Operating Instructions

Impact Dot Matrix Printer

KX-P1595

Panasonic

Before operating this unit, please read these instructions completely.

This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications set forth in Subpart J of Part 15 of the FCC Rules. If this equipment does cause interference to radio or television reception which can be determined by turning the equipment on and off, use the equipment in another location and/or utilize and electrical outlet different from that used by the receiver. When using special accessories such as cable, the user should use accessories recommended in these operating instructions or supplied by the manufacturer to comply with the limits for a Class B computing device pursuant to subpart J of Part 15 of FCC Rules.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR ANY TYPE OF MOISTURE.

The serial number of the unit may be found on the label on the bottom of the unit. For your convenience, note this number below, and retain this book, along with your proof of purchase, to serve as a permanent record of your purchase in the event of a theft, or for future reference.

MODEL NO. **KX-P1595** NAME OF DEALER _____

SERIAL NO. _____ DATE OF PURCHASE _____

DISCLAIMER

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FX 1050.

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INTRODUCTION

1.1 Product Overview

This printer is a high quality impact dot matrix printer designed for use with a wide variety of computers in a business environment. This printer can also be used to provide a printout from computer terminals connected to a network.

This printer is rated at 240 characters per second (cps) and can print bi-directionally, i.e., left-to-right and right-to-left. The printer has three basic print fonts—Draft, Courier Near Letter Quality (NLQ) and Bold PS NLQ. It also has 5 character pitch selections. They are 10, 12, 15 & 17 characters per inch (cpi) and proportional spacing (ps). These modes can be selected by front panel switches or by software control codes. This printer also has a graphics mode. In this mode the user can create charts, graphs, or other illustrations.

This printer uses a nine pin print head to form a 9×9 dot matrix character in draft mode. In near letter quality mode, the matrix is 18×18. The standard character set consists of 96 ASCII characters which can be printed in the conventional font or in italics. DIP switches allow the user to select alternate IBM® character sets. With these sets, block graphics or line graphics are available. The user can also select 11 international character sets.

Characters can be printed in Pica (10 cpi) or Elite (12 cpi) pitch. The printer also has a 15 cpi mode and a compressed mode of 17 cpi which is very useful when printing spread sheets or other 233 column format documents. The appearance of a standard printout can be enhanced by using proportional spacing. In this mode, the spacing of each character varies. For example, an "I" will take up less space than an "M" or a "W". Proportional spacing gives the document a typeset appearance.

Tractor feed and friction feed are both standard on this printer. This allows the printer to accommodate a wide range of paper styles-fanfold, single sheet. The unidirectional tractor option allows paper to be fed from beneath the printer.

Also, the printer uses "push" tractors. Therefore, pre-printed forms can be used without the need to skip a form when advancing to the next one. The printer also has a forms length selector on the front panel. The user can select the length of the form between 3" (76 mm) to 12" (305 mm). This is very useful when printing on non-standard paper sizes such as mailing labels.

The print head life is designed for 100 million characters. The seamless fabric ribbon has an operating life of 3 million characters. The ribbon cassette design makes changing the ribbon easy and clean.

This printer has both Centronics parallel and RS-232-C serial interfaces as standard. The RS-232-C interface supports the XON/XOFF and DTR handshaking protocols at baud rates up to 9600 bps. The printer also comes equipped with an internal standard 15K buffer. The entire buffer area can be used as a receiving buffer or a portion can be used as a download font area. The buffer area assignment is selected by DIP switches. An additional 32K buffer is available as an option. This expands the total buffer size to 47K.

For software compatibility, this printer has two software command sets. The Standard/IBM Printer mode allows the printer to use standard Panasonic KX-P1595 codes (compatible with FX-100™ codes) or to emulate the IBM Matrix or Graphics printers. The Daisy Printer mode allows it to emulate the Diablo® 630 daisy wheel printer.

1.3 Specifications

Power requirements:	AC 120 V (60 Hz)
Current:	2.5 A
Fuses:	4 A 125 V, 3.0 A 250 V
Print fonts:	Draft, Near Letter Quality (Courier, Bold PS)
Character sets:	96 ASCII characters, 96 Italic ASCII characters, 32 International characters (11 countries), 32 Italic International characters (11 countries), 64 Block Graphics, 132 IBM-PC® special characters, 82 Italic IBM-PC special characters
Dot configuration:	3/254 inch (0.3 mm) dot diameter

	Draft	NLQ
Dot alignment (Hor.×Ver.)	9×9	18×18
Dot pitch (Hor.)	1/120" (0.21 mm)	1/240" (0.11 mm)
(Ver.)	1/72" (0.35 mm)	1/144" (0.18 mm)

Character size	
Ordinary characters:	0.078 (W)×0.095 (H) in. (1.99×2.42 mm)
Superscript/subscript characters:	0.078 (W)×0.053 (H) in. (1.99×1.36 mm)
Number of characters per line (per inch (25.4 mm)):	

Pica (Draft, NLQ)	136 cpl (10 cpi)
Elite (Draft, NLQ)	163 cpl (12 cpi)
Mikron (Draft, NLQ)	204 cpl (15 cpi)
Compressed (Draft, NLQ)	233 cpl (17 cpi)
Pica elongated	68 cpl (5 cpi)
Elite elongated	81 cpl (6 cpi)
Mikron elongated	102 cpl (7.5 cpi)
Compressed elongated	116 cpl (8.5 cpi)

Printing speed:	
Draft-Pica	240 cps
Draft-Elite	240 cps
Near Letter Quality (Pica)	51 cps
White Spacing	360 cps
Printing direction:	
Text printing:	Bi-directional
Bit Image printing:	Single direction (left to right)
New line time:	Approx. 100 msec [with 1/6 inch (4.2 mm) line feeding]
Paper feed:	Tractor feed (with fanfold paper) Friction feed (with single sheet)
Paper used:	Fanfold paper Width: 4~16.5 inches (102~394 mm) Thickness (paper weight in pound): 11~17 pounds Single Sheet Width: 4~16.5 inches (102~419 mm) Height: 5~14.3 inches (127~363 mm) Thickness (paper weight in pound): 11~24 pounds (only 1 sheet)
Paper thickness:	0.013 inch (0.32 mm) maximum
Copies:	Original and 3 copies
Storage environment:	−4°F (−20°C) to 140°F (60°C) temperature, 10~90% humidity
Operating environment:	41°F (5°C) to 104°F (40°C) temperature, 20~80% humidity (Please allow printer to stabilize at room temperature within the operating temperature range before operation.)
Head service life:	100 million characters in draft mode
Ribbon:	Cassette seamless fabric ribbon Service life: Approx. 3 million characters in draft mode
Dimensions:	24 (W)×15.4 (D)×6.1 (H) in. (610×390×155 mm)
Weight:	32.4 lbs (14.7 kg)

INSTALLATION

2.1 Unpacking and Inspection

Carefully open the shipping carton and remove the contents. The carton should contain the following items.

Printer
Ribbon Cassette (1)
Paper Separator (1)
Operating Instructions Manual

Inspect the printer and accessories for damage. Report damages or shortages to the store from which the unit was purchased. Inside the front cover is an area for recording important information regarding the printer.

2.2 Site Requirements

This printer can be installed in any normal office environment. No special wiring or cooling is required. However, a minimum of 4" (10 cm) clearance on all sides is necessary to insure proper ventilation. The printer should be placed on a flat horizontal surface away from a heater or other heat source. The printer should not be used in an excessively humid or dusty environment. Table 2.1 lists the operating requirements of the printer.

Line Voltage	AC120 V
Frequency	60 Hz
Temperature	41~104°F (5~40°C)
Humidity	20~80%

Table 2.1 Installation Requirements

2.3 Initial Setup

Removing the printer cover

To remove the smoked plastic cover and the top cover, lift them in the directions shown in Figure 2.1.

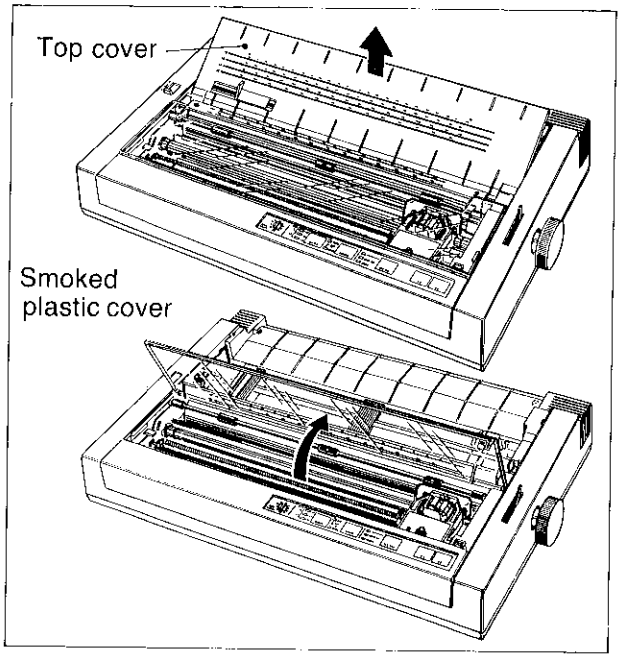


Figure 2.1 Removing the Printer Covers
Remove the protective paper around the platen.

Removing the carriage stopper

To prevent damage to the print head during transit, the carriage is held in place by a carriage stopper. This stopper must be removed prior to operating the unit.
Figure 2.2 shows the location of the stopper. Be sure to replace it before transporting the printer.

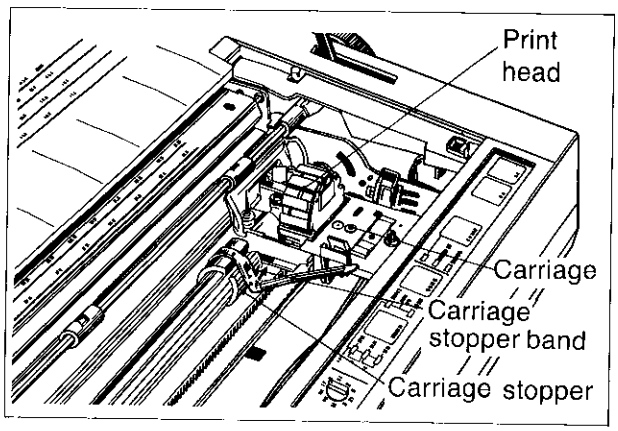


Figure 2.2 Removing the Carriage Stopper

Mounting the ribbon cassette

Refer to Figure 2.3A and 2.3B. Make sure the printer is off. Gently slide the print head carriage toward the center of the unit. Prior to installing the cassette, remove any slack in the ribbon by rotating the knob on the cassette counterclockwise. Position the cassette over the print head and lower it in place as shown in Figure 2.3C. Visually insure that the ribbon slips between the nose cover and the nose of the print head. Gently, but firmly, press down on the cassette until the two wing tabs snap into place.

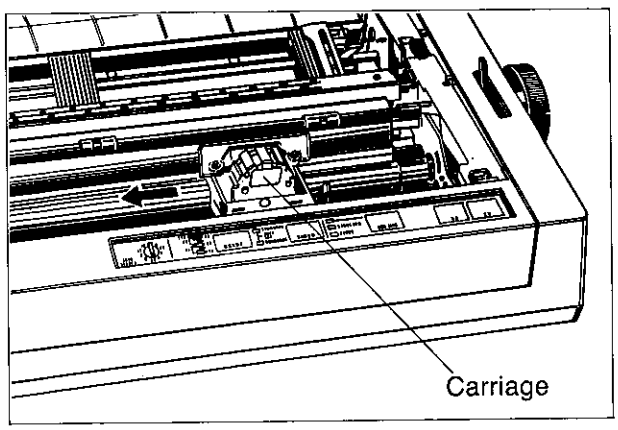


Figure 2.3A Positioning the Carriage

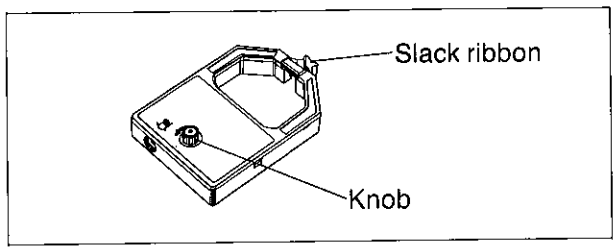


Figure 2.3B Removing the Ribbon Slack

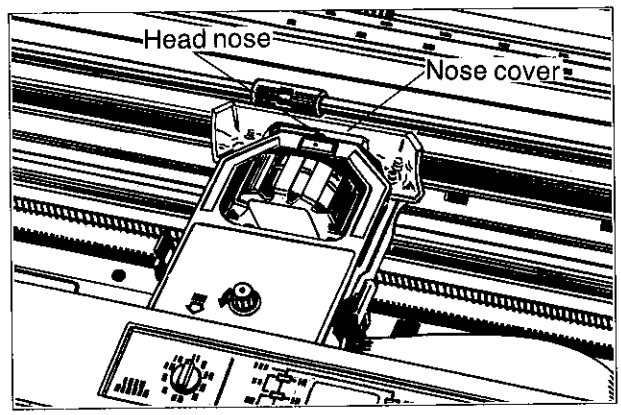


Figure 2.3C Installing the Ribbon Cassette

To remove the cassette, gently spread the wing tabs and lift up the cassette.

Mounting the paper separator

Paper separator insures the smooth flow of continuous or fanfold paper. Figure 2.4 shows how to install the separator. Install separator in the holes at the top-rear of the case.

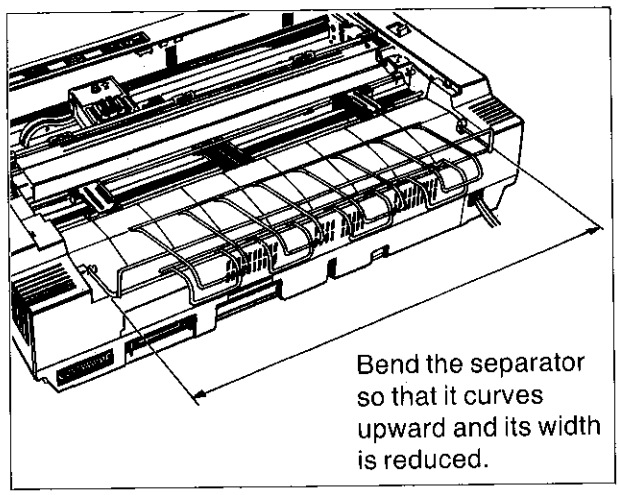


Figure 2.4 Installing the Paper Separator

Installing the paper

This printer paper feed mechanism can handle single sheet paper or fanfold paper. Alternating between the two is accomplished by the lever on the left side of the printer labeled "F" (friction) and "T" (tractor). In the friction mode the paper is held by pinch rollers which press the paper against the platen. This mode is used for single sheets. The tractor mode is for use with fanfold paper. This printer uses pusher-type tractors. This allows multiple forms to be used without wasting a copy between printouts. Refer to following paper installing procedures and Appendix G (paper) and Appendix H (printing area).

Single Sheet

To install a single sheet of paper, follow these procedures:

- Turn the power switch ON. A one second beep will sound.
- Place the PAPER FEED selector in the "F" position. Refer to Figure 2.5A.

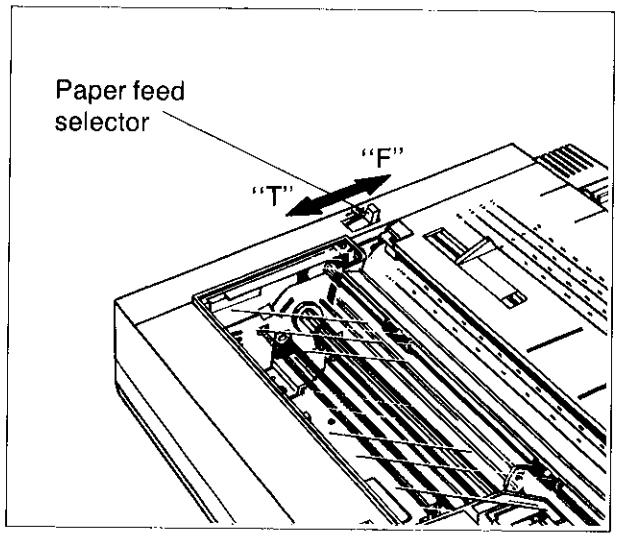


Figure 2.5A Paper Feed Selector

- Stand the top cover and insert the paper as Figure 2.5B shows behind the platen. Use the markings and the paper guide on the top cover as a guide.

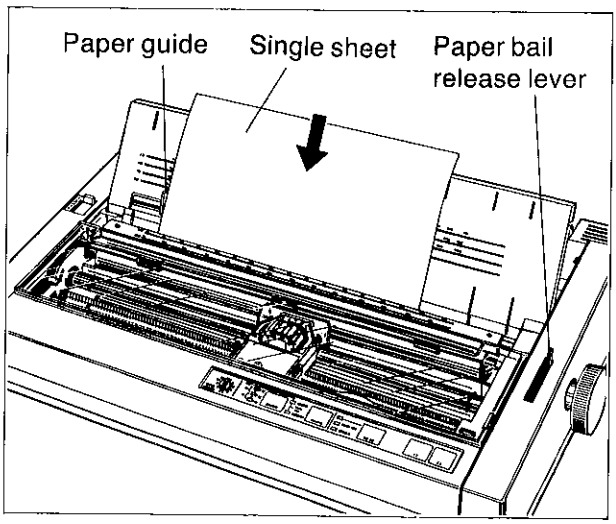


Figure 2.5B Inserting a Single Sheet

- Pull the paper bail release lever to far front of the printer to wrap the paper automatically around the platen. Then push back the paper bail release lever back into its original position.
- Press down and hold the line feed switch (LF) to advance the paper.
- To align the paper horizontally or vertically, set the PAPER FEED selector to the "T" position. This releases the pinch rollers and allows the paper to be positioned as required. Set the selector back to "F" before printing.

