESC (5) (0)

Notes:

- (1) Refer to **Section 3** for the line feed by CR code function.
- (2) After receipt of spacing commands, each LF command or equivalent results in a special line feed.

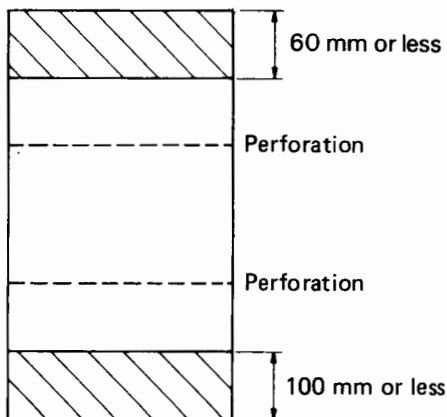
CAUTION:

To avoid paper jam, do not use negative line feed command such as ESC j (n) in a reverse-feed-prohibited area. See **Figure 5.2**.

These commands are invalid if the cut sheet feeder is enabled by DIP switch setting.

With fanfold paper

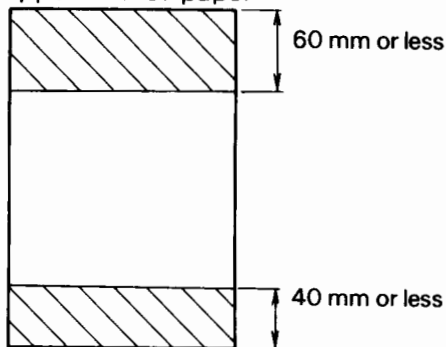
Upper end of paper



Lower end of paper

With cut-sheet paper

Upper end of paper



Lower end of paper

Figure 5.2 Reverse-feed-prohibited area

5.3.5 Vertical Tabbing Commands

Vertical tab stops (paper motion) are controlled with the following commands.

Table 5.25 Vertical tabbing commands

Function	Set
Set Top of form	ESC (4)
Execute vertical tab	VT
Set vertical tab stops	ESC B (n1)... (nk) (0)
Clear vertical tab	ESC B (0)
Reset vertical tab to Power on state (P)	ESC R

Notes:

- (1) Up to 64 vertical tab locations can be set. (ESC B)
- (2) (nk) is an ASCII character with a binary value between 0 and 255. (ESC B)
- (3) 64 vertical tab locations can be set within page length.

5.3.6 Page Formatting Commands

These commands set the left, right, top and bottom margins.

Table 5.26 Page formatting commands

Function	Set
Set right margin (G)	ESC Q (n)
Set Left margin (G)	ESC L (n)
Set Skip perforation	ESC N (n)
Set Page length to (n) lines	ESC C (n)
Set Page length to (n) inches	ESC C (0) (n)

Notes:

- (1) The ESC L command clears the horizontal tabs. (G)
- (2) The ESC C command clears the vertical tabs and skip. (G)

**Table 5.27 Right and left margin
(Graphics printer mode)**

	Pitch	From	To
Right margin	10 CPI	Left margin + 2	80 (with 80-column) 136 (with 136-column)
	12 CPI	Left margin + 3	96 (with 80-column) 163 (with 136-column)
	Condensed	Left margin + 4	137 (with 80-column) 233 (with 136-column)
Left margin	10 CPI	Column 0	Right margin - 2
	12 CPI	Column 0	Right margin - 3
	Condensed	Column 0	Right margin - 4

5.3.7 Bit Image Graphics Commands

The printer can print characters and pictures as a collection of dots. This feature is called bit image printing, and those commands that print bit images are called bit image graphics commands. There are two image modes: 8-dot and 9-dot.

A bit image is structured by a collection of dots arranged in rows and columns. A collection of eight dots sequentially arranged on a column is called a pattern byte. The smallest unit of the bit image is called pattern element. There are two types of pattern which are determined by the number of dots used in an element: 8-dot and 9-dot elements.

Table 5.28 Image elements

	Element in 8-dot Image mode	Element in 9-dot Image mode (G)
Consists of represented by	8 dots 1 byte of data	9 dots 2 bytes of data

Print Example:

8-dot image mode

m= 0



m= 1



m= 2



m= 3



m= 4



m= 5



m= 6



m= 7



m= 8



9-dot image mode

m= 0



m= 1



Table 5.29 Bit image graphics commands

Function	Set
8-dot image mode	ESC * (m) (n1) (n2) (p1) (p2)...(pk)
9-dot image mode (G)	ESC ^ (m) (n1) (n2) (p1) (p2)...(pk)
Single density image	ESC K (n1) (n2) (p1) (p2)...(pk)
Double density image	ESC L (n1) (n2) (p1) (p2)...(pk)
Double-density and double-speed image	ESC Y (n1) (n2) (p1) (p2)...(pk)
Quadruple density image	ESC Z (n1) (n2) (p1) (p2)...(pk)

Table 5.30 8-dot image mode

Value of m	Mode
0	Single density
1	Double density
2	Double speed & double density
3	Quadruple density
4	CRT I
5	Plotter
6	CRT II
7	Double density plotter
8	Triple density

Table 5.31 9-dot image mode
(Only for Graphics printer mode)

Value of m	Mode
0	Single density
1	Double density

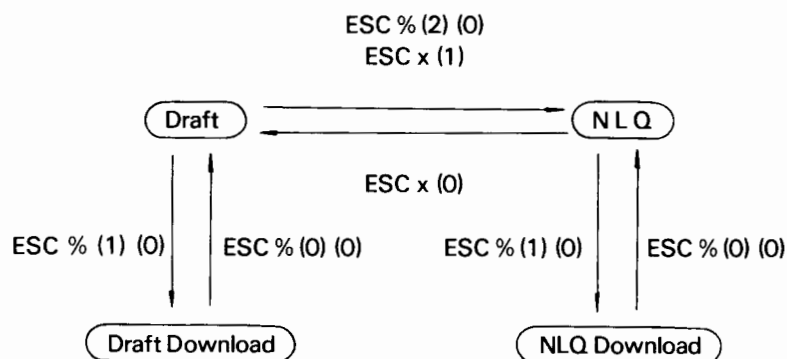
5.3.8 Font Control and Download Commands

The following commands are download commands. Refer to the programmer's manual for how to design and print download characters.

**Table 5.32 Font control and download commands
(Graphics printer mode)**

Function	Set	Reset
Select internal character set	ESC % (0) (0)	(Default)
Select download character set	ESC % (1) (0)	
Select NLQ character set	ESC x (1) ESC % (2) (0)	ESC x (0)
Define download characters	ESC & (0) (n) (m) (a) (p1) (p2) to (p11)	
Define NLQ download characters	ESC & (1) (n) (m) (a1) (a2) (p1) (p2) to (p48)	

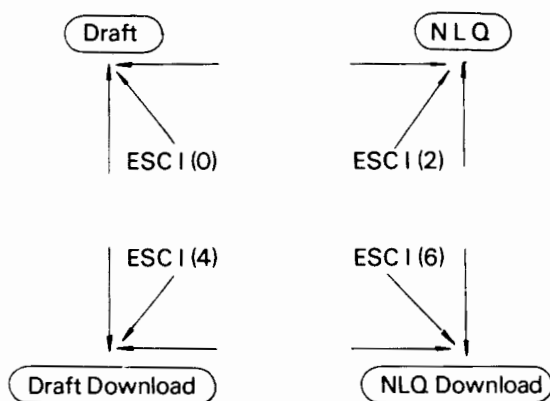
[Graphics printer mode]



**Table 5.33 Font control and download commands
(Proprinter mode)**

Function	Set	Reset
Select draft quality (Internal CG set)	ESC I (0)	ESC H
Select NLQ quality (Internal NLQ CG set)	ESC I (2) ESC G	
Select draft quality (Download CG set)	ESC I (4)	
Select NLQ quality (Download CG set)	ESC I (6)	
Define download characters	ESC = (ct1) (ct2) (20) (n) (a) (0) (p1) (p2) ... (p11) ...	

[Proprinter mode]



Print Example:

Internal character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

NLQ character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

5.3.9 Character Set Selection Commands

Character set selection commands are listed below.

Table 5.34 Character set selection commands

Function	Set
Select CG set 2	ESC 6
Select CG set 1	ESC 7
Print continuous from all characters set (P)	ESC \ (n1) (n2)
Print one character from all characters set (P)	ESC ^

5.3.10 Miscellaneous Commands

Miscellaneous commands are listed below.

Table 5.35 Miscellaneous commands

Function	Set	Reset
Select printer (P)	DC1	ESC Q (3)
Bell	BEL	
Cancell data on print line	CAN	
Move head to home position	ESC <	
Enable paper out detector	ESC 9	ESC 8
Half-speed printing	ESC s (1)	ESC s (0)
Reset Printer (G)	—	ESC @
Unidirectional printing	ESC U (1)	ESC U (0)

5.3.11 Color Selection Commands

This command selects the color of the data to be printed. When this command is entered, subsequent data is printed in the color specified by *n*. When the printer is turned on, the default color is black (*n* = 0). **Table 5.37** lists the value of *n* for other colors. The specified color is effective until another color is specified by this command.

Table 5.36 Color selection command

Function	Set
Select printer color	ESC r (<i>n</i>)

Table 5.37 Values of *n* for other colors

Value of <i>n</i>	Color	1st pass printing	2nd pass printing
0	Black	Black	—
1	Magenta	Magenta	—
2	Cyan	Cyan	—
3	Violet	Magenta	Cyan
4	Yellow	Yellow	—
5	Orange	Yellow	Magenta
6	Green	Yellow	Cyan

NOTE:

In unidirectional print mode, additional colors not listed in **Table 5.37** may be blended by using the ESC U (1) command.

APPENDIX A

COLOR KIT INSTALLATION

A.1 OPTIONAL COLOR KIT

The optional color kit can be ordered when you order your printer, and is also available as a separate item from your dealer.

If the color kit is ordered with the printer it will be shipped with the printer, for you to install.

The color kit includes:

Ribbon Shift Unit — shifts the four-color ribbon cassette to place the selected color in front of the print head. The unit consists of the motor with a cam and a cable which carries drive signals from the driver board to the motor.

Ribbon Cassette — loads with a four-color ribbon (black, magenta, cyan and yellow).

A.2 INSTALLATION OF COLOR KIT

Proceed as follows to install the color kit.

1. Make sure your computer and printer are turned off.
2. Open the top cover and remove the ribbon cassette.

3. Slide the carrier frame to the right side and loosen the two screws on the carrier frame.
4. Insert the color kit flat-conductor cable into the space between the print head and the carrier frame.
5. Install the color kit and tighten the two screws.

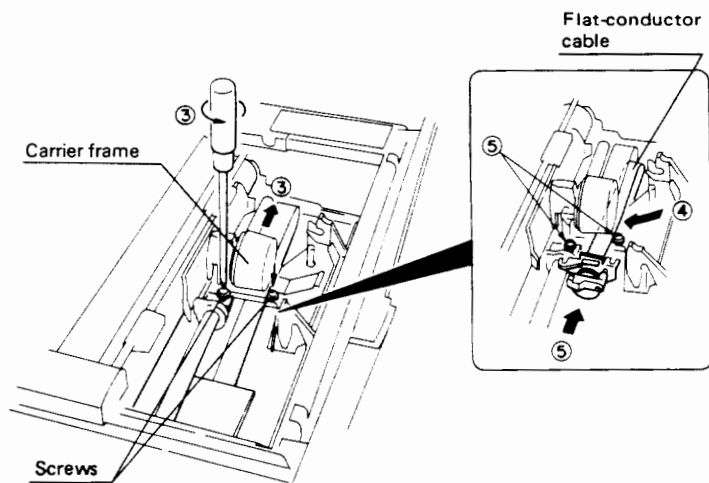


Figure A-1 Installation of the Color Kit (1)

6. Slide the connector cover towards the right and remove it.
7. After unlocking the connector for the color kit, insert the flat-conductor cable into the connector. Lock the connector and attach the connector cover.

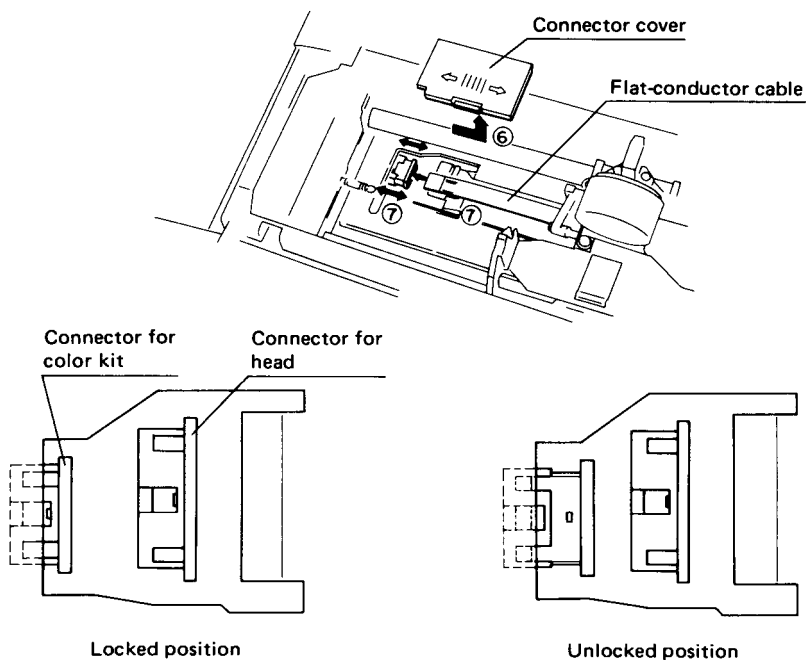


Figure A-2 Installation of the Color Kit (2)

Install the color ribbon cassette, referring to paragraph 2.2.

This completes the installation of the color kit.

Consult your dealer if assistance is required.

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‘

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‘

‘

APPENDIX B CIRCUIT BOARDS

B.1 EXCHANGEABLE CIRCUIT BOARDS

Refer to paragraph 1.7 for summary information on the installation of these circuit boards.

This printer allows the user to exchange the Interface Circuit Board and the Memory Circuit Board. These boards are located beneath the Circuit Board Cover at the right rear corner of the printer.

The Interface Circuit Board contains either a RS-232C Serial or a Centronics Type Parallel Interface. The board contains the interface circuits and the interface cable receptacle (which is exposed at the rear of the printer). Only the Serial Interface Circuit Board has the DIP switch.

The Memory Circuit Board contains RAM and ROM memory and the slide and DIP switches set by the user to establish default print parameters.

RAM Memory Circuit Boards are offered:

With 8K bytes of RAM Memory

With 16K bytes of RAM Memory

At least 8K bytes of RAM memory are recommended before installing an optional Color Kit, and 16K bytes is preferred, to achieve printing speed. 2.4K bytes of RAM are installed on the Main Circuit Board for user use with the 80-column printer while, with the 136-column printer, RAM is set for addressing additional print columns.

B.2 INSTALLATION OF A CIRCUIT BOARD

To install a circuit board, proceed as follows.

Make sure the Power Switch is turned OFF.

Refer to **Figure B-1**.

1. Loosen the Card Cover holding bolt with a screwdriver or coin.
2. Remove the cover by sliding it rearward while raising it upward.
3. Carefully align the circuit board into its guide slots and push it downward until the connector is fully seated.
4. If installing an Interface Board, tighten the mounting screw to ensure an electrical ground.
5. Install the Card Cover and fasten the holding bolt.

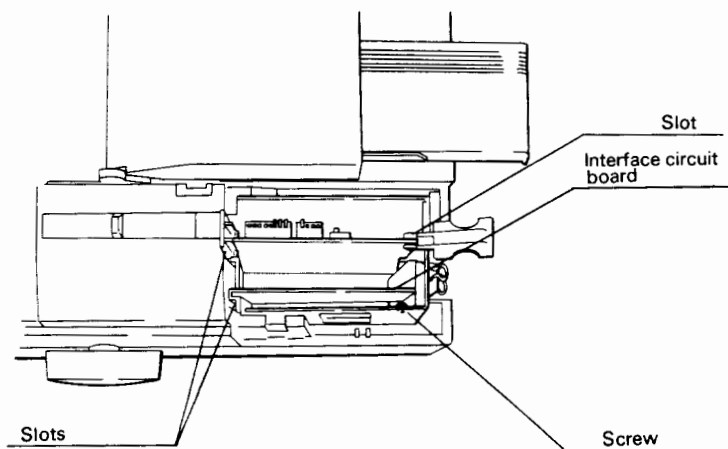


Figure B-1 Circuit Board Installation

CAUTION:

Set the interface board firmly by pushing Printed Circuit Board down.

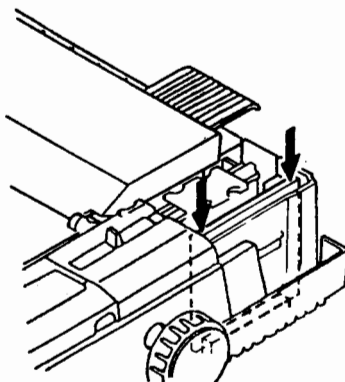


Figure B-2 Installation of Interface Board

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APPENDIX C

CUT SHEET FEEDER

An optional Cut Sheet Feeder is available from your dealer. This section gives the model numbers of the currently supported Sheet Feeders. Installation and operation information are also given.

C.1 SUPPORTED MODELS

Your printer can be equipped with the following model number Cut Sheet Feeders.

ASF300-FJ2101	Single Bin unit for the 80-column printer
ASF300-FJ2201	Single Bin unit for the 136-column printer

These Cut Sheet Feeders are produced by BDT (Büro und Datentechnik).

Consult your dealer for additional performance data on available Sheet Feeders.

C.2 CUT SHEET FEEDER INSTALLATION

1. Turn off the printer Power Switch.
2. Open the soundproof, front and top covers.

3. Push downward the rear end of the Cut Sheet Feeder cover and then remove the cover by raising upward as shown in **Figure C-1**.

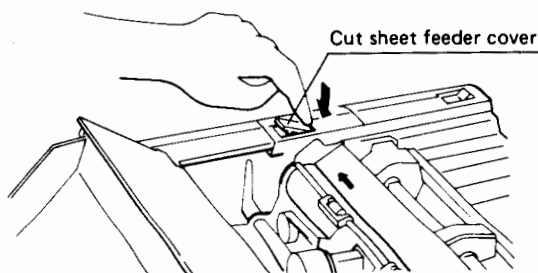


Figure C-1 Removing the Cut Sheet Feeder Cover

4. Remove the rear cover.
5. Remove Bail Roller Unit as follows:

Rotate this unit toward the front of the printer to snap it out, and then pull it upward to remove as shown in **Figure C-2**.

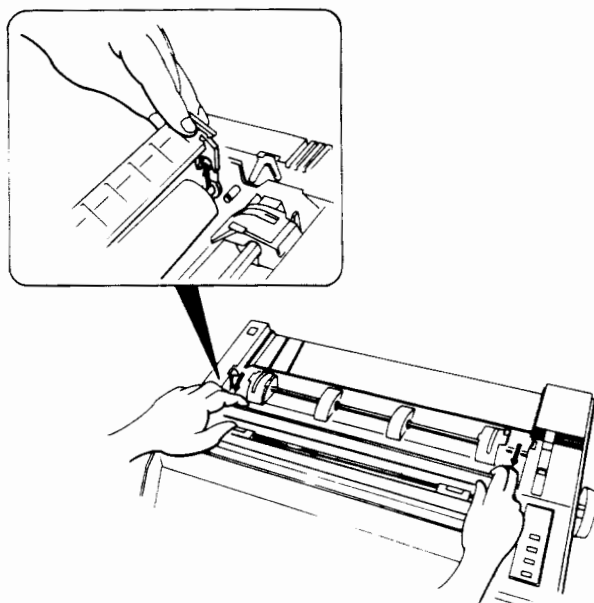


Figure C-2 Removing Bail Roller Unit

6. Set DIP switch 2-2 (for Type F) or 1-7 (for Type I) to ON as in paragraph 1.8 and remount the card cover.

NOTE:

If necessary, change the setting of DIP switch 1-5 (for Type F) or DIP switches 2-2 to 2-4 (for Type I) according to the paper length.

7. Re-install the rear cover and move Guides to the center of the rear cover as shown in **Figure C-3**.

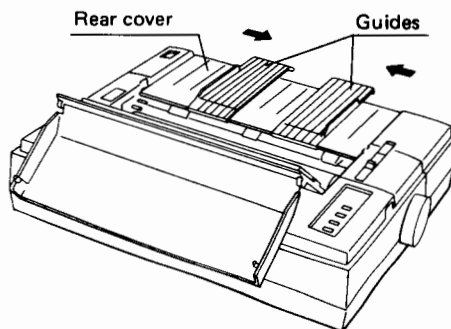


Figure C-3 Install Rear Cover

8. Remove the Cut Sheet Feeder from the package and remove the Paper Stacker from the Cut Sheet Feeder as shown in **Figure C-4**.

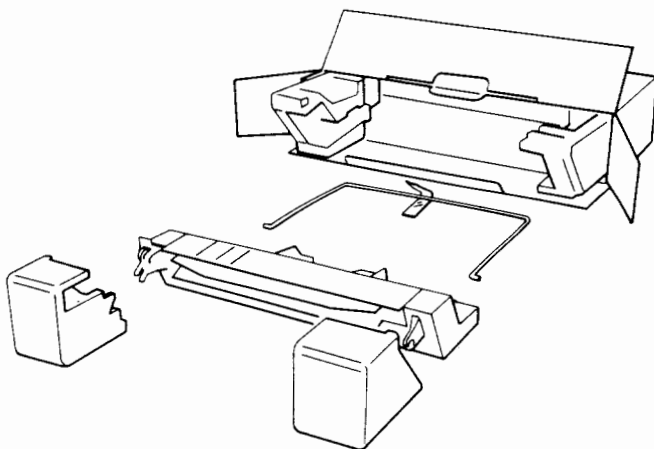


Figure C-4 Removing the Cut Sheet Feeder

9. Install the Cut Sheet Feeder on the printer, so the adaptor of the Sheet Feeder's clamps fit over the studs on the printer as shown in **Figure C-5**.

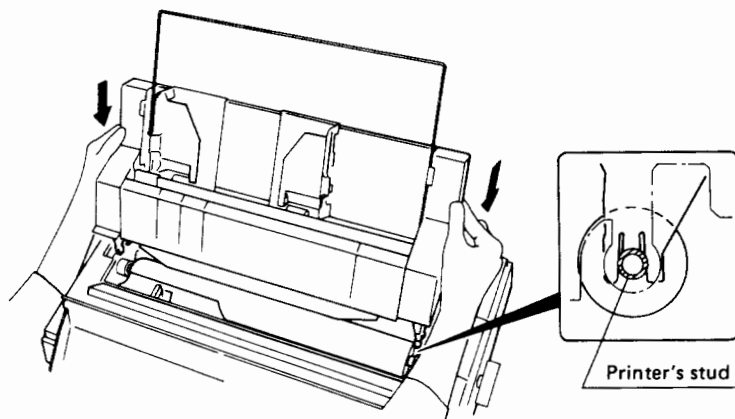


Figure C-5 Installation of Cut Sheet Feeder

10. Put the front covers against the front face of the Cut Sheet Feeder as shown in **Figure C-6**.

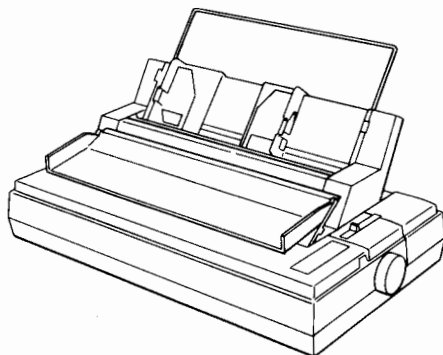


Figure C-6 Setting the Front Cover

11. Set the Paper Release Lever towards the front of the printer.
12. Turn on the Power Switch.

C.3 LOADING PAPER

1. Place the Paper Stacker, for the length of paper being used, into the holes in the Feeder.

2. Push the Feeder's tabs by gripping the whole part and open the paper bin as shown in **Figure C-7**.

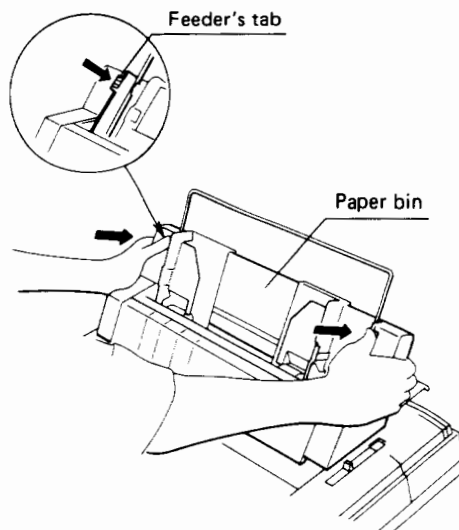


Figure C-7 Opening the Paper Bin

NOTE:

Do not try to open the paper bin as shown in **Figure C-8**.

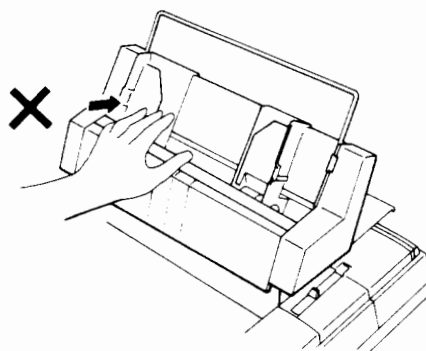


Figure C-8 Prohibited Operation

3. Adjust the width of the bin for the paper being used.
4. Fan the paper well as shown in **Figure C-9** and align the edges before placing it on the Paper Stacker.

Letterhead paper is loaded with the printed face towards the rear of the bin and with the top edge down.

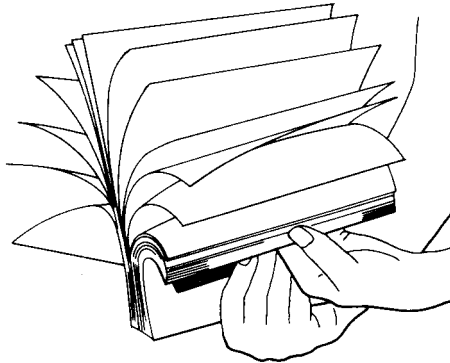


Figure C-9 Fanning the Paper

5. Load paper.
6. Close the paper bin by pushing the Paper Stacker and clamp as shown in **Figure C-10**.

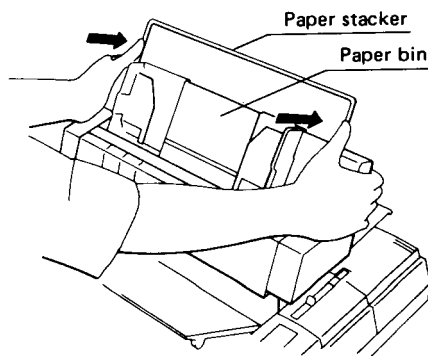


Figure C-10 Closing the Paper Bin

7. Press the FF switch to feed the first sheet of the paper to its first print line (Top of Form).

The printer will feed subsequent sheets to this Top of Form position.

C.4 OPERATION

Paper will advance through the printer:

When a paper feed command is received from the host system.

When the Platen Knob is turned.

When the LF switch is pressed on the Operator Panel while the printer is OFF LINE.

Loaded cut sheet paper is ejected from the Sheet Feeder when the FF switch on the Operator Panel is pressed.

If the paper bin runs out of paper, the "PAPER OUT" lamp on the Operator Panel will light.

To resume printing after a Paper Out condition:

Insert paper into the empty bin according to paragraph C.3.

Press the FF switch on the Operator Panel.

Paper will load and the "PAPER OUT" lamp will go out.

Press the ON LINE switch to continue printing.

C.5 CUT SHEET FEEDER REMOVAL

1. Turn off the Power Switch and open the front cover.
2. Pull the Cut Sheet Feeder upward and lift it off the printer as shown in **Figure C-11**. Remove the rear cover.

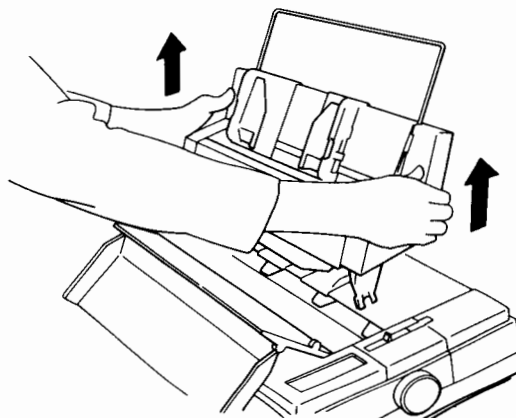


Figure C-11 Removing the Cut Sheet Feeder

3. Install the Bail Roller Unit according to the following procedure.

- (1) Set the slot of the Bail Roller Unit onto the studs which support the Platen as shown in **Figure C-12**.

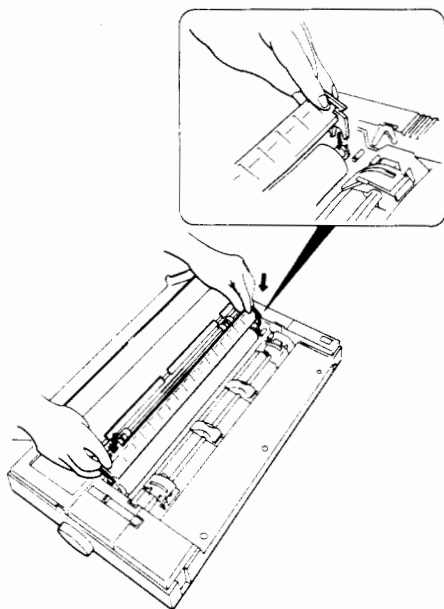


Figure C-12 Installation of the Bail Roller Unit

- (2) Rotate the Bail Roller Unit to the direction of **Figure C-13** until it is locked by the printer front studs.