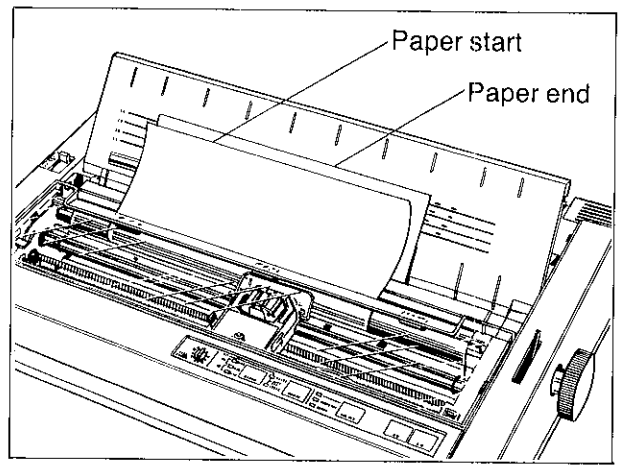


Figure 2.5C Aligning a Single Sheet

Fanfold Paper

The following steps describe how to load fanfold paper:

- Turn the power switch ON. A one second beep will sound.
- Remove the top cover as shown in Figure 2.6A.

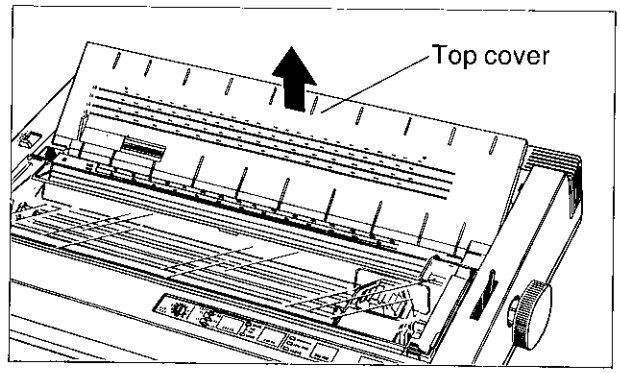


Figure 2.6A Removing the Top Cover

- Refer to Figures 2.6B and 2.6C. Unlock the tractors by pulling forward on the tractor clamping levers.
- Slide the tractors out toward the sides and raise the covers.

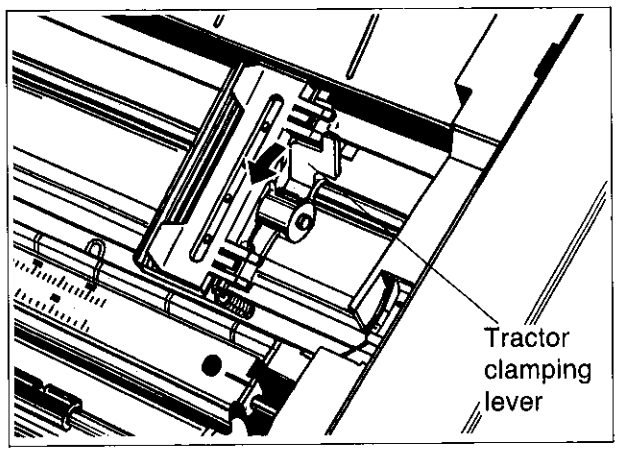


Figure 2.6B Unlocking the Tractors

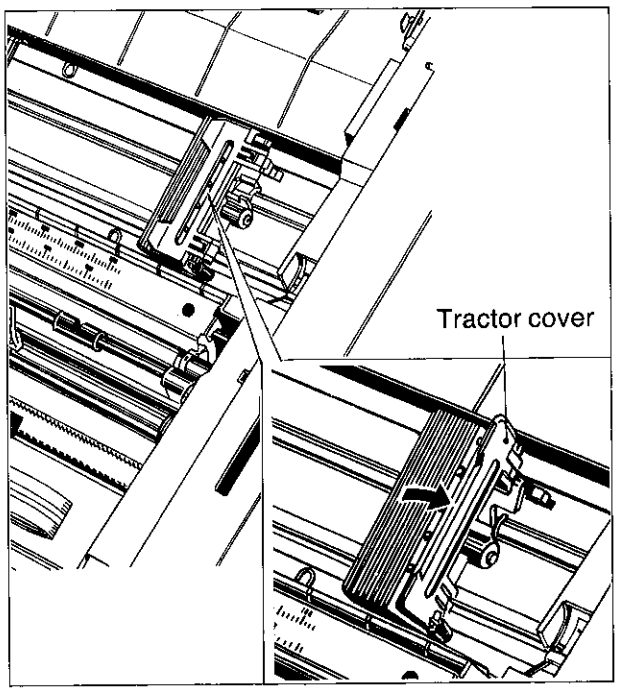


Figure 2.6C Raising the Tractor Cover

- Place the PAPER FEED selector in the "T" position.
- Align 4~5 paper sprocket holes with the tractor pins and close the tractor covers.
- Center the paper horizontally without any slack, using the scale on the scale plate as a guide. The printer will print between 0 and 136 on the scale (PICA). Press back on the tractor clamping levers locking the tractors in place.
- Pull the paper bail release lever toward you.
- Press down and hold the line feed switch (LF) to advance the paper and stop the paper just before it reaches the smoked plastic cover.
- Push the paper bail release lever toward the platen.
- Press down and hold the line feed switch (LF) to advance the paper.
- Rotate the platen knob in the reverse direction to adjust printing position.

- Replace the top cover as shown in Figure 2.6D.

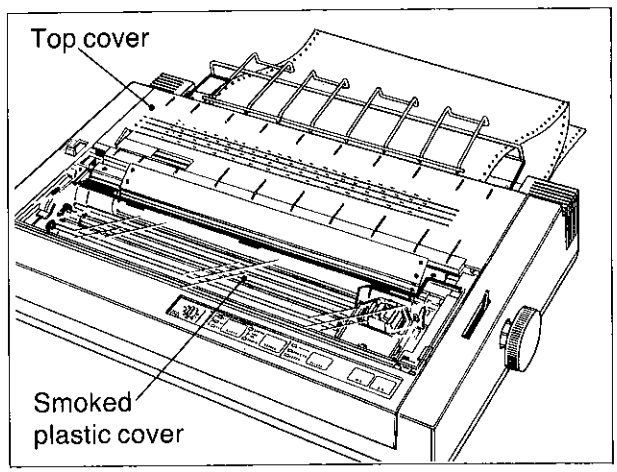


Figure 2.6D Replacing the Top Cover

Aligning the top of form

This printer has a line counter which keeps track of the vertical position of the print head. Each time power is turned on the line counter is reset and the current position of the head is designated as line one. This location is referred to as TOP OF FORM. A page is defined by the FORM LENGTH switch on the front panel or by the Page Length Designation command. The first line of text will begin 1/6" (4.2 mm) from the top edge of the back tension plate.

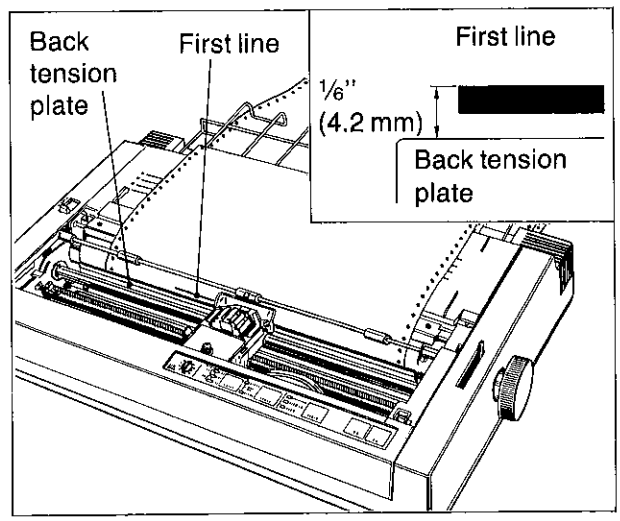


Figure 2.7 Setting the Top of Form

Adjusting the printing head gap

The distance between the printing head and platen can be adjusted to compensate for the thickness of the paper.

Figure 2.8 shows the location of the head gap lever.
The 6-position head gap lever moves the print head closer to or farther away from the platen approx. 0.0028 inch (0.07 mm) per step. To avoid the possibility of print head or ribbon damage, the head gap lever should always be set to the upper position (−) when printing on single sheet paper. For thick paper or multi-part forms, move the lever toward the lower position (+).
Maximum paper thickness is 0.013 inch (0.32 mm).

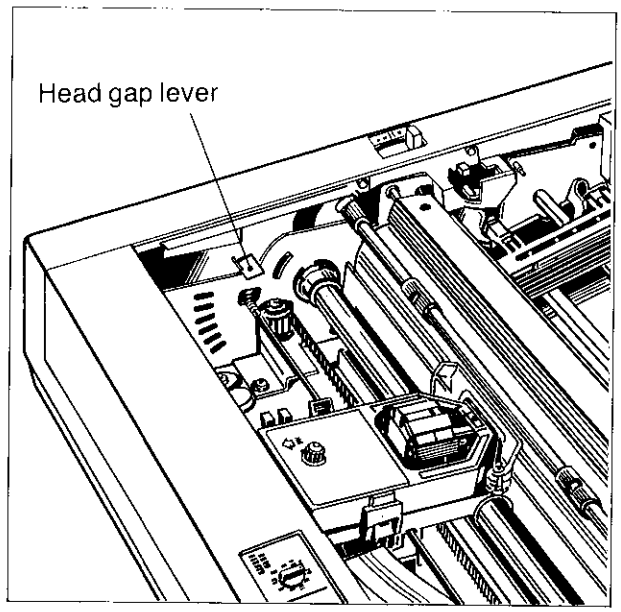


Figure 2.8 Adjusting the Head Gap

HEAD GAP LEVER ADJUSTMENT
Be sure to set the lever properly.

−	1	1 sheet (17 lbs)
	2-3	3 non-carbon multi-layer sheets (11 lbs)
+	4-6	When more gap required

Stacking the paper

- To insure smooth paper flow when using fanfold paper, be sure the paper is not stacked higher than the paper separator. By feeding the paper as shown in Figure 2.9, the weight of the paper will provide reverse tension. The paper should be directly behind the printer and not off to one side.

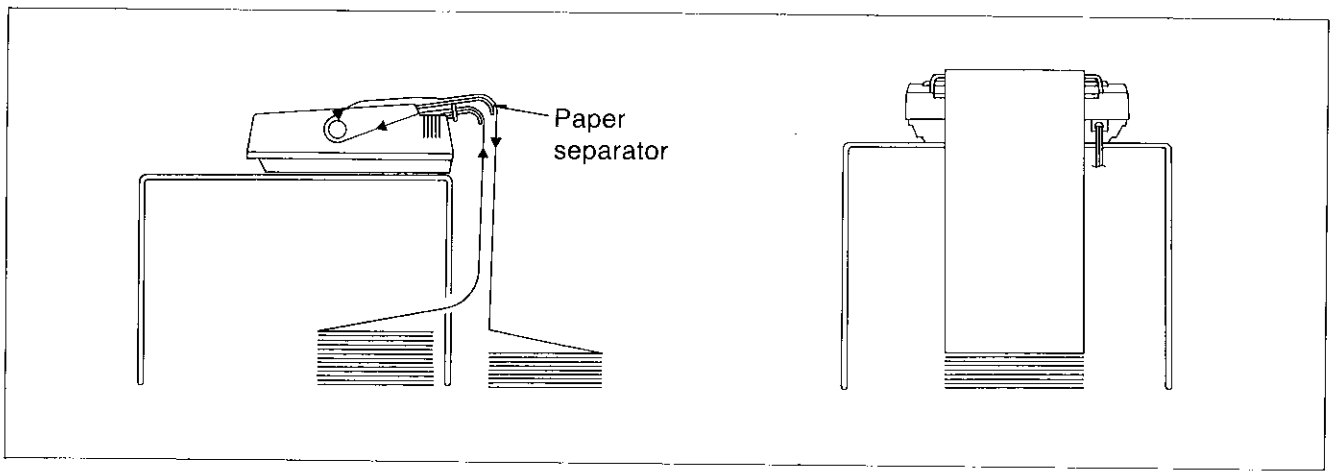


Figure 2.9 Stacking the Paper

3.1 Switches and Indicators

Power switch

The power switch is located on the left side of the printer towards the rear. It is used to turn the AC power ON or OFF. When power is supplied to the printer the power indicator light on the front panel will be lit.

Line feed switch

The switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. Pressing this switch will cause the paper to advance one line. Multiple line feeds can be performed by holding the switch down. If a LINE FEED command advances the print head into the skip perforation area, the paper will advance to the top of the next page.

Form feed switch

The switch is active in the OFF LINE mode and when the printer is not printing in ON LINE mode. Pressing the FF switch will advance the paper from its current location to the top of the next page. Then a new top of form is established.

On-line switch

The ON LINE switch is an alternate action switch which opens and closes the communications line with the computer. When the power switch is turned on, the printer will power up in the ON LINE mode if paper is installed and the smoked plastic cover is closed. If paper is not installed or the smoked plastic cover is opened, the printer will power up in the OFF LINE mode. The printer can be switched between the ON LINE and OFF LINE modes by pressing the ON LINE switch.

If the printer is in the ON LINE mode and a Paper Out condition occurs, or the smoked plastic cover is raised, or the ON LINE switch is pressed, the printer will switch to the OFF LINE mode and the indicator light will be out.

In the ON LINE mode, the printer is able to receive information from the computer and the ON LINE indicator will be lit. When OFF LINE, the indicator light will be out and the printer can no longer receive data. Refer to Figure 3.1.

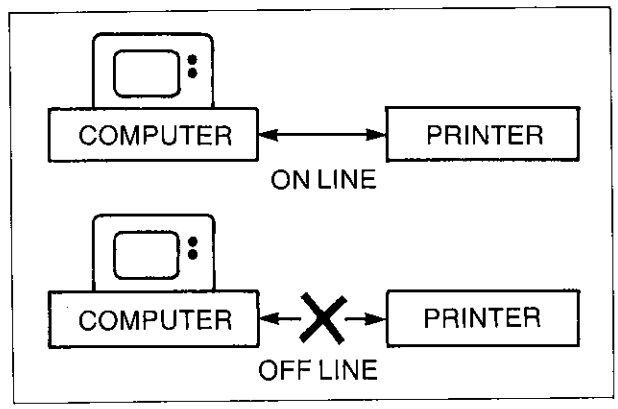


Figure 3.1 ON LINE & OFF LINE

Print mode selector switch

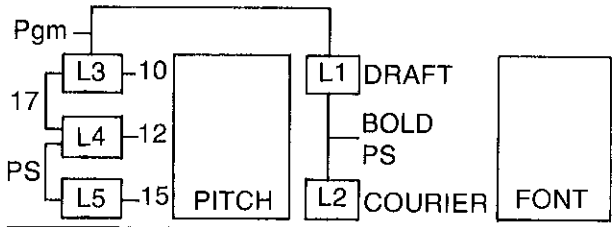
A. Font selector switch

The printer has three basic print fonts—Draft, Courier Near Letter Quality (NLQ) and Bold PS NLQ. The FONT selector switch allows the user to change between these print styles. The light on the front panel indicates the current print font. The default condition (the mode selected when power is turned on) is DRAFT. When the switch is pressed the print font will advance to the next position. Table 3.1 shows the status of the lights for each font.

B. Pitch selector switch

This printer has 5 character pitch selections. They are 10, 12, 15 & 17 characters per inch (cpi) and proportional spacing (PS). The PITCH selector switch allows the user to change between these character pitches. The light on the front panel indicates the current character pitch. The default condition (the pitch selected when power is turned on) is 10 cpi. When the switch is pressed the pitch will advance to the next position. Table 3.1 shows the status of the lights for each character pitch.

NOTE: Print mode selections through software commands can be made only while the printer is in Pgm (DRAFT, 10 cpi) mode. The indicator lights will not change when the mode is changed under software control.



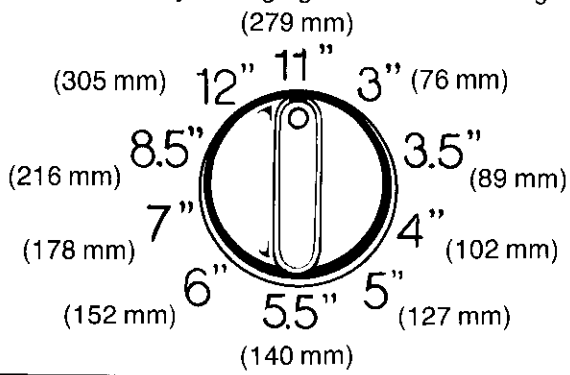
	L1	L2	FONT
1	ON	OFF	DRAFT
2	OFF	ON	COURIER NLQ
3	ON	ON	BOLD PS NLQ

	L3	L4	L5	PITCH
1	ON	OFF	OFF	10 CPI
2	OFF	ON	OFF	12 CPI
3	OFF	OFF	ON	15 CPI
4	ON	ON	OFF	17 CPI
5	OFF	ON	ON	PS

Table 3.1 Font and Pitch Selector Switch Settings

Form length selector switch

The Form Length selector switch sets the form length in inches. The setting of the switch is sensed automatically when the power is turned on or when the switch setting is changed. A new top of form position is set each time the form length is changed, either through the Form Length software command or by changing the switch setting.



Reset switch

The Reset switch is located on the right side of the printer towards the rear. It is used to initialize the printer. When this switch pushed, printer is initialized as if the $\overline{\text{PRIME}}$ signal were received. However, Download character buffer is not cleared.

3.2 Detectors

Out of paper detector

This printer has two paper out detectors. One is located under the platen. The other is located at the bottom and used only with the bottom feed tractor option. They sense the absence of paper. When an out of paper condition occurs, the printing stops, the printer goes to the OFF LINE mode, and the alarm sounds, and the Paper Out light is lit. To continue printing to the end of current paper when out of paper condition occurs, press the ON LINE switch. To resume printing after paper out condition, install the paper and press the ON LINE switch. The printer will start printing.

The Paper Out detector will be disabled under the following conditions:

- The paper feed selector is set to friction feed.
- DIP switch SW2-3 is ON.
- The paper out detector is disabled by a software command.
- The smoked plastic cover is open.

The Paper Out light will be lit even if the paper out detector is disabled when the paper feed selector is set to tractor feed.

Over heat detector

If the printer is printing continuously for extended periods of time, the printhead may become overheated. When this occurs, an internal protective circuit will cause the printer to quit printing and the alarm will sound at one second intervals. This condition will remain in effect until the head temperature decreases sufficiently, at which time the printer will automatically resume printing.

Cover open detector

When the smoked plastic cover is opened, the printer detects it and goes to the OFF LINE mode after printing to the end of the current line. The print head moves to the auto paper loading position and sounds the alarm five times. When ON LINE switch is pressed after closing the cover, the print head travels to the far right stop to check for jamming, then returns to the home position, and the printer will start printing.