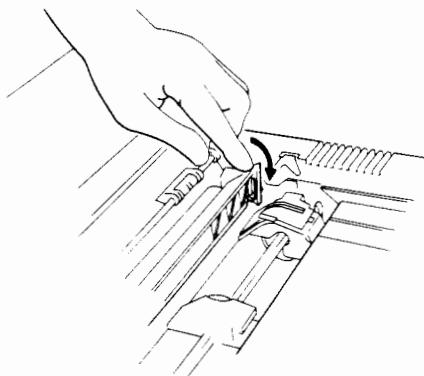


Figure C-13 Fixing the Bail Roller Unit

4. Set DIP switch 2-2 OFF for Type F and DIP switch 1-7 OFF for Type I.
5. Re-install the rear cover and the Cut Sheet Feeder cover, and close the soundproof, top and front covers.

C.6 PAPER SPECIFICATIONS

1. Paper dimensions

		FJ2101	FJ2201
Length	Max.	12" (305 mm)	12" (305 mm)
	Min.	5" (127 mm)	5" (127 mm)
Width	Max.	8.5" (216 mm) (A4 portrait)	14.4" (365 mm) (B4 landscape)
	Min.	5.7" (145 mm)	5.7" (145 mm)

2. Paper weight

Max. 20 lbs (81 g/m²)

Min. 15 lbs (60 g/m²)

3. Details

Refer to the Operator's Manual ASF300-FJ2101/2201 in the Cut Sheet Feeder package.

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APPENDIX D

PRINTER SPECIFICATIONS

Print Method:

Impact dot matrix with a 9-wire print head

Printing Speed:

Draft Quality mode prints 220 characters per second at 10 CPI and 176 characters per second at 12 CPI

Condensed mode prints 188 characters per second at 17.1 CPI

Near Letter Quality mode prints 44 characters per second at 10 CPI

Line Feed Speed:

100 milliseconds at 6 lines per inch

Form Feed Speed:

4 inches per second

Character Matrix (Horizontal x Vertical):

Draft Quality is 9 x 7 dots

Near Letter Quality is 19 x 16 dots

Character Set:

Type F

96 ASCII characters, 32 international characters (both standard and italic)

256 Near Letter Quality characters

Type I

96 ASCII characters, 134 other characters and symbols

230 Near Letter Quality characters

Downloadable Characters (Resident RAM):**Type F**

Up to 255-character set and a 64-character Near Letter Quality Set.

Type I, Proprinter Mode

Up to a 94-character set and a 94-character Near Letter Quality Set

Type I, Graphics Printer Mode

Up to a 224-character set and 64-character Near Letter Quality Set

Character Spacing:**Type F**

1/10", 1/12", 1/15", 1/17.1", 1/20", Proportional space, and programmable increments of 1/120"

Type I

1/10", 1/12", 1/17.1"

Print Line:**80-column printer**

80 Characters per line at 10 CPI

96 Characters per line at 12 CPI

120 Characters per line at 15 CPI
(Type-F Only)

137 Characters per line at 17.1 CPI

160 Characters per line at 20 CPI
(Type-F Only)

136-column printer

136 Characters per line at 10 CPI

163 Characters per line at 12 CPI

204 Characters per line at 15 CPI
(Type-F Only)

233 Characters per line at 17.1 CPI

272 Characters per line at 20 CPI
(Type-F Only)

Line Spacing:

1/6", 1/8", 7/72", n/72" or n/216"

Number of copies:

Up to 3, including the original

Forms:

80-column printer	Up to 0.011" thick 4" (101.6 mm) to 10" (254 mm) wide Cut Sheets 4" (101.6 mm) to 10.5" (266.7 mm) wide Continuous Forms
136-column printer	Up to 0.011" thick 4" (101.6 mm) to 15" (381 mm) wide Cut Sheets 4" (101.6 mm) to 16.5" (419.1 mm) wide Continuous Forms

Ribbon:

Monochrome fabric ribbon or 4-color fabric ribbon in an easily installed cassette

Paper Handling:

Friction feed Platen and rear feed continuous forms tractors are standard

Auto Load:

Auto Load with cut sheet paper and with the 136-column printers a paper less than 8.5" wide.

The 80-column printer will also Auto Load continuous forms, (which is not available on the 136-column printer)

Cut Sheet Feeder:

Available as an option, see **Appendix C**.

Interface:

Mounted on user exchangeable circuit board

Centronics Type Parallel and RS-232C Serial Interface Circuit Boards are available

AC Power:

115 VAC to 120 VAC $\pm 10\%$, 50/60 Hz
220 VAC to 240 VAC $\pm 10\%$, 50/60 Hz

Operating Environmental Requirements:

5°C to 38°C, 20% to 80% RH

Storage Environmental Requirements:

-20°C to 60°C, 5% to 95% RH

Physical Dimensions:

80-column printer	Height:	4.7" (120 mm)
	Width:	17.2" (438 mm)
	Depth:	13.6" (345 mm)
	Weight:	20.2 lbs (9.2 kg)

136-column printer	Height:	4.7" (120 mm)
	Width:	22.8" (580 mm)
	Depth:	13.6" (345 mm)
	Weight:	25.7 lbs (11.7 kg)

APPENDIX E

PARALLEL INTERFACE

Your printer has a user exchangeable interface circuit board. A RS-232C Serial or Centronics Type Parallel Interface Circuit Board is presently available. Refer to paragraphs 1.7 and 1.11 for additional information.

When an interface board is installed in the printer its connector is exposed through a cutout at the rear of the printer.

This Appendix describes the Parallel Interface.

Appendix F describes the Serial Interface.

E.1 PARALLEL INTERFACE OVERVIEW

Most variations of the Centronics Type Parallel Interface can be supported by this printer.

The interface connector plug, for the cable, is an Amphenol-DDK (57FE-30360) or equivalent. **Figure E-1** illustrates the connector layout.

(Cable End)

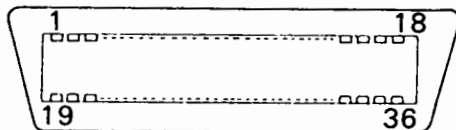


Figure E-1 Parallel Interface Connector Layout

E.2 PARALLEL INTERFACE PIN ASSIGNMENTS

Table E-1 lists the Centronics type parallel interface signals, gives the signal and return pin numbers, and defines each signal.

**Table E-1 Centronics Type Parallel Interface
Signal Definitions**

Signal Name	Signal Pin #	Return Pin #	Signal Definition
<u>DSTB</u> *	1	19	Low level pulse of 0.5 microsecond or more, used to strobe the DATA signals into the printer. The printer reads the data at the Low level of this signal. Ensure an -Acknowledge has been returned before issuing the next -Data Strobe. -Data Strobe is ignored if BUSY is high.
DATA 1*	2	20	8 data lines from the host. High level represents binary 1, Low level represents binary 0. DATA 8 is the most significant bit. Signal must be High at least 0.5 microsecond before the falling edge of the -Data Strobe signal and held at least 0.5 microsecond after the rising edge.
DATA 2*	3	21	
DATA 3*	4	22	
DATA 4*	5	23	
DATA 5*	6	24	
DATA 6*	7	25	
DATA 7*	8	26	
DATA 8*	9	27	
ACK (-Acknowledge)	10	28	Low level pulse of 2 to 6 microseconds indicates input of a character into the print data buffer, or the end of an operation (i.e., indicates printer has received data and is ready for the next input).

* = Signal generated by the host system.

**Table E-1 Centronics Type Parallel Interface
Signal Definitions (Continued)**

Signal Name	Signal Pin #	Return Pin #	Signal Definition
BUSY	11	29	High level indicates printer cannot receive data. Typical conditions that cause a High BUSY level are buffer full or ERROR condition.
PE (Paper Empty)	12		High level indicates the printer is out of paper.
SLCT (Select)	13		High level indicates the printer is ON LINE (Selected).
AUTO FEED XT*	14		Low level indicates LF (Line Feed) occurs after each CR (Carriage Return) code.
No Connection	15		Reserved signal line.
Signal Ground (SG)		16	Logic/Signal ground level (0 Volts).
Frame Ground (FG)		17	Printer Cabinet/Frame ground line.
No Connection	18		Reserved signal line.
Signal Ground (SG)		19-30	Twisted pair cable return lines.
INIT* (-Initialize)	31		Low level pulse of 50 microseconds or more, resets the buffer and initializes the printer.
ERROR	32		Low level indicates the printer is OFF LINE, has a PAPER OUT or has sensed an ERROR condition.
Signal Ground (SG)	33		Logic/Signal ground level (0 Volts).
No Connection	34		Not used.
+5 Volts Regulate	35		Connected to the +5 Volt source through a 3.3 kilo ohm resistor.

* = Signal generated by the host system.

**Table E-1 Centronics Type Parallel Interface
Signal Definitions (Continued)**

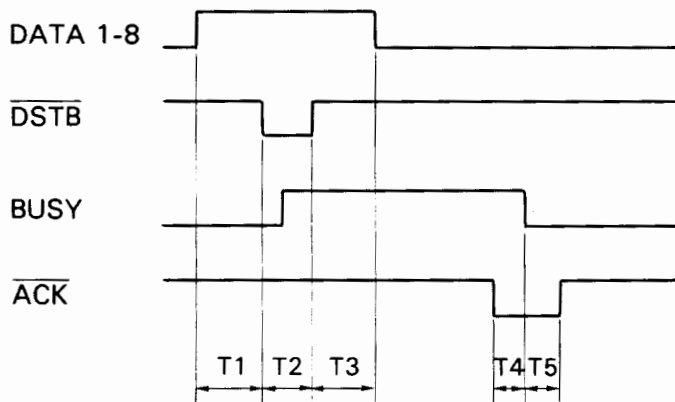
Signal Name	Signal Pin #	Return Pin #	Signal Definition
SLCT IN* (-Select In)	36		Low level indicates the printer is placed ON LINE (Selected) when power is turned ON. (Type F Only)

* = Signal generated by the host system.

E.3 PARALLEL INTERFACE SIGNAL TIMING

The timing relationship of the handshake (or protocol) signals in the Centronics Type Parallel Interface is given in **Figure E-2**.

TYPE F



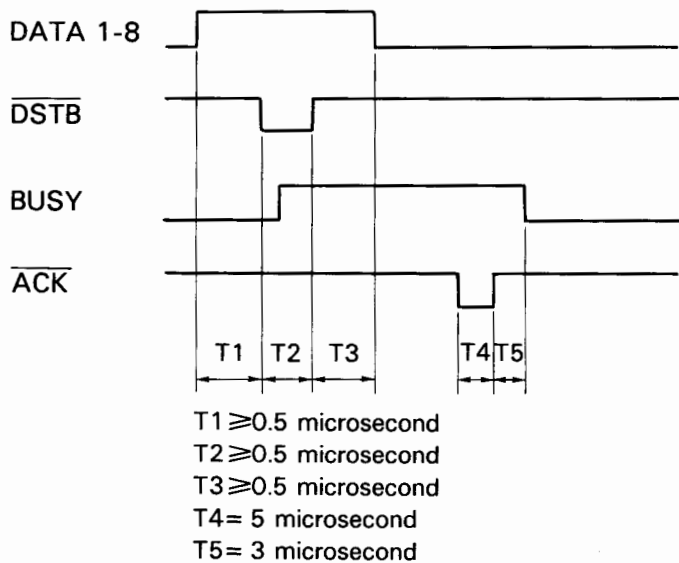
$T1 \geq 0.5$ microsecond

$T2 \geq 0.5$ microsecond

$T3 \geq 0.5$ microsecond

$T4 = 7$ microsecond

$T5 = 5$ microsecond

TYPE I**Figure E-2 Parallel Interface Signal Timing**

E.4 PARALLEL DRIVER/RECEIVER CIRCUITS

Figure E-3 shows the parallel interface output (Driver) circuit. A SN7406 or SN74LS06 or equivalent driver circuit is used.

Figure E-4 shows the parallel interface input (Receiver) circuit. A SN74LS14 or equivalent and a 8255A receiver circuit is used. Voltage levels are 0V and +5V (nominal).

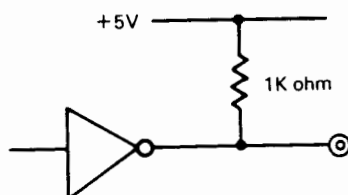


Figure E-3 Parallel Interface Output Circuit

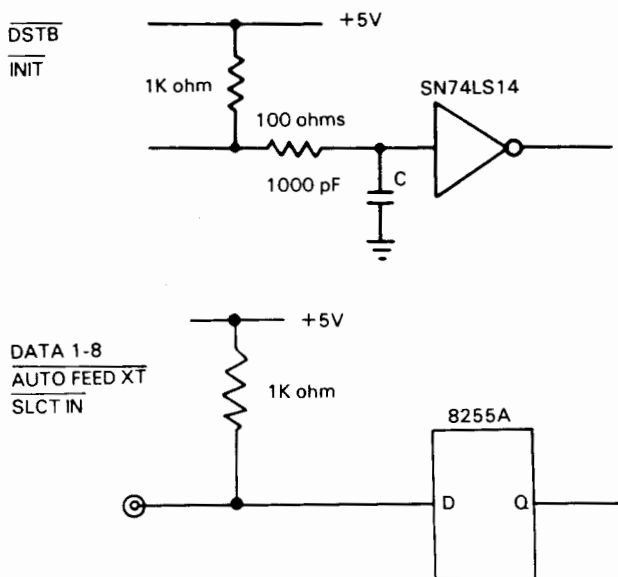


Figure E-4 Parallel Interface Input Circuit

APPENDIX F

SERIAL INTERFACE

This printer has a user exchangeable interface circuit board. A RS-232C Serial or Centronics Type Parallel Interface Circuit Board is presently available. Refer to paragraphs 1.7 and 1.11 for additional information.

When an interface board is installed in the printer its connector is exposed through a cutout at the rear of the printer.

This Appendix describes the Serial Interface.

Appendix E describes the Parallel Interface.

F.1 OVERVIEW OF SERIAL INTERFACE

The printer transmits and receives (switch selectable) 7-bit or 8-bit asynchronous data at (switch selectable) baud rates of 200, 300, 600, 1200, 2400, 4800 or 9600. The operator sets the bit configuration and baud rate with DIP switches installed on the Serial Interface Board as described in paragraphs 1.8 and 3.3.

The interface connector plug, for the cable, is a Cannon Cinch DB-25P or equivalent. **Figure F-1** illustrates the connector layout.

(Cable End)

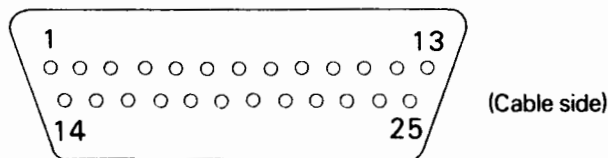


Figure F-1 Serial Interface Connector

F.2 COMMUNICATIONS PROTOCOL

A communications protocol is used, with the Serial Interface, to prevent a buffer overflow condition when print data is received faster than the printer can empty the print buffer.

The operator selects either XON/XOFF or Printer Ready/Busy Protocol, using the Serial Interface Circuit Board DIP switch # 1.

The communication protocol responds to conditions within the printer as described in the following paragraphs.

F.2.1 XON/XOFF (DC1/DC3) Protocol

This protocol is selected and used when DIP switch # 1, on the Serial Interface Circuit Board, is set ON.

The printer will send a DC3 control code to the host when the print buffer is nearly full (within 16 bytes).

The host system should stop transmitting data when a DC3 control code is received, and wait for the printer to send a DC1 Control Code. A DC1 control code is transmitted by the printer when its buffer can receive additional data and no error conditions exist.

When the printer is first turned on, the +DTR signal is set true, and a DC1 (XON) code is transmitted from the printer.

F.2.2 Data Terminal Ready (DTR) Protocol

This protocol is selected when DIP switch # 1 on the Serial Interface Circuit Board is set OFF.

This protocol will cause the Data Terminal Ready (+DTR) interface signal to become LOW when the print buffer is nearly full (within 16 bytes)

The +DTR interface line will go high to indicate the printer is ready to receive 256 or more bytes of print data in the print buffer and no error conditions exist.

F.3 SERIAL DATA FORMAT

Serial data consists of a start bit, 7 or 8 data bits, a parity bit or without a parity bit, and 1 or 2 stop bits. The data must consist of 10 or 11 bits. A bit is in the mark (true) state when it is low and in the space (false) state when it is high.

The number of data bits, parity, and number of stop bits are DIP switch selectable (see **Section 3**).

The typical transmission of the character "K" (with 7 data bits and even parity) is shown in **Figure F-2**.

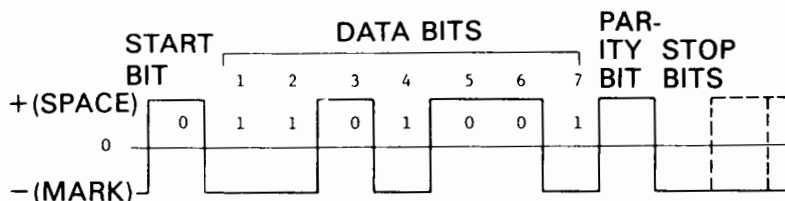


Figure F-2 Serial Data Format

F.4 SERIAL INTERFACE DRIVER RECEIVER

Figure F-3 shows the serial interface output (Driver) circuit. The printer uses a SN75188N or equivalent to convert TTL signal levels (+5 to 0 Volts) to serial interface signal levels (+12 to -12 Volts). A 1000 pF capacitor mutes noise on the output signal line.

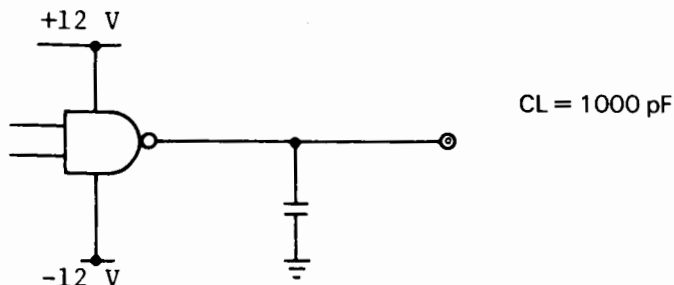


Figure F-3 Serial Interface Output Circuit

Figure F-4 shows the serial interface input (Receiver) circuit. The printer uses a SN75189AN or equivalent to convert Serial Interface signal levels (+12 to -12 Volts) to TTL signal levels (+5 to 0 Volts).



Figure F-4 Serial Interface Input Circuit

F.5 SERIAL INTERFACE PIN ASSIGNMENTS

Table F-1 lists the serial interface signals and gives the name of each signal.

Table F-1 Serial Interface Signal Definitions

Signal	Name	Printer Pin #	CCITT	TelCo Circuit
FG	Frame Ground	1	101	AA
TD	-Transmitted Data	2	103	BA
RD	-Received Data	3	104	BB
RTS	+Request to Send	4	105	CA
CTS	+Clear to Send	5	106	CB
DSR	+Data Set Ready	6	107	CC
SG	Signal Ground	7	102	AB
DCD	+Data Carrier Detect	8	109	CF
DTR	+Data Terminal Ready	20	108	CD

Pins 9 through 19, and 21 through 25, are unused.

F.6 SIGNAL DEFINITIONS

Frame (Chassis) Ground
Safety ground.

Signal Ground
Common signal ground.

Transmitted Data
Serial data bits are sent to the host over this line.

Received Data
Serial data bits are received from the host over this line.

Request to Send
High level is sent to the host when printer initialization is complete.
Request to Send stays high until power is shut off.

Clear to Send
The host sets this signal high when it is ready to receive transmitted data from the printer.

Data Set Ready
Indicates transmission and reception are enabled. The host must set this signal high when data is to be sent or received.

Data Carrier Detect
Indicates carrier signal from the host has been received. The host must set this signal high before transmitting data to the printer.

Data Terminal Ready
High state indicates that the printer is ready to receive or transmit data.

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APPENDIX G

CODE TABLES

G.1 TYPE F PRINTER

ASCII Code Chart printed in Draft quality

Code Table (U.S.A.)																
HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		SP	!	"	#	\$	%	&	'	()	*	+	,	-	.
1		DC1														
2		DC2														
3		DC3														
4		DC4														
5																
6																
7	BEL															
8	BS	CAN														
9	HT															
A	LF		*	:	;	<	=	>	?							
B	VT	ESC														
C	FF															
D	CR															
E	SO															
F	SI															

International Language Unique Symbols Chart printed in Draft quality

Language\HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
English(U.S.A.)	#	\$	@	£	/	J	<	,	£	ı	ı	~
French	#	\$	@	£	£	ı	<	,	£	ı	ı	~
German	#	\$	@	£	£	ı	<	,	£	ı	ı	~
English(U.K.)	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Danish	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Swedish	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Italian	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Spanish	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Japanese	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Norwegian	#	\$	@	£	£	ı	<	,	£	ı	ı	~
Danish II	#	\$	@	£	£	ı	<	,	£	ı	ı	~

Language\HEX	A3H	A4H	COH	DBH	DCH	DDH	DEH	EOH	FBH	FCH	FDH	FEH
English(U.S.A.)	#	\$	@	£	/	J	<	,	£	/	ı	~
French	#	\$	@	£	£	ı	<	,	£	/	ı	~
German	#	\$	@	£	£	ı	<	,	£	/	ı	~
English(U.K.)	#	\$	@	£	£	ı	<	,	£	/	ı	~
Danish	#	\$	@	£	£	ı	<	,	£	/	ı	~
Swedish	#	\$	@	£	£	ı	<	,	£	/	ı	~
Italian	#	\$	@	£	£	ı	<	,	£	/	ı	~
Spanish	#	\$	@	£	£	ı	<	,	£	/	ı	~
Japanese	#	\$	@	£	£	ı	<	,	£	/	ı	~
Norwegian	#	\$	@	£	£	ı	<	,	£	/	ı	~
Danish II	#	\$	@	£	£	ı	<	,	£	/	ı	~

International Language Unique Symbols Chart printed in NLQ

Language\HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
English(U.S.A.)	#	\$	@	!	/	J	^	~	{	--	}é	~
French	#	\$	@	!	/	J	^	~	{	--	}é	~
German	#	\$	@	!	/	J	^	~	{	--	}é	~
English(U.K.)	#	\$	@	!	/	J	^	~	{	--	}é	~
Danish	#	\$	@	!	/	J	^	~	{	--	}é	~
Swedish	#	\$	@	!	/	J	^	~	{	--	}é	~
Italian	#	\$	@	!	/	J	^	~	{	--	}é	~
Spanish	#	\$	@	!	/	J	^	~	{	--	}é	~
Japanese	#	\$	@	!	/	J	^	~	{	--	}é	~
Norwegian	#	\$	@	!	/	J	^	~	{	--	}é	~
Danish II	#	\$	@	!	/	J	^	~	{	--	}é	~

Language\HEX	A3H	A4H	COH	DBH	DCH	DDH	DEH	EOH	FBH	FCH	FDH	FEH
English(U.S.A.)	#	\$	@	!	/	J	^	~	{	--	}é	~
French	#	\$	@	!	/	J	^	~	{	--	}é	~
German	#	\$	@	!	/	J	^	~	{	--	}é	~
English(U.K.)	#	\$	@	!	/	J	^	~	{	--	}é	~
Danish	#	\$	@	!	/	J	^	~	{	--	}é	~
Swedish	#	\$	@	!	/	J	^	~	{	--	}é	~
Italian	#	\$	@	!	/	J	^	~	{	--	}é	~
Spanish	#	\$	@	!	/	J	^	~	{	--	}é	~
Japanese	#	\$	@	!	/	J	^	~	{	--	}é	~
Norwegian	#	\$	@	!	/	J	^	~	{	--	}é	~
Danish II	#	\$	@	!	/	J	^	~	{	--	}é	~

Character Set 2 printed in Draft quality

ProPrinter Mode CGSET 2

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		DC1	!	1	A	Q	a	q	ü							
2		DC2	"	2	B	R	b	r	é	ä	ä	ä	ä	ä	ä	ä
3			#	3	C	S	c	s	ä	ä	ä	ä	ä	ä	ä	ä
4			\$	4	D	T	d	t	ä	ä	ä	ä	ä	ä	ä	ä
5			%	5	E	U	e	u	ä	ä	ä	ä	ä	ä	ä	ä
6			&	6	F	V	f	v	ä	ä	ä	ä	ä	ä	ä	ä
7			'	7	G	W	w	w	ä	ä	ä	ä	ä	ä	ä	ä
8			(	8	H	X	x	x	ä	ä	ä	ä	ä	ä	ä	ä
9			)	9	I	Y	y	y	ä	ä	ä	ä	ä	ä	ä	ä
A			*	A	J	Z	z	z	ä	ä	ä	ä	ä	ä	ä	ä
B			+	B	VT	ESC			ä	ä	ä	ä	ä	ä	ä	ä
C			,	C	FF				ä	ä	ä	ä	ä	ä	ä	ä
D			-	D	CR				ä	ä	ä	ä	ä	ä	ä	ä
E			.	E	SO				ä	ä	ä	ä	ä	ä	ä	ä
F			/	F	SI				ä	ä	ä	ä	ä	ä	ä	ä

All Characters printed in Draft quality

ProPrinter Mode All Character

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0																
1		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Character Set 1 printed in NLQ

ProPrinter Mode CGSET 1

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	~	p										
1	DC1	!	1	A	Q	a	q									
2	DC2	"	2	B	R	b	r									
3		#	3	C	S	c	s									
4	DC4	\$	4	D	T	d	t									
5		%	5	E	U	e	u									
6		&	6	F	V	f	v									
7	BEL	.	7	G	W	w	w		BEL							
8	BS	(	8	H	X	x	x		BS	CAN						
9	HT	)	9	I	Y	y	y		HT							
A	LF	*	: J	Z	j	z	z		LF							
B	VT	+	; K	[	k	{	{		VT	ESC						
C	FF	,	< L	\	l	|	|		FF							
D	CR	-	= M	] m	}	}	}		CR							
E	SO	.	> N	^ n	~	~	~		SO							
F	SI	/	? O	_	o	o	o		SI							

All Characters printed in NLQ

ProPrinter Mode All Character

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	1	2	3	4	5	6	7	8	9	:	;	<	=	>
1		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
2		"	#	\$	%	&	'	()	*	+	,	-	.	/	
3		"	#	\$	%	&	'	()	*	+	,	-	.	/	
4		"	#	\$	%	&	'	()	*	+	,	-	.	/	
5		"	#	\$	%	&	'	()	*	+	,	-	.	/	
6		"	#	\$	%	&	'	()	*	+	,	-	.	/	
7		"	#	\$	%	&	'	()	*	+	,	-	.	/	
8		"	#	\$	%	&	'	()	*	+	,	-	.	/	
9		"	#	\$	%	&	'	()	*	+	,	-	.	/	
A		"	#	\$	%	&	'	()	*	+	,	-	.	/	
B		"	#	\$	%	&	'	()	*	+	,	-	.	/	
C		"	#	\$	%	&	'	()	*	+	,	-	.	/	
D		"	#	\$	%	&	'	()	*	+	,	-	.	/	
E		"	#	\$	%	&	'	()	*	+	,	-	.	/	
F		"	#	\$	%	&	'	()	*	+	,	-	.	/	

G.3 TYPE I GRAPHICS PRINTER

Character Set 1 printed in Draft quality

Graphic Printer Mode CGSET 1

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	P											
1			!	1	A	Q	a	q								
2			"	2	B	R	b	r								
3			#	3	C	S	c	s								
4			\$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	v	v								
7			'	7	G	W	w	w	BEL							
8			(	8	H	X	x	x		CAN						
9			)	9	I	Y	y	y	HT							
A			*	:	J	Z	z	z	LF							
B			+	;	K	[	k	{	VT	ESC						
C			,	<	L	\	l	|	FF							
D			=	=	M	]	m	}	CR							
E			.	>	N	^	n	~	SO							
F			/	?	O	_	o		SI							

APPENDIX H

CODE CONVERSION TABLE

This table omits ASCII characters with most significant bit ON and control characters not used for this printer.