3.3 DIP Switches

DIP switches allow the user to set certain operating conditions of the printer. The switches are read into memory on power up. These memory locations then contain an image of the switch settings. The computer can change the contents of the memory and thereby effectively change the switch settings. Character sets, skip perforation etc. can be changed in this manner. Refer to section 5.3 and 6.3 for information regarding software control of the switches.

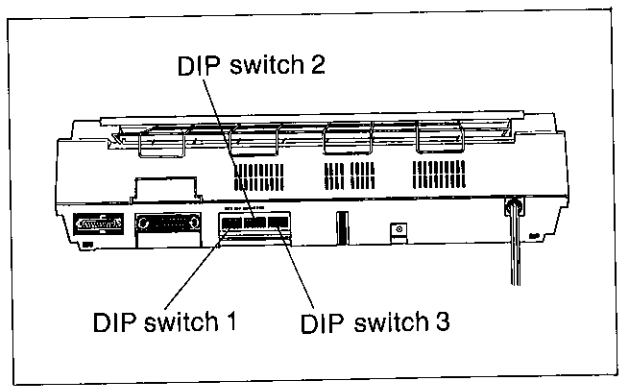


Figure 3.2 Location of DIP switches

Figure 3.2 shows the location of the DIP switches at the rear of the printer. Table 3.2 lists the settings of switch banks SW1, SW2 and SW3.

DIP switch settings

SW1-1, -2, & -3 Printer Mode

These three switches select the printer mode and thus which of the five character sets will be used. Table 3.3 lists the settings for each mode and Appendix A shows the character sets.

SW1-4 Auto Line Feed

ON	A line feed (LF) command is added to each carriage return (CR) command received.
OFF	Performs a carriage return only. Computer must supply a LF command.

SW1-5 Skip Perforation

ON	Total of 1 inch (25.4 mm) margin is skipped before and after the page perforation.
OFF	Printing is continuous. No margins around perforation.

The setting can be changed by the computer. Refer to Section 5.3 and 6.3.

SW1-6, -7, & -8 International Character Set

Selects one of 8 international character sets. Table 3.4 shows the settings. The character sets are located in Appendix A. These settings can be changed by the computer. Refer to section 5.1. International character set selection by these switches is ineffective in IBM-PC Graphics-G1, G2 modes.

SW2-1 and SW2-2 Buffer Size

The printer has 15K of internal buffer space standard. It can be expanded up to 47K with the addition of the 32K RAM buffer option. The buffer can be divided between receive buffer space and download character space. Table 3.6 shows how the space can be allocated. These settings cannot be changed through software commands.

SW2-3 Paper Out Detector

ON	Detector is ignored.
OFF	Detector is active.

This setting is effective only in tractor feed mode. In friction feed mode the paper out detector is ignored. The setting can be changed through software command.

SW2-4 Zero Font

This switch selects the zero font.

ON	Zero=Ø
OFF	Zero=0

The setting cannot be changed through software command.

SW2-5 Alarm

This switch determines if the alarm is enabled or disabled.

ON	Alarm sounds
OFF	Alarm does not sound

SW2-6 Cut Sheet Feeder

The form length is normally controlled by the Page Length selector switch on the front panel or by a software command. However, the paper feed mechanism of the cut sheet feeder requires that the form length be set to 15 inches (381 mm). When the cut sheet feeder option is used, SW2-6 must set to the ON position for the form feed to function properly. If a cut sheet feeder is not used, SW2-6 should be in the OFF position.

SW2-7 7 Bit/8 Bit

ON	=7 Bit Word
OFF	=8 Bit Word

When serial interface is used, this switch decides bit length per word (7 bit or 8 bit).

SW2-8 Interface

This switch selects the parallel or serial interface.

ON	Serial interface
OFF	Parallel interface

SW3-1, SW3-2 and SW3-3 Baud Rate

The printer baud rate can be set to that of the computer by using SW3-1, SW3-2, and SW3-3. Refer to Table 3.5.

SW3-4 Selection of Parity Check

"Parity Check" is an error-checking system to check received data errors.

ON	With parity check (Valid)
OFF	Without parity check (Invalid)

SW3-5 Odd/Even Parity

When the computer is using a parity check system, set SW3-5 to odd or even parity to match that of the computer.

ON	Even parity
OFF	Odd parity

SW3-6 Protocol

DTR protocol indicates the printer condition with DTR signal. XON/XOFF protocol indicates the printer condition in ASCII code corresponding to XON/XOFF.

ON	DTR Protocol
OFF	XON/XOFF Protocol

SW3-7 Remaining Buffer Capacity

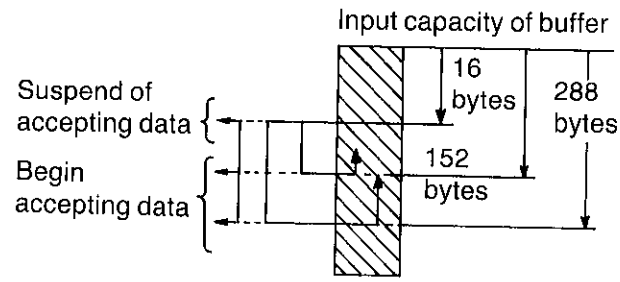
When the computer's data transferring speed is faster than the printer's data processing speed, the printer buffer will gradually fill. The input capacity of the buffer is 2048 bytes. So when the number of bytes remaining in the buffer becomes 16, the printer instructs the computer to suspend the transfer of data through reverse channel (DTR or XOFF signal), and the printer itself temporarily ceases to accept data.

When the number of bytes remaining in the buffer increases to a designated amount, the printer resumes accepting data. This designated amount can be set as follows:

Buffer full recovery timing

Remaining Buffer Capacity	SW3-7
152 Bytes	ON
288 Bytes	OFF

The reverse channel (DTR or XON/XOFF) sequence by number of bytes remaining in the buffer is as follows.



1. When the number of bytes remaining becomes 16, a signal is sent to the computer through reverse channel (setting DTR off or sending XOFF code), and blocks the data input after this time.
2. When data processing continues after the blocking of data input, the number of bytes remaining in the buffer increases.
3. When the number of bytes remaining reaches the number designated (152, 288 bytes), the printer sets DTR on or sends XON code and then resumes accepting data.

SW3-8 Designation for Signal Polarity of Reverse Channel

Adjust the signal polarity of the printer to match that of the computer by setting adapter DIP switch SW3-8.

ON	When the signal is "space", the printer tells the computer that it can not accept transferring data.
OFF	When the signal is "mark", the printer tells the computer that it can not accept transferring data.

SWITCH NUMBER	FUNCTION	ON	OFF	POSITION WHEN SHIPPED
SW1-1 SW1-2 SW1-3	Printer Mode	See Printer Mode Chart		ON ON ON
SW1-4	Auto Line Feed	CR+LF	CR Only	OFF
SW1-5	Skip Perforation	1 inch (25.4 mm) skip	No skip	OFF
SW1-6 SW1-7 SW1-8	International Character Set	See International Character Set Chart		ON ON ON
SW2-1 SW2-2	Buffer Size	See Buffer Size Chart		ON OFF
SW2-3	Paper Out Detector	Disabled	Enabled	OFF
SW2-4	Zero Font	Ø	0	OFF
SW2-5	Alarm	Enabled	Disabled	ON
SW2-6	Cut Sheet Feeder Option	Installed	Not Installed	OFF
SW2-7	7 bit/8 bit	7 bit	8 bit	OFF
SW2-8	Interface	Serial	Parallel	OFF
SW3-1 SW3-2 SW3-3	Baud rate	See Baud Rate Chart		ON ON OFF
SW3-4	Parity check	Valid	Invalid	OFF
SW3-5	Parity bit	Even	Odd	OFF
SW3-6	Protocol	DTR	XON/XOFF	ON
SW3-7	Remaining buffer capacity	152 bytes	288 bytes	OFF
SW3-8	Signal polarity	Reversed	Normal	OFF

Table 3.2 DIP Switch Settings

Note: SW3-1 though SW3-8 apply only when the serial interface is used (SW2-8 is ON).

SW1-1	SW1-2	SW1-3	PRINTER MODE
ON	ON	ON	**Standard Mode** ASCII = 96 Italic ASCII = 96 International = 32 Italic International = 32
OFF	ON	ON	**IBM-PC Matrix Mode** ASCII = 96 Block Graphics = 64 International Characters = 32
ON	OFF	ON	**IBM-PC Graphics-G1** ASCII = 96 Special Characters = 95
OFF	OFF	ON	**IBM-PC Graphics-G2** ASCII = 96 Special Characters = 132
ON	ON	OFF	**Daisy Printer Mode** ASCII = 96 Italic ASCII = 96 International = 32 Italic International = 32

Table 3.3 Printer Mode

SW1-6	SW1-7	SW1-8	INTERNATIONAL CHARACTER SET
ON	ON	ON	USA
OFF	ON	ON	FRANCE
ON	OFF	ON	GERMANY
OFF	OFF	ON	ENGLAND
ON	ON	OFF	DENMARK I
OFF	ON	OFF	SWEDEN
ON	OFF	OFF	ITALY
OFF	OFF	OFF	SPAIN

Table 3.4 Int'l Character Set

SW3-1	SW3-2	SW3-3	BAUD RATE (BPS)
ON	ON	ON	75
OFF	ON	ON	110
ON	OFF	ON	134.5
OFF	OFF	ON	300
ON	ON	OFF	1200
OFF	ON	OFF	2400
ON	OFF	OFF	4800
OFF	OFF	OFF	9600

Table 3.5 Baud Rate

		15K BUFFER		47K BUFFER	
SW2-1	SW2-2	BUFFER	DOWNLOAD	BUFFER	DOWNLOAD
ON	ON	15K	0K	47K	0K
OFF	ON	7K	7K	39K	7K
ON	OFF	7K	7K	7K	35K
OFF	OFF	4K	10K	4K	38K

Table 3.6 Buffer Size

3.4 Initialization

A. Power up sequence

The following procedures should be followed when turning the printer on:

1. Insure that the print carriage stopper has been removed.
2. Load the paper and set the paper feed selector.
3. Be sure the ribbon is installed correctly.
4. Set the DIP switches as required.
5. Turn the power switch off and plug the power cord into an outlet of the proper rating.
6. Turn the power on.

B. Initialization

The printer is initialized under the following conditions:

—the AC power is turned on
—the $\overline{\text{PRIME}}$ signal is received
—the RESET command (ESC+@) is received
—the RESET switch depressed

When the printer is initialized, the following conditions are set:

—the print head goes to the home position
—the print buffer is cleared
—the receive buffer is cleared (not cleared by RESET PRINTER command)
—vertical tab settings are cleared
—horizontal tabs are set every 8 columns (Standard/IBM Printer Mode)
—horizontal tabs are cleared (Daisy Printer Mode)
—the DIP switches are read and printer modes set
—print mode is set to draft mode (Pgm) by power on
—print mode set by selector switch is not changed by $\overline{\text{PRIME}}$ signal, RESET PRINTER command* or RESET switch
—present form position is designated as top of form
—all modes set by control and escape commands will be cleared
—the printer goes ON LINE
—the form length is set according to the position of the form length selector switch.
—the download character buffer is cleared (not cleared by RESET switch)

*Some software packages send $\overline{\text{PRIME}}$ signal at the top of their programs. Print modes set by the selector switch will not change.

3.5 Self Test

The printer has a self test feature which allows the user to test the printer independently. The mode is entered by turning on the power switch while pressing down the line feed (LF) switch. All 96 ASCII characters will be printed continuously until the power is turned off.
The print mode selector is active in self test. Even though the printer is in the Pgm mode when turned on, other modes can be tested by pressing the print mode selector.
The self test printing stops automatically in approx. 15 minutes (with draft character printing).
To release the self test mode turn the power off.
When the smoked plastic cover is opened or an out of paper condition occurs, the self test mode will be stopped.

3.6 Hex. Dump

The HEX. DUMP mode is activated by turning on the power while pressing both the line feed (LF) and form feed (FF) switches. In this mode, all data received from the computer is printed in hex. code instead of the normal ASCII characters. Function codes for the printer (CR, LF, HT, etc.) are not executed. To reset the mode, turn the power off, then back on.

SOFTWARE INTRODUCTION

4.1 Introduction

In order for a computer to communicate with a printer, both pieces of equipment must understand a common language or coding scheme. One such coding scheme is called ASCII (American Standard Code for Information Interchange). As an example, the ASCII code for the character "K" can be expressed in any of the following forms:

$(01001011)_2$—Binary
4B HEX, $4B_H$—Hexadecimal
75 DEC, 75_D—Decimal

Many computers allow you to enter ASCII codes in hexadecimal form. Most computers which support ASCII allow the input to be in decimal form. Many allow you to enter the code in either form. Once entered, the ASCII codes are converted to binary form by the computer and then sent to the printer.

In the sections which follow, you will see how to enter various ASCII codes to enable the printer to perform the functions you would like. Since the decimal equivalent of the ASCII code is most commonly used, all examples which follow will use the decimal form.

Appendix A contains the ASCII character and control command tables used by this printer.

4.2 Control Codes

The various printer functions are set through the use of control codes, which consist of one or more ASCII characters entered into the computer in a special way. These control codes often differ from printer to printer. Control codes generally fall into two categories: one-byte control codes and multi-byte control codes. The multi-byte control codes are often referred to as Escape Sequences since each code begins with the ASCII code for the ESCAPE character (ESC). Such an ESC character should not be confused with the Escape Key found on some computer keyboards.

Control codes can be sent to this printer from your computer in different ways. The three most common ways are:

- Through commercial software packages
- Directly from the keyboard
- From within a user-written program

The latter two methods will specifically reference the BASIC language, although other languages such as FORTRAN, PASCAL, etc., can also be used. We will use BASIC since it is relatively easy language to use. In addition it is the most commonly used microcomputer language.

4.3 Entering Control Codes through Commercial Software Packages

Many computer users do not have the time, the expertise, or the interest to develop software suited for their applications. In such cases software written by professionals can be purchased. Such software should be selected not only to meet the needs of the user, but must also be compatible with both computer and printer.

Commercial software is often written with what is called a driver. A driver is that part of the software which allows the user to configure the package to the type of printer and interface being used. Once the software has been booted, the user is generally requested to supply additional information such as:

- Brand/Model of printer being used.
- Slot number in which interface card is installed.
- Baud rate, parity, etc. if a serial interface is being used.

Once the necessary information has been supplied, the software will provide the computer with the control codes and other data needed by this printer.

Many word processing packages will request that you enter the ASCII codes used by this printer for special settings such as underlining, compressed print, super- and subscript, italics, etc.. In all cases you should refer to your software instruction manual for the proper use of the package with this printer.

4.4 Entering Control Codes Directly from the Keyboard

With many computers, the BASIC language is ready to use once you power up. With others, BASIC must be loaded from cassette or disk. In any case, once BASIC is ready, you may then enter this printer control commands directly from your computer keyboard.

BASIC requires the use of the PRINT command (or LPRINT, PRINT#, etc. depending on the type of BASIC your computer uses) to process and send the control commands to this printer. As part of this PRINT command, you must supply the appropriate ASCII code(s) for the CHR$ function.

For example, the command: **LPRINT CHR$(15)** followed by a **RETURN** will set this printer to compressed mode. Subsequent output to this printer will appear in compressed mode.

If, after issuing the above command, subsequent PRINT statements output nothing to the printer, check for one or more of the following:

- Have you indicated to the computer that output is to the printer and not the screen? For example, PR#1, say, causes subsequent PRINT statements on the Apple® computer to PRINT the printer and not the screen. LPRINT do the same in Microsoft® BASIC.
- Is this printer on line? If not, press the green ON LINE button on the front panel.
- Is the interface cable plugged into the computer and printer?
- When using a serial interface, is the baud rate setting on the printer the same as that on the computer or interface card?

Notice that when you enter a BASIC command directly from the keyboard, you do NOT use a line number as you would in a BASIC program. Moreover, control codes may be entered only one line at a time.

4.5 Entering Control Codes from Within a Program

Control commands may also be entered from within a BASIC program. The advantage to this technique is that you can incorporate a number of different control commands into a single program and therefore produce output with a variety of special features. This is done by RUNning your program once. In this case BASIC requires that each line in your program be preceded by a line number.

As an example, we mentioned earlier that the command **LPRINT CHR$(15)** entered directly from the keyboard will set compressed print on this printer. From within a BASIC program, this command might be:

50 LPRINT CHR$(15)

The remainder of this chapter will show you how to enter each of the control commands which this printer uses. All examples will be IBM-PC® BASIC programs which use LPRINT to access the printer and use decimal numbers for the ASCII codes.

4.6 Entering Hexadecimal Code

In the event that you will be entering ASCII codes in hexadecimal form, you must supply two extra characters per code. These are the ampersand (&) and the letter H. The example below illustrates the BASIC command to set compressed print on this printer.

Decimal	Hexadecimal
LPRINT CHR$(15)	**LPRINT CHR$(&H0F)**

Refer to Appendix A for the ASCII code table.

4.7 Control Codes

A number of the printer control commands require only a single ASCII-coded character as part of the LPRINT statement. The command LPRINT CHR$(15) which we discussed earlier is an example of a single-byte control command.

Multi-byte control codes, often called Escape control codes or Escape sequences, always begin with an ESC designation. ESC is designated by CHR$(27) in decimal form or CHR$(&H1B) in hexadecimal form. The ESC designation is always followed by one or more additional codes, hence, the name multi-byte control code.

In BASIC, these two or more bytes are joined (or concatenated) into a single command or string using either a plus (+) sign, a semicolon (;), or by neither symbol but rather by listing one byte after another without any spaces. BASIC on many computers allows you to use any of these formats. Refer to your BASIC manual for the proper method of string concatenation.

Table 4.1 shows equivalent methods of entering multi-byte control commands for most computers.

There is one remaining input format commonly used to reduce the keystrokes necessary to enter a multi-byte control command. As you examine the multi-byte control commands in the pages ahead, you will notice that the second byte, with the exception of ESC+SO and ESC+SI, is always a character which appears somewhere on your keyboard. In such cases, rather than enter that character's ASCII code as part of the CHR$ function, you may simply enter that character in quotes ("). For example, to set pica pitch (ESC+P), you may enter:

```
LPRINT CHR$(27)+CHR$(80);
        or
LPRINT CHR$(27)+"P";
```

As another example, to set double width printing, you may enter:

```
LPRINT CHR$(27)+CHR$(87)+CHR$(1);
        or
LPRINT CHR$(27)+"W"+CHR$(1);
```

With this method, any of the three input formats shown in Table 4.1 may also be used (subject to the BASIC you are using).