Decimal	Hexa- decimal	Binary	ASCII Character
0	00	00000000	(NUL)
1	01	00000001	
2	02	00000010	
3	03	00000011	
4	04	00000100	
5	05	00000101	
6	06	00000110	
7	07	00000111	(BEL)
8	08	00001000	(BS)
9	09	00001001	(HT)
10	0A	00001010	(LF)
11	0B	00001011	(VT)
12	0C	00001100	(FF)
13	0D	00001101	(CR)
14	0E	00001110	(SO)
15	0F	00001111	(SI)
16	10	00010000	
17	11	00010001	(DC1)
18	12	00010010	(DC2)
19	13	00010011	(DC3)
20	14	00010100	(DC4)
21	15	00010101	
22	16	00010110	
23	17	00010111	
24	18	00011000	(CAN)
25	19	00011001	
26	1A	00011010	
27	1B	00011011	(ESC)
28	1C	00011100	
29	1D	00011101	

Decimal	Hexa- decimal	Binary	ASCII Character
30	1E	00011110	
31	1F	00011111	
32	20	00100000	(SP)
33	21	00100001	!
34	22	00100010	"
35	23	00100011	#
36	24	00100100	\$
37	25	00100101	%
38	26	00100110	&
39	27	00100111	'
40	28	00101000	(
41	29	00101001)
42	2A	00101010	.
43	2B	00101011	+
44	2C	00101100	,
45	2D	00101101	-
46	2E	00101110	.
47	2F	00101111	/
48	30	00110000	0
49	31	00110001	1
50	32	00110010	2
51	33	00110011	3
52	34	00110100	4
53	35	00110101	5
54	36	00110110	6
55	37	00110111	7
56	38	00111000	8
57	39	00111001	9
58	3A	00111010	:
59	3B	00111011	;
60	3C	00111100	<
61	3D	00111101	=
62	3E	00111110	>
63	3F	00111111	?
64	40	01000000	@
65	41	01000001	A
66	42	01000010	B
67	43	01000011	C
68	44	01000100	D
69	45	01000101	E

Decimal	Hexa- decimal	Binary	ASCII Character
70	46	01000110	F
71	47	01000111	G
72	48	01001000	H
73	49	01001001	I
74	4A	01001010	J
75	4B	01001011	K
76	4C	01001100	L
77	4D	01001101	M
78	4E	01001110	N
79	4F	01001111	O
80	50	01010000	P
81	51	01010001	Q
82	52	01010010	R
83	53	01010011	S
84	54	01010100	T
85	55	01010101	U
86	56	01010110	V
87	57	01010111	W
88	58	01011000	X
89	59	01011001	Y
90	5A	01011010	Z
91	5B	01011011	[
92	5C	01011100	\
93	5D	01011101]
94	5E	01011110	^
95	5F	01011111	_
96	60	01100000	`
97	61	01100001	a
98	62	01100010	b
99	63	01100011	c
100	64	01100100	d
101	65	01100101	e
102	66	01100110	f
103	67	01100111	g
104	68	01101000	h
105	69	01101001	i
106	6A	01101010	j
107	6B	01101011	k
108	6C	01101100	l
109	6D	01101101	m

Decimal	Hexa- decimal	Binary	ASCII Character
110	6E	01101110	n
111	6F	01101111	o
112	70	01110000	p
113	71	01110001	q
114	72	01110010	r
115	73	01110011	s
116	74	01110100	t
117	75	01110101	u
118	76	01110110	v
119	77	01110111	w
120	78	01111000	x
121	79	01111001	y
122	7A	01111010	z
123	7B	01111011	{
124	7C	01111100	|
125	7D	01111101	}
126	7E	01111110	-
127	7F	01111111	(DEL)
128	80	10000000	
129	81	10000001	
130	82	10000010	
131	83	10000011	
132	84	10000100	
133	85	10000101	
134	86	10000110	
135	87	10000111	
136	88	10001000	
137	89	10001001	
138	8A	10001010	
139	8B	10001011	
140	8C	10001100	
141	8D	10001101	
142	8E	10001110	
143	8F	10001111	
144	90	10010000	
145	91	10010001	
146	92	10010010	
147	93	10010011	
148	94	10010100	
149	95	10010101	

Decimal	Hexa- decimal	Binary	ASCII Character
150	96	10010110	
151	97	10010111	
152	98	10011000	
153	99	10011001	
154	9A	10011010	
155	9B	10011011	
156	9C	10011100	
157	9D	10011101	
158	9E	10011110	
159	9F	10011111	
160	A0	10100000	
161	A1	10100001	
162	A2	10100010	
163	A3	10100011	
164	A4	10100100	
165	A5	10100101	
166	A6	10100110	
167	A7	10100111	
168	A8	10101000	
169	A9	10101001	
170	AA	10101010	
171	AB	10101011	
172	AC	10101100	
173	AD	10101101	
174	AE	10101110	
175	AF	10101111	
176	B0	10110000	
177	B1	10110001	
178	B2	10110010	
179	B3	10110011	
180	B4	10110100	
181	B5	10110101	
182	B6	10110110	
183	B7	10110111	
184	B8	10111000	
185	B9	10111001	
186	BA	10111010	
187	BB	10111011	
188	BC	10111100	
189	BD	10111101	

Decimal	Hexa- decimal	Binary	ASCII Character
190	BE	10111110	
191	BF	10111111	
192	C0	11000000	
193	C1	11000001	
194	C2	11000010	
195	C3	11000011	
196	C4	11000100	
197	C5	11000101	
198	C6	11000110	
199	C7	11000111	
200	C8	11001000	
201	C9	11001001	
202	CA	11001010	
203	CB	11001011	
204	CC	11001100	
205	CD	11001101	
206	CE	11001110	
207	CF	11001111	
208	D0	11010000	
209	D1	11010001	
210	D2	11010010	
211	D3	11010011	
212	D4	11010100	
213	D5	11010101	
214	D6	11010110	
215	D7	11010111	
216	D8	11011000	
217	D9	11011001	
218	DA	11011010	
219	DB	11011011	
220	DC	11011100	
221	DD	11011101	
222	DE	11011110	
223	DF	11011111	
224	E0	11100000	
225	E1	11100001	
226	E2	11100010	
227	E3	11100011	
228	E4	11100100	
229	E5	11100101	

Decimal	Hexa- decimal	Binary	ASCII Character
230	E6	11100110	
231	E7	11100111	
232	E8	11101000	
233	E9	11101001	
234	EA	11101010	
235	EB	11101011	
236	EC	11101100	
237	ED	11101101	
238	EE	11101110	
239	EF	11101111	
240	F0	11110000	
241	F1	11110001	
242	F2	11110010	
243	F3	11110011	
244	F4	11110100	
245	F5	11110101	
246	F6	11110110	
247	F7	11110111	
248	F8	11111000	
249	F9	11111001	
250	FA	11111010	
251	FB	11111011	
252	FC	11111100	
253	FD	11111101	
254	FE	11111110	
255	FF	11111111	

1

2

3

4

5

APPENDIX I

PAPER SPECIFICATIONS

I.1 PAPER TYPES AND SIZES

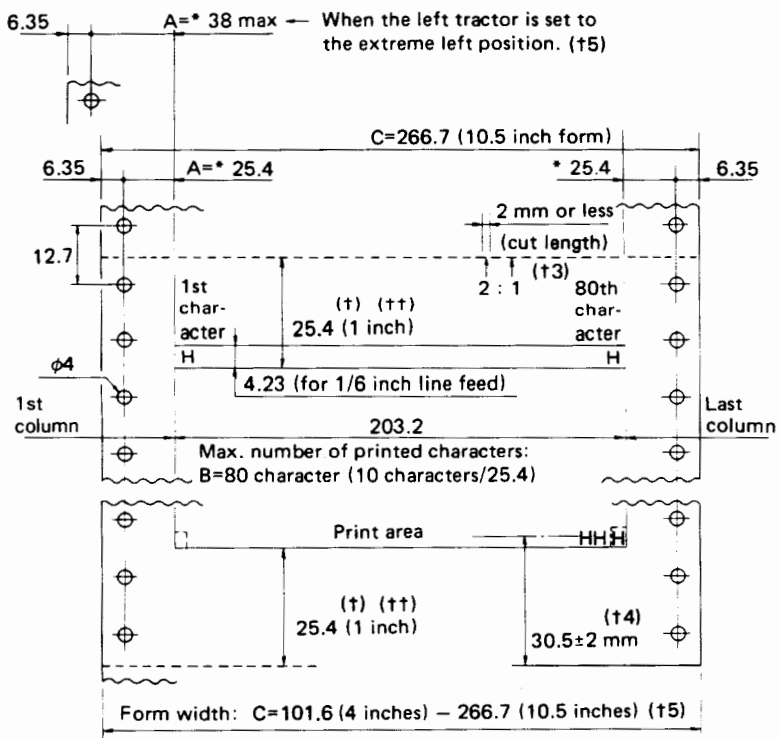
The types and sizes of paper that can be used in this printer are listed in **Table I.1**.

Table I-1 Paper Types and Sizes

	Types	Sizes
80-column printer	Continuous	Width 4 inches (101.6 mm) to 10.5 inches (266.7 mm)
	Cut Sheet	Width 4 inches (101.6 mm) to 10 inches (254 mm) Length 76 to 364 mm
136-column printer	Continuous	Width 4 inches (101.6 mm) to 16.5 inches (419.1 mm)
	Cut Sheet	Width 4 inches (101.6 mm) to 15 inches (381 mm) Length 76 to 364 mm

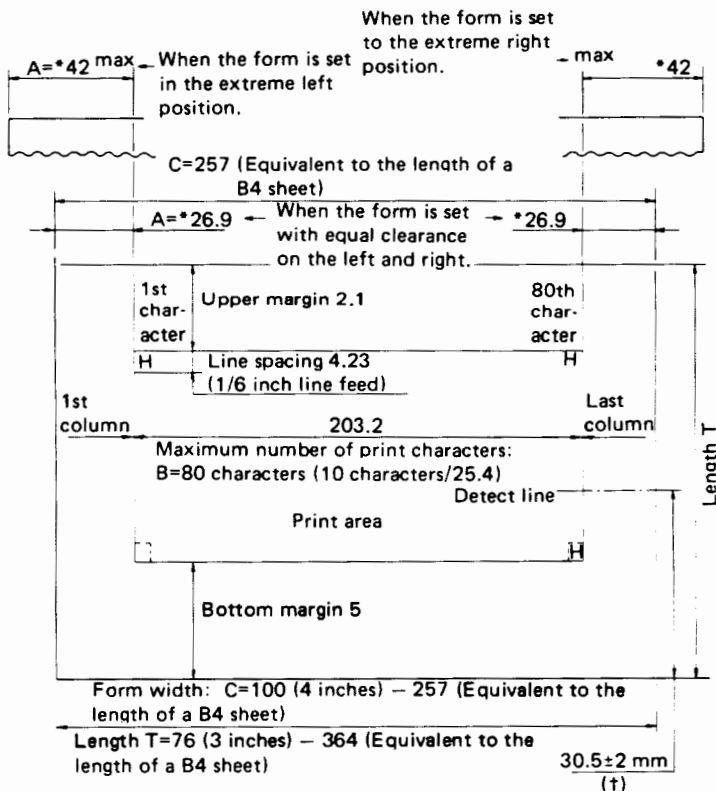
I.2 PRINT AREAS

Print areas on continuous forms and cut sheet paper for the 80-column printer are shown in **Figures I-1** and **I-2** and print areas for the 136-column printer are shown in **Figures I-3** and **I-4**.



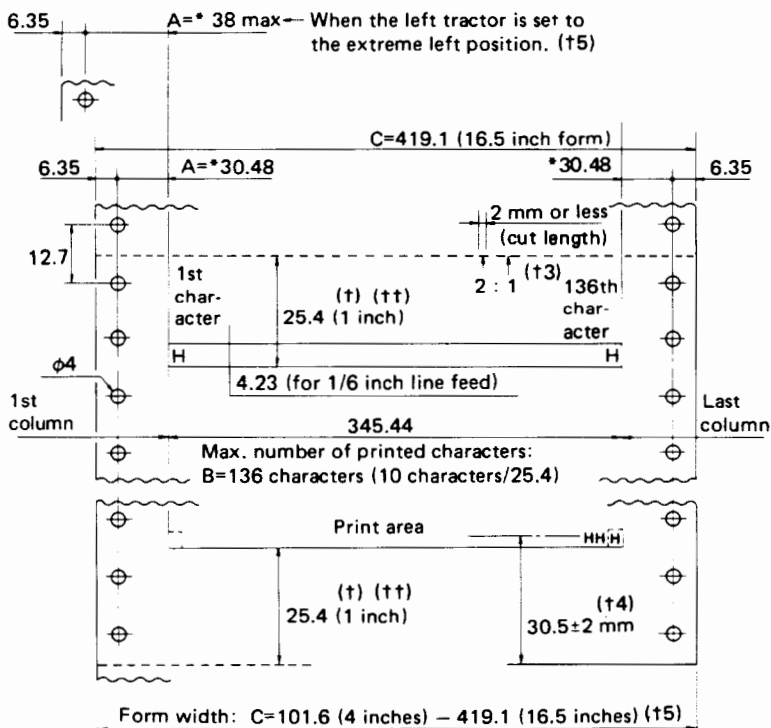
**Figure I-1 Print Area on Continuous Forms
(for the 80-column printer)**

- Notes:** (1) Units used in the figure are mm. For the sizes marked *, tolerance is ± 2.5 mm.
- (2) Note that "Out-of-paper" may be detected if printing is done on paper already having dark printing or lettering other than standard lines or frames within 24/25 characters from the left edge.
- † If the printed form is to be cut into single sheets, leave a margin of 25.4 mm (1 inch) from the perforations.
- †† Since there is a possibility of line displacement near perforations, leave a margin of over 25.4 mm (1 inch) from the perforations.
- †3 The cut/un-cut ratio on the perforated line is 2:1.
- †4 The paper end detection switch is activated when the distance from the lower edge of the paper to the printing line center is 30.5 ± 2 mm.
- †5 There are restrictions on the initial print position for forms wider than 9.5 inches.



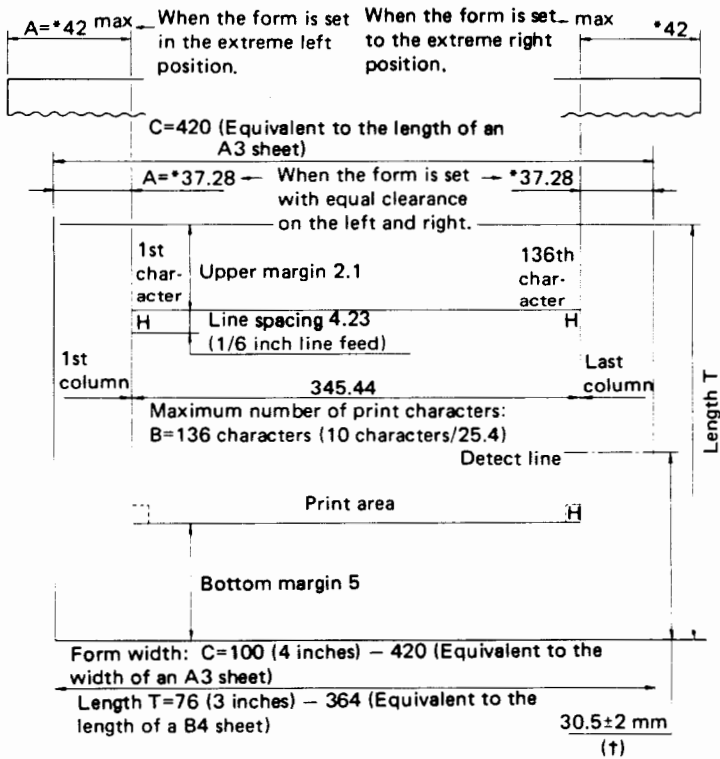
**Figure I-2 Print Area on Cut Sheet Paper
(for the 80-column printer)**

- Notes:** (1) Units used in the figure are mm. For the sizes marked *, tolerance is ± 2.5 mm.
- (2) If the cut sheet form has horizontal ruled lines, it is difficult to align the lines when setting the form. Therefore, unruled forms are recommended.
- (3) Note that "Out-of-paper" may be detected if printing is done on paper already having dark printing or lettering other than standard lines or frames within 24/25 characters from the left edge.
- † The paper end detection switch is activated when the distance from the lower edge of the form to the printing line center is 30.5 ± 2 mm.



**Figure I-3 Print Area on Continuous Forms
(for the 136-column printer)**

- Notes:** (1) Units used in the figure are mm. For the sizes marked *, tolerance is ± 2.5 mm.
- (2) Note that "Out-of-paper" may be detected if printing is done on paper already having dark printing or lettering other than standard lines or frames within 24/25 characters from the left edge.
- † If the printed form is to be cut into single sheets, leave a margin of 25.4 mm (1 inch) from the perforations.
- †† Since there is a possibility of line displacement near perforations, leave a margin of over 25.4 mm (1 inch) from the perforations.
- †3 The cut/un-cut ratio on the perforated line is 2:1.
- †4 The paper end detection switch is activated when the distance from the lower edge of the paper to the printing line center is 30.5 ± 2 mm.
- †5 There are restrictions on the initial print position for forms wider than 15 inches.



**Figure I-4 Print Area on Cut Sheet Paper
(for the 136-column printer)**

- Notes:** (1) Units used in the figure are mm. For the sizes marked *, tolerance is ± 2.5 mm.
- (2) If the cut sheet form has horizontal ruled lines, it is difficult to align the lines when setting the form. Therefore, unruled forms are recommended.
- (3) Note that "Out-of-paper" may be detected if printing is done on paper already having dark printing or lettering other than standard lines or frames within 24/25 characters from the left edge.
- † The paper end detection switch is activated when the distance from the lower edge of the form to the printing line center is 30.5 ± 2 mm.

I.3 NUMBER OF COPIES AND BINDING FORMS

Follow the descriptions below to copy continuous forms and cut sheet paper and to bind them.

I.3.1 Number of Copies for Continuous Forms

Paper types and number of copies are as follows:

Number of copies	Form thickness (g/m ²)	Condition
3	40, 52, 64	Only the bottom copy can be the 52 or 64 g/m ² type.
2	52, 64, 81	Only the bottom copy can be the 81 g/m ² type.
1	52, 64, 81	

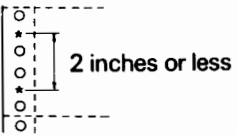
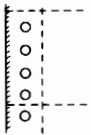
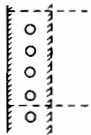
Notes:

- (1) The number of copies includes the original.
- (2) For copies, use carbon coated or NCR forms.
- (3) If carbon paper is inserted between forms, the carbon paper is counted as one sheet. Therefore, the number of sheets of carbon paper that are inserted will have to be subtracted from the number of copies.
- (4) Total thickness must be 0.28 mm or less.

I.3.2 Binding Forms for Continuous Forms

When making multipart continuous forms, forms that have adhesive on both sides are recommended.

Several methods of gluing can be used; however, the forms on which adhesive is used at alternate points on each copy is recommended.

	Spot adhesive	Line adhesive	
		1 line	2 lines
Illustration			
Evaluation	Good	Acceptable	
Remarks	<ul style="list-style-type: none"> — Adhesive intervals should be 2 inches or less. — Adhesive spots should be as close to the perforations as possible. — Adhesive spots should be as small as possible and be at alternate positions on each copy. 		

In the figure above, only one side of the form is shown. Make sure that there are no bulges along the perforated line, as shown in the following figure, after the forms have been bound together.



Notes:

- (1) Metal or paper staples are likely to cause print displacement and feed problems. Use of staples should be avoided.
- (2) Use forms having a tractor hole alignment tolerance of 0.4 mm or less.

I.3.3 Number of Copies for Cut Sheet Paper

The number of copies and types of forms are as follows:

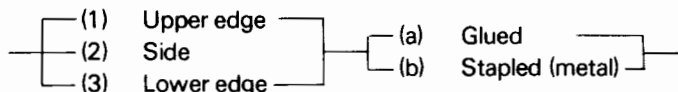
Number of copies	Form thickness (g/m ²)	Condition
3	40, 52, 64	Two copies of 40 g/m ² type with 64 or 52 g/m ² type as the bottom copy
2	40, 52, 64, 81	One copy of 40 or 52 g/m ² type and 64 or 81 g/m ² type as the bottom copy
1	52, 64, 81	

Notes:

- (1) The number of copies indicated above includes the original.
- (2) For copying, use carbon coated or NCR forms.
- (3) Do not insert carbon paper between forms.
- (4) Total thickness must be 0.28 mm or less.

I.3.4 Binding Forms for Cut Sheet Paper

Generally, cut sheet paper are bound together as follows:



The standard for this printer is upper edge (1)/glued (a) forms.

I.4 OTHER PRECAUTIONS

Use high-quality type paper forms.

Make sure that cut sheet paper is not curled.

Handle and store forms carefully. Make sure that they are not deformed or damaged.

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APPENDIX J

GLOSSARY OF TERMS

AC Line Fuse:

Protects the printer's power supply in case of a power overload or short circuit.

AC Power Cord:

Provides electricity to the printer (two prongs for power and one plug for ground).

Application Software:

Program that provides a solution to a particular problem such as maintaining an inventory or creating a report.

ASCII:

An acronym for American Standard Code for Information Interchange, or the code sent to the printer with a unique binary coded number for each character.

Bail Roller Unit:

A unit consisted of a movable bar with three rollers, used to hold the paper against the Platen.

Baud Rate:

The speed of data transmission to the printer. Applies to serial data only. Baud rate is equal to the number of bits transmitted per second.

Bidirectional Printing:

The ability to print from left to right and then right to left to avoid carriage returns and increase printed output.

Bit:

A bit is the smallest unit of data and has a value of 0 or 1.

Bold Print:

Multi-strike printing that darkens the letter without increased line thickness.

Buffer:

Storage area for incoming data.

Byte:

Eight bits that are considered as one symbol. Used to represent a single character such as a number, a letter, or a special control character.

Card Guide:

Used to help position paper. Horizontal lines indicate the position.

Carriage Return:

The return of the print head to the beginning of the next line.

Character:

Any letter, number, or symbol.

Command:

An instruction that tells the computer what to do. A command usually consists of words, parts of words, or codes. The computer will only respond to those commands that are accepted by the program which the computer is currently running.

Command Set:

The series of print or format instructions imbedded in the printer firmware, and actuated by codes sent from the host computer.

Continuous Form:

Another word for continuous fanfolded sheets of paper at perforation, with punched holes for tractor feeding.

Data:

Another word for information.

Default:

A printer parameter that the printer returns to power on state.

DIP Switch:

"Dual in-line package" switch, these switches found in groups, provide the operator with control of the printing default settings.

Escape Code:

A sequence of characters, beginning with ESCAPE(ESC) that make up a command to the printer.

Font:

A complete set of type in one size and style of characters.

Form Feed:

A signal to the printer to advance the printer Platen until the next top-of-form position is reached.

Form Length:

A printer setting for the spacing between top-of-form positions measured in inches.

Format:

The shape and appearance of printer output, including page size, character width and spacing, line spacing, etc.

Friction Feed:

Feeding of paper through the printer is accomplished by the friction between the Platen and pressure rollers.

Interface:

The connection that transfers electrical signals from one part of a system to another.

Line Spacing:

The vertical spacing between lines, measured in lines per inch.

Matrix:

An array of elements; in the case of printers the arrangement of the pins that form the letters through closely spaced dots.

Platen:

The rubber roller in the printer, which provides a backing for the printing action.

Power Switch:

The system's ON/OFF switch located on the rear of the printer unit. This switch is labeled with the international designations 1 for ON and 0 for OFF.

Proportional Spacing:

Character width differs from one character to another. These characters require variable printhead spacing (proportional).

Reset:

A function performed by turning printer OFF and then ON again.

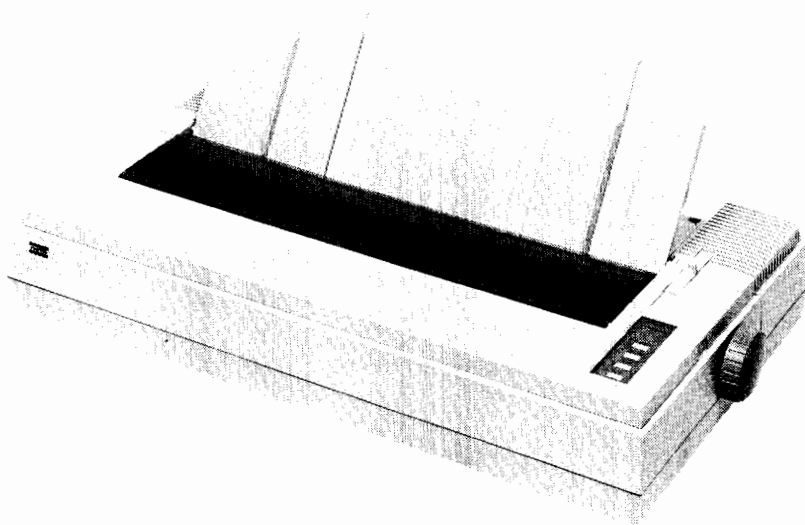
Top-of-Form:

The very top of a page of text.

Tractor Feed:

A paper handling device for continuous forms. The tractor sprockets engage holes in the edge strip of the form, guiding and registering the paper.

DX 2000 SERIES
(DX2100/DX2200)
DOT MATRIX PRINTER
PROGRAMMER'S MANUAL



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Preface

This manual describes the command set for type F of the DX 2000 series.

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SECTION 1

COMMAND SET FOR TYPE F

1.1 Overview

The commands are specified as Control Codes or Escape Code sequences, and enable the printer to:

- 1) Exchange, store, and print data
- 2) Establish and reset different print modes (e.g., enlarged, shadow, bold, underscore)
- 3) Format the printer's output
- 4) Control other operations performed by the printer

When a command specifies a change to a DIP (or Form Length) switch setting, the previous switch setting is over-ridden.

The host computer sends commands and data to the printer via the interface under software control. For example, the LPRINT statement in BASIC enables a command to be entered. With the BASIC routine shown below, the printer will print one line in normal print mode, then print subsequent lines in double-width print mode until instructed to change to normal print mode.

Turn on your system, load BASIC and enter:

```
10 LPRINT "Print is switch selected mode"
20 LPRINT CHR$(27);"W";CHR$(1);
30 LPRINT "Printed in Double Width mode"
40 LPRINT "Also in Double Width print mode"
50 LPRINT CHR$(27);"W";CHR$(0)
60 LPRINT "Printed in switch selected mode"
```

Line 10 instructs the printer to print in normal print mode.

Line 20 instructs it to print in double-width mode.

Lines 30 and 40 are printed in double-width mode.

Line 50 cancels double-width mode.

Line 60 is printed in normal print mode.

This example uses the LPRINT statement, but some versions of BASIC use a PRINT # 1 statement instead.

The LPRINT statement can use the following formats to send information to the printer:

LPRINT "A"	Character as it is
LPRINT CHR\$(65)	Decimal
LPRINT CHR\$(&H41)	Hexadecimal, two digits

The DX 2000 series command set contains commands which are undefined in the JX or the FX command set.

Refer to **Table 1.1** for differences among the DX2000, the JX-80 and the FX-80.

Table 1.1 Difference among command sets

Command	Function	DX 2000	JX-80	FX-80
ESC R + n	Inter-national character	11 countries	11 countries	9 countries
ESC r + n	Color selection	○	○	×
ESC ? (n) (m)	Convert image mode	○	○	×
ESC \$ (n1) (n2)	Specify absolute print position	○	×	×
ESC \ (n1) (n2)	Specify relative print position	○	×	×
ESC SP (n)	Set character spacing	○	×	×
ESC x (n)	Select NLQ or draft mode	○	×	×
ESC V (n)	Set repeat data	○	×	×
ESC & (1)	Define NLQ download character	○	×	×

Refer to your computer manual for additional information.

1.2 Print Mode Commands

Print mode is changed with the following commands. Default print mode, established by DIP switches, is restored when power is turned on, or when a selected print mode is reset.

Set double-width print

Code	Decimal	Hex
SO	14	0E
ESC SO	27 14	1B 0E
ESC W (1)	27 87 1	1B 57 01

Reset double-width print

ESC W (0)	27 87 0	1B 57 00
DC4	20	14

Double-width:

- Effective until reset with DC4; ESC ! (n); ESC W (0); LF; FF; or VT when set with SO or ESC SO.
- Effective until reset with ESC W (0) or ESC ! (n) when set with ESC W (1).

Example:

Load BASIC and enter:

```
10 LPRINT "ESC W+n"
20 LPRINT "(Set and Reset Double-width Mode)"
30 LPRINT
40 LPRINT CHR$(27);"W";CHR$(1);
50 LPRINT "Double-width printing"
60 LPRINT "set using this mode"
70 LPRINT "continues"
80 LPRINT CHR$(27);"W";CHR$(0);
90 LPRINT "until reset."
100 END
```

Your printer should print:

ESC W+n
(Set and Reset Double-width Mode)

**Double-width printing
set using this mode
continues**
until reset.

Load BASIC and enter:

```
10 LPRINT "SD (Set Double-width Mode)"
20 LPRINT
30 LPRINT CHR$(14); "Double-width"
40 LPRINT "reverts to normal print"
50 LPRINT "at line feed."
60 END
```

Your printer should print:

SD (Set Double-width Mode)

Double-width
reverts to normal print
at line feed.

Load BASIC and enter:

```
10 LPRINT CHR$(14); "Double-width ";
20 LPRINT CHR$(20); "Normal"
30 END
```

Your printer should print:

Double-width Normal

Set condensed print

Code	Decimal	Hex
SI	15	0F
ESC SI	27 15	1B 0F

Reset condensed print

DC2	18	12
-----	----	----

Condensed print (17.1 characters per inch):

- Effective until reset with DC2 or ESC ! (n).
- Can coincide with double-width print.
- Effective in pica pitch or elite pitch.

Example:

Load BASIC and enter:

```
10 LPRINT "SI (Set Condensed Printing)"
20 LPRINT
30 LPRINT CHR$(15);
40 LPRINT "Condensed printing is"
50 LPRINT "effective only with pica pitch."
60 LPRINT "It can be used with"
70 LPRINT "Double-width mode,"
80 LPRINT "but not with Emphasized mode."
90 LPRINT
100 LPRINT CHR$(18);
110 LPRINT "DC2 (Reset Condensed Printing)"
120 LPRINT
130 LPRINT "Normal printing"
140 END
```

Your printer should print:

SI (Set Condensed Printing)

Condensed printing is
effective only with pica pitch.
It can be used with
Double-width mode,
but not with Emphasized mode.

DC2 (Reset Condensed Printing)

Normal printing

Set double-strike

Code	Decimal	Hex
ESC G	27 71	1B 47

Reset double-strike

ESC H	27 72	1B 48
-------	-------	-------

Double-strike (Double density in vertical dots):

— Effective until reset with ESC H or ESC ! (n).

Example:

Load BASIC and enter:

```
10 LPRINT "ESC G (Set Double-strike Print)"
20 LPRINT
30 LPRINT CHR$(27);"G";"Double-strike Print"
40 LPRINT "continues until reset."
50 LPRINT
60 LPRINT CHR$(27);"H";
70 LPRINT "ESC H (Reset Double-strike Print)"
80 LPRINT
90 LPRINT "Normal Printing"
100 END
```

Your printer should print:

ESC G (Set Double-strike Print)

Double-strike Print
continues until reset.

ESC H (Reset Double-strike Print)

Normal Printing

Set emphasized print

Code	Decimal	Hex
ESC E	27 69	1B 45

Reset emphasized print

ESC F	27 70	1B 46
-------	-------	-------

Emphasized print (Double density in horizontal dots):

- Effective until reset with ESC F or ESC ! (n).
- Effective in pica pitch only.
- If both condensed print and emphasized print modes are set, emphasized print mode has priority over condensed print mode.

Example:

Load BASIC and enter:

```
10 LPRINT "ESC E (Set Emphasized Printing)"
20 LPRINT
30 LPRINT CHR$(27);"E";
40 LPRINT "Emphasized printing is"
50 LPRINT "effective only with pica pitch."
60 LPRINT "It assumes priority over"
70 LPRINT "Condensed printing"
80 LPRINT "does not reset"
90 LPRINT "condensed printing, but"
100 LPRINT
110 LPRINT CHR$(27);"F";
120 LPRINT "ESC F (Reset Emphasized printing)"
130 LPRINT "Normal printing"
140 END
```

Your printer should print:

ESC E (Set Emphasized Printing)

Emphasized printing is
effective only with pica pitch.
It assumes priority over
Condensed printing
does not reset
condensed printing, but

ESC F (Reset Emphasized printing)
Normal printing

Set underline mode

Code	Decimal	Hex
ESC - (1)	27 45 1	1B 2D 01

Reset underline mode

ESC - (0)	27 45 0	1B 2D 00
-----------	---------	----------

Underline:

- Effective until reset with ESC - (0) or ESC ! (n).