This printer has five printer modes. They are classified into two groups, Standard/IBM printer mode and Daisy printer mode.

Software commands of each group are covered in chapter 5 and 6 correspondently. Software commands can be summarized by the following classifications:

Standard/IBM printer mode
- Font Selection
- Character Pitch Selection
- Character Highlight Selection
- Character Set Selection
- Bit Image (Graphics) Mode Selection
- Paper Feed Control
- Page Format Control
- Tabulation
- Carriage Control
- Data Control
- Downloadable Character Selection
- Miscellaneous

Daisy printer mode
- Print Mode Commands
- Bit Image (Graphics) Mode Selection
- Vertical Movement Commands
- Formatting Commands
- Word Processing Commands
- Horizontal Movement Commands
- Downloadable Character Selection
- Miscellaneous

NOTE: Certain programs include WIDTH, OPEN, PRINT, and CLOSE statements. These BASIC statements are necessary on many IBM compatible computers to avoid unwanted "breaks" in output. Refer to page 5-33 for additional information.

	Two-Byte Command	Three-Byte Command
Function Name Code	Set Pica Pitch ESC+P 27,80 DEC	Set Double Width Printing ESC+W+1 27,87,1 DEC
Input Format 1 **Input Format 2** **Input Format 3**	LPRINT CHR$(27)+CHR$(80); LPRINT CHR$(27);CHR$(80); LPRINT CHR$(27)CHR$(80);	LPRINT CHR$(27)+CHR$(87)+CHR$(1); LPRINT CHR$(27);CHR$(87);CHR$(1); LPRINT CHR$(27)CHR$(87)CHR$(1);

Table 4.1 Input Formats

5.1 Control Codes

FONT SELECTION

The term **font** refers to a particular style, shape, or design of a set of characters. Font selection commands will enable you to select a particular character set design from a variety of such designs, thereby producing greater flexibility in the appearance of your final document.

Fonts available on this printer include Draft, Italic, Subscript, Superscript, and Near Letter Quality.

ITALIC FONT:

Selects italic character printing.

Name: Setting: ESC+4
Release: ESC+5

Code: Setting: 27,52 DEC 1B,34 HEX
Release: 27,53 DEC 1B,35 HEX

Input Format: Setting: LPRINT CHR$(27)+"4"
Release: LPRINT CHR$(27)+"5"

Example:

```
10 REM ITALIC SETTING/RELEASE
20 LPRINT CHR$(27)+"4";
30 LPRINT "ITALIC CHARACTERS ON"
40 LPRINT CHR$(27)+"5";
50 LPRINT "ITALIC CHARACTERS OFF"
60 END
```

ITALIC CHARACTERS ON
ITALIC CHARACTERS OFF

Comments:

- Italic characters can be printed in the near letter quality font and in proportional spacing.
- This command is not operational when printing IBM Block Graphic or 12-Dot graphics characters.
- Italic characters in locations 160 DEC–254 DEC (A0 HEX–FE HEX) are printed in place of characters in locations 32 DEC–126 DEC (20 HEX–7E HEX) in standard printer mode.

NEAR LETTER QUALITY (NLQ) FONT:

Selects near letter quality font printing.

Name:

Courier NLQ Setting:	ESC+x+n	n=1,49,129,177
Bold PS NLQ Setting:	ESC+x+n	n=2,50,130,178
Release:	ESC+x+m	m=0,48,128,176

Code:

Setting:	27,120,n DEC	1B,78,n HEX
Release:	27,120,m DEC	1B,78,m HEX

Input Format:

Setting: LPRINT CHR$(27)+"x"+CHR$(n)
Release: LPRINT CHR$(27)+"x"+CHR$(m)

Example:

```
10 REM  NEAR LETTER QUALITY FONT
20 LPRINT "PRINTING USING THE DRAFT FONT"
30 LPRINT CHR$(27)+"x"+CHR$(1);
40 LPRINT "PRINTING USING THE COURIER NLQ FONT"
50 LPRINT CHR$(27)+"x"+CHR$(2);
60 LPRINT "PRINTING USING THE BOLD PS NLQ FONT"
70 LPRINT CHR$(27)+"x"+CHR$(0);
80 LPRINT "PRINTING USING THE DRAFT FONT"
90 END
```

```
PRINTING USING THE DRAFT FONT
PRINTING USING THE COURIER NLQ FONT
PRINTING USING THE BOLD PS NLQ FONT
PRINTING USING THE DRAFT FONT
```

Comments:

This command is operational only when the print mode selector is set to "Pgm".

- This command sets near letter quality printing in whichever pitch is set at the time.
- IBM Block Graphic and IBM 12-Dot Graphic characters cannot be printed with near letter quality font.
- Near letter quality characters are printed with two passes of the print head. Therefore double printing by ESC+G is ineffective in near letter quality printing.
- Sub/superscript characters can be printed in the near letter quality font.
- Font are set as follows:
  - n=0: Draft font
  - n=1: Courier NLQ font
  - n=2: Bold PS NLQ font

SUPERSCRIPT FONT:

Selects superscript font with characters printed on the top-half of the line. Characters are reduced to ½ their original height.

Name: Setting: ESC+S+n n=0,48,128,176
Release: ESC+T

Code: Setting: 27,83,n DEC 1B,53,n HEX
Release: 27,84 DEC 1B,54 HEX

Input Format: Setting: LPRINT CHR$(27)+"S"+CHR$(n)
Release: LPRINT CHR$(27)+"T"

Example: (See SUBSCRIPT.)

Comments:
- Superscript characters are normal width.
- To print very small characters, such as exponents, set superscript and compressed modes simultaneously.
- Superscript characters can be printed in the near-letter-quality mode.
- ESC+T also releases the subscript print setting.
- See subscript comments.

SUBSCRIPT FONT:

Selects subscript font with characters printed on the bottom-half of the line. Characters are reduced to ½ their original height.

Name: Setting: ESC+S+m m=1,49,129,177
Release: ESC+T

Code: Setting 27,83,m DEC 1B,53,m HEX
Release: 27,84 DEC 1B,54 HEX

Input Format: Setting: LPRINT CHR$(27)+"S"+CHR$(m)
Release: LPRINT CHR$(27)+"T"

Example:

```
10 REM SUPER/SUB SCRIPT
20 LPRINT CHR$(27)+"-"+CHR$(1);
30 LPRINT CHR$(27)+"S"+CHR$(0);
40 LPRINT "ABCDEFGHIJKLMN - SUPERSCRIPT"
50 LPRINT CHR$(27)+"S"+CHR$(1);
60 LPRINT "ABCDEFGHIJKLMN - SUBSCRIPT"
70 LPRINT CHR$(27)+"T";
80 LPRINT "ABCDEFGHIJKLMN"
90 LPRINT CHR$(27)+"-"+CHR$(0);
100 END
```

ABCDEFGHIJKLMN - SUPERSCRIPT
ABCDEFGHIJKLMN - SUBSCRIPT
ABCDEFGHIJKLMN

Comments:
- Subscript characters are normal width.
- To print very small characters, such as exponents, set subscript and compressed modes simultaneously.
- Subscript characters can be printed in the near letter quality mode.
- ESC+T also releases the superscript print setting.
- In both the subscript and superscript mode, the printer performs double-strike, single direction printing. Following the first pass of the print head, the paper is fed 1/216 inch (0.12 mm), and the line is printed again. The printer automatically compensates for the paper feed to maintain the proper line count.

CHARACTER PITCH

The term **pitch** as it pertains to dot matrix printers refers to the number of characters which can be printed in one inch (25.4 mm). This includes 10, 12, 15, 17 characters per inch (25.4 mm), and proportional spacing.

DRAFT PICA PITCH:

Sets draft pica pitch (10 characters per inch (25.4 mm)) printing.

Name: ESC+P

Code: 27,80 DEC 1B,50 HEX

Input Format: LPRINT CHR$(27)+"P"

Example:

```
10 REM DRAFT PICA PITCH
20 LPRINT CHR$(27)+"P";
30 LPRINT "PICA"
40 FOR I=1 TO 3
50 LPRINT "ABCDE";
60 NEXT I
70 LPRINT CHR$(10);
80 END
```

```
PICA
ABCDEABCDEABCDE
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Setting pica pitch produces 10 characters per inch (25.4 mm) or 136 characters per line.
- Pica pitch can be changed to elite, proportional, compressed, etc. by entering the appropriate control commands.
- ESC+P releases the near letter quality font and subsequent output is printed using draft font.
- If ESC+P is executed after compressed printing has been set, draft font is printed at 17 characters per inch (25.4 mm).
- If ESC+P is executed after proportional spacing has been set, draft font is printed using proportional spacing.

DRAFT ELITE PITCH:

Sets draft elite pitch (12 characters per inch (25.4mm)) printing.

Name: ESC+M

Code: 27,77 DEC 1B,4D HEX

Input Format: LPRINT CHR$(27)+"M"

Example:

```
10 REM DRAFT ELITE PITCH
20 LPRINT "------DRAFT PICA------"
30 LPRINT CHR$(27)+"M";
40 LPRINT "------DRAFT ELITE------"
50 END
```

```
------DRAFT PICA------
------DRAFT ELITE------
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Setting elite pitch produces 12 characters per inch (25.4 mm) or 163 characters per line.
- Compressed printing and proportional spacing cannot be printed using the elite pitch. In the elite pitch, the compressed print or proportional spacing setting will be ignored. If the elite pitch designation is made after compressed printing or proportional spacing has been set, compressed printing or proportional spacing is released and the elite pitch remains in effect.
- ESC+M releases the near letter quality font and subsequent output is printed using the draft font.

NEAR LETTER QUALITY—PICA PITCH:

Sets NLQ pica pitch (10 characters per inch (25.4 mm)) printing.

Name: ESC+n

Code: 27,110 DEC 1B,6E HEX

Input Format: LPRINT CHR$(27)+"n"

Example:

```
10 REM NEAR LETTER QUALITY, PICA PITCH
20 LPRINT CHR$(27)+"n";
30 LPRINT "NLQ PICA PITCH"
40 LPRINT "NLQ PICA PITCH WITH ";
50 LPRINT CHR$(27)+"S"+CHR$(1);
60 LPRINT "SUBSCRIPT";
70 LPRINT CHR$(27)+"S"+CHR$(0);
80 LPRINT "SUPERSCRIPT"
90 LPRINT CHR$(27)+"T"
100 LPRINT CHR$(27)+"P"
110 END
```

```
NLQ PICA PITCH
NLQ PICA PITCH WITH SUBSCRIPTSUPERSCRIPT
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Courier or Bold PS NLQ characters are printed depending upon previous ESC+x+n setting.
- If ESC+n is executed after compressed printing has been set, near letter quality font is printed at 17 characters per inch (25.4 mm).
- If ESC+n is executed after proportional spacing has been set, near letter quality font is printed using proportional spacing.
- IBM Block Graphic and IBM 12-Dot Graphic characters cannot be printed with near letter quality, pica pitch characters.
- NLQ characters are printed with two passes of the print head. Therefore double printing by ESC+G is ineffective in the near letter quality pica pitch.
- Near letter quality pica pitch characters can be selected by setting the print mode selector on the front panel of the printer to "10" and "COURIER", or "10" and "BOLD PS".
- Sub/superscript characters can be printed using near letter quality pica pitch characters.
- ESC+P releases near letter quality pica pitch and sets printing to draft pica pitch.

NEAR LETTER QUALITY—ELITE PITCH:

Sets NLQ elite pitch (12 characters per inch (25.4 mm)) printing.

Name: ESC+o

Code: 27,111 DEC 1B,6F HEX

Input Format: LPRINT CHR$(27)+"o"

Example:

```
10 REM NEAR LETTER QUALITY, ELITE PITCH
20 LPRINT CHR$(27)+"o";
30 LPRINT "NLQ ELITE PITCH"
40 LPRINT "NLQ ELITE PITCH WITH ";
50 LPRINT CHR$(27)+"S"+CHR$(1);
60 LPRINT "SUBSCRIPT";
70 LPRINT CHR$(27)+"S"+CHR$(0);
80 LPRINT "SUPERSCRIPT"
90 LPRINT CHR$(27)+"T";
100 LPRINT CHR$(27)+"P";
110 LPRINT "DRAFT PICA PITCH"
120 END
```

```
NLQ ELITE PITCH
NLQ ELITE PITCH WITH SUBSCRIPTSUPERSCRIPT
DRAFT PICA PITCH
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Courier or Bold PS NLQ characters are printed depending upon previous ESC+x+n setting.
- If near letter quality elite pitch and compressed printing or proportional spacing are set simultaneously, compressed printing or proportional spacing will be ignored and elite near letter quality characters will be printed.
- IBM Block Graphic and IBM 12-Dot Graphic characters cannot be printed with near letter quality, elite pitch characters.
- Near letter quality characters are printed with two passes of the print head. Therefore double printing by ESC+G is ineffective in near letter quality elite pitch.
- NLQ elite pitch characters can be selected by setting the print mode selector on the front panel of the printer to "12" and "COURIER", or "12" and "BOLD PS".
- Sub/superscript characters can be printed using near letter quality elite pitch characters.
- ESC+P releases near letter quality elite pitch and sets printing to draft pica pitch.

COMPRESSED PITCH:

Sets compressed pitch (17 characters per inch (25.4 mm)) printing.

Name: Setting: SI or ESC+SI
Release: DC2

Code: Setting: 15 or 27,15 DEC — 0F or 1B,0F HEX
Release: 18 DEC — 12 HEX

Input Format: Setting: LPRINT CHR$(15)
or
LPRINT CHR$(27)+CHR$(15)
Release: LPRINT CHR$(18)

Example:

```
10 REM COMPRESSED PITCH
20 LPRINT "DRAFT PICA PITCH - 10 CHARACTERS PER INCH"
30 LPRINT CHR$(15);
40 LPRINT "COMPRESSED PITCH USING (SI) - 17 CHARACTERS PER INCH"
50 LPRINT CHR$(18);
60 LPRINT "BACK TO DRAFT PICA PITCH - 10 CHARACTERS PER INCH"
70 LPRINT CHR$(27)+CHR$(15);
80 LPRINT "COMPRESSED PITCH USING (ESC+SI) - 17 CHARACTERS PER INCH"
90 LPRINT CHR$(18);
100 LPRINT "BACK TO DRAFT PICA PITCH - 10 CHARACTERS PER INCH"
110 END
```

```
DRAFT PICA PITCH - 10 CHARACTERS PER INCH
COMPRESSED PITCH USING (SI) - 17 CHARACTERS PER INCH
BACK TO DRAFT PICA PITCH - 10 CHARACTERS PER INCH
COMPRESSED PITCH USING (ESC+SI) - 17 CHARACTERS PER INCH
BACK TO DRAFT PICA PITCH - 10 CHARACTERS PER INCH
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Setting compressed pitch produces 17 characters per inch (25.4 mm) or 233 characters per line.
- When emphasized and compressed characters are set simultaneously, compressed printing is ignored and emphasized characters are printed. However, when emphasized printing is released, characters are printed in compressed pitch. Use DC2 to release compressed pitch.

PROPORTIONAL SPACING:

Sets proportional spacing between characters.

Name:	Setting:	ESC+p+n	n=1,49,129,177
	Release:	ESC+p+m	m=0,48,128,176
Code:	Setting:	27,112,n DEC	1B,70,n HEX
	Release:	27,112,m DEC	1B,70,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"p"+CHR$(n)	
	Release:	LPRINT CHR$(27)+"p"+CHR$(m)	

Example:

```
10 REM PROPORTIONAL SPACING
20 LPRINT "DRAFT PICA PITCH:"
30 LPRINT " ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz"
40 LPRINT CHR$(27)+"p"+CHR$(1);
50 LPRINT "PROPORTIONAL SPACING:"
60 LPRINT " ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz"
70 LPRINT CHR$(27)+"n";
80 LPRINT "COURIER NLQ PROPORTIONAL SPACING:"
90 LPRINT " ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz"
100 LPRINT CHR$(27)+"P";
110 LPRINT CHR$(27)+"p"+CHR$(0);
120 END
```

```
DRAFT PICA PITCH:
 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
PROPORTIONAL SPACING:
 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
COURIER NLQ PROPORTIONAL SPACING:
 ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- When using proportional spacing in draft font printing mode, characters are printed as emphasized draft characters. Refer to tables 5.1 and 5.2 for proportional spacing tables.
- Proportional spacing can be invoked only when in pica pitch. If proportional spacing is set together with compressed printing, compressed printing is ignored and characters are printed using proportional spacing.
- When proportional spacing is released, characters are printed in pica pitch.