Example:

Load BASIC and enter:

```
10 LPRINT "ESC -+n"
20 LPRINT "(Set and Reset Underline Mode)"
30 LPRINT
40 LPRINT CHR$(27); "-"; CHR$(1);
50 LPRINT "Underline Printing"
60 LPRINT "is effective"
70 LPRINT CHR$(27); "-"; CHR$(0);
80 LPRINT "until reset."
90 END
```

Your printer should print:

```
ESC -+n
(Set and Reset Underline Mode)
```

```
Underline Printing
is effective
until reset.
```

Set superscript

Code	Decimal	Hex
ESC S (0)	27 83 0	1B 53 00

Set subscript

ESC S (1)	27 83 1	1B 53 01
-----------	---------	----------

Reset superscript/subscript

ESC T	27 84	1B 54
-------	-------	-------

Superscript or subscript (Condensed to 1/2 height):

— Effective until reset with ESC T.

Example:

Load BASIC and enter:

```

10 LPRINT "ESC S+0 (Set Superscript Mode)"
20 LPRINT
30 LPRINT "From normal to ";
40 LPRINT CHR$(27);"S";CHR$(0);
50 LPRINT "Superscript"
60 LPRINT
70 LPRINT CHR$(27);"T";
80 LPRINT "ESC T resets Superscript mode."
90 END

```

Your printer should print:

ESC S+1 (Set Subscript Mode)

From normal to *subscript*

ESC T resets both Superscript
and Subscript.

Load BASIC and enter:

```
10 LPRINT "ESC S+1 (Set Subscript Mode)"
20 LPRINT
30 LPRINT "From normal to ";
40 LPRINT CHR$(27);"S";CHR$(1);
50 LPRINT "Subscript"
60 LPRINT
70 LPRINT CHR$(27);"T";
80 LPRINT "ESC T resets both Superscript"
90 LPRINT "and Subscript."
100 END
```

Your printer should print:

ESC S+0 (Set Superscript Mode)

From normal to *Superscript*

ESC T resets both Superscript
and Subscript.

Set italics

Code
ESC 4

Decimal
27 52

Hex
1B 34

Reset italics

ESC 5

27 53

1B 35

Italics print (Codes (20)H to (7E)H):

- Effective until reset with ESC 5 or ESC ! (n).

Note:

Codes (A0)H to (FE)H are always printed in italics.

Example:

Load BASIC and enter:

```
10 LPRINT "ESC 4 (Set Italics)"
20 LPRINT CHR$(27);"4";
30 LPRINT
40 LPRINT "Italics for emphasis"
50 LPRINT "and foreign languages"
60 LPRINT
70 LPRINT CHR$(27);"5";
80 LPRINT "ESC 5 (Reset Italics)"
90 LPRINT
100 LPRINT "Normal printing for English"
110 END
```

Your printer should print:

ESC 4 (Set Italics)

*Italics for emphasis
and foreign languages*

ESC 5 (Reset Italics)

Normal printing for English

Set proportional print

Code	Decimal	Hex
ESC p (1)	27 112 1	1B 70 01

Reset proportional print

ESC p (0)	27 112 0	1B 70 00
-----------	----------	----------

Proportional print:

- Effective until reset with ESC p (0) or ESC ! (n).
- Effective in pica pitch only.
- Prior to superscript or subscript print.
- Always sets emphasized print. You can reset with ESC F.

Note:

In this mode, BS and DEL codes are not acceptable.

Table 1.2 Character width (USA characters)

No. of columns	Characters			
	Capital	Small	Digit	Symbol
1				! !
2				
3				' () , . : ; `
4				
5	I	il	1	" []
6		j		
7	XZ	fkxz		/ < > \ { }
8	J	bcdgh npqrt		
9	Others	aemos	Others	##%&*+ -=?@^~
10				
11				

Most characters are separated by three spaces in proportional spacing as shown below.

Normal:

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

Proportional:

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

Example:

Load BASIC and enter:

```
10 LPRINT "ESC p+1 ";
20 LPRINT "(Set Proportional Spacing)"
30 LPRINT
40 LPRINT CHR$(27);"p";CHR$(1);
50 LPRINT "wwiimmWWIIMM (Proportional)"
60 LPRINT CHR$(27);"F";
70 LPRINT "wwiimmWWIIMM (Proportional--";
80 LPRINT "Reset Emphasized)"
90 LPRINT
100 LPRINT CHR$(27);"p";CHR$(0);
110 LPRINT "ESC p+0 ";
120 LPRINT "(Reset Proportional Spacing)"
130 LPRINT
140 LPRINT "wwiimmWWIIMM (Normal)"
150 END
```

Your printer should print:

```
ESC p+1 (Set Proportional Spacing)
```

```
wwiimmWWIIMM (Proportional)
```

```
wwiimmWWIIMM (Proportional--Reset Emphasized)
```

```
ESC p+0 (Reset Proportional Spacing)
```

```
wwiimmWWIIMM (Normal)
```

Set/Reset print modes

Code
ESC ! (n)

Decimal
27 33 n

Hex
1B 21 n

Print modes:

- Set according to the value of (n). **Table 1.3** gives the bit assignment and the corresponding print mode.

Table 1.3 Print mode set bit assignment

	7	6	5	4	3	2	1	0
1 (set)	Set under- line	Set italics	Set double- width	Set double- strike	Set empha- sized	Set con- densed	Set propor- tional	Set Elite pitch
0 (cleared)	Reset under- line	Reset italics	Reset double- width	Reset double- strike	Reset empha- sized	Reset con- densed	Reset propor- tional	Set Pica pitch

Note the following mode priorities:

- Elite pitch mode has priority over emphasized print mode.
- Emphasized print mode has priority over condensed print mode.
- Superscript/subscript mode has priority over double-strike mode.

All print modes can be used in 256 combinations by specifying the eight bits (print modes) of the print mode select command (ESC ! +n). However, the number of effective combinations is less than 256 combinations.

The tables below show examples of printouts for combinations of print modes.

Table 1.4 Printout examples by modes

Impression		Character pitch			
Width	Thickness	Pica	Elite	Condensed	Elite-condensed
Normal	Regular	ABCDefgh	ABCDefgh	ABCDefgh	ABCDefgh
	Emphasized	ABCDefgh			
	Double-strike	ABCDefgh	ABCDefgh	ABCDefgh	ABCDefgh
	Emph, dbl-strk	ABCDefgh			
Double	Regular	ABCDefgh	ABCDefgh	ABCDefgh	ABCDefgh
	Emphasized	ABCDefgh			
	Double-strike	ABCDefgh	ABCDefgh	ABCDefgh	ABCDefgh
	Emph, dbl-strk	ABCDefgh			

Table 1.5 Printout examples (underlined) by modes

Impression		Character pitch			
Width	Thickness	Pica	Elite	Condensed	Elite-condensed
Normal	Regular	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>
	Emphasized	<u>ABCDefgh</u>			
	Double-strike	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>
	Emph, dbl-strk	<u>ABCDefgh</u>			
Double	Regular	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>
	Emphasized	<u>ABCDefgh</u>			
	Double-strike	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>	<u>ABCDefgh</u>
	Emph, dbl-strk	<u>ABCDefgh</u>			

Table 1.6 Printout examples (italics) by modes

Impression		Character pitch			
Width	Thickness	Pica	Elite	Condensed	Elite-condensed
Normal	Regular	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>
	Emphasized	<i>ABCDefgh</i>			
	Double-strike	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>
	Emph, dbl-strk	<i>ABCDefgh</i>			
Double	Regular	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>
	Emphasized	<i>ABCDefgh</i>			
	Double-strike	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>	<i>ABCDefgh</i>
	Emph, dbl-strk	<i>ABCDefgh</i>			

1.3 Horizontal Movement Commands

The print head is controlled and positioned by the following commands.

Backspace

Code	Decimal	Hex
BS	8	08

This command moves the print head backward one print position after previous data is print, just like the backspace key on a typewriter.

In double-width print mode, a double-width backspace is performed. If the data to be printed is bit image data, the print head is moved to the starting position. If the print mode has been changed, operation of the BS code is unpredictable.

Note:

This command cannot be used in the Proportional print mode and the spacing mode (ESC SP).

Carriage return

CR	13	0D
----	----	----

This command sends the print position to left margin and also resets double-width print mode if CR is on LF.

A line feed is performed if the AUTO FEED XT signal is low or if DIP switch SW2-4 is on.

Set pica pitch (10 CPI)

Code	Decimal	Hex
ESC P	27 80	1B 50

Set elite pitch (12 CPI)

Code	Decimal	Hex
ESC M	27 77	1B 4D

Set 15-CPI pitch

Code	Decimal	Hex
ESC m	27 109	1B 6D

Pitch:

- Changed with another pitch command.
- Set to pica when the printer is first turned on.

Notes:

- (1) The printer can print up to 80 columns in pica pitch, 96 columns in elite pitch and 120 columns in 15-CPI pitch (DX2100 version).
- (2) Emphasized print is invalid for elite pitch and 15-CPI pitch.
- (3) Condensed print and NLQ print are invalid for 15-CPI pitch.

Example:

Load BASIC and enter:

```
10 LPRINT CHR$(27);"P";  
20 LPRINT "Pica-pitch printing"  
30 LPRINT  
40 LPRINT CHR$(27);"M";  
50 LPRINT "Elite-pitch printing"  
60 LPRINT  
70 LPRINT CHR$(27);"m";  
80 LPRINT "15 CPI-pitch printing"  
90 END
```

Your printer should print:

Pica-pitch printing

Elite-pitch printing

15 CPI-pitch printing

Set absolute print position

Code	Decimal	Hex
ESC \$ (n1) (n2)	27 36 (n1) (n2)	1B 24 (n1) (n2)

This command sets the horizontal print position according to n1 and n2 as a position that is $(256 \times n2 + n1) \times 1/60$ inches from the left margin. (This command must be set from left margin to right margin.)

Set relative print position

ESC \ (n1) (n2)	27 92 (n1) (n2)	1B 5C (n1) (n2)
-----------------	-----------------	-----------------

This command sets the horizontal print position according to n1 and n2 as a position that is $(256 \times n2 + n1) \times 1/120$ inches from the current print position. (This command must be set from left margin to right margin.)

Example:

Spacing	n2	n1
10/120 inches	0, (00)H	10, (0A) H
-10/120 inches	255, (FF)H	246, (F6)H

Set character spacing

Code	Decimal	Hex
ESC SP (n)	27 32 (n)	1B 20 (n)

This command sets the spacing between text characters to n/120 inches. n is a decimal value between 0 and 63.

The default value is 0. This command is effective in the NLQ, pica, and condensed modes. If the double-width print mode is set, the spacing is twice the value specified.

BS and DEL codes are invalid in this mode.

1.4 Horizontal Tab Commands

Absolute and relative horizontal tab stops are controlled with the following commands.

Execute horizontal tab

Code	Decimal	Hex
HT	9	09

This command moves print position to the next horizontal tab stop, set with ESC D (n1)...(nk) (0).

This command is ignored if it is received after the last tab stop.

Set horizontal tab at (n1) through (nk)

ESC D (n1)...(nk) (0) 27 68 (n1)...(nk) 0 1B 44 (n1)...(nk) 00

Tab stops:

- Executed with HT and reset to the default values with ESC L (n).
- Can be set up to 32 positions with position 1 as left margin.
- Must be set in ascending order.
- Unchanged even if the print mode is changed.
- Ignored beyond the maximum print width.
- Set at intervals of 8 characters when the printer is first turned on and no tab stop has been set.

1.5 Vertical Movement Commands

Paper motion is controlled and positioned by the following commands.

Form feed

Code	Decimal	Hex
FF	12	0C

This command moves the form to the first line of the next page and resets double-width print mode set with SO or ESC SO.

Notes:

- (1) The page length is initially set at 11 inches or 12 inches depending on SW1-5 (on the memory board), when the printer is first turned on. You can set the page length with ESC C (n) or ESC C (0) (n).
- (2) The first line of the page is initialized when the printer is first turned on; when receiving INIT signal; when receiving ESC @ or when setting the page length with ESC C (n) or ESC C(0)(n).

Line feed

LF	10	0A
----	----	----

This command moves the forms one line upward and resets double-width print mode set with SO or ESC SO.

Line feed occurs with each CR if DIP switch SW2-4 (on the memory board) is ON.

Note:

The feed pitch is initially set at 1/6 inches when the printer is first turned on. You can set the feed pitch with ESC 0; ESC 1; ESC 2; ESC 3 (n) or ESC A (n).

Single line feed of (n)/216" ((n) is a decimal value between 0 and 255)

Code	Decimal	Hex
ESC J (n)	27 74 (n)	1B 4A (n)

This command is effective on the current line only.

Minimum motion is 0(0/216 = 0") and maximum motion is 255(255/216 = 1.18").

Note:

Print start position on the next line corresponds to the print end position on the current line.

Single negative line feed of (n)/216" ((n) is a decimal value between 0 and 255)

ESC j (n)	27 106 (n)	1B 6A (n)
-----------	------------	-----------

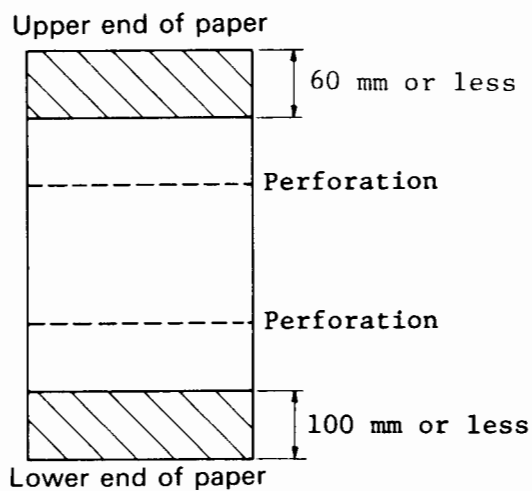
This command performs the same operation as ESC J (n), except that the line feed occurs in the opposite direction.

Caution:

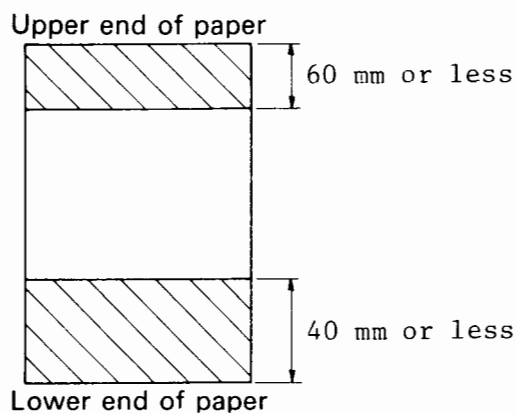
To avoid a paper jam, do not use this command in reverse-feed-prohibited areas. See **Figure 1.1**.

ESC j (n) and ESC i (n) are invalid if the cut-sheet feeder is enabled by DIP switch setting. (For ESC i (n), see Section 1.11.)

With fanfold paper



With cut-sheet paper

**Figure 1.1 Reverse feed prohibited area**

Set line spacing to 1/8" (8 lines per inch)

Code
ESC 0

Decimal
27 48

Hex
1B 30

After receipt of this command, each LF command or equivalent results in an 1/8" line feed.

Set line spacing to (n)/216 ((n) is a decimal value between 0 and 255)

ESC 3 (n)

27 51 (n)

1B 33 (n)

The rate of (n) is 1/3 dot. Minimum motion is 0 (0/216 = 0") and maximum motion is 255 (255/216 = 1.18").

After receipt of this command, each LF command or equivalent results in an (n)/216" line feed.

For example:

LPI	(n)
6	36
8	27

Note:

Line spacing accuracy is not guaranteed when $n < 3$.

Set line spacing to 7/72"

ESC 1

27 49

1B 31

After receipt of this command, each LF command or equivalent results in an 7/72 inch line feed.

Set line spacing to $(n)/72''$ ((n) is a decimal value between 0 and 85)

Code	Decimal	Hex
ESC A (n)	27 65 (n)	1B 41 (n)

The rate of (n) is 1 dot. After receipt of this command, each LF command or equivalent results in an $(n)/72$ inch line feed. ($n \leq 85$)

Note:

You can feed lines for 8 bit image by using this command. ($n=8$)

Set line spacing to $1/6''$ (6 lines per inch)

ESC 2	27 50	1B 32
-------	-------	-------

After receipt of this command, each LF command or equivalent results in a $1/6$ inch line feed.

1.6 Vertical Tab Commands

Vertical tab stops (paper motion) are controlled with the following commands:

Execute vertical tab

Code	Decimal	Hex
VT	11	0B

Vertical tab moves the paper to the next vertical tab stop set with ESC B (n1)...(nk) (0) or ESC b (n1)...(nk) (0). Performs the same as an LF command when no vertical tab positions are set. Also resets double-width print mode.

When the current position is over the maximum VT position, the printer feeds the paper to the next top of form.

Set vertical tabs

ESC B (n1) ...(nk) (0)	27 66 (n1) ...(nk) 0	1B 42 (n1) ...(nk) 00
---------------------------	-------------------------	--------------------------

Tab locations are set in ascending order until a (0) code (00) is received. Vertical tab locations beyond page length are ignored and subsequent data is regarded as print data. (n) is an ASCII character with a decimal value between 1 and 255. An (n) value of 1 is for the first line below the top of the form. Up to 16 vertical tab locations can be set.

ESC B is a version of ESC b with channel 0 specified.

Set tabs in VFU (Vertical Format Unit)

ESC b (n) (m1)...(mk) (0)	27 98 (n) (m1)...(mk) 0	1B 62 (n) (m1)...(mk) 00
------------------------------	----------------------------	-----------------------------

(n) denotes the channel number. Up to 8 channels, from channel 0 to channel 7, can be selected; there may be up to 16 tab locations for each.

Channels are specified by ESC / (n), and tabbing is executed with VT.

Channel 0 is assumed when the printer is first turned on.

Specify a VFU channel

Decimal	Hex
27 47 (n)	1B 2F (n)

A VFU channel stores the vertical tab locations set with
ESC b (n) (m1)...(mk) (0). ($0 \leq n \leq 7$)

1.7 Page Formatting Commands

These commands set the left, right, top and bottom margins.

Set right margin

Code	Decimal	Hex
ESC Q (n)	27 81 (n)	1B 51 (n)

The maximum print position number is based on character pitch. Any print position beyond the length of the print line is ignored. (For details, see User's Manual, Section 5.7.)

This command must be sent before print data.

Set left margin

ESC ℓ(n)	27 108 (n)	1B 6C (n)
----------	------------	-----------

ℓ is lower case L. This command sets the left margin at the print position designated by (n). The leftmost print position is set (as the left margin) when (n) is set to 0.

This command clears the horizontal tabs. (For details, see User's Manual, Section 5.7.)

This command must be sent before print data.

Set skip perforations

ESC N (n)	27 78 (n)	1B 4E (n)
-----------	-----------	-----------

Reset skip perforations

Code	Decimal	Hex
ESC O	27 79	1B 4F

Skip perforations:

- Effective until reset with ESC O; ESC C (n) or ESC C (O) (n). (n) is decimal value between 1 and 127.
- Causes the printer to skip (n) lines on the current page and advance the paper to the first print line.

Note:

If DIP switch SW2-3 (on the memory board) is ON, the printer skips 1 inch (default).

Set page length to (n) lines

ESC C (n)	27 67 (n)	1B 43 (n)
-----------	-----------	-----------

(n) is an ASCII character with a decimal value between 1 and 127. Page length is stored as an absolute length in lines. This absolute length is determined by multiplying the current single-line spacing by (n).

This command clears vertical tabs.

Set page length to (n) inches

ESC C (O) (n)	27 67 O (n)	1B 43 00 (n)
---------------	-------------	--------------

(n) is an ASCII character with a decimal value between 1 and 22 (1 and 16 Hex). This command sets the page length in inches.

1.8 Select International Character Set

The language selected by DIP Switches (SW1-6, SW1-7, and SW1-8) is changed with this command. Selected international characters are shown at the end of Appendix A.

Select international character set designated by (n)

Code	Decimal	Hex
ESC R (n)	27 82 (n)	1B 52 (n)

(n) is an ASCII character with a hexadecimal value of 0 to A as shown in Table 1.7.

Table 1.7 Language selection

Value of (n)	Language selected
0	U.S.A.
1	France
2	Germany
3	England
4	Denmark
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
A	Denmark II

Example:

Load BASIC and enter:

```

10 A=0
20 LPRINT CHR$(27); "R"; CHR$(6);
30 LPRINT "{}'!~{";
40 LPRINT CHR$(27); "R"; CHR$(3);
50 LPRINT "#";
60 LPRINT CHR$(27); "R"; CHR$(7);
70 LPRINT "[ ]/!";
80 LPRINT CHR$(27); "R"; CHR$(5);
90 LPRINT "$";
100 LPRINT CHR$(27); "R"; CHR$(7);
110 LPRINT "#";
120 LPRINT CHR$(27); "R"; CHR$(5);
130 LPRINT " ]>";
140 LPRINT CHR$(27); "R"; CHR$(1);
150 LPRINT "/ ]";
160 LPRINT CHR$(27); "R"; CHR$(2);
170 LPRINT "~";
180 LPRINT CHR$(27); "R"; CHR$(4);
190 LPRINT "[ (/!";
200 LPRINT CHR$(27); "R"; CHR$(7);
210 LPRINT "{";
220 LPRINT CHR$(27); "R"; CHR$(5);
230 LPRINT "[ \^ { ! ~ @ \";
240 LPRINT CHR$(27); "R"; CHR$(8);
250 LPRINT "\";
260 LPRINT
270 IF A=0 THEN A=A+1:GOTO 310
280 LPRINT CHR$(27); "=";
290 LPRINT CHR$(27); "R"; CHR$(0);
300 END
310 LPRINT CHR$(27); "4";
320 GOTO 20

```

Your printer should print:

```

àè'òiaà£;¿/ŕŕRÀà/ŖŖŖæ/ø"ÀÖÜäöüÉé¥
àè'òiaà£/¿/ŕŕRÀà/ŖŖŖæ/ø"ÀÖÜäöüÉé¥

```

1.9 Bit Image Graphics

Bit images are structured by dots arranged in rows and columns.

Eight dots arranged in a column is a pattern byte. The smallest unit of the bit image (one column) is called a pattern element. There are 8-dot and 9-dot pattern elements.

The precision of an image can be determined by the size of a dot and how many pins are used to print a dot.

Line spacing must be set to $8/72''$ in the 8-pin image mode and $9/72''$ in the 9-pin image mode.

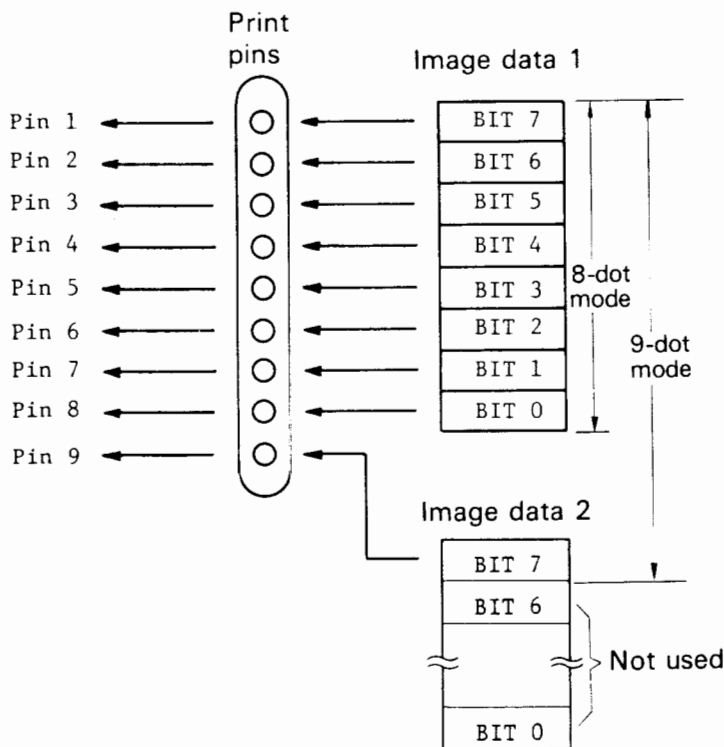


Figure 1.2 8-dot & 9-dot image modes
— Pin arrangement

Table 1.8 Image elements

	Element in 8-dot image mode	Element in 9-dot image mode
Consists of	8 dots	9 dots
Represented by	1 byte of data	2 bytes of data

Refer to **Figure 1.3** to obtain 8-bit image data for example.

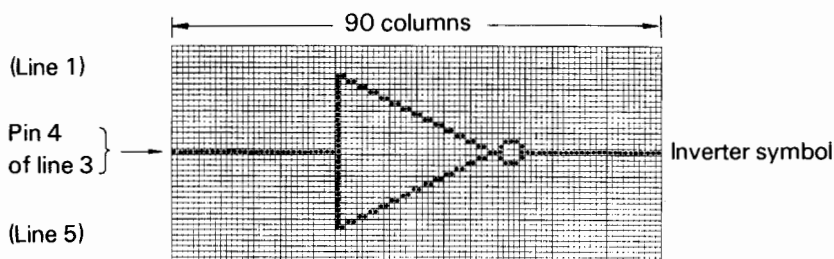


Figure 1.3 Picture on graph paper

Hexadecimal:

Line 1: 30 × 00, 07, 04, 02, 02, 01, 01, 54 × 00
 Line 2: 30 × 00, FF, 00 00 00, 00, 00, 80, 80, 40, 40, 20, 20,
 10, 10, 08, 08, 04, 04, 02, 02, 01, 01, 38 × 00
 Line 3: 30 × 10, FF, 19 × 00, 01, 01, 82, 82, 44, 44, 28, 28, 10,
 10, 38, 44, 44, 44, 38, 25 × 10
 Line 4: 30 × 00, FF, 00, 00, 00, 01, 01, 02, 02, 04, 04, 08, 08,
 10, 10, 20, 20, 40, 40, 80, 80, 40 × 00
 Line 5: 30 × 00, C0, 40, 80, 80, 56 × 00

Decimal:

Line 1: 30 × 0, 7, 4, 2, 2, 1, 1, 54 × 0
 Line 2: 30 × 0, 255, 0, 0, 0, 0, 0, 128, 128, 64, 64, 32, 32, 16,
 16, 8, 8, 4, 4, 2, 2, 1, 1, 38 × 0
 Line 3: 30 × 16, 255, 19 × 0, 1, 1, 130, 130, 68, 68, 40, 40,
 16, 16, 56, 68, 68, 68, 56, 25 × 16
 Line 4: 30 × 0, 255, 0, 0, 0, 1, 1, 2, 2, 4, 4, 8, 8, 16, 16, 32, 32,
 64, 64, 128, 128, 40 × 0
 Line 5: 30 × 0, 192, 64, 128, 128, 56 × 0

Set 8-dot image mode

Code	Decimal	Hex
ESC * (m) (n1)	27 42 (m) (n1)	1B 2A (m) (n1)
(n2) (p1) (p2)	(n2) (p1) (p2)	(n2) (p1) (p2)
...(pk)	...(pk)	...(pk)

(m) is an ASCII character with a decimal value between 0 and 8, (n1) is between 0 and 255, (n2) is between 0 and 7 with an 80-column printer (DX2100) or 0 and 12 with a 136-column printer (DX2200). This command causes the printer to print image data, from column 1 to the column designated by $(n1) + (n2) \times 256$. Print mode is specified by m, as shown in **Table 1.9**. This command prints one line, a picture image may required several commands to print the entire image.

Table 1.9 8-dot image modes

(m)	Mode	Number of elements per line		Horizontal dot density (dots/inch)	Speed (inch/second)
		DX2200	DX2100		
0	Single density	816	480	60	22
1	Double density	1632	960	120	11
2	Double speed & Double density	1632	960	120*	22
3	Quadruple density	3264	1920	240*	11
4	CRT	1088	640	80	13.2
5	Plotter	979	576	72	14.7
6	CRT II	1224	720	90	14.7
7	Double density plotter	1958	1152	144	7.3
8	Triple density	2448	1440	180	7.3

Notes:

(1) For m=0 to 3, specific commands are provided.

m=0 (single density) : ESC K (n1) (n2)

m=1 (double density) : ESC L (n1) (n2)

m=2 (double speed & double density) : ESC Y (n1) (n2)

m=3 (quadruple density) : ESC Z (n1) (n2)

(2) * indicates that one pin cannot be activated consecutively even with all "1" data.