Normal Characters

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

Italic Characters

ASCII code	Char.	Width	ASCII code	Char.	Width
128	*à*	11	192	*@*	12
129	*è*	11	193	*A*	12
130	*ù*	11	194	*B*	12
131	*ò*	11	195	*C*	12
132	*ì*	8	196	*D*	12
133	°	8	197	*E*	12
134	£	12	198	*F*	12
135	*¡*	10	199	*G*	12
136	*¿*	11	200	*H*	12
137	*Ñ*	12	201	*I*	10
138	*ñ*	12	202	*J*	12
139	*¤*	12	203	*K*	12
140	*Pt*	12	204	*L*	10
141	*Å*	12	205	*M*	12
142	*å*	11	206	*N*	12
143	*ç*	11	207	*O*	12
144	*§*	12	208	*P*	12
145	*ß*	11	209	*Q*	12
146	*Æ*	12	210	*R*	12
147	*æ*	12	211	*S*	12
148	*Ø*	12	212	*T*	12
149	*ø*	11	213	*U*	12
150	¨	9	214	*V*	12
151	*Ä*	12	215	*W*	12
152	*Ö*	12	216	*X*	12
153	*Ü*	12	217	*Y*	12
154	*ä*	11	218	*Z*	12
155	*ö*	11	219	*[*	11
156	*ü*	12	220	\	7
157	*É*	12	221	*]*	11
158	*é*	11	222	^	10
159	¥	12	223	_	12
160	*SPACE*	12	224	`	5
161	*!*	10	225	*a*	11
162	"	10	226	*b*	11
163	#	12	227	*c*	11
164	$	11	228	*d*	12
165	%	12	229	*e*	11
166	&	12	230	*f*	12
167	'	6	231	*g*	11
168	*(*	8	232	*h*	11
169	*)*	8	233	*i*	9
170	*	12	234	*j*	10
171	+	12	235	*k*	11
172	,	7	236	*l*	9
173	–	12	237	*m*	11
174	.	7	238	*n*	10
175	/	10	239	*o*	11
176	*0*	12	240	*p*	11
177	*1*	12	241	*q*	11
178	*2*	12	242	*r*	10
179	*3*	12	243	*s*	11
180	*4*	12	244	*t*	10
181	*5*	12	245	*u*	11
182	*6*	12	246	*v*	10
183	*7*	12	247	*w*	13
184	*8*	12	248	*x*	12
185	*9*	12	249	*y*	12
186	*:*	7	250	*z*	12
187	*;*	7	251	*{*	10
188	<	10	252	*|*	9
189	=	11	253	*}*	10
190	>	9	254	~	12
191	*?*	11	255	*Ø*	12

Table 5.1 Proportional Spacing: Standard Mode Characters
Unit: 1/120 inch (0.21 mm)

Normal Characters

ASCII code	Char.	Width
3	♥	12
4	♦	12
5	♣	12
6	♠	12
21	§	10
128	Ç	12
129	ü	11
130	é	12
131	â	12
132	ä	12
133	à	12
134	å	12
135	ç	11
136	ê	12
137	ë	12
138	è	12
139	ï	8
140	î	8
141	ì	8
142	Ä	12
143	Å	12
144	É	12
145	æ	12
146	Æ	12
147	ô	10
148	ö	10
149	ò	10
150	û	11
151	ù	11
152	ÿ	11
153	Ö	12
154	Ü	12
155	¢	11
156	£	12
157	¥	12
158	Pt	12
159	ƒ	12
160	á	12
161	í	8
162	ó	10
163	ú	11
164	ñ	11
165	Ñ	12
166	ª	12
167	º	12
168	¿	12
169	⌐	12
170	¬	12
171	½	12
172	¼	12
173	¡	5
174	«	12
175	»	12
224	α	12
225	β	12
226	Γ	12
227	π	12
228	Σ	12
229	σ	12
230	μ	12
231	γ	12
232	Φ	12
233	θ	12
234	Ω	12
235	δ	12
236	∞	12
237	φ	12
238	ε	12
239	∩	12

ASCII code	Char.	Width
240	≡	12
241	±	12
242	≥	12
243	≤	12
246	÷	12
247	≈	12
248	°	8
249	∙	12
250	·	12
251	√	12
252	n	8
253	2	8
254	■	12
255	SP	12

Italic Characters

ASCII code	Char.	Width
3	♥	12
4	♦	12
5	♣	12
6	♠	12
21	§	12
128	Ç	12
129	ü	12
130	é	11
131	â	11
132	ä	11
133	à	11
134	å	11
135	ç	11
136	ê	11
137	ë	11
138	è	11
139	ï	8
140	î	10
141	ì	8
142	Ä	12
143	Å	12
144	É	12
145	æ	12
146	Æ	12
147	ô	11
148	ö	11
149	ò	11
150	û	11
151	ù	11
152	ÿ	11
153	Ö	12
154	Ü	12
155	¢	11
156	£	12
157	¥	12
158	Pt	12
159	ƒ	12
160	á	11
161	í	8
162	ó	11
163	ú	11
164	ñ	12
165	Ñ	12
166	ª	12
167	º	12
168	¿	11
169	⌐	12
170	¬	12
171	½	12
172	¼	12
173	¡	10
174	«	12
175	»	12
224	α	12
225	β	12
226	Γ	12
227	π	12
228	Σ	12
229	σ	12
230	μ	12
231	γ	12
232	Φ	12
233	θ	12
234	Ω	12
235	δ	12
236	∞	12
237	φ	12
238	ε	12
239	∩	12

ASCII code	Char.	Width
240	≡	12
241	±	12
242	≥	12
243	≤	12
246	÷	12
247	≈	12
248	°	8
249	∙	12
250	·	12
251	√	12
252	n	8
253	2	8
254	■	12
255	SP	12

Table 5.2 Proportional Spacing: IBM Graphic Characters
Unit: 1/120 inch (0.21 mm)

PROGRAMMABLE PITCH:

Sets a character pitch at 10, 12, 15, 17, or proportional spacing.

Name: ESC+w+n n=0,1,2,3,4

Code: 27,119,n DEC 1B,77,n HEX

Input Format: LPRINT CHR$(27)+"w"+CHR$(n)

Example:

```
10 REM PROGRAMMABLE PITCH
20 FOR L=1 TO 2
30 IF L=1 THEN LPRINT "DRAFT FONT:":GOTO 50
40 LPRINT CHR$(27)+"n";"NEAR LETTER QUALITY FONT:"
50 FOR I=0 TO 4
60 LPRINT CHR$(27)+"w"+CHR$(I);
70 IF I=4 THEN 110
80 READ X
90 LPRINT "CHARACTERS PER INCH =";X
100 NEXT I
110 LPRINT "proportional spacing"
120 LPRINT CHR$(10);:RESTORE
130 NEXT L
140 LPRINT CHR$(27)+"P";CHR$(27)+"w"+CHR$(0);
150 DATA 10,12,15,17
160 END
```

```
DRAFT FONT:
CHARACTERS PER INCH = 10
CHARACTERS PER INCH = 12
CHARACTERS PER INCH = 15
CHARACTERS PER INCH = 17
proportional spacing

NEAR LETTER QUALITY FONT:
CHARACTERS PER INCH = 10
CHARACTERS PER INCH = 12
CHARACTERS PER INCH = 15
CHARACTERS PER INCH = 17
proportional spacing
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Pitches are set as follows:
  - n=0: 10 characters per inch (25.4 mm)
  - n=1: 12 characters per inch (25.4 mm)
  - n=2: 15 characters per inch (25.4 mm)
  - n=3: 17 characters per inch (25.4 mm)
  - n=4: proportional spacing
- This command releases any previous character pitch settings.
- If emphasized printing has been invoked and ESC+w+2 (15 pitch) or ESC+w+3 (17 pitch) is executed, emphasized printing is released and 15 pitch (or 17 pitch) characters are printed.
- Execution of ESC+w+n alters character pitch only and does not affect the character font.

PROGRAMMABLE PITCH/HIGHLIGHTING:

Sets a combination of character pitch and/or highlighting.

Name: ESC+!+n 0≦n≦255

Code: 27,33,n DEC 1B,21,n HEX

Input Format: LPRINT CHR$(27)+"!"+CHR$(n)

Example:

```
10 REM PRINT MODE SELECTION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 DIM D(80)
50 D(1)=0:N=2:K=1
60 FOR I=1 TO 16
70 D(N)=K:D(N+1)=K+3:D(N+2)=K+7:D(N+3)=K+8
80 IF N+4>80 THEN 100
90 D(N+4)=K+15:N=N+5:K=K+16
100 NEXT I
110 PRINT#1,CHR$(27)+"D"+CHR$(12)+CHR$(0);
120 FOR N=1 TO 80
130 PRINT#1,CHR$(27)+"!"+CHR$(0);
140 PRINT#1,"MODE:";D(N);CHR$(9);
150 PRINT#1,CHR$(27)+"!"+CHR$(D(N));
160 PRINT#1,"Print Mode Combinations"
170 PRINT#1,CHR$(10);
180 NEXT N
190 CLOSE
200 END
```

```
MODE:  0    Print Mode Combinations
MODE:  1    Print Mode Combinations
MODE:  4    Print Mode Combinations
MODE:  8    Print Mode Combinations
MODE:  9    Print Mode Combinations
MODE:  16   Print Mode Combinations
MODE:  17   Print Mode Combinations
MODE:  20   Print Mode Combinations
MODE:  24   Print Mode Combinations
MODE:  25   Print Mode Combinations
MODE:  32   P r i n t  M o d e  C o m b i n a t i o n s
MODE:  33   Print Mode Combinations
MODE:  36   Print Mode Combinations
MODE:  40   Print Mode Combinations
MODE:  41   Print Mode Combinations
MODE:  48   Print Mode Combinations
MODE:  49   Print Mode Combinations
MODE:  52   Print Mode Combinations
MODE:  56   Print Mode Combinations
MODE:  57   Print Mode Combinations
```

Example: (cont'd)

MODE: 64 Print Mode Combinations
MODE: 65 Print Mode Combinations
MODE: 68 Print Mode Combinations
MODE: 72 Print Mode Combinations
MODE: 73 Print Mode Combinations
MODE: 80 Print Mode Combinations
MODE: 81 Print Mode Combinations
MODE: 84 Print Mode Combinations
MODE: 88 Print Mode Combinations
MODE: 89 Print Mode Combinations
MODE: 96 Print Mode Combinations
MODE: 97 Print Mode Combinations
MODE: 100 Print Mode Combinations
MODE: 104 Print Mode Combinations
MODE: 105 Print Mode Combinations
MODE: 112 Print Mode Combinations
MODE: 113 Print Mode Combinations
MODE: 116 Print Mode Combinations
MODE: 120 Print Mode Combinations
MODE: 121 Print Mode Combinations
MODE: 128 Print Mode Combinations
MODE: 129 Print Mode Combinations
MODE: 132 Print Mode Combinations
MODE: 136 Print Mode Combinations
MODE: 137 Print Mode Combinations
MODE: 144 Print Mode Combinations
MODE: 145 Print Mode Combinations
MODE: 148 Print Mode Combinations
MODE: 152 Print Mode Combinations
MODE: 153 Print Mode Combinations
MODE: 160 Print Mode Combinations
MODE: 161 Print Mode Combinations
MODE: 164 Print Mode Combinations
MODE: 168 Print Mode Combinations
MODE: 169 Print Mode Combinations
MODE: 176 Print Mode Combinations
MODE: 177 Print Mode Combinations
MODE: 180 Print Mode Combinations
MODE: 184 Print Mode Combinations
MODE: 185 Print Mode Combinations
MODE: 192 Print Mode Combinations
MODE: 193 Print Mode Combinations
MODE: 196 Print Mode Combinations
MODE: 200 Print Mode Combinations
MODE: 201 Print Mode Combinations
MODE: 208 Print Mode Combinations
MODE: 209 Print Mode Combinations

Example: (cont'd)

```
MODE: 212   Print Mode Combinations
MODE: 216   Print Mode Combinations
MODE: 217   Print Mode Combinations
MODE: 224   Print Mode Combinations
MODE: 225   Print Mode Combinations
MODE: 228   Print Mode Combinations
MODE: 232   Print Mode Combinations
MODE: 233   Print Mode Combinations
MODE: 240   Print Mode Combinations
MODE: 241   Print Mode Combinations
MODE: 244   Print Mode Combinations
MODE: 248   Print Mode Combinations
MODE: 249   Print Mode Combinations
```

Comments:

- Print modes correspond to the setting of each bit as illustrated below.

bit	7	6	5	4	3	2	1	0
"1"	Underlining	Italic	Double width	Double printing	Empha-sized	Compres-sed	No meaning	Elite
"0"	Normal	Normal	Normal	Normal	Normal	Normal		Pica

- Bits 0 and 2 only pertain to pitch.
- If n=49 (31 HEX), setting bits 0,4 and 5 to "1" produces double width, elite, double printing.
- When bits 2 and 3 are both set to "1", emphasized printing takes priority over compressed pitch.
- Pitch and highlight combinations are determined by the value of "n" as illustrated in Table 5.3.
- Compressed, pica, and elite pitch, as well as emphasized printing, are operational only when the print mode selector is set to "Pgm".
- Also refer to Table 5.9 and 5.10 Mixing Print Mode, and the ESC+!+n command in the "CHARACTER HIGHLIGHT" section of this manual.

n	UL	IT	DW	DP	EM	COM	EL
0							
1							○
2							
3							○
4						○	
5							○
6						○	
7							○
8					○		
9					○		○
10					○		
11					○		○
12					○		
13					○		○
14					○		
15					○		○
16				○			
17				○			○
18				○			
19				○			○
20				○		○	
21				○			○
22				○		○	
23				○			○
24				○	○		
25				○	○		○
26				○	○		
27				○	○		○
28				○	○		
29				○	○		○
30				○	○		
31				○	○		○
32			○				
33			○				○
34			○				
35			○				○
36			○			○	
37			○				○
38			○			○	
39			○				○
40			○		○		
41			○		○		○
42			○		○		

n	UL	IT	DW	DP	EM	COM	EL
43			○		○		○
44			○		○		
45			○		○		○
46			○		○		
47			○		○		○
48			○	○			
49			○	○			○
50			○	○			
51			○	○			○
52			○	○		○	
53			○	○			○
54			○	○		○	
55			○	○			○
56			○	○	○		
57			○	○	○		○
58			○	○	○		
59			○	○	○		○
60			○	○	○		
61			○	○	○		○
62			○	○	○		
63			○	○	○		○
64		○					
65		○					○
66		○					
67		○					○
68		○				○	
69		○					○
70		○				○	
71		○					○
72		○			○		
73		○			○		○
74		○			○		
75		○			○		○
76		○			○		
77		○			○		○
78		○			○		
79		○			○		○
80		○		○			
81		○		○			○
82		○		○			
83		○		○			○
84		○		○		○	
85		○		○			○

UL: Underline
IT: Italic
DW: Double width
DP: Double printing
EM: Emphasized
COM: Compressed
EL: Elite

Table 5.3 Print Mode Selection

n	UL	IT	DW	DP	EM	COM	EL
86		○		○		○	
87		○		○			○
88		○		○	○		
89		○		○	○		○
90		○		○	○		
91		○		○	○		○
92		○		○	○		
93		○		○	○		○
94		○		○	○		
95		○		○	○		○
96		○	○				
97		○	○				○
98		○	○				
99		○	○				○
100		○	○			○	
101		○	○				○
102		○	○			○	
103		○	○				○
104		○	○		○		
105		○	○		○		○
106		○	○		○		
107		○	○		○		○
108		○	○		○		
109		○	○		○		○
110		○	○		○		
111		○	○		○		○
112		○	○	○			
113		○	○	○			○
114		○	○	○			
115		○	○	○			○
116		○	○	○		○	
117		○	○	○			○
118		○	○	○		○	
119		○	○	○			○
120		○	○	○	○		
121		○	○	○	○		○
122		○	○	○	○		
123		○	○	○	○		○
124		○	○	○	○		
125		○	○	○	○		○
126		○	○	○	○		
127		○	○	○	○		○
128	○						

n	UL	IT	DW	DP	EM	COM	EL
129	○						○
130	○						
131	○						○
132	○					○	
133	○						○
134	○					○	
135	○						○
136	○				○		
137	○				○		○
138	○				○		
139	○				○		○
140	○				○		
141	○				○		○
142	○				○		
143	○				○		○
144	○			○			
145	○			○			○
146	○			○			
147	○			○			○
148	○			○		○	
149	○			○			○
150	○			○		○	
151	○			○			○
152	○			○	○		
153	○			○	○		○
154	○			○	○		
155	○			○	○		○
156	○			○	○		
157	○			○	○		○
158	○			○	○		
159	○			○	○		○
160	○		○				
161	○		○				○
162	○		○				
163	○		○				○
164	○		○			○	
165	○		○				○
166	○		○			○	
167	○		○				○
168	○		○		○		
169	○		○		○		○
170	○		○		○		
171	○		○		○		○

UL: Underline
IT: Italic
DW: Double width
DP: Double printing
EM: Emphasized
COM: Compressed
EL: Elite

n	UL	IT	DW	DP	EM	COM	EL
172	○		○		○		
173	○		○		○		○
174	○		○		○		
175	○		○		○		○
176	○		○	○			
177	○		○	○			○
178	○		○	○			
179	○		○	○			○
180	○		○	○		○	
181	○		○	○			○
182	○		○	○		○	
183	○		○	○			○
184	○		○	○	○		
185	○		○	○	○		○
186	○		○	○	○		
187	○		○	○	○		○
188	○		○	○	○		
189	○		○	○	○		○
190	○		○	○	○		
191	○		○	○	○		○
192	○	○					
193	○	○					○
194	○	○					
195	○	○					○
196	○	○				○	
197	○	○					○
198	○	○				○	
199	○	○					○
200	○	○			○		
201	○	○			○		○
202	○	○			○		
203	○	○			○		○
204	○	○			○		
205	○	○			○		○
206	○	○			○		
207	○	○			○		○
208	○	○		○			
209	○	○		○			○
210	○	○		○			
211	○	○		○			○
212	○	○		○		○	
213	○	○		○			○
214	○	○		○		○	

n	UL	IT	DW	DP	EM	COM	EL
215	○	○		○			○
216	○	○		○	○		
217	○	○		○	○		○
218	○	○		○	○		
219	○	○		○	○		○
220	○	○		○	○		
221	○	○		○	○		○
222	○	○		○	○		
223	○	○		○	○		○
224	○	○	○				
225	○	○	○				○
226	○	○	○				
227	○	○	○				○
228	○	○	○			○	
229	○	○	○				○
230	○	○	○			○	
231	○	○	○				○
232	○	○	○		○		
233	○	○	○		○		○
234	○	○	○		○		
235	○	○	○		○		○
236	○	○	○		○		
237	○	○	○		○		○
238	○	○	○		○		
239	○	○	○		○		○
240	○	○	○	○			
241	○	○	○	○			○
242	○	○	○	○			
243	○	○	○	○			○
244	○	○	○	○		○	
245	○	○	○	○			○
246	○	○	○	○		○	
247	○	○	○	○			○
248	○	○	○	○	○		
249	○	○	○	○	○		○
250	○	○	○	○	○		
251	○	○	○	○	○		○
252	○	○	○	○	○		
253	○	○	○	○	○		○
254	○	○	○	○	○		
255	○	○	○	○	○		○

UL: Underline
IT: Italic
DW: Double width
DP: Double printing
EM: Emphasized
COM: Compressed
EL: Elite

CHARACTER HIGHLIGHT

Character **highlighting** refers to the use of control commands to "make one or more characters stand out" on the printed page. Characters may be highlighted by using emphasized printing, double printing, double width printing, and underlining. Each is discussed below.

EMPHASIS PRINTING:

Sets printing to twice the original horizontal dot density.

Name: Setting: ESC+E
Release: ESC+F

Code: Setting: 27,69 DEC 1B,45 HEX
Release: 27,70 DEC 1B,46 HEX

Input Format: Setting: LPRINT CHR$(27)+"E"
Release: LPRINT CHR$(27)+"F"

Example:

```
10 REM EMPHASIZED PRINTING
20 LPRINT CHR$(27)+"E";
30 LPRINT "EMPHASIZED CHARACTERS"
40 LPRINT CHR$(27)+"F";
50 LPRINT "DARFT CHARACTERS"
60 END
```

```
EMPHASIZED CHARACTERS
DARFT CHARACTERS
```

Comments:

- Emphasized characters are printed at half speed (120 characters per second in draft pica pitch).
- When emphasis and compressed printing are set simultaneously, compressed printing is ignored. However, upon releasing emphasis printing, characters will be printed in compressed pitch. The compressed pitch must be released separately.
- Emphasized printing is available in pica pitch, elite pitch and proportional spacing.
- When the pitch selector switch is set to "15" or "17" positions, this command is not operational.

DOUBLE PRINTING:

Sets printing of each line of data with two passes of the print head, feeding the paper 1/216" (0.12 mm) between the first and second pass.

Name: Setting: ESC+G
Release: ESC+H

Code: Setting: 27,71 DEC 1B,47 HEX
Release: 27,72 DEC 1B,48 HEX

Input Format: Setting: LPRINT CHR$(27)+"G"
Release: LPRINT CHR$(27)+"H"

Example:

```
10 REM DOUBLE PRINTING
20 LPRINT "[1] Character Highlighting OFF - DRAFT PICA"
30 LPRINT CHR$(27)+"G";
40 LPRINT "[2] Character Highlighting ON - DOUBLE PRINT PICA"
50 LPRINT CHR$(27)+"M";
60 LPRINT "[3] Character Highlighting ON - DOUBLE PRINT ELITE"
70 LPRINT CHR$(27)+"p"+CHR$(1);
80 LPRINT CHR$(27)+"P";
90 LPRINT "[4] Character Highlighting ON - DOUBLE PRINT, PROP. SPACING"
100 LPRINT CHR$(27)+"H";CHR$(27)+"p"+CHR$(0)
110 END
```

```
[1] Character Highlighting OFF - DRAFT PICA
[2] Character Highlighting ON - DOUBLE PRINT PICA
[3] Character Highlighting ON - DOUBLE PRINT ELITE
[4] Character Highlighting ON - DOUBLE PRINT, PROP. SPACING
```

Comment:

- Superscript, subscript, and near letter quality characters require two passes of the print head. Thus, setting double printing has no effect on such characters.

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name:

Setting:	SO or ESC+SO	
Release:	DC4 or ESC+W+m	m=0,48,128,176

Code:

Setting:	14 or 27,14 DEC	0E or 1B, 0E HEX
Release 1:	20 DEC	14 HEX
Release 2:	27,87,m DEC	1B,57,m HEX

Input Format:

Setting:	LPRINT CHR$ (14) or LPRINT CHR$(27)+CHR$(14)
Release 1:	LPRINT CHR$(20)
Release 2:	LPRINT CHR$(27)+"W"+CHR$(m)

Example:

```
10 REM DOUBLE WIDTH PRINTING - SINGLE LINE
20 LPRINT "DRAFT PICA";CHR$(10);
30 LPRINT CHR$(14);
40 LPRINT "DOUBLE WIDTH";CHR$(10);
50 LPRINT "...RELEASED BY A (LF)"
60 LPRINT CHR$(14);
70 LPRINT "DOUBLE WIDTH";
80 LPRINT CHR$(20);
90 LPRINT "...ALSO RELEASED BY DC4"
100 LPRINT CHR$(14);
110 LPRINT "DOUBLE WIDTH";
120 LPRINT CHR$(27)+"W"+CHR$(0);
130 LPRINT "...AND ALSO RELEASED BY ESC+W+0"
140 END
```

```
DRAFT PICA
DOUBLE WIDTH
...RELEASED BY A (LF)
DOUBLE WIDTH...ALSO RELEASED BY DC4
DOUBLE WIDTH...AND ALSO RELEASED BY ESC+W+0
```

Comments:

- Single-line double width printing is released when:
  - —a LF, FF, or VT is executed
  - —the printer is initialized
  - —DC4, ESC+W+m or ESC+!+0 is executed
- See "DOUBLE WIDTH PRINTING" on page 5-22.

DOUBLE WIDTH PRINTING:

Sets double width (elongated) character printing.

Name:
Setting: ESC+W+n n=1,49,129,177
Release: ESC+W+m m=0,48,128,176

Code:
Setting: 27,87,n DEC 1B,57,n HEX
Release: 27,87,m DEC 1B,57,m HEX

Input Format:
Setting: LPRINT CHR$(27)+"W"+CHR$(n)
Release: LPRINT CHR$(27)+"W"+CHR$(m)

Example:

```
10 REM DOUBLE WIDTH USING (ESC+W+n)
20 LPRINT "DRAFT PICA";CHR$(10);
30 LPRINT CHR$(27)+"W"+CHR$(1);
40 LPRINT "DOUBLE WIDTH";
50 LPRINT CHR$(20);CHR$(10);
60 LPRINT "NOT RELEASED BY LF OR DC4";CHR$(10);
70 LPRINT CHR$(27)+"W"+CHR$(0);
80 LPRINT "RELEASED BY ESC+W+0"
90 END
```

```
DRAFT PICA
DOUBLE WIDTH
NOT RELEASED BY LF OR DC4
RELEASED BY ESC+W+0
```

Comments:

- Double width printing set by ESC+W+n is NOT released by a LF or DC4.
- Single-line double width printing set by SO or ESC+SO is also released by ESC+W+m or ESC+!+0.
- See "DOUBLE WIDTH PRINTING—SINGLE LINE" on page 5-21.

UNDERLINING:

Sets continuous underlining of characters.

Name: Setting: ESC+−+n n=1,49,129,177
Release: ESC+−+m m=0,48,128,176

Code: Setting: 27,45,n DEC 1B,2D,n HEX
Release: 27,45,m DEC 1B,2D,m HEX

Input Format: Setting: LPRINT CHR$(27)+"−"+CHR$(n)
Release: LPRINT CHR$(27)+"−"+CHR$(m)

Example 1:

```
10 REM CONTINUOUS UNDERLINING
20 LPRINT CHR$(27)+"-"+CHR$(1);
30 LPRINT "CONTINUOUS UNDERLINING"
40 LPRINT CHR$(27)+"-"+CHR$(0);
50 LPRINT "NO UNDERLINING"
60 END
```

```
CONTINUOUS UNDERLINING
NO UNDERLINING
```

Example 2:

```
10 REM BROKEN UNDERLINING
20 LPRINT "BROKEN";
30 FOR I=1 TO 6
40 LPRINT CHR$(8);
50 NEXT I
60 FOR I=1 TO 6
70 LPRINT CHR$(95);
80 NEXT I
90 LPRINT CHR$(10);
100 END
```

```
BROKEN
```

Comments:

- Bit image data and spaces set by the HT code, spaces set by the ESC+f+0+n, IBM Block Graphics and IBM 12-dot special characters are not underlined.
- Pin No. 9 of the print head is used for underlining.
- Since g, j, p, q, y etc. have true descenders, they also use Pin No. 9, and will touch the underline.
- Whenever two passes of the print head are required, underline is printed only on the first pass.

PROGRAMMABLE PITCH/HIGHLIGHTING:

Sets a combination of character pitch and/or highlighting.

Name: ESC+!+n 0≦n≦255

Code: 27,33,n DEC 1B,21,n HEX

Input Format: LPRINT CHR$(27)+"!"+CHR$(n)

Example: (See page 5-13)

Comments:

- Print modes correspond to the setting of each bit as illustrated below.

bit	7	6	5	4	3	2	1	0
"1"	Underlining	Italic	Double width	Double printing	Empha-sized	Compres-sed	No meaning	Elite
"0"	Normal	Normal	Normal	Normal	Normal	Normal		Pica

- Bits 0 and 2 only pertain to pitch.
- IF n=49 (31 HEX), setting bits 0,4 and 5 to "1" produces double width, elite, double printing.
- When bits 2 and 3 are both set to "1", emphasized printing takes priority over compressed pitch.
- Pitch and highlight combinations are determined by the value of "n" as illustrated in Table 5.3.
- Compressed, pica, and elite pitch, as well as emphasized printing, are operational only when the print mode selector is set to "Pgm".
- Also refer to Table 5.9 and 5.10 Mixing Print Modes, and the ESC+!+n command in the "CHARACTER PITCH" section, page 5-13.

CHARACTER SET

Character set commands enable you to access a variety of ASCII character sets available on this printer. The setting of DIP switches 1-1, 1-2 and 1-3, as shown below, determines which character mode you may access. Within each character mode you may then input the appropriate control commands to access specific character sets.

SW1-1	SW1-2	SW1-3	FUNCTION
ON	ON	ON	Standard Mode
OFF	ON	ON	IBM-PC Matrix Printer Mode
ON	OFF	ON	IBM-PC Graphic Printer Mode I
OFF	OFF	ON	IBM-PC Graphic Printer Mode II

Appendix A contains the character sets in each of these modes.

In Standard Mode, you may access draft, international, and italic international characters.

In IBM-PC Matrix Printer Mode, you may access the character set used by the IBM-PC Matrix Printer. This enables this printer to emulate the IBM-PC Matrix Printer.

In IBM-PC Graphics Printer Mode, you may access either of two different graphics modes to enable this printer to emulate the IBM-PC Graphics Printer.

INTERNATIONAL CHARACTER SET:

Selects any one of 11 international character sets.

Name: ESC+R+n 0≦n≦10

Code: 27,82,n DEC 1B,52,n HEX

Input Format: LPRINT CHR$(27)+"R"+CHR$(n)

Example:

```
10 REM SELECT GERMAN CHARACTERS
20 LPRINT "SAMPLE USA CHARACTERS:"
30 LPRINT "# $ @ [ \ ] ^ ` { : } ~"
40 LPRINT CHR$(10);
50 LPRINT CHR$(27)+"R"+CHR$(2);
60 LPRINT "SAMPLE GERMAN CHARACTERS:"
70 LPRINT "# $ @ [ \ ] ^ ` { : } ~"
```

```
SAMPLE USA CHARACTERS:
# $ @ [ \ ] ^ ` { : } ~

SAMPLE GERMAN CHARACTERS:
# $ § Ä ö Ü ^ ` ä : ü ß
```

Comments:

- Table 5.4 illustrates allocation of international characters to their respective locations.
- International character sets 0–7 can be set with DIP switches 1-6, 1-7 and 1-8.
- Character sets 8, 9, and 10 may be accessed through software ONLY.
- International character set is not available in IBM Graphic printer modes.

	n	35D 23H	36D 24H	64D 40H	91D 5BH	92D 5CH	93D 5DH	94D 5EH	96D 60H	123D 7BH	124D 7CH	125D 7DH	126D 7EH
USA	0	#	$	@	[	\	]	^	`	{	¦	}	~
FRANCE	1	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	2	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ENGLAND	3	£	$	@	[	\	]	^	`	{	¦	}	~
DENMARK I	4	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	6	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	7	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
JAPAN	8	#	$	@	[	¥	]	^	`	{	¦	}	~
NORWAY	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	10	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

Table 5.4 International Character Set Locations

ITALIC INTERNATIONAL CHARACTERS:

Allocates locations 128 DEC–159 DEC (80 HEX–9F HEX) and 255 DEC (FF HEX) to italic international characters (effective only in Standard Printer Mode).

Name: Setting: ESC+6
Release: ESC+7

Code: Setting: 27,54 DEC 1B,36 HEX
Release: 27,55 DEC 1B,37 HEX

Input Format: Setting: LPRINT CHR$(27)+"6"
Release: LPRINT CHR$(27)+"7"

Example:

```
10 REM ITALIC INTERNATIONAL CHARACTERS
20 LPRINT "ITALIC INTERNATIONAL CHARACTERS"
30 LPRINT CHR$(27)+"6";CHR$(10);
40 FOR I=128 TO 159
50 LPRINT CHR$(I);
60 NEXT I
70 LPRINT CHR$(255)
80 LPRINT CHR$(27)+"7"
90 END
```

```
ITALIC INTERNATIONAL CHARACTERS

àèùòì°£¡¿ÑñªºÅåçßßæØø¨ÄÖÜäöüéé¥Ø
```

Comments:

- Table 5.5 illustrates allocation of italic international characters to their respective locations.
- This command registers characters only in the areas 128 DEC–159 DEC, 255 DEC.

LOCATION		CHAR.	LOCATION		CHAR.	LOCATION		CHAR.	LOCATION		CHAR.
DEC	HEX		DEC	HEX		DEC	HEX		DEC	HEX	
128	80	à	137	89	Ñ	146	92	Æ	155	9B	ö
129	81	è	138	8A	ñ	147	93	æ	156	9C	ü
130	82	ù	139	8B	ª	148	94	Ø	157	9D	É
131	83	ò	140	8C	Pt	149	95	ø	158	9E	é
132	84	ì	141	8D	Å	150	96	¨	159	9F	¥
133	85	°	142	8E	å	151	97	Ä	255	FF	Ø
134	86	£	143	8F	ç	152	98	Ö			
135	87	¡	144	90	§	153	99	Ü			
136	88	¿	145	91	ß	154	9A	ä			

Table 5.5 International Italic Character Locations

IBM-PC GRAPHIC PRINTER MODE I:

Selects IBM-PC Graphic printer Mode I.

Name: ESC+7

Code: 27,55 DEC 1B,37 HEX

Input Format: LPRINT CHR$(27)+"7"

Example:

```
10 REM IBM-PC GRAPHIC MODE(CHARACTER SET 1)
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"SPECIAL CHARACTERS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"7";
70 FOR I=160 TO 239:PRINT#1,CHR$(I);:NEXT I
80 PRINT#1,CHR$(10);
90 FOR I=240 TO 254:PRINT#1,CHR$(I);:NEXT I
100 PRINT#1,CHR$(10);
110 CLOSE
120 END
```

```
SPECIAL CHARACTERS
áíóúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌
≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

Comments:

- Refer to Appendix A.
- This command is operational only when DIP switch 1-2 is OFF and 1-3 is ON. (i.e. IBM-PC GRAPHIC MODE is selected.)
- The output from the sample program above was purposely reduced in order that all characters could properly be typeset for printing of this manual.

IBM-PC GRAPHIC PRINTER MODE II:

Selects IBM-PC Graphic printer Mode II.

Name: ESC+6

Code: 27,54 DEC 1B,36 HEX

Input Format: LPRINT CHR$(27)+"6"

Example:

```
10 REM IBM-PC GRAPHIC MODE(CHARACTER SET 2)
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"SPECIAL CHARACTERS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"6";
70 FOR I=3 TO 6:PRINT#1,CHR$(I);:NEXT I
80 PRINT#1,CHR$(21);
90 FOR I=128 TO 202:PRINT#1,CHR$(I);:NEXT I
100 PRINT#1,CHR$(10);
110 FOR I=203 TO 254:PRINT#1,CHR$(I);:NEXT I
120 PRINT#1,CHR$(10);
130 CLOSE
140 END
```

```
SPECIAL CHARACTERS
♥♦♣♠§ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥₧ƒáíóúñÑªº¿⌐¬½¼¡«»
```

Comments:

- Refer to Appendix A.
- This command is operational only when DIP switch 1-2 is OFF and 1-3 is ON. (i.e. IBM-PC GRAPHIC MODE is selected.)
- The output from the sample program above was purposely reduced in order that all characters could properly be typeset for printing of this manual.

PROGRAMMABLE PRINTER MODE:

Sets printer mode to Standard Printer, IBM Matrix, IBM Graphic I, or IBM Graphic II mode.

Name: ESC+m+n 0≦n≦3

Code: 27,109,n DEC 1B,6D,n HEX

Input Format: LPRINT CHR$(27)+"m"+CHR$(n)

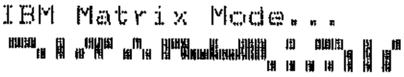
Example:

```
10 REM PRINTER MODE SELECTION
20 LPRINT "SAMPLE OF EXTENDED ASCII CHARACTERS"
30 LPRINT "LOCATIONS 3 - 6 & 162 - 182";CHR$(10)
40 FOR I=1 TO 4
50 LPRINT CHR$(27)+"m"+CHR$(I-1);
60 ON I GOTO 70,80,90,100
70 LPRINT "Standard Mode...":GOTO 110
80 LPRINT "IBM Matrix Mode...":GOTO 110
90 LPRINT "IBM Graphic Mode I...":GOTO 110
100 LPRINT "IBM Graphic Mode II...":GOTO 110
110 FOR L=3 TO 6:LPRINT CHR$(L);:NEXT L
120 FOR L=162 TO 182:LPRINT CHR$(L);:NEXT L
130 LPRINT CHR$(10)
140 NEXT I
150 END
```

```
SAMPLE OF EXTENDED ASCII CHARACTERS
LOCATIONS 3 - 6 & 162 - 182

Standard Mode...
"#$%&'()*+,-./0123456

IBM Matrix Mode...
```



```
IBM Graphic Mode I...
óúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢

IBM Graphic Mode II...
♥♦♣♠óúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢
```

Comments:

- The value of "n" specifies the printer mode:
  - n=0: Standard
  - n=1: IBM Matrix
  - n=2: IBM Graphic I
  - n=3: IBM Graphic II
- The printer default mode is set by DIP switches 1-1, 1-2 and 1-3.
- This command is not cleared by the printer reset command .

BIT IMAGE (GRAPHICS)

The **bit image** (graphics) mode enables you to control the firing of each pin of the print head to create virtually any graphics design you desire.

Dot density (dot resolution) refers to the maximum number of dots which can be printed on a given line. This printer enables you to access a variety of dot densities through specific control commands. The various dot densities and corresponding control commands appear in Table 5.6.