Example:

Load BASIC and enter:

```

10 WIDTH "LPT1:",254
20   FOR I=0 TO 8
30     LPRINT "m=";I
40     LPRINT CHR$(27);"*";CHR$(I);
50     LPRINT CHR$(240 MOD 256);
60     LPRINT CHR$(INT(240/256));
70     FOR J=1 TO 240/8
80       LPRINT STRING$(4,255);
90     NEXT J
100    FOR K=1 TO 240/8
110     LPRINT CHR$(255);CHR$(170);
120    NEXT K
130    FOR L=1 TO 240/8
140     LPRINT CHR$(170);CHR$(85);
150    NEXT L
160    LPRINT
170  NEXT I
180 END

```

Your printer should print:

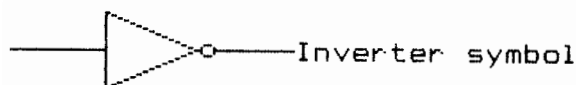
$$m = 0$$
$$m = 1$$
 $m = 2$
$$m = 3$$
$$m = 4$$
 $m = 5$
$$m = 6$$
$$m = 7$$

$m = 8$

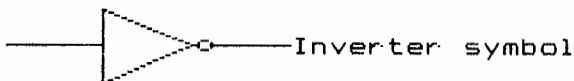
Load BASIC and enter:

```
10 LPRINT CHR$(27); "A"; CHR$(8);
20 WIDTH "LPT1:",254
30 GOSUB 390
40 LPRINT STRING$(30,0); CHR$(7); CHR$(4);
50 LPRINT STRING$(2,2); STRING$(2,1);
60 LPRINT STRING$(54,0);
70 LPRINT
80 GOSUB 390
90 LPRINT STRING$(30,0); CHR$(255);
100 LPRINT STRING$(5,0); STRING$(2,128);
110 LPRINT STRING$(2,64); STRING$(2,32);
120 LPRINT STRING$(2,16); STRING$(2,8);
130 LPRINT STRING$(2,4); STRING$(2,2);
140 LPRINT STRING$(2,1); STRING$(38,0);
150 LPRINT
160 GOSUB 390
170 LPRINT STRING$(30,16); CHR$(255);
180 LPRINT STRING$(19,0); STRING$(2,1);
190 LPRINT STRING$(2,130); STRING$(2,68);
200 LPRINT STRING$(2,40); STRING$(2,16);
210 LPRINT CHR$(56); STRING$(3,68);
220 LPRINT CHR$(56); STRING$(25,16);
230 LPRINT "Inverter symbol"
240 GOSUB 390
250 LPRINT STRING$(30,0); CHR$(255);
260 LPRINT STRING$(3,0); STRING$(2,1);
270 LPRINT STRING$(2,2); STRING$(2,4);
280 LPRINT STRING$(2,8); STRING$(2,16);
290 LPRINT STRING$(2,32); STRING$(2,64);
300 LPRINT STRING$(2,128); STRING$(40,0);
310 LPRINT
320 GOSUB 390
330 LPRINT STRING$(30,0); CHR$(192);
340 LPRINT CHR$(64); STRING$(2,128);
350 LPRINT STRING$(56,0);
360 LPRINT CHR$(27); "A"; CHR$(12);
370 LPRINT
380 END
390 LPRINT CHR$(27); "*"; CHR$(0);
400 LPRINT CHR$(90); CHR$(0);
410 RETURN
```

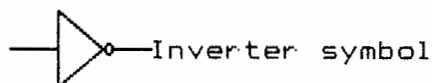
Your printer should print:



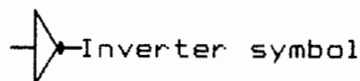
Single density mode:



Double density mode:



Quadruple density mode:



Set 9-dot image mode

Code	Decimal	Hex
ESC ^ (m) (n1)	27 94 (m) (n1)	1B 5E (m) (n1)
(n2) (p1) (p2)	(n2) (p1) (p2)	(n2) (p1) (p2)
...(pk)	...(pk)	...(pk)

The meanings of m, n1, n2, p1, p2, ... pk are the same as for the 8-dot image mode except that the number of image data bytes is twice the number specified by n1 and n2.

Table 1.10 9-dot image modes

(m)	Mode	Number of elements per line		Horizontal dot density (dots/inch)	Speed (inch/second)
		DX2200	DX2100		
0	Single density	1632	960	60	22
1	Double density	3264	1920	120	11

Example:

Load BASIC and enter:

```

10 WIDTH "LPT1:",255
20 FOR I=0 TO 1
30 LPRINT "m="; I
40   LPRINT CHR$(27);"^";CHR$(I);
50   LPRINT CHR$(240 MOD 256);
60   LPRINT CHR$(INT (240/256));
70     FOR J=1 TO 240/2
80       LPRINT CHR$(255);CHR$(128);
90     NEXT J
100    FOR K=1 TO 240/8
110      LPRINT CHR$(255);CHR$(128);
115      LPRINT CHR$(170);CHR$(128);
120    NEXT K
130    FOR L=1 TO 240/8
140      LPRINT CHR$(170);CHR$(128);
145      LPRINT CHR$(85);CHR$(0);
150    NEXT L
160    LPRINT
170 NEXT I
180 END

```

Your printer should print:

m= 0



m= 1



Set single density image

Code	Decimal	Hex
ESC K (n1) (n2)	27 75 (n1) (n2)	1B 4B (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. (n2) is 0 or 1 with an 80-column printer (DX2100) or between 0 and 3 with a 136-column printer (DX2200). This command causes the printer to print the amount of data specified by (n1) and (n2) in a single-density image.

See **Table 1.9**, this command corresponds to m=0 of an ESC * command.

Set double density image

ESC L (n1) (n2)	27 76 (n1) (n2)	1B 4C (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. n2 is between 0 and 3 with an 80-column printer (DX2100) or 0 and 6 with a 136-column printer (DX2200). This command causes the printer to print the amount of data specified by (n1) and (n2) in a double density image.

See **Table 1.9**, this command corresponds to m=1 of an ESC * command.

Example:

Load BASIC and enter:

```
10 LPRINT CHR$(27); "L"; CHR$(100); CHR$(0);  
20 LPRINT STRING$(100,16);  
30 LPRINT "ABCDEFGH";  
40 LPRINT  
50 END
```

Your printer should print

—————ABCDEFGH

Load BASIC and enter:

```
10 LPRINT CHR$(27);"L";CHR$(100);CHR$(0);
20 WIDTH "LPT1:",108
30 LPRINT STRING$(100,16);
40 LPRINT "ABCDEFGH";
50 LPRINT
60 END
```

Your printer should print:

—————ABCDEFGH

Load BASIC and enter:

```
10 LPRINT CHR$(27);"L";CHR$(100);CHR$(0);
20 WIDTH "LPT1:",225
30 LPRINT STRING$(100,16);
40 LPRINT "ABCDEFGH";
50 WIDTH "LPT1:",80
60 LPRINT
70 END
```

Your printer should print

—————ABCDEFGH

Load BASIC and enter:

```
10 LPRINT CHR$(27);"L";CHR$(100);CHR$(0);
20 WIDTH "LPT1:",108
30 LPRINT STRING$(96,16);
40 LPRINT "ABCDEFGH";
50 LPRINT
60 END
```

Your printer should print:

_____EFGH

Load BASIC and enter:

```
10 LPRINT CHR$(27); "L"; CHR$(100); CHR$(0);  
20 WIDTH "LPT1:", 108  
30 LPRINT STRING$(104, 32);  
40 LPRINT "ABCDEFGH";  
50 LPRINT  
60 END
```

Your printer should print:

ABCDEFGH

Set double speed and double density image

Code	Decimal	Hex
ESC Y (n1) (n2)	27 89 (n1) (n2)	1B 59 (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
..(pk)	..(pk)	..(pk)

(n1) is between 0 and 255. (n2) is between 0 and 3 with an 80-column printer (DX2100) or 0 and 6 with a 136-column printer (DX2200). This command causes the printer to print the amount of data specified by (n1) and (n2) in a double-density image at a speed that is twice as fast as the ESC L (n1) (n2) command.

See **Table 1.9**, this command corresponds to m=2 of an ESC * command.

Set quadruple density image

Code	Decimal	Hex
ESC Z (n1) (n2)	27 90 (n1) (n2)	1B 5A (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
..(pk)	..(pk)	..(pk)

(n1) is between 0 and 255. (n2) is between 0 and 7 with an 80-column printer (DX2100) or 0 and 12 with a 136-column printer (DX2200). This command causes the printer to print the amount of data specified by (n1) and (n2) in a quadruple-density image.

See **Table 1.9**, this command corresponds to m=3 of the ESC * command.

Convert image mode

ESC ? (n) (m)	27 63 (n) (m)	1B 3F (n) (m)
---------------	---------------	---------------

This command converts the ESC K, L, Y, or Z image mode to the ESC * image mode. (n) is a decimal value 75, 76, 89 or 90. (m) is a decimal value between 0 and 8.

For example, when an image is designed in single density mode by ESC K, it can be changed to an image in CRT mode by putting ESC ? with n=75 and m=4 before ESC K.

1.10 Font Control and Download Commands

Select internal character set

Code	Decimal	Hex
ESC % (0) (0)	27 37 0 0	1B 25 00 00

This command selects the normal character set. (See Appendix A.)

Print Example:

Normal character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Italic character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Select download character set

ESC % (1) (0)	27 37 1 0	1B 25 01 00
---------------	-----------	-------------

This command selects the download character set.

This character set should be defined by define commands (ESC &).

Example:

Load BASIC and enter:

```

10 LPRINT CHR$(27); "&"; CHR$(0);
20 LPRINT CHR$(65); CHR$(66);
30 LPRINT CHR$(139);
40 LPRINT CHR$(18); CHR$(4); CHR$(40);
50 LPRINT CHR$(16); CHR$(32); CHR$(12);
60 LPRINT CHR$(50); CHR$(0); CHR$(34);
70 LPRINT CHR$(0); CHR$(0);
80 LPRINT CHR$(10);
90 LPRINT CHR$(15); CHR$(16); CHR$(36);
100 LPRINT CHR$(0); CHR$(68); CHR$(0);
110 LPRINT CHR$(72); CHR$(48); CHR$(0);
120 LPRINT CHR$(0); CHR$(0);
130 LPRINT "AAAAAAAAAABBBBBBBBBB"
140 LPRINT CHR$(27); "%"; CHR$(1); CHR$(0);
150 LPRINT "AAAAAAAAAABBBBBBBBBB"
160 LPRINT CHR$(27); "a";
170 END

```

Your printer should print:

```

AAAAAAAAAABBBBBBBBBB
ππππππππππρρρρρρρρρρ

```

Select NLQ (Near Letter Quality) character set

Code	Decimal	Hex
ESC % (2) (0)	27 37 2 0	1B 25 02 00
ESC x (1)	27 120 1	1B 78 01

Select draft character set

ESC x (0)	27 120 0	1B 78 00
-----------	----------	----------

NLQ character set (Double density both vertically and horizontally):

- Effective until reset with ESC x (0) when set with ESC x (1).
- Not effective in condensed, emphasized, 15-cpi, and double-strike modes. See Appendix A for the fonts.

Note:

You can also select the NLQ character set without these commands by pressing the (NLQ) switch.

Print Example:

Internal character set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

NLQ set

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Copy character set

Code	Decimal	Hex
ESC (0) (0) (0)	27 58 00 00	1B 3A 00 00 00

This command copies the internal character set to the download character set.

This command is undefined under the NLQ mode.

Define download characters

ESC I (n)	27 38 0 (n)	18 28 00 (n)
(n) (a) (p1)	(m) (a) (p1)	(m) (a) (p1)
(p2) to (p11)	(p2) to (p11)	(p2) to (p11)

This command loads the characters you designed into the specified address of the download character RAM.

You can define codes (00)H to (FF)H, and print codes (20)H to (FF)H.

(n) and (m) are respectively starting and ending code of a download RAM into which the succeeding data is to be loaded. (a) is attribute data.

This command needs data for (p1) to (p11). Repeat the set (a) (p1) to (p11) to set two or more characters.

See **Figure 1.7** and explanation under "Attribute information" for details of (a).

Notes:

- (1) You can print codes (00)H - (1F)H except control codes with ESC I (n).
- (2) If you define adjoining dot positions, the second dot does not print.

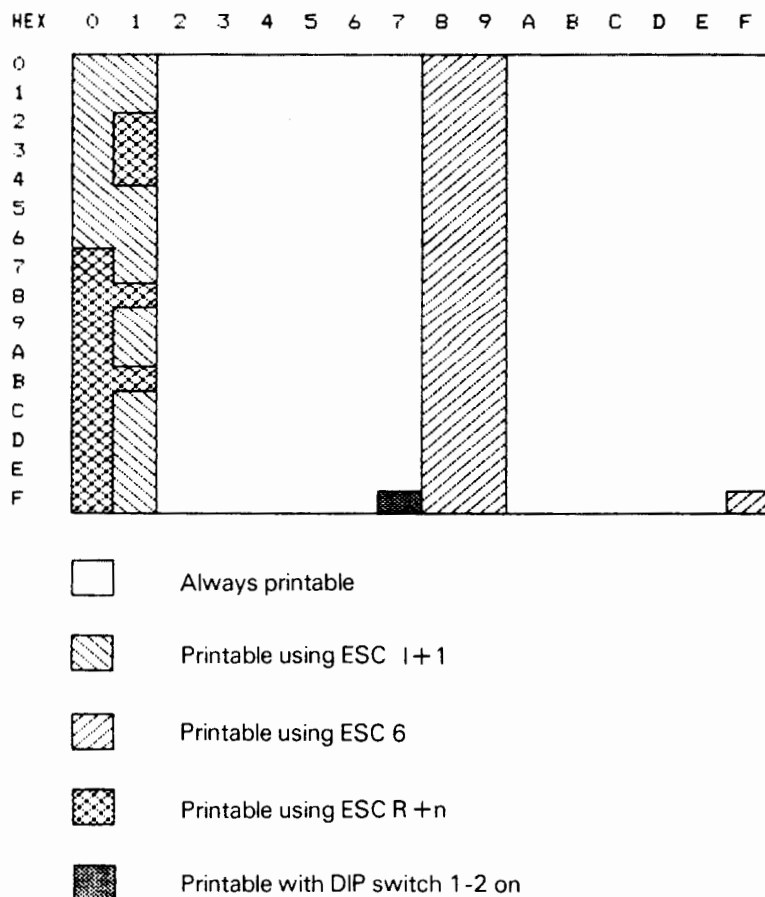


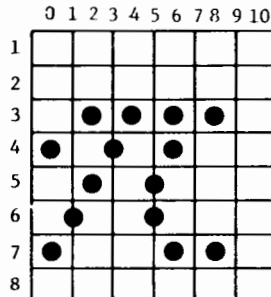
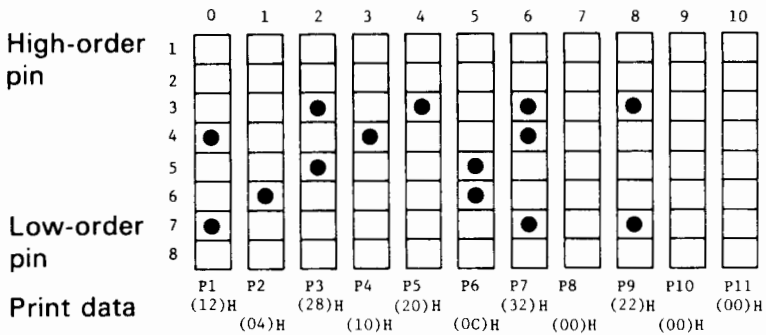
Figure 1.4 Printing download characters stored in control code areas

To design your own characters:

Sketch an 8 by 11 dot matrix and darken the dots that make the character image. Then, encode each of the 8-dot image elements.

Note:

Refer to Paragraph 1.4 for image element details.

Figure 1.5 Download image of π

Characters usually use seven dots vertically; pins 1 to 7 for ordinary characters and pins 3 to 9 for characters with descenders, such as g and y. (Character j uses pins 1 to 8.)

To print characters with descenders:

You can print data consisting of dots 1 to 8 with pins 2 to 9 by specifying a descender. A descender is specified when MSB (Most Significant Bit) of (a) is 0 and not specified when MSB of (a) is 1. Refer to Figure 1.7 for a byte of attribute information.

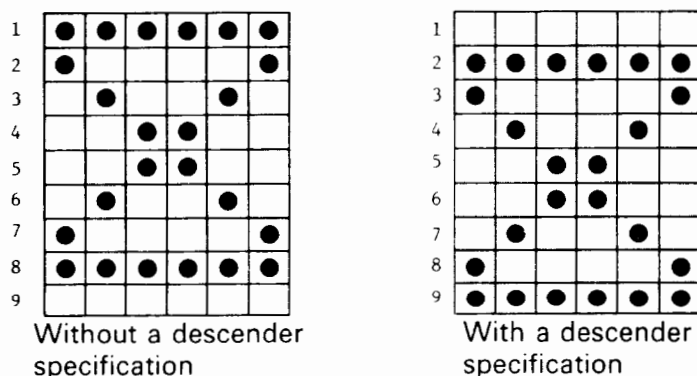


Figure 1.6 Specifying descender

To print in proportional mode:

You must specify the width of the character with a byte of attribute information. Minimum width of the character is a decimal value of 5.

Attribute information:

In this information, you can specify the descender, the print start position and the print end position.

Note:

(s) is a decimal value between 0 and 7. (e) is a decimal value less than or equal to 11. However the difference between (s) and (e) must be 4 or more because the minimum width of the character is 5. If the values specified do not satisfy the conditions above, the attribute information is defaulted into (8B)H.

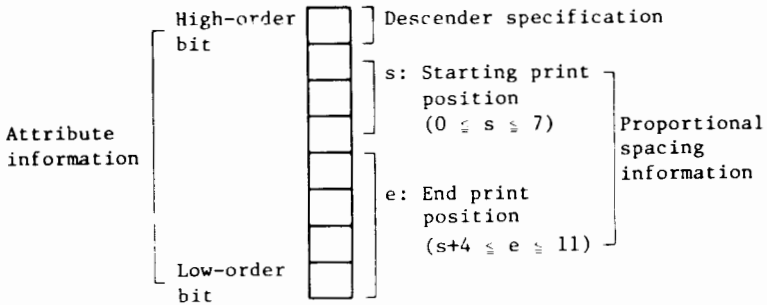


Figure 1.7 Attribute information

Proportional information:

You can define up to 11 positions of proportional information.

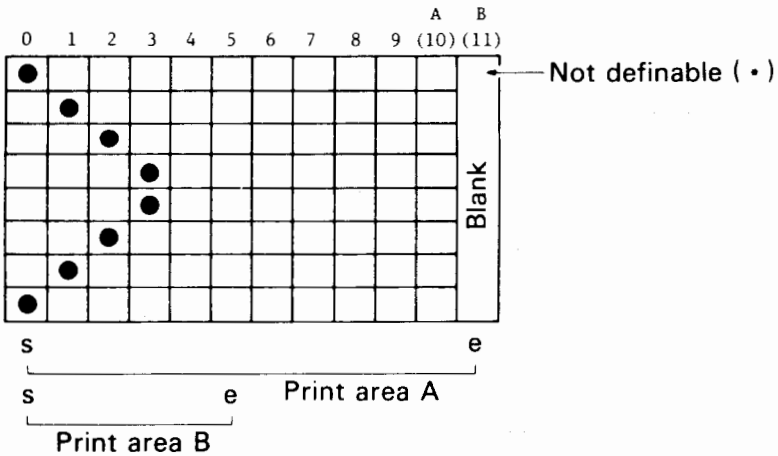


Figure 1.8 Proportional print positions

Note:

If you print emphasized characters in the proportional mode, you must define the character so that the difference between the character end position and the print end position is greater than 1.

Define NLQ download characters

Code	Decimal	Hex
ESC & (1) (n)	27 38 1 (n)	1B 26 01 (n)
(m) (a1) (a2)	(m) (a1) (a2)	(m) (a1) (a2)
(p1) (p2) to	(p1) (p2) to	(p1) (p2) to
(p48)	(p48)	(p48)

This command defines the codes between (n) and (m) with (p1) to (p48).
(20)H $\leq n \leq m \leq$ (5F)H

(a1) and (a2) are attribute data. (p1) to (p48) are print data.

This command needs attribute and print data for each character. Repeat the set (a1), (a2), (p1) to (p48) by the number of times specified by (n-m+1) to set two or more characters.

Notes:

- (1) If you define adjoining dot positions, the second dot does not print.
- (2) When the elite pitch is selected, (P41) to (P48) are ignored.

To define NLQ download characters:

The following is an example of defining an NLQ character pattern, mathematical symbol of root, at address (21)H of the NLQ character code table.

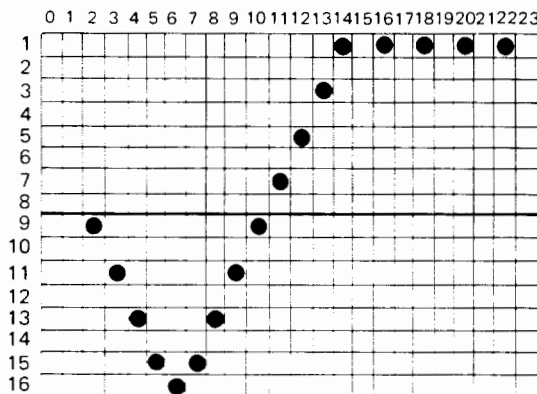


Figure 1.9 NLQ character pattern

The print area for an NLQ character consists of 16(V)x24(H) dots, twice the dot configuration for a pica-pitch character, so attribute information and print data differ as shown below.

(1) Attribute information

NLQ characters need two bytes for this information: (a1) for the starting print position and (a2) for the end print position.

$$(0)10 \leq a1 \leq (15)10$$

$$(8)10 \leq a2 \leq (23)10$$

$$a2 \geq a1 + (8)10$$

If the above conditions are not satisfied, (a1) is assumed to (0)10 and (a2) to (23)10; undefined positions are padded with all-zero data.

For the above example, (a1) is (2)10 or (02)H and (a2) is (22)10 or (16)H.

(2) Print data

NLQ characters need two bytes for each print position (0 to 23) of a character pattern: odd-numbered suffix data for the upper half of the pattern and even-numbered suffix data for the lower half.

For the above example, (p1, p2, ..., p48) are (00, 00, 00, 00, 00, 80, 00, 20, 00, 08, 00, 02, 00, 01, 00, 02, 00, ..., 80, 00, 00, 00)H.

So, to define the NLQ character pattern designed on **Figure 1.9** at address (21)H of the NLQ character code table, send the following data to the printer.

(1B)H, (26)H, (01)H, (21)H, (21)H, (00)H, (00)H, (00)H, (00)H,
(00)H, (80)H, (00)H, (20)H, (00)H, (08)H, (00)H, (02)H, (00)H,
(01)H, (00)H, (02)H, (00)H, ..., (80)H, (00)H, (00)H, (00)H

1.11 Miscellaneous Commands

Select printer

Code	Decimal	Hex
DC1	17	11

Deselect printer

DC3	19	13
------------	-----------	-----------

- Once the printer enters the offline state (deselected state) by the DC3 code, the succeeding data is all ignored until receiving the DC1 code.
- In the offline state due to the DC3 code, the SELECT signal (parallel interface connector pin 13) does not change its state and then the ONLINE lamp remains lit.
- The table below summarizes the relationship between the interface processing and the ONLINE switch state (operator panel), the SLCT IN signal (interface input), and DC1/DC3 codes.

Table 1.11 Select printer relationship

The state of ON-LINE switch	SLCT IN	DC1 / DC3	ERROR	BUSY	ACK	Input data processing
Offline	H/L	DC1	LOW	HIGH	No pulses are output	Data entry is disabled.
		DC3	HIGH	H/L	Pulses are output	Data entry is enabled. Normal processing
	HIGH	DC1	HIGH	H/L	Pulses are output	Data entry is enabled. Normal processing
		DC3	HIGH	H/L	Pulses are output	Data entry is enabled, but input data is discarded until the DC1 code is received.
Online	LOW	DC1	HIGH	H/L	Pulses are output	Data entry is enabled. Normal processing
		DC3	HIGH	H/L	Pulses are output	Data entry is enabled. Normal processing
	H/L	DC1	LOW	HIGH	No pulses are output	Data entry is disabled.
		DC3	HIGH	H/L	Pulses are output	Data entry is enabled. Normal processing

Note:

The DC1/DC3 functions are enabled if DIP switch SW2-1 (on the memory board) is open (off) and if the SLCT IN signal (interface connector pin 36) is high when the printer is first turned on.

Sound alarm

Code	Decimal	Hex
BEL	7	07

This command sounds the alarm for about 0.1 seconds.

Cancel

CAN	24	18
-----	----	----

This command cancels all previous data on the line containing this command.

Delete

DEL	127	7F
-----	-----	----

This command clears one item of data immediately before this code in the print buffer.

Note:

This command cannot be used in the proportional spacing mode.

Move head to home position

27 80	1B 3C
-------	-------

This command moves the print head to its home position.

Set MSB to 0

Code	Decimal	Hex
ESC =	27 61	1B 3D

Set MSB to 1

ESC >	27 62	1B 3E
-------	-------	-------

Reset MSB control

ESC #	27 35	1B 23
-------	-------	-------

Forced to be set MSB to 0 or 1 until reset with ESC #.

Note:

ESC = and ESC > are invalid in image data.

Enable paper out detector

ESC 9	27 57	1B 39
-------	-------	-------

Disable paper out detector

ESC 8	27 56	1B 38
-------	-------	-------

Paper out detector:

- Enabled with ESC 9 (has the same effect as the setting DIP switch SW1-3 (on the memory board) to OFF), and the printer enters the OFF-LINE state when a paper out condition occurs.
- Disabled with ESC 8 (has the same effect as the setting DIP switch SW1-3 (on the memory board) to ON), and the printer ignores the paper out signal.

Set increment and view mode

Code	Decimal	Hex
ESC i (1)	27 105 1	1B 69 01

Reset increment and view mode

ESC i (0)	27 105 0	1B 69 00
-----------	----------	----------

Increment and view mode (Typewriter mode):

- Effective until reset with ESC i (0).
- Causes the printer to print characters each time input data is received. If succeeding data is not received for about 0.1 second, the paper is advanced to the position where printed characters are visible.

Example:

Load BASIC and enter:

```
10 LPRINT "Input any key, please."
20 LPRINT CHR$(27);"i";CHR$(1);
30 A$=INKEY$
40 IF A$=CHR$(27) THEN 70
50 LPRINT A$;
60 GOTO 30
70 LPRINT CHR$(27);"i";CHR$(0);
80 END
```

Your printer should print:

Input any key, please.

Caution:

To avoid paper jam, do not use this command in reverse-feed-prohibited areas. See **Figure 1.1**.

The character set is changed with the following commands. Selectable character sets are shown in Appendix A.

Enable function code printing

Code	Decimal	Hex
ESC 6	27 54	1B 36

Disable function code printing

ESC 7	27 55	1B 37
-------	-------	-------

Control codes (80)H to (9F)H & (FF)H

Printable until reset with ESC 7.

Note:

Remember that all control codes are handled as printable if the MSB is set with ESC > after ESC 6 is received. Your printer is beyond your control.

Example:

Load BASIC and enter:

```
10 LPRINT CHR$(27);"6";
20 FOR I=128 TO 159
30   LPRINT CHR$(I);
40 NEXT I
50 LPRINT
60 LPRINT CHR$(255)
70 LPRINT CHR$(27);"7";
80 END
```

Your printer should print:

æùòì°£/¿ÑÑÑÑÀàç5BÆæØØ"ÀÒÒàÒÙÊÊ¥
Ø

Enable printing of undefined codes

	Decimal	Hex
ESC ()	27 73 1	1B 49 01

Disable printing of undefined codes

	Decimal	Hex
ESC ()	27 73 0	1B 49 00

Undefined control characters:

- Listed in **Table 1.12**. Function codes such as CR and so on are not affected by this command.

Note:

DC 1 code can be set to printable if the printer does not use DC 1 and DC 3.

Table 1.12 Undefined control characters

	O(8)	1(9)		O(8)	1(9)
0	•	•	8	BS	CAN
1	•	DC 1	9	HT	•
2	•	DC 2	A	LF	•
3	•	DC 3	B	VT	ESC
4	•	DC 4	C	FF	•
5	•	•	D	CR	•
6	•	•	E	SO	•
7	BEL	•	F	SI	•

* Undefined character
() MSB = 1.

To print download characters defined using the same codes with control characters like FF and LF:

Using ESC 6 or ESC I (1), you can print most of the download characters defined in the control code area, but cannot print the download characters defined with the codes which are used for the defined control characters such as FF and LF (see **Table 1.12**). To resolve this problem, you can use ESC R (n), Select International Character Set command.

International characters are practically stored in the character generator (CG) using the same codes as those for the control characters because the control characters are used to perform functions and therefore do not need storage areas for generating visual characters. For example, the peseta symbol is stored with code (12)10 used for the FF character and can be accessed and printed using code (35)10 after setting the Spain mode by ESC R (n).

This method can apply to the download character RAM. So you can print any download character using ESC R (n). From the table below, find the code which was used to define the download character to be printed. Use the corresponding country and code found in the row and column.

Table 1.13 Country and code to be selected for printing
download character by ESC R(n)

HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
DEC	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.			0	5	15	16			30	2	1	22
FRANCE			16	23	24	25			26	27	28	17
GERMANY												
ENGLAND	6			18	20	13			19	21	14	
DENMARK				23	24	13			26	27	14	28
SWEDEN		11	29	5		30	25	30	0	3	1	4
ITALY				7	9	8		2	22	10		
SPAIN	12				31							
JAPAN												
NORWAY		11	29	18	20	13	25	30	19	21	14	28
DENMARKII			29	18	20	13	25	30	19	21	14	28

Example:

Load BASIC and enter:

```

10 LPRINT CHR$(27); "I"; CHR$(1);
20 FOR I=1 TO 18
30   READ A
40   LPRINT CHR$(A);
50 NEXT I
60 LPRINT
70 FOR J=1 TO 18
80   READ B
90   LPRINT CHR$(B);
100  NEXT J
110 LPRINT
120 LPRINT CHR$(27); "I"; CHR$(0);
130 DATA 0,1,2,3,4,5
140 DATA 6,16,17,21,22,23
150 DATA 25,26,28,29,30,31
160 DATA 128,129,130,131,132,133
170 DATA 134,144,145,149,150,151
180 DATA 153,154,156,157,158,159
190 END

```

Your printer should print:

```

àèùòì °£$Bø"ÀÜÜÉÉ¥
àèùòì °£$Bø"ÀÜÜÉÉ¥

```

Note:

This sample is taken on IBM PC. Code 26 cannot be sent from IB PC.

Set half-speed printing

Code	Decimal	Hex
ESC s (1)	27 115 1	1B 73 01

Reset half-speed printing

ESC s (0)	27 115 0	1B 73 00
-----------	----------	----------

Half-speed printing:

- Effective in the pica mode until reset with ESC s (0).
- Useful for quieting printer noise.

Reset printer

Code	Decimal	Hex
ESC @	27 64	1B 40

This command performs a reset equivalent to the initialization performed when first turned on.

Note:

The input buffer is not cleared.

Set unidirectional printing

Code	Decimal	Hex
ESC V	27 86	1B 56

Reset unidirectional printing

Code	Decimal	Hex
ESC U	27 85	1B 55

Unidirectional printing mode:

- Effective until reset with ESC U (0).
- Suitable for the print modes in which misalignment of dots due to bidirectional printing is of concern, such as printing vertical ruled lines.

Note:

When the printer is first turned on, the bidirectional printing mode is set.

Set repeat data

Code	Decimal	Hex
ESC V (n)	27 86 (n)	1B 56 (n)
(d1) (d2) to (dm)	(d1) (d2) to (dm)	(d1) (d2) to (dm)
ESC V (0)	27 86 0	1B 56 00

When receiving this command, the printer performs as if the print data matrix (d1) to (dm) were received (n) times.

(n) is between 1 and 10 of decimal value. (m) is between 1 and 16 of decimal value. Data matrix (d1) to (dm) must be print data.

This command is valid for one print line only.

1.12 DX 2000 Series Color Selection

This command is active only on printers with a color unit.

Select print color (moves the ribbon up and down)

Code	Decimal	Hex
ESC r (n)	27 114 (n)	1B 72 (n)

When this command is received, subsequent data is printed in the color specified by (n). When the printer is initialized, the default color is black (n = 0). **Table 1.14** lists the values of (n) for other colors. The selected color is changed when a new color command is received.

Colors (Violet, Orange, Green) not on the ribbon are created by a double-pass unidirectional printing. To minimize ribbon stain, any color mix sequence should always be yellow, magenta, cyan, and black.

Additional colors (not shown in **Table 1.14**) may be blended in unidirectional print mode with ESC U (1).

Table 1.14 Values of (n) for other colors

Value of (n)	Color	1st pass	2nd pass
0	Black	Black	—
1	Magenta	Magenta	—
2	Cyan	Cyan	—
3	Violet	Magenta	Cyan
4	Yellow	Yellow	—
5	Orange	Yellow	Magenta
6	Green	Yellow	Cyan

There are two color print methods. One is the conventional color printing, which prints 6 colors and black, color by color. The other is the primary color scanning print, which scans primary colors to storage in the line buffers and prints a line of 3 primary color data and black data. Using the latter method, you can save time when printing in color. See the following example.

Example:

If a line of data has yellow, green, cyan and orange color information, print is accomplished as follows.

When printing yellow, green, cyan, orange:

(1) Using Conventional Color Printing

The printer first prints yellow, then yellow + cyan, cyan, and then yellow + magenta. The total number of ribbon changes is 4.

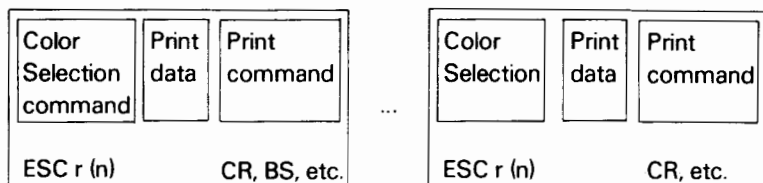
(2) Using Primary Color Scanning Print

The printer first prints yellow, then magenta, and last cyan. Because the total number of ribbon changes is less, printing speed is higher than conventional method.

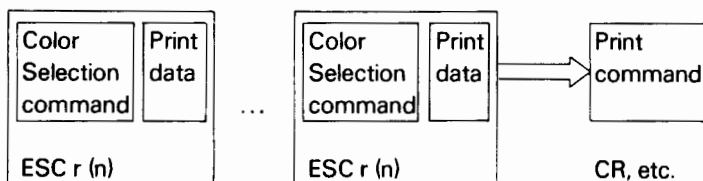
Color Data Transmission:

Color data is transmitted as follows.

(1) For Conventional Color Print



(2) For Primary Color Scanning Print



Note:

When BS code is input following image data, the print head is returned to the position where image printing started.

APPENDIX A

CODE TABLES

Draft

Code Table (U.S.A.)

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		SP	0	1	2	3	4	5	6	7	8	9	A	B	C	D
1	DC1	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	DC2	"														
3	DC3	#														
4	DC4	\$														
5		%														
6		&														
7	BEL	,														
8	BS	(
9	HT)														
A	LF	*														
B	VT	+														
C	FF	,														
D	CR	-														
E	SO	.														
F	SI	/														

Draft (international characters)

HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
U.S.A.	#	\$	@	£	/	J	<	,	{	!	~	~
FRANCE	#	\$	@	£	/	J	<	,	{	!	~	~
GERMANY	#	\$	@	£	/	J	<	,	{	!	~	~
ENGLAND	#	\$	@	£	/	J	<	,	{	!	~	~
DENMARK	#	\$	@	£	/	J	<	,	{	!	~	~
SWEDEN	#	\$	@	£	/	J	<	,	{	!	~	~
ITALY	#	\$	@	£	/	J	<	,	{	!	~	~
SPAIN	#	\$	@	£	/	J	<	,	{	!	~	~
JAPAN	#	\$	@	£	/	J	<	,	{	!	~	~
NORWAY	#	\$	@	£	/	J	<	,	{	!	~	~
DENMARK II	#	\$	@	£	/	J	<	,	{	!	~	~

HEX	A3H	A4H	C0H	DBH	DCH	DDH	DEH	E0H	FBH	FCH	FDH	FEH
U.S.A.	#	\$	@	£	/	J	<	,	{	/	~	~
FRANCE	#	\$	@	£	/	J	<	,	{	/	~	~
GERMANY	#	\$	@	£	/	J	<	,	{	/	~	~
ENGLAND	#	\$	@	£	/	J	<	,	{	/	~	~
DENMARK	#	\$	@	£	/	J	<	,	{	/	~	~
SWEDEN	#	\$	@	£	/	J	<	,	{	/	~	~
ITALY	#	\$	@	£	/	J	<	,	{	/	~	~
SPAIN	#	\$	@	£	/	J	<	,	{	/	~	~
JAPAN	#	\$	@	£	/	J	<	,	{	/	~	~
NORWAY	#	\$	@	£	/	J	<	,	{	/	~	~
DENMARK II	#	\$	@	£	/	J	<	,	{	/	~	~

NLQ

Code Table (U.S.A.)

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		SP	0	1	2	3	4	5	6	7	8	9	0	@	P	.
1		DC1	!	"	#	\$	%	&	'	()	*	+	,	-	.
2		DC2														a
3		DC3														b
4		DC4														c
5																d
6																e
7	BEL															f
8	BS	CAN														g
9	HT															h
A	LF															i
B	VT	ESC														j
C	FF															k
D	CR															l
E	SO															m
F	SI															n
																o
																DEL

NLO (international characters)

HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
U.S.A.	#	\$	@	!	/	J	(-	{	--	{	~
FRANCE	#	\$	@	!	/	J	(-	{	--	{	~
GERMANY	#	\$	@	!	/	J	(-	{	--	{	~
ENGLAND	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK	#	\$	@	!	/	J	(-	{	--	{	~
SWEDEN	#	\$	@	!	/	J	(-	{	--	{	~
ITALY	#	\$	@	!	/	J	(-	{	--	{	~
SPAIN	#	\$	@	!	/	J	(-	{	--	{	~
JAPAN	#	\$	@	!	/	J	(-	{	--	{	~
NORWAY	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK I	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK II	#	\$	@	!	/	J	(-	{	--	{	~

HEX	A3H	A4H	C0H	DBH	DCH	DDH	DEH	E0H	FBH	FCH	FDH	FEH
U.S.A.	#	\$	@	!	/	J	(-	{	--	{	~
FRANCE	#	\$	@	!	/	J	(-	{	--	{	~
GERMANY	#	\$	@	!	/	J	(-	{	--	{	~
ENGLAND	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK	#	\$	@	!	/	J	(-	{	--	{	~
SWEDEN	#	\$	@	!	/	J	(-	{	--	{	~
ITALY	#	\$	@	!	/	J	(-	{	--	{	~
SPAIN	#	\$	@	!	/	J	(-	{	--	{	~
JAPAN	#	\$	@	!	/	J	(-	{	--	{	~
NORWAY	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK I	#	\$	@	!	/	J	(-	{	--	{	~
DENMARK II	#	\$	@	!	/	J	(-	{	--	{	~

APPENDIX B

COMMAND QUICK REFERENCE

(TYPE F)

(1) Print mode commands

Function	Command		Reference pages
	Set	Reset	
Double-width print	SO	DC4, LF, FF	4, 25
	ESC SO	VT,	4, 30
		ESC ! (n)	16
		ESC W (0)	4
Double-width print	ESC W (1)	ESC W (0)	4
	ESC ! (n)		16
Condensed printing	SI	DC2	6
	ESC SI	ESC ! (n)	6, 16
Double-strike	ESC G	ESC H	7
Emphasized printing	ESC E	ESC F	8
Underline mode	ESC - (1)	ESC - (0)	10
Superscript	ESC S (0)	ESC T	11
Subscript	ESC S (1)	ESC T	11
Italics	ESC 4	ESC 5	12
Proportional printing	ESC p (1)	ESC p (0)	14
Print modes	ESC ! (n)	ESC ! (n)	16

(2) Horizontal movement commands

Function	Command		Reference pages
	Set	Reset	
Backspace	BS	-	20
Carriage return	CR	-	20
Elite pitch (12 CPI)	ESC M	ESC P	21
Pica pitch (10 CPI)	ESC P	with another pitch command	21
15-CPI pitch	ESC m	ESC P	21
Absolute print position	ESC \$ (n1) (n2)	-	22
Relative print position	ESC \ (n1) (n2)	-	22
Character spacing	ESC SP (n)	-	23

(3) Horizontal tabbing commands

Function	Command		Reference pages
	Set	Reset	
Execute horizontal tab	HT	-	24
Horizontal tab stops	ESC D (n1) ... (nk) (0)	-	24

(4) Vertical movement commands

Function	Command		Reference pages
	Set	Reset	
Form feed	FF	-	25
Line feed	LF	-	25
Line feed of (n)/216" (0 to 255/216)	ESC J (n)	-	26
Negative line feed of (n)/216" (0 to 255/216)	ESC j (n)	-	26
Line spacing to 1/8"	ESC O	with another line spacing	28
Line spacing to (n)/216" (0 to 255/216)	ESC 3 (n)	with another line spacing	28
Line spacing to 7/72"	ESC 1	with another line spacing	28
Line spacing to (n)/72" (0 to 85/72)	ESC A (n)	with another line spacing	29
Line spacing to 1/6"	ESC 2	with another line spacing	29

(5) Vertical tabbing commands

Function	Command		Reference pages
	Set	Reset	
Execute vertical tab	VT	-	30
Vertical tab stops	ESC B (n1) ... (nk) (0)	-	30
Tabs in VFU	ESC b (n) (m1) ... (mk) (0)	-	30
Specify VFU channel	ESC / (n)	-	31

(6) Page formatting commands

Function	Command		Reference pages
	Set	Reset	
Right margin	ESC Q (n)	-	32
Left margin	ESC ℓ (n)	-	32
Skip perforation	ESC N (n)	ESC O	32, 33
Page length to (n) lines	ESC C (n)	-	33
Page length to (n) inches	ESC C (0) (n)	-	33

(7) Select international character set commands

Function	Command		Reference pages
	Set	Reset	
Select international character set designated by (n)	ESC R (n)	-	34

(8) Bit image graphics commands

Function	Command		Reference pages
	Set	Reset	
8-dot image mode	ESC * (m) (n1) (n2) (p1) (p2) ...(pk)	-	38
9-dot image mode	ESC ^ (m) (n1) (n2) (p1) (p2) ...(pk)	-	42
Single density image	ESC K (n1) (n2) (p1) (p2)...(pk)	-	44
Double density image	ESC L (n1) (n2) (p1) (p2)...(pk)	-	44
Double-density and double-speed image	ESC Y (n1) (n2) (p1) (p2)...(pk)	-	46
Quadruple density image	ESC Z (n1) (n2) (p1) (p2)...(pk)	-	47
Convert image mode	ESC ? (n) (m)	-	47

(9) Font control and download commands

Function	Command		Reference pages
	Set	Reset	
Select internal character set	ESC % (0) (0)	-	48
Select download character set	ESC % (1) (0)	-	48
Select NLQ character set	ESC % (2) (0)	-	49
	ESC x (1)	ESC x (0)	49
Copy character set	ESC : (0) (0) (0)	-	50
Define download characters	ESC & (0) (n) (m) (a) (p1) (p2) to (p11)	-	51
Define NLQ download characters	ESC & (1) (n) (m) (a1) (a2) (p1) (p2) to (p48)	-	56

(10) Miscellaneous commands

Function	Command		Reference pages
	Set	Reset	
Select printer	DC1	DC3	58
Sound alarm	BEL	-	59
Cancell	CAN	-	59
Delete	DEL	-	59
Move head to home position	ESC <	-	59
MSB to 0	ESC =	ESC #	60
MSB to 1	ESC >	ESC #	60
Enable paper out detector	ESC 9	ESC 8	60
Increment and view mode	ESC i (1)	ESC i (0)	61
Print function codes	ESC 6	ESC 7	62
Print undefined codes	ESC I (1)	ESC I (0)	63
Half-speed printing	ESC s (1)	ESC s (0)	66
Reset printer	ESC @	-	67
Unidirectional printing	ESC U (1)	ESC U (0)	67
Repeat data	ESC V (n) (d1) (d2) to (dm) ESC V (0)	-	68

(11) DX 2000 series color selection commands

Function	Command		Reference pages
	Set	Reset	
Select printer color	ESC r (n)	-	69

—

—

—

—

—

1

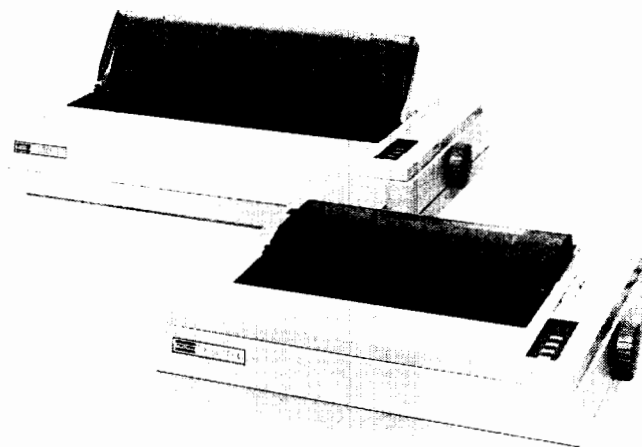
2

3

4

5

**DX 2000 SERIES
TYPE I
DOT MATRIX PRINTER
PROGRAMMER'S MANUAL**



DX 2000
B-69268, I, Rev. B

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Preface

This manual describes the command set for type I of the DX 2000 series.

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SECTION 1

COMMAND SET FOR TYPE I

1.1 Overview

The commands are specified as Control Codes or Escape Code sequences, and enable the printer to:

- 1) Exchange, store, and print data
- 2) Establish and reset different print modes (e.g., enlarged, shadow, bold, underscore)
- 3) Format the printer's output
- 4) Control other operations performed by the printer

When a command specifies a change to a DIP (or Form Length) switch setting, the previous switch setting is over-ridden.

The host computer sends commands and data to the printer via the interface under software control. For example, the LPRINT statement in BASIC enables a command to be entered. With the BASIC routine shown below, the printer will print one line in normal print mode, then print subsequent lines in double-width print mode until instructed to change to normal print mode.

Turn on your system, load BASIC and enter:

```
10 LPRINT "Print is switch selected mode"
20 LPRINT CHR$(27);"W";CHR$(1);
30 LPRINT "Printed in Double Width mode"
40 LPRINT "Also in Double Width print mode"
50 LPRINT CHR$(27);"W";CHR$(0)
60 LPRINT "Printed in switch selected mode"
```

Line 10 instructs the printer to print in normal print mode.

Line 20 instructs it to print in double-width mode.

Lines 30 and 40 are printed in double-width mode.

Line 50 cancels double-width mode.

Line 60 is printed in normal print mode.

This example uses the LPRINT statement, but some versions of BASIC use a PRINT #1 statement instead.

The LPRINT statement can use the following formats to send information to the printer:

LPRINT "A"	Character as it is
LPRINT CHR\$(65)	Decimal
LPRINT CHR\$(&H41)	Hexadecimal, two digits

The DX 2000 series command set contains commands which are undefined in the Proprinter or the Graphics command set.

Refer to **Table 1.1** for differences among the DX2000, the Proprinter and the Graphics printer.

Table 1.1 Difference among command sets

(P): Effective Proprinter mode only

(G): Effective Graphics printer mode only

Command	Function	DX 2000	Proprinter	Graphics printer
ESC \$ (n1)(n2)	Specify absolute print position	○	×	×
ESC % (n1)(n2)	Select print mode	○ (G)	×	×
ESC & (0) (1)	Define download character	○ (G)	×	×
ESC *	8-dot image modes	○	×	×
ESC :	Set elite pitch	○ (P)	○	×
ESC =	Define download character	○ (P)	○	×
ESC G	Set double strike mode	○ (G)	Set NLQ mode	○
ESC H	Reset double strike mode	○ (G)	Reset NLQ mode	○
ESC I (n)	Select print mode	○ (P)	○	×
ESC M	Set elite pitch	○ (P)	×	○
ESC Q (3)	Deselect printer	○ (P) Q(n): Set right margin (G)	○	×
ESC R	Tab stops initialize	○ (P)	○	×

Command	Function	DX 2000	Proprinter	Graphics printer
ESC \ (n1)(n2)	Select all character set	<input type="radio"/> (P)	<input type="radio"/>	×
ESC ^	Print one character from all character set	<input type="radio"/> (P) 9-dot image mode (G)	<input type="radio"/>	×
ESC _ (n)	Set overscore mode	<input type="radio"/> (P)	<input type="radio"/>	×
ESC x (n)	Select NLQ or draft mode	<input type="radio"/> (G)	×	×
ESC r (n)	Color selection	<input type="radio"/>	×	×

1.2 Print Mode Commands

Print mode is changed with the following commands. Default print mode, established by DIP switches, is restored when power is turned on, or when a selected print mode is reset.

Set double-width print

Code	Decimal	Hex
SO	14	0E
ESC SO	27 14	1B 0E
ESC W (1)	27 87 1	1B 57 01

Reset double-width print

ESC W (0)	27 87 0	1B 57 00
DC4	20	14

Double-width:

- i) Proprietary mode
 - Effective until reset with DC4; LF; FF; VT; ESC W (0); CR or CAN when set with SO or ESC SO.
- ii) Graphics printer mode
 - Effective until reset with DC4; LF; FF; VT; buffer full LF; manual LF or ESC W (0) when set with SO or ESC SO.
 - Effective until reset with ESC W (0) when set with ESC W (1).

Example:

Load BASIC and enter:

```
10 LPRINT "ESC W+n"
20 LPRINT "(Set and Reset Double-width Mode)"
30 LPRINT
40 LPRINT CHR$(27);"W";CHR$(1);
50 LPRINT "Double-width printing"
60 LPRINT "set using this mode"
70 LPRINT "continues"
80 LPRINT CHR$(27);"W";CHR$(0);
90 LPRINT "until reset."
100 END
```

Your printer should print:

```
ESC W+n
(Set and Reset Double-width Mode)
```

```
Double-width printing
set using this mode
continues
until reset.
```

Load BASIC and enter:

```
10 LPRINT "SO (Set Double-width Mode)"
20 LPRINT
30 LPRINT CHR$(14);"Double-width"
40 LPRINT "reverts to normal print"
50 LPRINT "at line feed."
60 END
```

Your printer should print:

```
SO (Set Double-width Mode)
```

```
Double-width
reverts to normal print
at line feed.
```

Set condensed print

Code	Decimal	Hex
SI	15	0F
ESC SI	27 15	1B 0F

Reset condensed print

DC2	18	12
-----	----	----

Condensed print (17.1 characters per inch):

- Effective until reset with DC2.
- Can coincide with double-width print.
- Effective only in pica pitch.

Note:

NLQ mode ignored when in Proprietary mode.

Example:

Load BASIC and enter:

```

10 LPRINT "SI (Set Condensed Printing)"
20 LPRINT
30 LPRINT CHR$(15);
40 LPRINT "Condensed printing is"
50 LPRINT "effective only with pica pitch."
60 LPRINT "It can be used with"
70 LPRINT "Double-width mode,"
80 LPRINT "but not with Emphasized mode."
90 LPRINT
100 LPRINT CHR$(18);
110 LPRINT "DC2 (Reset Condensed Printing)"
120 LPRINT
130 LPRINT "Normal printing"
140 END

```

Your printer should print:

SI (Set Condensed Printing)

Condensed printing is
effective only with pica pitch.
It can be used with
Double-width mode,
but not with Emphasized mode.

DC2 (Reset Condensed Printing)

Normal printing

Set double-strike



Reset double-strike



Double-strike (Double density in vertical dots):

- Only Graphics printer mode.
- Effective until reset with ESC H.

Example:

Load BASIC and enter:

```

10 LPRINT "ESC G (Set Double-strike Print)"
20 LPRINT "This command effective "
30 LPRINT "in Graphics printer mode only."
40 LPRINT
50 LPRINT CHR$(27);"G";"Double-strike Print"
60 LPRINT "continues until reset."
70 LPRINT
80 LPRINT CHR$(27);"H";
90 LPRINT "ESC H (Reset Double-strike Print)"
100 LPRINT
110 LPRINT "Normal Printing"
120 END

```

Your printer should print:

```

ESC G (Set Double-strike Print)
This command effective
in Graphics printer mode only.

```

```

Double-strike Print
continues until reset.

```

```

ESC H (Reset Double-strike Print)

```

```

Normal Printing

```

Set emphasized print

Code	Decimal
ESC E	27 69

Reset emphasized print

ESC F	27 70
-------	-------

Emphasized print (Double density in horizontal dots):

- Effective until reset with ESC F.
- Effective in pica pitch, elite pitch, and NLQ mode.
- If both condensed print and emphasized print modes are set, emphasized print mode has priority over condensed print mode.

Example:

Load BASIC and enter:

```

10 LPRINT "ESC E (Set Emphasized Printing)"
20 LPRINT
30 LPRINT CHR$(27);"E";
40 LPRINT "Emphasized printing is"
50 LPRINT "effective in pica pitch ";
60 LPRINT "or elite pitch."
70 LPRINT "It assumes priority over"
80 LPRINT "Condensed printing"
90 LPRINT "does not reset"
100 LPRINT "condensed printing, but"
110 LPRINT
120 LPRINT CHR$(27);"F";
130 LPRINT "ESC F (Reset Emphasized printing)"
140 LPRINT "Normal printing"
150 END

```

Your printer should print:

ESC E (Set Emphasized Printing)

**Emphasized printing is
effective in pica pitch or elite pitch.
It assumes priority over
Condensed printing
does not reset
condensed printing, but**

ESC F (Reset Emphasized printing)
Normal printing

Set underline mode

Code	Decimal	Hex
ESC - (1)	27 45 1	1B 2D 01

Reset underline mode

ESC - (0)	27 45 0	1B 2D 00
-----------	---------	----------

Underline:

- Effective until reset with ESC - (0).
- Space caused HT is not underlined when in Proprinter mode.

Example:

Load BASIC and enter:

```

10 LPRINT "ESC -+n"
20 LPRINT "(Set and Reset Underline Mode)"
30 LPRINT
40 LPRINT CHR$(27);"-";CHR$(1);
50 LPRINT "Underline Printing ";
60 LPRINT "is effective"
70 LPRINT CHR$(27);"-";CHR$(0);
80 LPRINT "until reset."
90 END

```

Your printer should print:

```

ESC -+n
(Set and Reset Underline Mode)

```

```

Underline Printing is effective
until reset.

```

Set overscore mode

Code	Decimal	Hex
ESC _ (1)	27 95 1	1B 5F 01

Reset overscore mode

ESC _ (0)	27 95 0	1B 5F 00
-----------	---------	----------

Overscore:

- Effective in Proprinter mode only.
- Effective until reset with ESC _ (0).
- Space caused HT is not overscored.

Example:

Load BASIC and enter:

```
10 LPRINT "ESC _+n"
20 LPRINT "(Set and Reset Overscore Mode)"
30 LPRINT
40 LPRINT CHR$(27);"_";CHR$(1);
50 LPRINT "Overscore Printing "
60 LPRINT "is effective only Proprinter mode"
70 LPRINT CHR$(27);"_";CHR$(0);
80 LPRINT "until reset."
90 END
```

Your printer should print:

```
ESC _+n
(Set and Reset Overscore Mode)
```

```
Overscore Printing
is effective only Proprinter mode
until reset.
```


Set superscript

Code	Decimal	Hex
ESC S (0)	27 83 0	1B 53 00

Set subscript

ESC S (1)	27 83 1	1B 53 01
-----------	---------	----------

Reset superscript/subscript

ESC T	27 84	1B 54
-------	-------	-------

Superscript or subscript (Condensed to 1/2 height):

- Effective until reset with ESC T.
- CG graphics character ((80)H ~ (AF)H, (F4)H) is printed only higher 8 bits.

Example:

Load BASIC and enter:

```

10 LPRINT "ESC S+0 (Set Superscript Mode)"
20 LPRINT
30 LPRINT "From normal to ";
40 LPRINT CHR$(27); "S"; CHR$(0);
50 LPRINT "Superscript"
60 LPRINT
70 LPRINT CHR$(27); "T";
80 LPRINT "ESC T resets both Superscript"
90 LPRINT "and Subscript."
100 END

```

Your printer should print:

ESC S+0 (Set Superscript Mode)

From normal to ^{Superscript}

ESC T resets both Superscript
and Subscript.

Load BASIC and enter:

```
10 LPRINT "ESC S+1 (Set Subscript Mode)"
20 LPRINT
30 LPRINT "From normal to ";
40 LPRINT CHR$(27);"S";CHR$(1);
50 LPRINT "Subscript"
60 LPRINT
70 LPRINT CHR$(27);"T";
80 LPRINT "ESC T resets both Superscript"
90 LPRINT "and Subscript."
100 END
```

Your printer should print:

ESC S+1 (Set Subscript Mode)

From normal to _{Subscript}

ESC T resets both Superscript
and Subscript.

1.3 Horizontal Movement Commands

The print head is controlled and positioned by the following commands.

Backspace

Code	Decimal	Hex
BS	8	08

- Effective in Proprinter mode only.

This command moves the print head backward one print position after previous data is prints, just like the backspace key on a typewriter.

In double-width print mode, a double-width backspace is performed. If the data to be printed is bit image data, the print head is moved to the starting position. If the print mode has been changed, operation of the BS code is unpredictable.

Carriage return

CR	13	0D
----	----	----

This command sends the print position to left margin and also resets double-width print mode if CR is on LF.

- i) Proprinter mode
 - A line feed is performed if DIP switch SW1-3 is on or if ESC 5 + 1 is received.
- ii) Graphics printer mode
 - A line feed is performed if the AUTO FEED XT signal is low or if the DIP switch SW1-3 or SW1-5 is on.

Set pica pitch (10 CPI)

Code	Decimal	Hex
ESC P	27 80	1B 50

- Effective in Graphics printer mode only.
- This command does not reset condensed or emphasized mode.

Set elite pitch (12 CPI)

i) Proprinter mode

ESC :	27 58	1B 3A
-------	-------	-------

- Effective until reset with DC2.

ii) Graphics printer mode

ESC M	27 77	1B 4D
-------	-------	-------

- Effective until reset with ESC P.

Notes:

- (1) When the printer is first turned on, it is set to pica pitch.
- (2) The printer can print up to 80 columns in pica pitch and 96 columns in elite pitch (DX2100/2300 version).
- (3) There is a difference in the dot configuration for the elite pitch between the DX2100/2200 and DX2300/2400.

Example:

Load BASIC and enter:

```
10 LPRINT "ESC : & DC2 (Elite & Pica pitch)"
20 LPRINT "Proprinter mode : "
30 LPRINT
40 LPRINT CHR$(27); ":";
50 LPRINT "Printing pitch (Elite)"
60 LPRINT
70 LPRINT CHR$(18);
80 LPRINT "Printing pitch (Pica)"
90 END
```

Your printer should print:

```
ESC : & DC2 (Elite & Pica pitch)
Proprinter mode :
```

```
Printing pitch (Elite)
```

```
Printing pitch (Pica)
```

Load BASIC and enter:

```
10 LPRINT "ESC M & ESC P (Elite & Pica pitch)"
20 LPRINT "Graphics printer mode : "
30 LPRINT
40 LPRINT CHR$(27); "M";
50 LPRINT "Printing pitch (Elite)"
60 LPRINT
70 LPRINT CHR$(27); "P";
80 LPRINT "Printing pitch (Pica)"
90 END
```

Your printer should print:

ESC M & ESC P (Elite & Pica pitch)
Graphics printer mode :

Printing pitch (Elite)

Printing pitch (Pica)

Set absolute print position

Code	Decimal	Hex
ESC \$ (n1) (n2)	27 36 (n1) (n2)	1B 24 (n1) (n2)

This command sets the horizontal print position according to n1 and n2 as a position that is $(256 \times n2 + n1) \times 1/60$ inches from the left margin. (This command must be set from left margin to right margin.)

This command is effective only for one line.

1.4 Vertical Movement Commands

If the current line includes CG graphics characters ((B0)H~(DF)H, (F4)H) and if line feed value is less than 1/6 inches, then line feed value is forced to 1/6 inches when Graphics printer mode (except script mode). If CG graphics characters not included in the current line, then the line feed return to its previous value.

Paper motion is controlled and positioned by the following commands.

Form feed

Code	Decimal	Hex
FF	12	0C

This command moves the form to the first line of the next page, resets double-width print mode set with SO or ESC SO, and causes CR.

Notes:

- (1) The page length is initially set depending on SW2-2~SW2-4 (on the memory board), when the printer is first turned on. You can set the page length with ESC C (n) or ESC C (0) (n).
- (2) The first line of the page is initialized when the printer is first turned on; when receiving INIT signal; or when setting the page length with ESC C (n) or ESC C(0)(n).

Line feed

LF	10	0A
----	----	----

This command moves the forms one line upward and resets double-width print mode set with SO or ESC SO.

i) Proprinter mode

- Line feed occurs with each CR if DIP switch SW1-5 (on the memory board) is ON.

ii) Graphics printer mode

- CR always occurs after line feed.