Command	Function	Dot Density
ESC+K+n_1+n_2	Standard density designation	60
ESC+L+n_1+n_2	Double density designation	120
ESC+Y+n_1+n_2	Double speed, double density designation	120
ESC+Z+n_1+n_2	Quadruple density designation	240
ESC+*+m+n_1+n_2	8-Pin Mode Selection:	
	m=0 (Standard)	60
	m=1 (Double)	120
	m=2 (Double speed, double density)	120
	m=3 (Quadruple density)	240
	m=4	80
	m=5	72
	m=6	90
	m=7	144
ESC+^+m+n_1+n_2	9-Pin Mode Selection:	
	m=0 (Standard)	60
	m=1 (Double)	120
	m=2 (Double speed, double density)	120
	m=3 (Quadruple density)	240
	m=4	80
	m=5	72
	m=6	90
	m=7	144
ESC+?+n+m	Bit Image Mode Reassignment:	
	n="K", "L", "Y", "Z"	
	m=0 (Standard)	60
	m=1 (Double)	120
	m=2 (Double speed, double density)	120
	m=3 (Quadruple density)	240
	m=4	80
	m=5	72
	m=6	90
	m=7	144

Table 5.6 Dot Resolution (Dots per inch)

As you can see, each graphics control command uses two bytes, n_1, and n_2, for the designation of the actual number of dots you want printed on a line. The data entered in your program must match this dot specification; if not, in all likelihood your graphics data will contain strange characters.

Determining the values of n_1, and n_2 can be accomplished in the following way. Assume that you want to print N dots on a line, where N is within the proper dot density range. Then the outcome of the division below yields the values n_1 and n_2.

$$\begin{array}{r} n_2 \\ 256\overline{)\ N} \\ -256\times n_2 \\ \hline n_1 \end{array}$$

That is, n_2 is the integer quotient and n_1 is the remainder. For those users with a BASIC programming background, n_2=INT (N/256) and n_1=N−(256*n_2).

As an example, suppose we want to print 967 dots per line. Then:

$$\begin{array}{r} 3 \\ 256\overline{)\ 967} \\ 768 \\ \hline 199 \end{array}$$

, so n_2=3 and n_1=199

8-Pin Bit Image Mode

Of the 9 pins in the print head, the 8-pin bit image graphics mode uses the upper eight pins only. Each pin corresponds to a power of two. By summing the powers of two corresponding to each of the pins you wish to fire, you will obtain a numerical value which instructs the printer to print one column of dots. Through such techniques in BASIC as looping, numerical values for each column on a line are input and processed. The result is one line of graphics.

Pin No.	Pins	8-Bit Interface	7-Bit Interface
1	•	2^7=128	Not used
2	•	2^6=64	2^6=64
3	•	2^5=32	2^5=32
4	•	2^4=16	2^4=16
5	•	2^3=8	2^3=8
6	•	2^2=4	2^2=4
7	•	2^1=2	2^1=2
8	•	2^0=1	2^0=1
9	•	Not used	Not used

As an example, suppose you want to fire pins 1, 2, 5, and 8 simultaneously. Then you compute the following sum:

Input Code=Pin 1 Code+Pin 2 Code+Pin 5 Code+Pin 8 Code
$=2^7+2^6+2^3+2^0$
=128+64+8+1
=201

Thus, the value 201 is entered in the CHR$ function in order to print a single column of dots resulting from firing pins 1, 2, 5, and 8.

For our final example, refer to the standard density designation in Table 5.6. This setting is given by ESC+K+n_1+n_2. Suppose you wish to print 100 columns of dots, where every column fires pins 1 and 8 only.

You first compute the values of n_1 and n_2.

$$256\overline{)100} \quad \begin{array}{r} 0 \\ 0 \\ \hline 100 \end{array}$$

, so $n_2=0$ and $n_1=100$

Our control code ESC+K+n_1+n_2 now translates into:

```
LPRINT CHR$(27)+"K"+CHR$(100)+CHR$(0);
```

Next computer the code for firing pins 1 and 8 simultaneously:

Input Code=Pins 1 Code+Pin 8 Code
$=2^7+2^0$
$=128+1$
$=129$

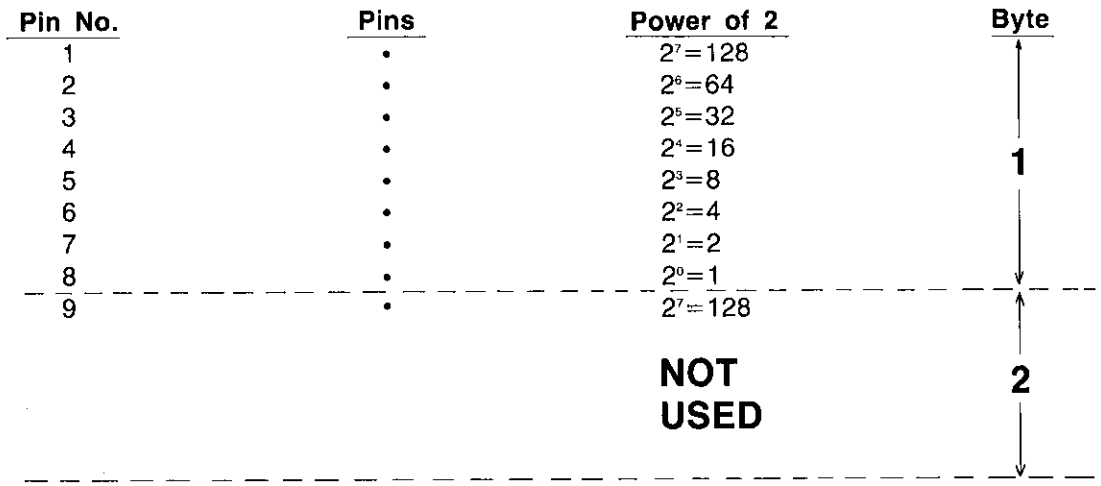
Finally, we incorporate our two calculations into the following program. Note that lines 20 and 30 are necessary for the proper execution of this program on many IBM-compatible computers.
Such BASIC statements suppress CR and LF codes and enable printing on a full line without unwanted "breaks". Programs which include statements such as lines 20 and 30 cannot use LPRINTs to print data. In such cases, PRINT# statements must be used. Line 90 is necessary to CLOSE all open files.

```
10 REM STANDARD DENSITY
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+"K"+CHR$(100)+CHR$(0);
50 FOR I=1 TO 100
60 PRINT#1,CHR$(129);
70 NEXT I
80 PRINT#1,CHR$(10);
90 CLOSE
100 END
```

9-Pin Bit Image Mode

In the 9-pin bit image mode, all 9 pins of the print head may be fired. The 9 pins in the print head are divided into two portions, the upper 8 pins and the bottom pin.

As in the 8-pin mode, the upper 8 pins correspond to powers of two, ranging from 2^0 to 2^7. The firing of one or more of these 8 pins represents 1 byte of data. The 9th (bottom-most) pin represents an additional byte of data. When fired, it is represented by the value 2^7. When not fired, it is represented by the value 0. Together, these two bytes determine the dot configuration for a single column of graphics.



As an example, suppose you want to fire pins 1, 2, 5, 8 and 9 simultaneously. Then you determine the following two values:

Byte 1: Input Code=Pin 1 Code+Pin 2 Code+Pin 5 Code+Pin 8 Code
$=2^7+2^6+2^3+2^0$
$=128+64+8+1$
$=201$

Byte 2: Input Code=Pin 9 Code
$=2^7$
$=128$

Thus, the two bytes for a single column of dots are entered as:
CHR$(201); CHR$(128);

Refer to the 9-pin standard density designation in Table 5.6. This setting is given by ESC+^+m+n_1+n_2, where m=0. Suppose you wish to print 100 columns of dots, where every column fires pins 1, 2, 5, 8 and 9 as above.

As in the 8-pin example on page 5-33, n_1=100 and n_2=0. Our control code ESC+^+m+n_1+n_2 now translates into:

```
LPRINT CHR$(27)+"^"+CHR$(0)+CHR$(100)+CHR$(0);
```

If we incorporate this information into a program, we might have the following:

```
10 REM 9-PIN STANDARD DENSITY
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+"^"+CHR$(0)+CHR$(100)+CHR$(0);
50 FOR I=1 TO 100
60 PRINT#1,CHR$(201)+CHR$(128);
70 NEXT I
80 PRINT#1,CHR$(10);
90 CLOSE
100 END
```

Before proceeding with examples of each graphics control command, three important points are worth noting.

First, bit image graphics is automatically set to single direction (left to right) printing. This is done to ensure that dots are correctly aligned vertically.

Second, the graphics mode is released immediately following the printing of all bit image data. Printing will return to the text mode.

Third, any bit image data are not affected by MSB control commands.

STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode (816 dots per line/60 dots per inch (25.4 mm)).

Name: ESC+K+n_1+n_2

Code: 27,75,n_1,n_2 DEC 1B,4B,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"K"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM STANDARD DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"STANDARD DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"K"+CHR$(64)+CHR$(1);
70 FOR I=1 TO 20
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
STANDARD DENSITY GRAPHICS
```

DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+L+n_1+n_2

Code: 27,76,n_1,n_2 DEC 1B,4C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"L"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM DOUBLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"DOUBLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"L"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
DOUBLE DENSITY GRAPHICS
```

DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+Y+n_1+n_2

Code: 27,89,n_1,n_2 DEC 1B,59,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"Y"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM DOUBLE SPEED, DOUBLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"DOUBLE SPEED, DOUBLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"Y"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
DOUBLE SPEED, DOUBLE DENSITY GRAPHICS
```


Comment:

- Horizontally adjacent dots cannot be printed.

QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode (3264 dots per line/240 dots per inch (25.4 mm)).

Name: ESC+Z+n_1+n_2

Code: 27,90,n_1,n_2 DEC 1B,5A,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"Z"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM QUADRUPLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"QUADRUPLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"Z"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
QUADRUPLE DENSITY GRAPHICS
▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲
```

Comment:

- Horizontally adjacent dots cannot be printed.

8-PIN BIT IMAGE MODE SELECTION:

Selects one of eight 8-pin bit image graphic modes.

Name: ESC+✳+m+n_1+n_2 0≦m≦7

Code: 27,42,m,n_1,n_2 DEC 1B,2A,m,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"✳"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)

Example:

```
10 REM 8-PIN BIT IMAGE MODE SELECTION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR M=0 TO 7
50 PRINT#1,"IMAGE MODE =";M
60 PRINT#1,CHR$(10);
70 PRINT#1,CHR$(27)+"*"+CHR$(M)+CHR$(200)+CHR$(0);
80 FOR I=1 TO 25
90 PRINT#1,STRING$(4,CHR$(15));
100 PRINT#1,STRING$(4,CHR$(240));
110 NEXT I
120 PRINT#1,CHR$(10);
130 NEXT M
140 PRINT#1,CHR$(10);
150 CLOSE
160 END
```

```
IMAGE MODE = 0
IMAGE MODE = 1
IMAGE MODE = 2
IMAGE MODE = 3
IMAGE MODE = 4
IMAGE MODE = 5
IMAGE MODE = 6
IMAGE MODE = 7
```

Comments:

- Table 5.7 illustrates the various modes based upon the values of m.

Value of m	Mode	Dot Density
0	Standard density	816 dpl/ 60 dpi
1	Double density	1632 dpl/120 dpi
2	Double speed, double density	1632 dpl/120 dpi
3	Quadruple density	3264 dpl/240 dpi
4	1088 dot density	1088 dpl/ 80 dpi
5	979 dot density	979 dpl/ 72 dpi
6	1224 dot density	1224 dpl/ 90 dpi
7	1958 dot density	1958 dpl/144 dpi

Table 5.7 Dot Density

- Both the vertical and horizontal dot pitch in the 979 dot density mode equal 1/72 inch (0.35 mm), thereby producing a 1:1 aspect ratio.
- The following settings are equivalent:
  - —ESC+K+n_1+n_2 and ESC+✳+0+n_1+n_2
  - —ESC+L+n_1+n_2 and ESC+✳+1+n_1+n_2
  - —ESC+Y+n_1+n_2 and ESC+✳+2+n_1+n_2
  - —ESC+Z+n_1+n_2 and ESC+✳+3+n_1+n_2

9-PIN BIT IMAGE MODE SELECTION:

Selects one of eight 9-pin bit image graphic modes.

Name: ESC+^+m+n_1+n_2 0≦m≦7

Code: 27,94,m,n_1,n_2 DEC 1B,5E,m,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"^"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)

Example:

```
10 REM 9-PIN BIT IMAGE MODE SELECTION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR N=0 TO 7
50 PRINT#1,"IMAGE MODE =";N
60 PRINT#1,CHR$(10);
70 PRINT#1,CHR$(27)+"^"+CHR$(N)+CHR$(180)+CHR$(0);
80 FOR I=1 TO 10
90 PRINT#1,CHR$(0)+CHR$(128)+CHR$(0)+CHR$(128);
100 PRINT#1,CHR$(1)+CHR$(128)+CHR$(1)+CHR$(128);
110 PRINT#1,CHR$(3)+CHR$(128)+CHR$(3)+CHR$(128);
120 PRINT#1,CHR$(7)+CHR$(128)+CHR$(7)+CHR$(128);
130 PRINT#1,CHR$(15)+CHR$(128)+CHR$(15)+CHR$(128);
140 PRINT#1,CHR$(31)+CHR$(128)+CHR$(31)+CHR$(128);
150 PRINT#1,CHR$(63)+CHR$(128)+CHR$(63)+CHR$(128);
160 PRINT#1,CHR$(127)+CHR$(128)+CHR$(127)+CHR$(128);
170 PRINT#1,CHR$(255)+CHR$(128)+CHR$(255)+CHR$(128);
180 NEXT I
190 PRINT#1,CHR$(10);
200 NEXT N
210 PRINT#1,CHR$(10);
220 CLOSE
230 END
```

```
IMAGE MODE = 0
```

```
IMAGE MODE = 1
```

```
IMAGE MODE = 2
```

```
IMAGE MODE = 3
```

```
IMAGE MODE = 4
```

```
IMAGE MODE = 5
```

```
IMAGE MODE = 6
```

```
IMAGE MODE = 7
```

BIT IMAGE MODE REASSIGNMENT:

Reassigns bit image graphics mode density.

Name: ESC+?+n+m n=75,76,89,90
m=0,1,2,3,4,5,6,7

Code: 27,63,n,m DEC 1B,3F,n,m, HEX

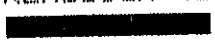
Input Format: LPRINT CHR$(27)+"?"+CHR$(n)+CHR$(m)

Example:

```
10 REM BIT IMAGE MODE REASSIGNMENT
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR L=1 TO 2
50 IF L=1 THEN PRINT#1,"NORMAL (ESC+K+n1+n2)"
60 IF L=2 THEN PRINT#1,"REASSIGN (ESC+K+n1+n2) TO QUAD. DENSITY"
70 PRINT#1,CHR$(10);
80 IF L=2 THEN PRINT#1,CHR$(27)+"?"+"K"+CHR$(3);
90 PRINT#1,CHR$(27)+"K"+CHR$(0)+CHR$(1);
100 FOR I=1 TO 256
110 PRINT#1,CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(10);CHR$(10);
140 NEXT L
150 CLOSE
160 END
```

```
NORMAL (ESC+K+n1+n2)
```

```
REASSIGN (ESC+K+n1+n2) TO QUAD. DENSITY
```



Comments:

- The value of "n" specifies the graphics mode which is to be reassigned:
  - n=75: Reassign STANDARD DENSITY (ESC+K+n_1+n_2)
  - n=76: Reassign DOUBLE DENSITY (ESC+L+n_1+n_2)
  - n=89: Reassign DOUBLE SPEED, DOUBLE DENSITY (ESC+Y+n_1+n_2)
  - n=90: Reassign QUADRUPLE DENSITY (ESC+Z+n_1+n_2)
- The value of "m" specifies the graphics mode to which the original is to be reassigned:
  - m=0: Reassign to STANDARD DENSITY
  - m=1: Reassign to DOUBLE DENSITY
  - m=2: Reassign to DOUBLE SPEED, DOUBLE DENSITY
  - m=3: Reassign to QUADRUPLE DENSITY
  - m=4: Reassign to 1088 DOTS PER LINE DENSITY
  - m=5: Reassign to 979 DOTS PER LINE DENSITY
  - m=6: Reassign to 1224 DOTS PER LINE DENSITY
  - m=7: Reassign to 1958 DOTS PER LINE DENSITY
- Refer to Table 5.6 on page 5-31 for details on the various bit image densities.

PAPER FEED

Paper feed refers to either the specification of the amount of paper to be fed or the commands to actually cause the paper to be fed. Paper feed amount and execution are discussed below. Settings for page length, vertical tab positions, and skip perforation remain as initially set even if the paper feed amount is changed.

•PAPER FEED AMOUNT•

Table 5.8 lists the various control commands for paper feed.

Line Pitch Size	Standard Mode	IBM-PC Matrix/Graphic Mode
1/8" (3.2 mm) 7/72" (2.47 mm) 1/6" (4.2 mm) n/72" n/216"	ESC+0 ESC+1 ESC+2 ESC+A+n ESC+3+n	ESC+0 ESC+1 [1]ESC+A+12, ESC+2 [2]ESC+A+n, ESC+2 ESC+3+n [1]If not set, default line spacing is 1/6" (4.2 mm). [2]ESC+A+n must be followed by ESC+2.

Table 5.8 Selection of Paper Feed Amount

1/8 INCH PAPER FEED:

Sets paper feed amount to 1/8 inch (3.2 mm).

Name: ESC+0

Code: 27,48 DEC 1B,30 HEX

Input Format: LPRINT CHR$(27)+"0"

Example:

```
10 REM PAPER FEED AMOUNT=1/8 INCH
20 LPRINT "PAPER FEED AMOUNT = 1/8 INCH"
30 LPRINT CHR$(27)+"0";
40 FOR I=1 TO 4
50 LPRINT "_____"
60 NEXT I
70 END
```

```
PAPER FEED AMOUNT = 1/8 INCH
_____
_____
_____
_____
```

Comments:

- ESC+0 sets 1/8 inch (3.2 mm) paper feed in all printer modes.

7/72 INCH PAPER FEED:

Sets paper feed amount to 7/72 inch (2.47 mm).

Name: ESC+1

Code: 27,49 DEC 1B,31 HEX

Input Format: LPRINT CHR$(27)+"1"

Example:

```
10 REM PAPER FEED AMOUNT=7/72 INCH
20 LPRINT "PAPER FEED AMOUNT = 7/72 INCH"
30 LPRINT CHR$(27)+"1";
40 FOR I=1 TO 4
50 LPRINT "_____"
60 NEXT I
70 END
```

```
PAPER FEED AMOUNT = 7/72 INCH
_____
_____
_____
_____
```

Comment:

- ESC+1 sets 7/72 inch (2.47 mm) paper feed in all printer modes.