Note:

The feed pitch is initially set at 1/6 inches or 1/8 inches when the printer is first turned on. You can set the feed pitch with ESC 0; ESC 1; ESC 2; ESC 3 (n) or ESC A (n).

Single line feed of (n)/216" ((n) is a decimal value between 0 and 255)

Code	Decimal	Hex
ESC J (n)	27 74 (n)	1B 4A (n)

This command is effective on the current line only.

Note:

- i) Proprinter mode
CR occurs if DIP switch SW1-5 (on the memory board) is ON.
- ii) Graphics printer mode
Print start position on the next line corresponds to the print end position on the current line.

Single negative line feed of (n)/216" ((n) is a decimal value between 0 and 255)

ESC j (n)	27 106 (n)	1B 6A (n)
-----------	------------	-----------

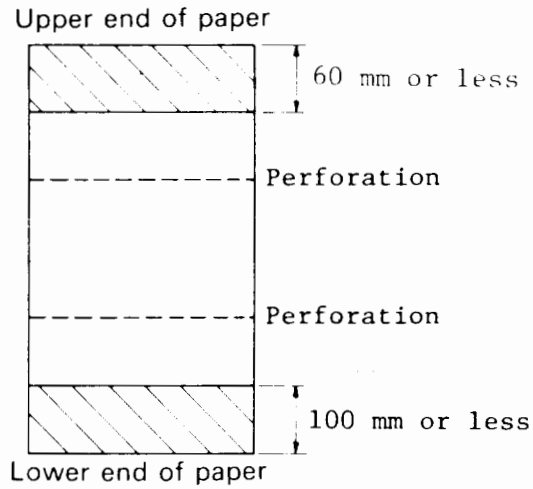
This command performs the same operation as ESC J (n), except that the line feed occurs in the opposite direction.

Caution:

To avoid a paper jam, do not use this command in reverse-feed-prohibited areas. See **Figure 1.1**.

ESC j (n) is invalid if the cut sheet feeder is enabled by DIP switch setting.

With fanfold paper



With cut-sheet paper

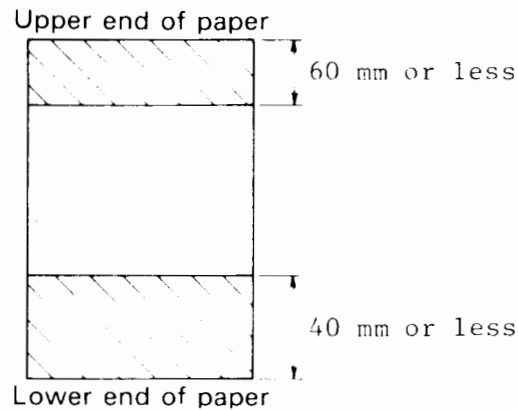


Figure 1.1 Reverse feed prohibited area

Set line spacing to 1/8" (8 lines per inch)

Code	Decimal	Hex
ESC 0	27 48	1B 30

After receipt of this command, each LF command or equivalent results in an 1/8" line feed.

Set line spacing to (n)/216 ((n) is a decimal value between 0 and 255)

ESC 3 (n)	27 51 (n)	1B 33 (n)

The rate of (n) is 1/3 dot.

After receipt of this command, each LF command or equivalent results in an (n)/216" line feed.

For example:

LPI	(n)
6	36
8	27

Note:

Line spacing accuracy is not guaranteed when $n < 3$.

Set line spacing to 7/72"

ESC 1	27 49	1B 31

After receipt of this command, each LF command or equivalent results in an 7/72 inch line feed.

Set line spacing to (n)/72" ((n) is a decimal value between 1 and 85)

Code	Decimal	Hex
ESC A (n)	27 65 (n)	1B 41 (n)

The rate of (n) is 1 dot. After receipt of this command, each LF command or equivalent results in an (n)/72 inch line feed. ($n \leq 85$)

Note:

You can feed lines for 8 bit image by using this command. ($n=8$)

Access line spacing (set by ESC A)

ESC 2

2750

1832

Line feed value is accessed by this command, with setting provided by ESC A. If not set by ESC A, line feed value is set to 1/6 inch.

Example:

Load BASIC and enter:

```

10 LPRINT " ESC A & ESC 2 (Set line spacing)"
20 LPRINT
30 LPRINT " Set ESC 2 only (1/6) "
40 FOR I=1 TO 3
50   LPRINT CHR$(27);"2";
60   LPRINT "ABCDEFGHIJKLMN -----"
70 NEXT I
80 LPRINT
90 LPRINT " Set ESC A & ESC 2 (1/72 TO
100 FOR N=1 TO 10
110   LPRINT CHR$(27);"A";CHR$(N);
120   LPRINT CHR$(27);"2";
130   LPRINT " _____"
140 NEXT N
150 END

```

Your printer should print:

ESC A & ESC 2 (Set line spacing)

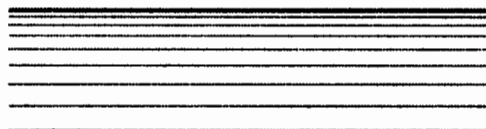
Set ESC 2 only (1/6)

ABCDEFGHIJKLMN -----

ABCDEFGHIJKLMN -----

ABCDEFGHIJKLMN -----

Set ESC A & ESC 2 (1/72 TO 10/72)



1.5 Tabbing

Horizontal Tab Commands

Absolute and relative horizontal tab stops are controlled with the following commands.

Execute horizontal tab

Code	Decimal	Hex
HT	9	09

This command moves print position to the next horizontal tab stop, set with ESC D (n1)...(nk) (0).

This command is ignored if it is received after the last tab stop.

Set horizontal tab at (n1) through (nk)

ESC D (n1)...(nk) (0)	27 68 (n1)...(nk) 0	1B 44 (n1)...(nk) 00
-----------------------	---------------------	----------------------

Tab stops:

- Executed with HT.
- Can be set up for to 28 positions with position 1 as left margin.
- Must be set in ascending order.
- Unchanged even if the print mode is changed.
- Ignored beyond the maximum print width.
- Set at intervals of 8 characters when the printer is first turned on and no tab stop has been set.

Note:

Tab position is reset to the default values by ESC *l* (n) when in Graphics printer mode.

Example:

Load BASIC and enter:

```
10 LPRINT "Horizontal Tab"
20 LPRINT "    (Position=5,10,20,25)";CHR$(10)
30 LPRINT CHR$(27);"D";
40 LPRINT CHR$(5);CHR$(10);CHR$(20);
50 LPRINT CHR$(25);CHR$(0);
60 FOR I=1 TO 4
70   LPRINT "1234567890";
80 NEXT I
90 LPRINT
100 FOR H=1 TO 4
110   LPRINT CHR$(9);"HT";
120 NEXT H
130 LPRINT
140 END
```

Your printer should print when Proprinter mode:

```
Horizontal Tab
  (Position=5,10,20,25)

1234567890123456789012345678901234567890
      HT   HT           HT   HT
```

Your printer should print when Graphics printer mode:

```
Horizontal Tab
  (Position=5,10,20,25)

1234567890123456789012345678901234567890
      HT   HT           HT   HT
```

Vertical Tab Commands

Vertical tab stops (paper motion) are controlled with the following commands.

Execute vertical tab

Code	Decimal	Hex
VT	11	0B

Vertical tab moves the paper to the next vertical tab stop set with ESC B (n1)...(nk) (0). Performs the same as an LF command when no vertical tab positions are set. Also resets doublewidth print mode set by SO code.

i) Proprinter mode

When the next VT position is over the page length or over the maximum VT position, the printer, performs the same as an LF command to the next top of form. CR occurs when the DiP switch (on the memory board) SW1-5 is ON.

ii) Graphics printer mode

When the next VT position is over the page length or over the maximum VT position, the printer feeds the paper to the next top of form.

Set vertical tabs

ESC B (n1)

...(nk) (0)

27 66 (n1)

...(nk) 0

1B 42 (n1)

...(nk) 00

Tab locations are set in ascending order until a (0) code (00) is received. Vertical tab locations beyond page length are ignored and subsequent data is regarded as print data. (n) is an ASCII character with a decimal value between 1 and 255. An (n) value of 1 is for the first line below the top of the form. Up to 64 vertical tab locations can be set.

Note:

Vertical tab position are reset with ESC R or ESC B (0) when in Proprinter mode.

Tab data initial setting

ESC R**27 82****1B 52**

Set vertical and horizontal tabs when the printer is first turned on (only is Proprinter mode).

This command clears all vertical tab positions and sets horizontal tab positions every 8 columns from column 9.

1.6 Page Formatting Commands

These commands set the left, right, top and bottom margins.

Set right margin

Code	Decimal	Hex
ESC Q (n)	27 81 (n)	1B 51 (n)

This command is effective in Graphics printer mode only.

The maximum print position number is based on character pitch. Any print position beyond the length of the print line is ignored. (For details, see User's Manual, Section 5.7.)

This command must be sent before print data.

If print data has already been entered beyond this setting, then it is printed and a line feed occurs.

Set left margin

ESC ℓ (n)	27 108 (n)	1B 6C (n)
-----------	------------	-----------

This command is effective in Graphics printer mode only.

ℓ is lower case L. This command sets the left margin at the print position designated by (n). The leftmost print position is set (as the left margin) when (n) is set to 0.

This command clears the horizontal tabs. (For details, see User's Manual, Section 5.7.)

This command must be sent before print data.

Set skip perforations

Code	Decimal	Hex
ESC N (n)	27 78 (n)	1B 4E (n)

Reset skip perforations

Code	Decimal	Hex
ESC O	27 79	1B 4F

Skip perforations:

- Effective until reset with ESC O; ESC C (n) or ESC C (0) (n). (n) is decimal value between 1 and 255.
- Causes the printer to skip (n) lines on the current page and advance the paper to the first print line at next page.

Note:

If DIP switch SW1-8 (on the memory board) is ON, the printer skips 1 inch (default).

Set page length to (n) lines

ESC C (n)	27 67 (n)	1B 43 (n)
-----------	-----------	-----------

(n) is an ASCII character with a decimal value between 1 and 255. Page length is stored as an absolute length in lines. This absolute length is determined by multiplying the current single-line spacing by (n).

Set page length to (n) inches

ESC C (0) (n)**27 67 0 (n)****1B 43 00 (n)**

(n) is an ASCII character with a decimal value between 1 and 255 (1 and FF Hex). This command sets the page length in inches.

Set top of form

ESC 4**27 52****1B 34**

When received, this command sets the current line as top of form.

This command never changes page length or skip perforation value.

1.7 Bit Image Graphics

Bit images are structured by dots arranged in rows and columns.

Eight dots arranged in a column is a pattern byte. The smallest unit of the bit image (one column) is called a pattern element. There are 8-dot and 9-dot pattern elements. (9-dot image mode effective in Graphics printer mode only.)

The precision of an image can be determined by the size of a dot and how many pins are used to print a dot.

Line spacing must be set to 8 72" in the 8-pin image mode and 9 72" in the 9-pin image mode.

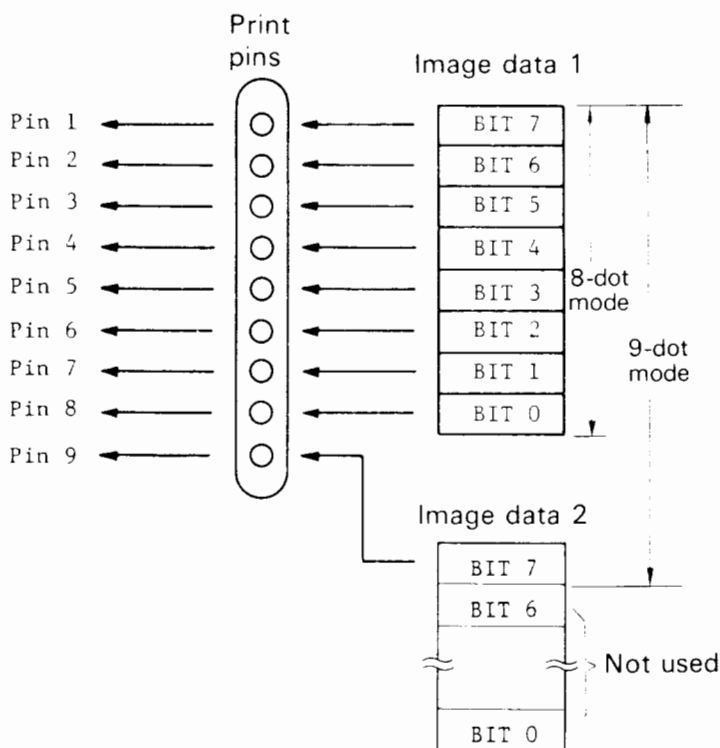
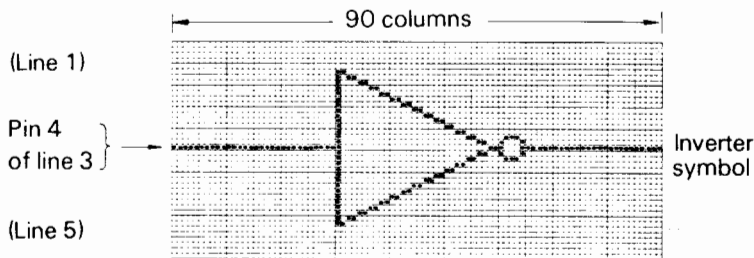


Figure 1.2 8-dot & 9-dot image modes
— Pin arrangement

Table 1.2 Image elements

	Element in 8-dot image mode	Element in 9-dot image mode
Consists of	8 dots	9 dots
Represented by	1 byte of data	2 bytes of data

Refer to **Figure 1.3** to obtain 8-bit image data for example.

**Figure 1.3 Picture on graph paper**

Hexadecimal:

Line 1: 30 × 00, 07, 04, 02, 02, 01, 01, 54 × 00
 Line 2: 30 × 00, FF, 00 00 00, 00, 00, 80, 80, 40, 40, 20, 20,
 10, 10, 08, 08, 04, 04, 02, 02, 01, 01, 38 × 00
 Line 3: 30 × 10, FF, 19 × 00, 01, 01, 82, 82, 44, 44, 28, 28, 10,
 10, 38, 44, 44, 44, 38, 25 × 10
 Line 4: 30 × 00, FF, 00, 00, 00, 01, 01, 02, 02, 04, 04, 08, 08,
 10, 10, 20, 20, 40, 40, 80, 80, 40 × 00
 Line 5: 30 × 00, C0, 40, 80, 80, 56 × 00

Decimal:

Line 1: 30 × 0, 7, 4, 2, 2, 1, 1, 54 × 0
 Line 2: 30 × 0, 255, 0, 0, 0, 0, 0, 128, 128, 64, 64, 32, 32, 16,
 16, 8, 8, 4, 4, 2, 2, 1, 1, 38 × 0
 Line 3: 30 × 16, 255, 19 × 0, 1, 1, 130, 68, 68, 40, 40,
 16, 16, 56, 68, 68, 68, 56, 25 × 16
 Line 4: 30 × 0, 255, 0, 0, 0, 1, 1, 2, 2, 4, 4, 8, 8, 16, 16, 32, 32,
 64, 64, 128, 128, 40 × 0
 Line 5: 30 × 0, 192, 64, 128, 128, 56 × 0

Set 8-dot image mode

Code	Decimal	Hex
ESC * (m) (n1)	27 42 (m) (n1)	1B 2A (m) (n1)
(n2) (p1) (p2)	(n2) (p1) (p2)	(n2) (p1) (p2)
...(pk)	...(pk)	...(pk)

(m) is an ASCII character with a decimal value between 0 and 8, (n1) is between 0 and 255, (n2) is between 0 and 7 with an 80-column printer (DX2100 2300) or 0 and 12 with a 136-column printer (DX2200 2400). This command causes the printer to print image data, from column 1 to the column designated by $(n1) + (n2) \times 256$. Print mode is specified by m, as shown in **Table 1.9**. This command prints one line, a picture image may required several commnads to print the entire image.

Table 1.3 8-dot image modes

(m)	Mode	Number of elements per line		Horizontal dot density (dots/inch)	Speed (inch/second)
		DX2200 DX2400	DX2100 DX2300		
0	Single density	816	480	60	22
1	Double density	1632	960	120	11
2	Double speed & Double density	1632	960	120*	22
3	Quadruple density	3264	1920	240*	11
4	CRT	1088	640	80	13.2
5	Plotter	979	576	72	14.7
6	CRT II	1224	720	90	14.7
7	Double density plotter	1958	1152	144	7.3
8	Triple density	2448	1440	180	7.3

Notes:

(1) For m=0 to 3, specific commands are provided:

m=0 (single density) : ESC K (n) (2)

m=1 (double density) : ESC M (n) (2)

m=2 (double speed & double density) : ESC Y (n) (2)

m=3 (quadruple density) : ESC Z (n) (2)

(2) * indicates that one pin cannot be activated continuously with all "1" data.

Example:

Load BASIC and enter:

```

10 WIDTH "LPT1:",254
20   FOR I=0 TO 8
30     LPRINT "m=";I
40     LPRINT CHR$(27);"*";CHR$(I);
50     LPRINT CHR$(240 MOD 256);
60     LPRINT CHR$(INT(240/256));
70     FOR J=1 TO 240/8
80       LPRINT STRING$(4,255);
90     NEXT J
100    FOR K=1 TO 240/8
110     LPRINT CHR$(255);CHR$(170);
120    NEXT K
130    FOR L=1 TO 240/8
140     LPRINT CHR$(170);CHR$(85);
150    NEXT L
160    LPRINT
170  NEXT I
180 END

```


Load BASIC and enter:

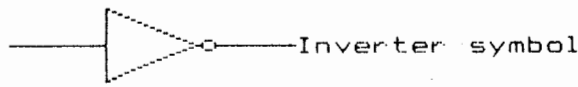
```

10 LPRINT CHR$(27);"A";CHR$(8);
20 LPRINT CHR$(27);"2";
30 WIDTH "LPT1:",254
40 GOSUB 410
50 LPRINT STRING$(30,0);CHR$(7);CHR$(4);
60 LPRINT STRING$(2,2);STRING$(2,1);
70 LPRINT STRING$(54,0);
80 LPRINT
90 GOSUB 410
100 LPRINT STRING$(30,0);CHR$(255);
110 LPRINT STRING$(5,0);STRING$(2,128);
120 LPRINT STRING$(2,64);STRING$(2,32);
130 LPRINT STRING$(2,16);STRING$(2,8);
140 LPRINT STRING$(2,4);STRING$(2,2);
150 LPRINT STRING$(2,1);STRING$(38,0);
160 LPRINT
170 GOSUB 410
180 LPRINT STRING$(30,16);CHR$(255);
190 LPRINT STRING$(19,0);STRING$(2,1);
200 LPRINT STRING$(2,130);STRING$(2,68);
210 LPRINT STRING$(2,40);STRING$(2,16);
220 LPRINT CHR$(56);STRING$(3,68);
230 LPRINT CHR$(56);STRING$(25,16);
240 LPRINT "Inverter symbol"
250 GOSUB 410
260 LPRINT STRING$(30,0);CHR$(255);
270 LPRINT STRING$(3,0);STRING$(2,1);
280 LPRINT STRING$(2,2);STRING$(2,4);
290 LPRINT STRING$(2,8);STRING$(2,16);
300 LPRINT STRING$(2,32);STRING$(2,64);
310 LPRINT STRING$(2,128);STRING$(40,0);
320 LPRINT
330 GOSUB 410
340 LPRINT STRING$(30,0);CHR$(192);
350 LPRINT CHR$(64);STRING$(2,128);
360 LPRINT STRING$(56,0);
370 LPRINT CHR$(27);"A";CHR$(12);
380 LPRINT CHR$(27);"2";
390 LPRINT
400 END

```

```
410 LPRINT CHR$(27);"*";CHR$(0);
420 LPRINT CHR$(90);CHR$(0);
430 RETURN
```

Your printer should print:



Set 9-dot image mode

Code	Default	Meaning
ESC (m) (n1)	27 94 (m) (n1)	18 dots per inch
(n2) (p1) (p2)	(n2) (p1) (p2)	(n2) (p1) (p2)
... (pk)	... (pk)	... (pk)

This command is effective in Graphics printer mode only.

The meanings of m, n1, n2, p1, p2, ... pk are the same as for the 8-dot image mode except that the number of image data bytes is twice the number specified by n1 and n2.

Table 1.4 9-dot image modes

(m)	Mode	Number of elements per line		Horizontal dot density (dots/inch)	Speed (inch/second)
		DX2200	DX2100 DX2400		
0	Single density	1632	960	60	22
1	Double density	3264	1920	120	11

Example:

Load BASIC and enter:

```

10 WIDTH "LPT1:",255
20 FOR I=0 TO 1
30 LPRINT "m=";I
40   LPRINT CHR$(27);"^";CHR$(I);
50   LPRINT CHR$(240 MOD 256);
60   LPRINT CHR$(INT (240/256));
70   FOR J=1 TO 240/2
80     LPRINT CHR$(255);CHR$(128);
90   NEXT J
100  FOR K=1 TO 240/8
110    LPRINT CHR$(255);CHR$(128);
120    LPRINT CHR$(170);CHR$(128);
130  NEXT K
140  FOR L=1 TO 240/8
150    LPRINT CHR$(170);CHR$(128);
160    LPRINT CHR$(85);CHR$(0);
170  NEXT L
180  LPRINT
190 NEXT I
200 END

```

Your printer should print:

m= 0



m= 1



Set single density image

Code	Decimal	Hex
ESC K (n1) (n2)	27 75 (n1) (n2)	1B 4B (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. (n2) is 0 or 1 with an 80-column printer (DX2100 2300) or between 0 and 3 with a 136-column printer (DX2200 2400). This command causes the printer to print the amount of data specified by (n1) and (n2) in a single-density image.

See **Table 1.3**, this command corresponds to m=0 of an ESC * command.

Set double density image

Code	Decimal	Hex
ESC L (n1) (n2)	27 76 (n1) (n2)	1B 4C (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. n2 is between 0 and 3 with an 80-column printer (DX2100 2300) or 0 and 6 with a 136-column printer (DX2200 2400). This command causes the printer to print the amount of data specified by (n1) and (n2) in a double density image.

See **Table 1.3**, this command corresponds to m=1 of an ESC * command.

Set double speed and double density image

Code	Decimal	Hex
ESC Y (n1) (n2)	27 89 (n1) (n2)	1B 59 (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. (n2) is between 0 and 3 with an 80-column printer (DX2100 2300) or 0 and 6 with a 136-column printer (DX2200 2400). This command causes the printer to print the amount of data specified by (n1) and (n2) in a double-density image at a speed that is twice as fast as the ESC L (n1) (n2) command.

See **Table 1.3**, this command corresponds to $m=2$ of an ESC * command.

Set quadruple density image

Code	Decimal	Hex
ESC Z (n1) (n2)	27 90 (n1) (n2)	1B 5A (n1) (n2)
(p1) (p2)	(p1) (p2)	(p1) (p2)
...(pk)	...(pk)	...(pk)

(n1) is between 0 and 255. (n2) is between 0 and 7 with an 80-column printer (DX2100/2300) or 0 and 12 with a 136-column printer (DX2200/2400). This command causes the printer to print the amount of data specified by (n1) and (n2) in a quadruple-density image.

See **Table 1.3**, this command corresponds to $m=3$ of the ESC * command.

Example:

Load BASIC and enter:

```

10 WIDTH "LPT1:",254
20 LPRINT "Image printing";CHR$(10)
30 LPRINT "ESC K (Single density,Data=180)"
40 LPRINT CHR$(27);"K";CHR$(180);CHR$(0);
50   GOSUB 170 : LPRINT CHR$(10)
60 LPRINT "ESC L (Double density,Data=180)"
70 LPRINT CHR$(27);"L";CHR$(180);CHR$(0);
80   GOSUB 170 : LPRINT CHR$(10)
90 LPRINT "ESC Y (Dbl-density & speed,Data=
100 LPRINT CHR$(27);"Y";CHR$(180);CHR$(0);
110   GOSUB 170 : LPRINT CHR$(10)
120 LPRINT "ESC Z (Quadruple density,Data=
130 LPRINT CHR$(27);"Z";CHR$(180);CHR$(0);
140   GOSUB 170 : LPRINT CHR$(10)
150 END
160 '
170   FOR I=1 TO 12
180     LPRINT CHR$(73);CHR$(0);CHR$(255);
190     LPRINT CHR$(0);CHR$(73);

```

```
200     NEXT I
210     FOR J=1 TO 12
220         LPRINT CHR$(170);CHR$(0);CHR$(85);
230         LPRINT CHR$(0);CHR$(170);
240     NEXT J
250     FOR K=1 TO 12
260         LPRINT CHR$(146);CHR$(0);CHR$(146);
270         LPRINT CHR$(0);CHR$(146);
280     NEXT K
290 RETURN
```

Your printer should print:

Image printing

ESC K (Single density,Data=180)

#####

ESC L (Double density,Data=180)

#####

ESC Y (Dbl-density & speed,Data=180)

#####

ESC Z (Quadruple density,Data=180)

#####

1.8 Font Control and Download Commands

Select internal character set

- i) Proprinter mode

Code	Decimal	Hex
ESC I (0)	27 73 0	1B 49 00

- ii) Graphics printer mode

ESC % (0) (0)	27 37 00	1B 25 00 00
---------------	----------	-------------

This command selects the normal character set. (See Appendix A.)

Select download character set

- i) Proprinter mode



- ii) Graphics printer mode



This command selects the download character set.

This character set should be defined by define commands (ESC = or ESC &).

Example:

Load BASIC and enter:

```

10 LPRINT CHR$(27); "="; CHR$(28); CHR$(0);
20 LPRINT CHR$(20); CHR$(65);
30 LPRINT CHR$(0); CHR$(0); 'Define "A"
40 LPRINT CHR$(18); CHR$(4); CHR$(40);
50 LPRINT CHR$(16); CHR$(32); CHR$(12);
60 LPRINT CHR$(50); CHR$(0); CHR$(34);
70 LPRINT CHR$(0); CHR$(0);
80 LPRINT CHR$(1); CHR$(0); 'Define "B"
90 LPRINT CHR$(15); CHR$(16); CHR$(36);
100 LPRINT CHR$(0); CHR$(68); CHR$(0);
110 LPRINT CHR$(72); CHR$(48); CHR$(0);
120 LPRINT CHR$(0); CHR$(0);
130 LPRINT "Proprietary mode: "; CHR$(10)
140 LPRINT "AAAAAAAAAABBBBBBBBBBBB"
150 LPRINT CHR$(27); "I"; CHR$(4);
160 LPRINT "AAAAAAAAAABBBBBBBBBBBB"
170 END

```

Your printer should print:

```

Proprietary mode:

```

AAAAAAAAAAAAEEEEEEEEEEEEEEEE

$\pi\pi\pi\pi\pi\pi\pi\pi\pi\rho\rho\rho\rho\rho\rho\rho\rho\rho$

Load BASIC and enter:

```

10 LPRINT CHR$(27); "&"; CHR$(0);
20 LPRINT CHR$(65); CHR$(66);
30 LPRINT CHR$(139); 'Define "A"
40 LPRINT CHR$(18); CHR$(4); CHR$(40);
50 LPRINT CHR$(16); CHR$(32); CHR$(12);
60 LPRINT CHR$(50); CHR$(0); CHR$(34);
70 LPRINT CHR$(0); CHR$(0);
80 LPRINT CHR$(10); 'Define "B"
90 LPRINT CHR$(15); CHR$(16); CHR$(36);
100 LPRINT CHR$(0); CHR$(68); CHR$(0);
110 LPRINT CHR$(72); CHR$(48); CHR$(0);
120 LPRINT CHR$(0); CHR$(0);
130 LPRINT "Graphics printer mode: "; CHR$(10)
140 LPRINT "AAAAAAAAAABBBBBBBBBBB"
150 LPRINT CHR$(27); "%"; CHR$(1); CHR$(0);
160 LPRINT "AAAAAAAAAABBBBBBBBBBB"
170 LPRINT CHR$(27); "a";
180 END

```

Your printer should print:

Graphics printer mode:

AAAAAAAAAABBBBBBBBBBB

ππππππππππρρρρρρρρρρρρ

Select NLQ (Near Letter Quality) character set

i) Proprinter mode

Code	Decimal	Hex
ESC I (2)	27 73 2	1B 49 02
ESC G	27 71	1B 47

ii) Graphics printer mode

ESC % (2) (0)	27 37 2 0	1B 25 02 00
ESC x (1)	27 120 1	1B 78 01

Select draft character set

i) Proprinter mode

ESC I (0)	27 73 0	1B 49 00
ESC H	27 72	1B 48

NLQ character set (Double density both vertically and horizontally):

- Effective until reset with ESC H or ESC I (0) when set with ESC G or ESC I (2).

ii) Graphics printer mode

ESC x (0)	27 120 0	1B 78 00
-----------	----------	----------

NLQ character set (Double density both vertically and horizontally):

- Effective until reset with ESC x (0) when set with ESC x (1) or ESC % (2) (0).

Note:

You can also select the NLQ character set without these commands by pressing the NLQ switch.

NLQ character set not effective in condensed, emphasized, and double-strike modes. See Appendix A for the fonts.

Define download characters

i) Graphics printer mode

Code	Decimal	Hex
ESC & (0) (n)	27 38 0 (n)	1B 26 00 (n)
(m) (a) (p1)	(m) (a) (p1)	(m) (a) (p1)
(p2) to (p11)	(p2) to (p11)	(p2) to (p11)

This command loads the characters you designed into the specified address of the download character RAM.

You can define, and print codes (20)H to (FF)H.

(n) and (m) are respectively starting and ending code of a download RAM into which the subsequent data is to be loaded. (a) is attribute data.

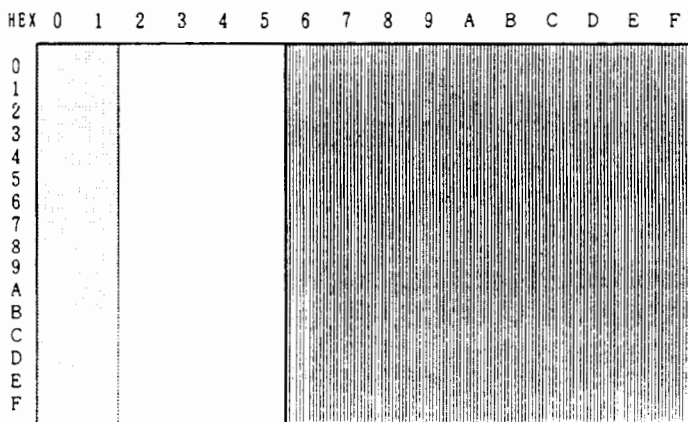
This command needs data for (p1) to (p11). Repeat the set (a) (p1) to (p11) to set two or more characters.

See **Figure 1.7** and explanation under "Attribute information" for details of (a).

Note:

If you define adjoining dot positions, the second dot does not print.

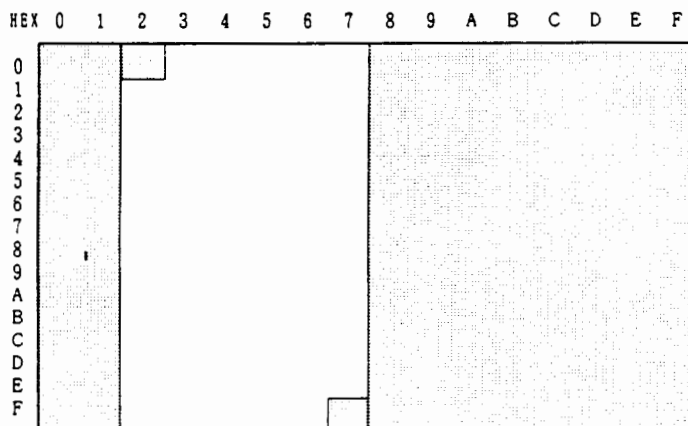
Graphics printer mode



☐ Draft and NLQ download character define inhibit area

☒ NLQ download character define inhibit area

Proprinter mode



☐ Draft and NLQ download character define inhibit area

Figure 1.4 Printing download characters stored areas

To design your own characters:

Sketch an 8 by 11 dot matrix and darken the dots that make the character image. Then, encode each of the 8-dot image elements.

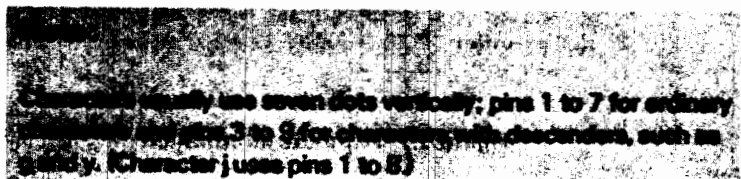
Notes:

Refer to Paragraph 1.9 for image element details.

	0	1	2	3	4	5	6	7	8	9	10
High-order pin											
2											
3			●		●		●		●		
4	●			●			●				
5			●			●					
6		●				●					
Low-order pin											
7	●						●		●		
8											
Print data	P1 (12)H	P2 (04)H	P3 (28)H	P4 (10)H	P5 (20)H	P6 (0C)H	P7 (32)H	P8 (00)H	P9 (22)H	P10 (00)H	P11 (00)H

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

Figure 1.5 Download image of π



To print characters with descenders:

You can print data consisting of dots 1 to 8 with pins 2 to 9 by specifying a descender. A descender is specified when MSB (Most Significant Bit) of (a) is 0 and not specified when MSB of (a) is 1. Refer to **Figure 1.7** for a byte of attribute information.

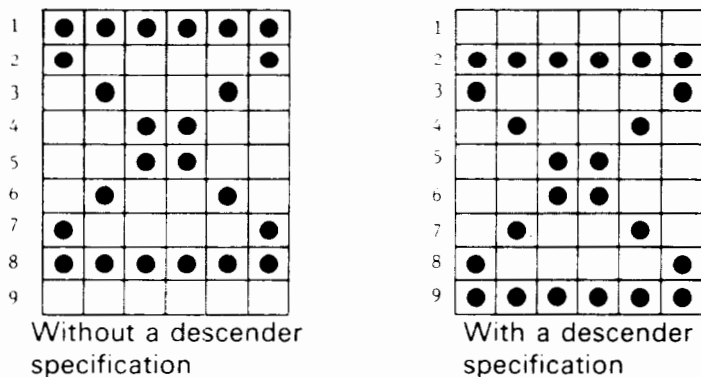


Figure 1.6 Specifying descender

Attribute information:

In this information, you can specify the descender.

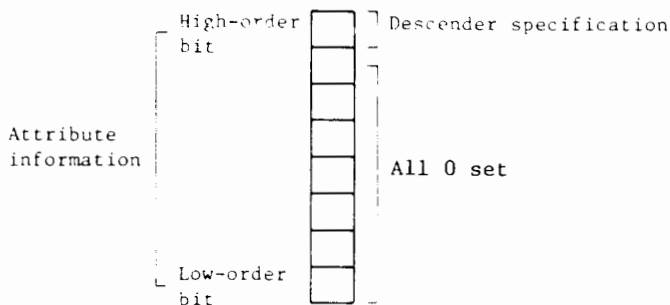


Figure 1.7 Attribute information

ii) Proprinter mode

Code	Decimal	Hex
ESC = (C1)(C2)(14)H	27 61 (C1)(C2) 20	1B 3D (C1)(C2) 14
(d)(a)(0)(P1)(P2) to (P11)	(d)(a)(0)(P1)(P2) to (P11)	(d)(a)(0)(P1)(P2) to (P11)

You can define codes (21)H to (7E)H, and print codes (21)H to (7E)H.

(d) is the definition starting code.

C1 and C2 express the number of defined characters as follows.

(How to calculate C1 and C2)

When defining 94 characters: $(94 \times 13) + 2 = (1224)_{10} = (04C8)_{16}$
then C1 = (C8)H, C2 = (04)H

(a) is attribute data.

- This command needs data for (0)(P1) to (P11). Repeat the set (a)(0)(P1) to (P11) to set two or more characters.
- Attribute data is specified in the same way as in Graphics printer mode.
- If the printer receives ESC = (0)(0) then it clears defined download characters and resets download print mode.
- Download characters are never cleared by INIT signal.

Define NLQ download characters

i) Graphics printer mode

Code	Decimal	Hex
ESC & (1) (n)	27 38 1 (n)	1B 26 01 (n)
(m) (0) (0)	(m) (0) (0)	(m) (0) (0)
(p1) (p2) to	(p1) (p2) to	(p1) (p2) to
(p48)	(p48)	(p48)

This command defines the codes between (n) and (m) with (p1) to (p48).
(20)H $\leq n \leq m \leq (5F)_{16}$

(p1) to (p48) are print data.

This command needs print data for each character. Repeat the set (0), (0), (p1) to (p48) by the number of times specified by (n-m + 1) to set two or more characters.



To define NLQ download characters:

The following is an example of defining an NLQ character pattern, mathematical symbol of root, at address (21)H of the NLQ character code table.

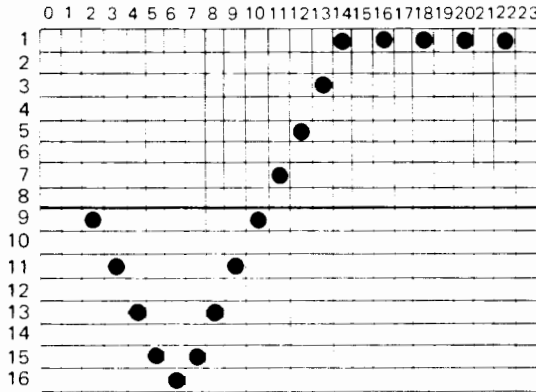


Figure 1.8 NLQ character pattern

The print area for an NLQ character consists of 16(V)x24(H) dots, twice the dot configuration for a pica-pitch character, so print data differ as shown below.

Print data

NLQ characters need two bytes for each print position (0 to 23) of a character pattern: odd-numbered suffix data for the upper half of the pattern and even-numbered suffix data for the lower half.

For the above example, (p1, p2, ..., p48) are (00, 00, 00, 00, 00, 80, 00, 20, 00, 08, 00, 02, 00, 01, 00, 02, 00, ..., 80, 00, 00, 00)H.

So, to define the NLQ character pattern designed on **Figure 1.8** at address (21)H of the NLQ character code table, send the following data to the printer.

(1B)H, (26)H, (01)H, (21)H, (21)H, (00)H, (00)H, (00)H, (00)H,
(00)H, (80)H, (00)H, (20)H, (00)H, (08)H, (00)H, (02)H, (00)H,
(01)H, (00)H, (02)H, (00)H, ..., (80)H, (00)H, (00)H, (00)H

ii) Proprinter mode

An NLQ download is made by using draft download data (filling vertical and horizontal dot gaps). Then the user must define draft download by using ESC = before the selected NLQ download.

Code	Decimal	Hex
ESC I (6)	27 73 6	1B 49 06

This command selects an NLQ download.

Select CG set 2

ESC 6	27 54	1B 36
-------	-------	-------

This command select Character Generator set 2 (See Appendix A).

Select CG set 1

ESC 7	27 55	1B 37
-------	-------	-------

This command select Character Generator set 1 (See Appendix A).

Note:

CG set is selectable by DIP switch (on the memory board) SW1-4 when the printer first turned on.

Select All character set

ESC \ (n1)(n2)**27 92 (n1)(n2)****1B 5C (n1)(n2)**

This command is effective in Proprinter mode only.

After receipt of this command, print (256xn2 + n1) data as all character set.

Undefined codes are printed as spaces. There are no function codes in this mode. (See Appendix A).

Select All character set (only one character)

Code**ESC ^****Decimal****27 94****Hex****1B 5E**

This command is effective in Proprinter mode only.

After receipt this command print data as All character set (effective one character only).

Example:

Load BASIC and enter:

```

10 LPRINT "ESC \ & ESC 6 & ESC 7"
20 LPRINT "      (Select character set)"
30 LPRINT CHR$(10);
40 LPRINT "All character : ";
50 LPRINT CHR$(27);"\";CHR$(7);CHR$(0);
60   GOSUB 150
70 LPRINT CHR$(27);"7";
80 LPRINT "CGSET 1      : ";
90   GOSUB 150
100 LPRINT CHR$(27);"6";
110 LPRINT "CGSET 2      : ";
120   GOSUB 150
130 END
140 '
150 LPRINT CHR$(3);CHR$(4);CHR$(5);CHR$(6);
160 LPRINT CHR$(20);CHR$(21);CHR$(26)
170 RETURN

```

Your printer should print:

```

ESC \ & ESC 6 & ESC 7
      (Select character set)

```

```

All character : ♥♦♣♠␣␣
CGSET 1       :
CGSET 2       : ♥♦♣♠♠

```

1.9 Miscellaneous Commands

Select printer

Code	Decimal	Hex
DC1	17	11

This command is effective in Proprinter mode only.

Deselect printer

ESC Q (3)	27 81 3	1B 51 03
-----------	---------	----------

This command is effective in Proprinter mode only.

- Once the printer is put in the offline state (deselected state) by the ESC Q (3) command, the subsequent data is all ignored until receiving the DC1 code.
- In the offline state due to the ESC Q (3) command, the SELECT signal (parallel interface connector pin 13) does not change its state and then the ONLINE lamp remains lit.
- The table below summarizes the relationship between the interface processing and the ONLINE switch state (operator panel), DC 1/ESC Q (3) statement

Table 1.5 Select printer relationship

The state of ON-LINE switch	DC1 ESC Q(3)	$\overline{\text{ERROR}}$	BUSY	$\overline{\text{ACK}}$	Input data processing
Offline	DC1 ESC Q(3)	LOW	HIGH	No pulses are output	Data entry is disabled.
Online	DC1	HIGH	H L	Pulses are output	Data entry is enabled. Normal processing
	ESC Q(3)	HIGH	H L	Pulses are output	Data entry is enabled, but input data is discarded until the DC1 code is received.
	DC1	HIGH	H L	Pulses are output	Data entry is enabled. Normal processing
	ESC Q(3)	HIGH	H L	Pulses are output	Data entry is enabled. Normal processing

Sound alarm

Code	Decimal	Hex
BEL	7	07

This command sounds the alarm for about 0.1 seconds.

Cancel

CAN	24	18
-----	----	----

This command cancels all previous data on the line containing this command.

Note:

This command clears the enlarged mode set by S0 or ESC S0 when in Proprietary mode only.

Move head to home position

ESC <

27 60

1B 3C

This command moves the print head to its home position.

Enable paper out detector

Code

Decimal

Hex

ESC 9

27 57

1B 39

Disable paper out detector

ESC 8

27 56

1B 38

Paper out detector:

- Enabled with ESC 9, and the printer enters the OFF-LINE state when a paper out condition occurs.
- Disabled with ESC 8, and the printer ignores the paper out signal.

Note:

This command is effective in standard mode only.

Set half-speed printing

Reset half-speed printing

ESC s (0) **Decimal** **Hex**
27 74 0 **1B 4D**

Half-speed printing:

- Effective in the pica mode until reset with ESC s (0).
- Useful for quieting printer noise.

Reset printer

Code **Decimal** **Hex**
ESC @ **27 64** **1B 40**

This command is effective in Graphics printer mode only.

This command performs a reset equivalent to the initialization performed when first turned on.

Note:

The input buffer is not cleared.

Set unidirectional printing

Code **Decimal** **Hex**
ESC U (1) **27 86 1** **1B 56 01**

Reset unidirectional printing

Code	Decimal	Hex
ESC U (0)	27 55 0	1B 55 00

Unidirectional printing mode:

- Effective until reset with ESC U (0).
- Suitable for the print modes in which misalignment of dots due to bidirectional printing is of concern, such as printing vertical ruled lines.

Note:

When the printer is first turned on, the bidirectional printing mode is set.

Set automatic line feed

Code	Decimal	Hex
ESC 5 (1)	27 53 1	1B 35 01

This command is effective in Proprinter mode only.

After receipt of this command line feed always occurs when the printer receives a CR code.

Reset automatic line feed

Code	Decimal	Hex
ESC 5 (0)	27 53 0	1B 35 00

Automatically line feed:

- Effective until reset with ESC 5 (0) when set with ESC 5 (1).

1.10 DX Series Color Selection

This command is active only on printers with a color unit.

Select print color (moves the ribbon up and down)

Code	Decimal	Hex
ESC r (n)	27 114 (n)	1B 72 (n)

When this command is received, subsequent data is printed in the color specified by (n). When the printer is initialized, the default color is black (n = 0). **Table 1.6** lists the values of (n) for other colors. The selected color is changed when a new color command is received.

Colors not on the ribbon (Violet, Orange, Green) are created by a double-pass unidirectional printing. To minimize ribbon stain, any color mix sequence should always be yellow, magenta, cyan, and black.

Additional colors (not shown in **Table 1.6**) may be blended in unidirectional print mode with ESC U (1).

Table 1.6 Values of (n) for other colors

Value of (n)	Color	1st pass	2nd pass
0	Black	Black	—
1	Magenta	Magenta	—
2	Cyan	Cyan	—
3	Violet	Magenta	Cyan
4	Yellow	Yellow	—
5	Orange	Yellow	Magenta
6	Green	Yellow	Cyan

There are two color print methods. One is the conventional color printing, which prints 6 colors and black, color by color. The other is the primary color scanning print, which scans primary colors to storage in the line buffers and prints a line of 3 primary color data and black data. Using the latter method, you can save time when printing in color. See the following example.

Example:

If a line of data has yellow, green, cyan and orange color information, print is accomplished as follows.

When printing yellow, green, cyan, orange:

(1) Using Conventional Color Printing

The printer first prints yellow, then yellow + cyan, then cyan, and then yellow + magenta. The total number of ribbon changes is 4.

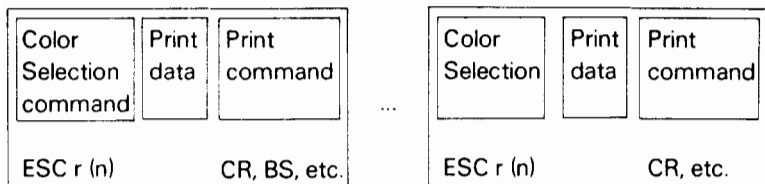
(2) Using Primary Color Scanning Print

The printer first prints yellow, then magenta, and last cyan. Because the total number of ribbon changes is less, printing speed is higher than conventional method.

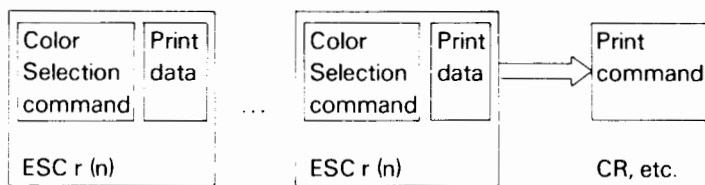
Color Data Transmission:

Color data is transmitted as follows.

(1) For Conventional Color Print



(2) For Primary Color Scanning Print



APPENDIX A

CODE TABLES

Draft

Proprietary mode CGSET 1

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	1	2	3	4	5	6	7	8	9	:	;	<	=
1		DC1	!	"	#	\$	%	&	'	()	*	+	,	-	.
2		DC2														/
3																
4		DC4														
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Frpprinter mode CGSET 2

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Draft

Printer mode All Character

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				♥	♦	♣	♠									
1		:	"	#	\$	%	&	'	()	*	+	,	-	.	/
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Draft

Graphics printer mode CGSET 1

[illegible]

Graphics printer mode CGSET 2

[illegible]

[illegible]

[illegible]

Proprinter mode All Character (NLQ mode)

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
								</								

Graphics printer mode CGSET 1 (NLQ mode)

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	~	p	G	e			L	T	α	=
1			!	1	A	Q	a	q	U	æ			T	T	β	±
2		DC2	"	2	B	R	b	r	e	Æ			T	T	Γ	≥
3	▼		#	3	C	S	c	s	a				T	T	Π	≤
4	◆	DC4	\$	4	D	T	d	t	a	ø			L	L	Σ	∩
5	♣	S	%	5	E	U	e	u	a	ö			L	L	ϕ	∪
6	♠		&	6	F	V	f	v	a	û			L	L	μ	÷
7	BEL		'	7	G	W	g	w	g	y			L	L	τ	°
8		CAN	(	8	H	X	h	x	e	ö			L	L	θ	·
9	HT		)	9	I	Y	i	y	æ	ü			L	L	Ω	·
A	LF		*	:	J	Z	j	z	æ	ç			L	L	δ	·
B	VT	ESC	+	;	K	[	k	{	æ	ε			L	L	∞	·
C	FF		,	<	L	\	l	|	i	w			L	L	0	·
D	CR		-	=	M	]	m	}	i	v			L	L	€	·
E	SO		.	>	N	^	n	~	ä	R			L	L	u	·
F	SI		/	?	O	_	o		Å	f			L	L		·

Graphics printer mode CGSET 2 (NLQ mode)

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			!	0	@	P	~	p	S	e	a	⋮	⋮	⋮	α	±
1			"	1	A	Q	a	q	U	æ	i	⋮	⋮	⋮	β	²
2		DC2	#	2	B	R	b	r	e	œ	ó	⋮	⋮	⋮	Γ	³
3	▼		\$	3	C	S	c	s	a	ø	ü	⋮	⋮	⋮	π	¼
4	♦	DC4	%	4	D	T	d	t	ä	ö	ñ	⋮	⋮	⋮	Σ	½
5	♦	S	&	5	E	U	e	u	å	ó	ñ	⋮	⋮	⋮	∞	¾
6	♦		'	6	F	V	f	v	ä	ü	ñ	⋮	⋮	⋮	∞	∞
7	BEL		(	7	G	W	g	w	å	ý	¿	⋮	⋮	⋮	∞	∞
8		CAN	)	8	H	X	h	x	æ	ö	¿	⋮	⋮	⋮	∞	∞
9	HT		*	9	I	Y	i	y	æ	ü	¿	⋮	⋮	⋮	∞	∞
A	LF		+	:	J	Z	j	z	æ	ü	¿	⋮	⋮	⋮	∞	∞
B	VT	ESC	,	;	K	[	k	{	æ	ü	¿	⋮	⋮	⋮	∞	∞
C	FF		-	<	L	\	l	|	æ	ü	¿	⋮	⋮	⋮	∞	∞
D	CR		.	=	M	]	m	~	æ	ü	¿	⋮	⋮	⋮	∞	∞
E	SO		/	>	N	^	n		æ	ü	¿	⋮	⋮	⋮	∞	∞
F	SI			?	O	_	o		æ	ü	¿	⋮	⋮	⋮	∞	∞

APPENDIX B

COMMAND QUICK REFERENCE

(TYPE I)

(P): Effective Proprinter mode only

(G): Effective Graphics printer mode only

B.1 In functional order

(1) Print mode commands

Function	Command		Reference pages
	Set	Reset	
Double-width print	SO ESC SO	DC4, LF, FF, VT, ESC W (0), CR (P), CAN (P)	5, 6, 15, 19, 20, 57
Double-width print	ESC W (1)	ESC W (0)	5, 6
Condensed printing	SI ESC SI	DC2	7, 8, 17
Double-strike (G)	ESC G	ESC H	8, 9, 45, 46
Emphasized printing	ESC E	ESC F	9, 10
Underline mode	ESC - (1)	ESC - (0)	11
Overscore mode (P)	ESC _ (1)	ESC _ (0)	12
Superscript	ESC S (0)	ESC T	13, 14
Subscript	ESC S (1)	ESC T	13, 14

(2) Horizontal movement commands

Function	Command		Reference pages
	Set	Reset	
Backspace (P)	BS	-	15
Carriage return	CR	-	15
Elite pitch (12 CPI)	ESC : (P) ESC M (G)	DC2 (P) ESC P (G)	7, 8, 16, 17, 18
Pica pitch (10 CPI) (G)	ESC P	with another pitch command	16, 17, 18
Absolute print position	ESC \$ (n1) (n2)	-	18

(3) Vertical movement commands

Function	Command		Reference pages
	Set	Reset	
Form feed	FF	-	19
Line feed	LF	-	19, 20
Line feed of (n)/216" (0 to 255/216)	ESC J (n)	-	20
Negative line feed of (n)/216" (0 to 255/216)	ESC j (n)	-	20, 21
Line spacing to 1/8"	ESC 0	with another line spacing	22
Line spacing to (n)/216" (0 to 255/216)	ESC 3 (n)	with another line spacing	22
Line spacing to 7/72"	ESC 1	with another line spacing	22
Line spacing to (n)/72" (0 to 85/72)	ESC A (n)	with another line spacing	22, 23, 24
Line spacing to ESC A (n)	ESC 2	-	23, 24

(4) Tabbing

Function	Command		Reference pages
	Set	Reset	
Execute horizontal tab	HT	-	25, 26
Horizontal tab stops	ESC D (n1) (n2)...(nk) (O)	ESC ℓ (n) (G)	25, 26, 29
Execute vertical tab	VT	-	27
Vertical tab stops	ESC B (n1) (n2)...(nk) (O)	ESC R (P) ESC B (O)	28

(5) Page formatting commands

Function	Command		Reference pages
	Set	Reset	
Right margin (G)	ESC Q (n)	-	29
Left margin (G)	ESC ℓ (n)	-	29
Skip perforation	ESC N (n)	ESC O	30
Page length to (n) lines	ESC C (n)	-	30
Page length to (n) inches	ESC C (O) (n)	-	31
Top of form	ESC 4	-	31

(6) Bit image graphics commands

Function	Command		Reference pages
	Set	Reset	
8-dot image mode	ESC * (m) (n1) (n2) (P1) (P2) ...(Pk)	-	34, 35, 36, 37, 38
9-dot image mode (G)	ESC ^ (m) (n1) (n2) (P1) (P2) ...(Pk)	-	38, 39
Single density mode	ESC K (n1) (n2) (P1) (P2)...(Pk)	-	40, 41, 42
Double density mode	ESC L (n1) (n2) (P1) (P2)...(Pk)	-	40, 41, 42
Double-density and double-speed image	ESC Y (n1) (n2) (P1) (P2)...(Pk)	-	40, 41, 42
Quadruple density image	ESC Z (n1) (n2) (P1) (P2)...(Pk)	-	41, 42

(7) Font control and download commands

Function	Command		Reference pages
	Set	Reset	
Select internal character set	ESC I (0) (P) ESC % (0) (0) (G)	-	43, 46
Select download character set	ESC I (4) (P) ESC % (1) (0) (G)	-	43, 44, 45
Select NLQ character set (P)	ESC I (2) ESC G	ESC I (0) ESC H	8, 9, 43, 45, 46
Select NLQ character set (G)	ESC % (2) (0) ESC x (1)	- ESC x (0)	45, 46
Define download characters (P)	ESC = (C1) (C2) (14)H (d) (a) (0) (P1) (P2) ...(P11)	-	44, 48, 49, 50, 51
Define download characters (G)	ESC & (0) (n) (m) (a) (P1) (P2)...(P11)	-	45, 47, 48, 49, 50
Define NLQ download characters (G)	ESC & (1) (n) (m) (0) (0) (P1) (P2) ...(P48)	-	48, 49, 50, 51, 52, 53
Select NLQ download characters (P)	ESC I (6)	-	53
Select CG set 2	ESC 6	-	53, 55
Select CG set 1	ESC 7	-	53, 55
Select all character set (P)	ESC \ (n1) (n2)	-	54, 55
Select all character set (one character only). (P)	ESC ^	-	54

(8) Miscellaneous commands

Function	Command		Reference pages
	Set	Reset	
Select printer (P)	DC1	ESC Q (3)	56, 57
Sound alarm	BEL	-	57
Cancell	CAN	-	57
Move head to home position	ESC <	-	58
Enable paper out detector	ESC 9	ESC 8	58
Half-speed printing	ESC s (1)	ESC s (0)	58, 59
Reset printer (G)	ESC @	-	59
Unidirectional printing	ESC U (1)	ESC U (0)	59, 60

(9) DX 2000 series color selection commands

Function	Command		Reference pages
	Set	Reset	
Select printer color	ESC r (n)	-	61

B.2 In alphabetical order

(P): Effective Proprietary mode only

(G): Effective Graphics printer mode only

Command		Function	Reference pages
BEL		Sound alarm	57
BS	(P)	Backspace	15
HT		Execute horizontal tab	25, 26
LF		Line feed	19, 20
VT		Execute vertical tab	27
FF		Form feed	19
CR		Carriage return	15
SO		Double-width print	5, 6
SI		Condensed printing	7, 8
DC1	(P)	Select printer	56, 57
DC2		Reset condensed printing	7, 8, 17
DC4		Reset double-width print	5
CAN		Cancell	57
ESC SO		Double-width print	5
ESC SI		Condensed printing	7
ESC \$ (n1) (n2)		Absolute print position	18
ESC % (0) (0)	(G)	Select internal character set	43
ESC % (1) (0)	(G)	Select download character set	43, 45
ESC % (2) (0)	(G)	Select NLQ character set	45
ESC & (0) (n) (m) (a) (P1) (P2)...(P11)	(P1) (G)	Define download characters	45, 47, 48, 49, 50
ESC & (1) (n) (m) (0) (0) (P1) (P2)...(P48)	(G)	Define NLQ download characters	48, 49, 50, 51, 52, 53

Command	Function	Reference pages
ESC * (m) (n1) (n2) (P1) (P2)...(Pk)	8-dot image mode	34, 35, 36, 37, 38
ESC - + n	Underline mode	11
ESC 0	Line spacing to 1/8"	22
ESC 1	Line spacing to 7/72"	22
ESC 2	Line spacing to ESC A (n)	23, 24
ESC 3 (n) (0 to 255/216")	Line spacing to (n)/216"	22
ESC 4	Set top of form	31
ESC 5 (P)	Set automatically line feed	60
ESC 6	Select CG set 2	53, 55
ESC 7	Select CG set 1	53, 55
ESC 8	Disable paper out detector	58
ESC 9	Enable paper out detector	58
ESC : (P)	Set elite pitch (12 CPI)	16, 17
ESC <	Move head to home position	58
ESC = (C1) (C2) (14)H (d) (a) (P1) (P2)...(P11) (P)	Define download characters	44, 48, 49, 50, 51
ESC @ (G)	Reset printer	59
ESC A (n)	Line spacing to (n)/72"	22, 23, 24
ESC B (n1) (n2)...(nk)	Vertical tab stops	28
ESC C (n)	Page length to (n) lines	30
ESC C (0) (n)	Page length to (n) inches	31
ESC D (n1) (n2)...(nk) (0)	Horizontal tab stops	25, 26
ESC E	Emphasized printing	9, 10
ESC F	Reset emphasized printing	9, 10
ESC G	Select NLQ character set (P) Double-strike (G)	8, 9, 45

Command	Function	Reference pages
ESC H	Reset NLQ character set (P) Reset double-strike (G)	8, 9, 46
ESC I (n)	Print mode selection (P)	43, 44, 45, 46, 53
ESC J (n)	Line feed of (n)/216" (0 to 255/216")	20
ESC K (n1) (n2)	Single density mode	40, 41, 42
ESC L (n1) (n2)	Double density mode	40, 41, 42
ESC M	Set elite pitch (G)	16, 17, 18
ESC N (n)	Set skip perforation	30
ESC O	Reset skip perforation	30
ESC P (G)	Pica pitch (10CPI)	16, 17, 18
ESC Q (n) (G)	Right margin	29
ESC Q (3) (P)	Deselect printer	56, 57
ESC R (P)	Reset tab stops	28
ESC S (0)	Super-script	13, 14
ESC S (1)	Sub-script	13, 14
ESC T	Reset script mode	13, 14
ESC U (n)	Unidirectional printing	59, 60
ESC W (n)	Double-width print	5, 6
ESC Y (n1) (n2)	Double density and double speed image	40, 41, 42
ESC Z (n1) (n2)	Quadruple density image	41, 42
ESC \ (n1) (n2) (P)	Select all character set	54, 55
ESC ^ (P)	Select all character set (only one character)	54
ESC ^ (m) (n1) (n2) (G)	9-dot image mode	38, 39
ESC _ (n) (P)	Overscore mode	12
ESC j (n)	Negative line feed of (n)/216" (0 to 255/216")	20, 21
ESC l (n) (G)	Left margin	29

Command	Function	Reference pages
ESC r (n)	Color selection	61
ESC s (n)	Half speed printing	58, 59
ESC x (n)	Print quality selection	45, 46,