1/6 INCH PAPER FEED:

Sets paper feed amount to 1/6 inch (4.2 mm).

Name: ESC+2 (Standard printer mode only)

Code: 27,50 DEC 1B,32 HEX

Input Format: LPRINT CHR$(27)+"2"

Example:

```
10 REM PAPER FEED AMOUNT=1/6 INCH
20 LPRINT "PAPER FEED AMOUNT = 1/6 INCH"
30 LPRINT CHR$(27)+"2";
40 FOR I=1 TO 4
50 LPRINT "__________"
60 NEXT I
70 END
```

```
PAPER FEED AMOUNT = 1/6 INCH
__________
__________
__________
__________
```

Comment:

- ESC+2 sets 1/6 inch (4.2 mm) paper feed in Standard Printer Mode only. Use ESC+A+n, n=12, to set 1/6 inch (4.2 mm) paper feed and use ESC+2 to activate the ESC+A+n setting in the IBM-PC Matrix/Graphic printer mode. The IBM-PC mode defaults to 1/6 inch (4.2 mm).

n/72 INCH PAPER FEED:

Sets programmable paper feed amount to n/72 inch.

Name: ESC+A+n

Code: 27,65,n DEC 1B,41,n HEX

Input Format: LPRINT CHR$(27)+"A"+CHR$(n)

Example:

```
10 REM PAPER FEED AMOUNT=n/72 INCH
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"PAPER FEED AMOUNT = n/72 INCH"
50 FOR I=1 TO 20
60 PRINT#1,CHR$(27)+"A"+CHR$(I);
70 PRINT#1,"_____"
80 PRINT#1,CHR$(10);
90 NEXT I
100 CLOSE
110 END
```

```
PAPER FEED AMOUNT = n/72 INCH
```

Comments:

- In the IBM-PC Matrix/Graphic printer mode only, ESC+2 must be input after ESC+A+n for n/72 inch paper feed to become effective.
- n/72 inch paper feed is valid for 0≦n≦85.

n/216 INCH PAPER FEED:

Sets programmable paper feed amount to n/216 inch.

Name: ESC+3+n

Code: 27,51,n DEC 1B,33,n HEX

Input Format: LPRINT CHR$(27)+"3"+CHR$(n)

Example:

```
10 REM PAPER FEED AMOUNT=n/216 INCH
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"PAPER FEED AMOUNT = n/216 INCH"
50 FOR I=1 TO 20
60 PRINT#1,CHR$(27)+"3"+CHR$(I);
70 PRINT#1,"_____"
80 PRINT#1,CHR$(10);
90 NEXT I
100 CLOSE
110 END
```

```
PAPER FEED AMOUNT = n/216 INCH
```

Comments:

- n/216 inch paper feed is valid for 0≦n≦255.
- ESC+3+n sets n/216 programmable paper feed in all printer modes.

•PAPER FEED EXECUTION•

LINE FEED (LF):

Causes data in buffer to be printed and then executes a single line feed.

Name: LF

Code: 10 DEC 0A HEX

Input Format: LPRINT CHR$(10)

Example:

```
10 REM LINE FEED
20 LPRINT "LINE";CHR$(10);"FEED"
30 END
```

```
LINE
FEED
```

Comments:

- When the new line position falls within the skip perforation range, the paper advances to the next top of form position.
- If there is no data, "space" data (ASCII 32), or blanks between HT print positions in the buffer, LF feeds the paper by only 1 line.
- The amount of spacing generated by LF is a function of the paper feed amount setting.
- LF releases single-line double width printing. (See page 5-21.)

FORM FEED (FF):

Feeds paper to next top of form position after first printing any data in the buffer.

Name: FF

Code: 12 DEC 0C HEX

Input Format: LPRINT CHR$(12)

Example: (See ESC+C+0+n or ESC+C+n)

Comments:

- FF releases single-line double width printing. See page 5-21.
- Amount of form feed depends upon page length set by the page length control command.

n/216 INCH PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/216 inch.

Name: ESC+J+n

Code: 27,74,n DEC 1B,4A,n HEX

Input Format: LPRINT CHR$(27)+"J"+CHR$(n)

Example:

```
10 REM SINGLE-LINE PROGRAMMABLE PAPER FEED
20 LPRINT "      SINGLE-LINE PROGRAMMABLE PAPER FEED";
30 LPRINT CHR$(27)+"J"+CHR$(108);
40 LPRINT "OF ONE-HALF INCH"
50 FOR I=1 TO 3
60 LPRINT "NORMAL PAPER FEED"
70 NEXT I
80 END
```

```
      SINGLE-LINE PROGRAMMABLE PAPER FEED

                                        OF ONE-HALF INCH
NORMAL PAPER FEED
NORMAL PAPER FEED
NORMAL PAPER FEED
```

Comments:

- Single-line, n/216 inch paper feed is valid for 0≦n≦255.
- This command sets the paper feed for ONE line only. Subsequent paper feed returns to previous setting. However, the carriage does not return to the left margin position. Instead, printing of next line begins where previous printing left off.
- This command does not release single-line double width printing. (See page 5-21.)
- ESC+J+n sets single-line n/216 inch paper feed in all printer modes.

n/216 INCH REVERSE DIRECTION SINGLE LINE PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/216 inch in reverse direction.

Name: ESC+j+n

Code: 27,106,n DEC 1B,6A,n HEX

Input Format: LPRINT CHR$(27)+"j"+CHR$(n)

Example:

```
10 REM PROGRAMMABLE REVERSE PAPER FEED
20 LET K=0
30 FOR I=10 TO 30 STEP 10
40 LET K=K+1
50 LPRINT "PRINT LINE #";K;
60 LPRINT CHR$(27)+"j"+CHR$(I);
70 NEXT I
80 END
```

```
PRINT LINE # 1 PRINT LINE # 2 PRINT LINE # 3
```

Comments:

- Reverse, single line n/216 inch paper feed is valid for 0≦n≦255.
- This command sets reverse direction paper feed for one line only. Subsequent paper feed returns to the previous setting. The carriage will not return, however, to the left margin position. Instead, the printing of the next line begins where the previous printing left off.
- This command does not release single-line double width printing. ESC+j+n is effective in all printer modes.

Notes:

- Reverse paper feed cannot be executed in the area from the bottom perforation upward 3.6 inches (91.4 mm). Additionally, the perforation should not be included in the area of reverse paper feed.
- Multi-part forms should not be used with reverse paper feed.

n-LINE PAPER FEED:

Feeds the paper "n" lines after printing data in the buffer.

Name: ESC+f+1+n

Code: 27,102,1,n DEC 1B,66,01,n HEX

Input Format: LPRINT CHR$(27)+"f"+CHR$(1)+CHR$(n)

Example:

```
10 REM n-LINE PAPER FEED
20 LPRINT "PAPER FEED OF";
30 LPRINT CHR$(27)+"f"+CHR$(1)+CHR$(6);
40 LPRINT "6 LINES"
50 END
```

```
PAPER FEED OF



6 LINES
```

Comments:

- ESC+f+1+n uses the current paper feed amount and printing continues in the very next column where previous printing ended.
- The value of n must be in the range 0≦n≦127. If n≧128, the paper is fed n−128 lines.
- Programmable n-line paper feed does not release double width printing.

PAGE FORMAT

Page format commands will enable you to design the layout of your printed page. Such commands include page length, margin setting and skip perforation commands.

PAGE LENGTH (INCHES):

Sets page length in inches.

Name: ESC+C+0+n

Code: 27,67,0,n DEC 1B,43,00,n HEX

Input Format: LPRINT CHR$(27)+"C"+CHR$(0)+CHR$(n)

Example:

```
10 REM PAGE LENGTH (INCHES)
20 LPRINT CHR$(27)+"C"+CHR$(0)+CHR$(1);
30 LPRINT "THIS PAGE IS 1 INCH LONG";
40 LPRINT CHR$(12);
50 LPRINT CHR$(27)+"C"+CHR$(0)+CHR$(2);
60 LPRINT "THIS PAGE IS 2 INCHES LONG";
70 LPRINT CHR$(12);
80 LPRINT "NEXT PAGE"
90 END
```

```
THIS PAGE IS 1 INCH LONG
```

```
THIS PAGE IS 2 INCHES LONG
```

```
NEXT PAGE
```

Comments:

- Upon receipt of ESC+C+0+n, the present line position becomes the top of page position.
- The value of n must be in the range 1≦n≦22. If n=0 or n≧23, the page length does not change.
- ESC+C+0+n releases the VT, VFU and skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

PAGE LENGTH (LINES):

Sets page length in number of lines.

Name: ESC+C+n

Code: 27,67,n $_{DEC}$ 1B,43,n $_{HEX}$

Input Format: LPRINT CHR$(27)+"C"+CHR$(n)

Example:

```
10 REM PAGE LENGTH (LINES)
20 LPRINT CHR$(27)+"C"+CHR$(3);
30 LPRINT "THIS PAGE IS 3 LINES LONG"
40 LPRINT CHR$(12);
50 LPRINT CHR$(27)+"C"+CHR$(5);
60 LPRINT "THIS PAGE IS 5 LINES LONG"
70 LPRINT CHR$(12);
80 LPRINT "NEXT PAGE"
90 END
```

```
THIS PAGE IS 3 LINES LONG


THIS PAGE IS 5 LINES LONG



NEXT PAGE
```

Comments:

- Upon receipt of ESC+C+n, the present line position becomes the top of page position.
- The value of n must be in the range $1 \leqq n \leqq 127$. If n=0, page length returns to the inch designation. If $n \geqq 128$ values are processed as n−128.
- ESC+C+n releases the VT, VFU and skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

LEFT MARGIN:

Sets position of left margin.

Name: ESC+l+n

Code: 27,108,n DEC 1B,6C,n HEX

Input Format: LPRINT CHR$(27)+"l"+CHR$(n)

Example:

```
10 REM LEFT MARGIN SETTING
20 FOR I=1 TO 5
30 LPRINT "0123456789";
40 NEXT I
50 LPRINT CHR$(10);
60 LPRINT CHR$(27)+"l"+CHR$(10);
70 LPRINT "LEFT MARGIN 10"
80 LPRINT CHR$(27)+"l"+CHR$(20);
90 LPRINT "LEFT MARGIN 20"
100 END
```

```
01234567890123456789012345678901234567890123456789
          LEFT MARGIN 10
                     LEFT MARGIN 20
```

Comments:

- If the value of "n" exceeds the right margin value, ESC+l+n is ineffective and the left margin does not change.
- Setting the left margin position clears all data in the print buffer.
- In proportional spacing, the left margin is set with pica pitch.
- Once the left margin position is set, a change in the character mode will not alter this left margin setting.

RIGHT MARGIN:

Sets position of right margin.

Name: ESC+Q+n

Code: 27,81,n DEC 1B,51,n HEX

Input Format: LPRINT CHR$(27)+"Q"+CHR$(n)

Example:

```
10 REM RIGHT MARGIN SETTING
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(10)
60 LPRINT CHR$(27)+"Q"+CHR$(40);
70 LPRINT "RIGHT MARGIN 40"
80 FOR I=1 TO 5
90 LPRINT "1234567890";
100 NEXT I
110 LPRINT CHR$(10)
120 LPRINT CHR$(27)+"Q"+CHR$(30);
130 LPRINT "RIGHT MARGIN 30"
140 FOR I=1 TO 5
150 LPRINT "1234567890";
160 NEXT I
170 LPRINT CHR$(10)
180 END
```

```
12345678901234567890123456789012345678901234567890

RIGHT MARGIN 40
1234567890123456789012345678901234567890
1234567890

RIGHT MARGIN 30
123456789012345678901234567890
123456789012345678901234567890
```

Comments:

- Permissible values of "n" are given below.

Pica print	2≦n≦136
Compressed print	4≦n≦233
Double Width print	1≦n≦68
Double Width/Compressed print	2≦n≦116

- Any designation to the left of the left margin position is ignored.
- Setting the right margin clears all data in the buffer.
- In proportional spacing, the right margin is set with pica pitch.
- Once the right margin position is set, a change in the character mode will not alter this right margin setting.

SKIP PERFORATION:

Sets skip-over perforation.

Name: Setting: ESC+N+n
Release: ESC+O

Code: Setting: 27,78,n DEC 1B,4E,n HEX
Release: 27,79 DEC 1B,4F HEX

Input Format: Setting: LPRINT CHR$(27)+"N"+CHR$(n)
Release: LPRINT CHR$(27)+"O"

Example:

```
10 REM SKIP PERFORATION
20 LPRINT CHR$(27)+"C"+CHR$(6);
30 LPRINT CHR$(27)+"N"+CHR$(3);
40 FOR I=1 TO 3
50 LPRINT "PAGE LENGTH SET TO 6 LINES - SKIP 3 LINES FROM PERF."
60 NEXT I
70 LPRINT CHR$(27)+"O";
80 FOR I=1 TO 7
90 LPRINT "SKIP PERFORATION IS CANCELLED"
100 NEXT I
110 END
```

```
PAGE LENGTH SET TO 6 LINES - SKIP 3 LINES FROM PERF.
PAGE LENGTH SET TO 6 LINES - SKIP 3 LINES FROM PERF.
PAGE LENGTH SET TO 6 LINES - SKIP 3 LINES FROM PERF.
```

```
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
SKIP PERFORATION IS CANCELLED
```

Comments:

- The value of "n" specifies the number of lines (or n times the current line spacing amount) to be skipped at the bottom of the page.
- This command is effective only for $1 \leqq n \leqq 127$. If $n \geqq 128$, the value is processed as $n-128$.
- The skip perforation amount does not change even if the paper feed amount is changed following a skip perforation designation.
- The skip perforation setting is released upon receipt of the page length designation command.
- If DIP switch 1-5 is set to ON, the skip perforation amount is set to 1 inch (25.4 mm). If DIP switch 1-5 is set to OFF, skip perforation is not executed unless specified by ESC+N+n.

TABULATION

Tabulation can be extremely important in the production of documents where items must be printed at locations other than the standard margin settings. The printing of tables, for example, may require substantial use of tabulation ("tabs"). The control commands which follow pertain to either **horizontal** or **vertical** tabs. For either horizontal or vertical tabs, we shall discuss commands which set and commands which execute tabs.

•Horizontal•

HORIZONTAL TAB STOP SETTING:

Sets horizontal tabulations specified values.

Name: Setting: ESC+D+n_1+n_2+...+n_x+0
Release: ESC+D+0

Code: Setting: 27,68,n_1,n_2,...,n_x,0 DEC 1B,44,n_1,n_2,...,n_x,00 HEX
Release: 27,68,0 DEC 1B,44,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"D"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0)
Release: LPRINT CHR$(27)+"D"+CHR$(0)

Example: (See HT, example 1, on page 5-57)

Comments:
- Horizontal tabs are set from the left margin position (column 0).
- Horizontal tabs must be designated such that $n_1<n_2<...<n_x$.
- A maximum of 60 tabs may be set on a single line.
- ESC+D+n_1+n_2+...+n_x+0 sets horizontal tab stops. The HT command on page 5-57 executes the tab designation.
- In proportional spacing, horizontal tabs are set with pica pitch.
- If the character pitch is altered after designating horizontal tabs, the tab positions do not change.
- When the left margin is changed, horizontal tabs default to every 8 columns, beginning with the new left margin setting.

HORIZONTAL TAB UNIT SETTING:

Sets horizontal tabulation every "n" positions, beginning at the left margin.

Name: ESC+e+0+n

Code: 27,101,0,n DEC 1B,65,00,n HEX

Input Format: LPRINT CHR$(27)+"e"+CHR$(0)+CHR$(n)

Example: (See HT, example 2, on page 5-57)

Comments:
- The HT unit setting is released when n=0 (ESC+e+0+0).
- HT is set every 8 columns in the default status.
- ESC+e+0+n sets horizontal tab units. The HT command on page 5-57 executes this tab designation.

HORIZONTAL TAB EXECUTION:

Executes the horizontal TAB as designated by ESC+D+n_1+n_2+...+n_k+0, ESC+e+0+n.

Name: HT

Code: 9 DEC 09 HEX

Input Format: LPRINT CHR$(9);

Example 1:

```
10 REM HORIZONTAL TAB SETTING/EXECUTION/RELEASE
20 LPRINT "HT SETTING"
30 FOR I=1 TO 5
40 LPRINT "0123456789";
50 NEXT I
60 LPRINT CHR$(10);
70 LPRINT CHR$(27)+"D";
80 LPRINT CHR$(1)+CHR$(8)+CHR$(20)+CHR$(30)+CHR$(45)+CHR$(0);
90 FOR I=1 TO 5
100 LPRINT CHR$(9);"HT";CHR$(48+I);
110 NEXT I
120 LPRINT CHR$(10);
130 LPRINT "HT RELEASE"
140 LPRINT CHR$(27)+"D"+CHR$(0);
150 FOR I=1 TO 5
160 LPRINT CHR$(9);"HT";CHR$(48+I);
170 NEXT I
180 LPRINT CHR$(10);
190 END
```

```
HT SETTING
01234567890123456789012345678901234567890123456789
 HT1     HT2          HT3         HT4               HT5
HT RELEASE
HT1HT2HT3HT4HT5
```

Example 2:

```
10 REM HT UNIT SETTING/EXECUTION
20 FOR I=1 TO 5
30 LPRINT "0123456789";
40 NEXT I
50 LPRINT CHR$(10);
60 LPRINT CHR$(27)+"e"+CHR$(0)+CHR$(8);
70 LPRINT CHR$(9);"TAB";
80 LPRINT CHR$(9);CHR$(9);"TAB";
90 LPRINT CHR$(9);CHR$(9);CHR$(9);"TAB"
100 END
```

```
01234567890123456789012345678901234567890123456789
         TAB              TAB                    TAB
```

Comments:

- If the value of the horizontal TAB is less than the present column position, that HT is ignored.
- If the value of the horizontal TAB exceeds the maximum printing width, all data within correct printing range will be printed according to the HT setting(s). A single line feed is executed.
- When in underline mode, the blank spaces between consecutive HT print positions are not underlined.
- When the printer is powered up, TAB is automatically set every 8 characters.

•Vertical•

VERTICAL TAB STOP SETTING:

Sets vertical tabulation to specified values.

Name: Setting: ESC+B+n_1+n_2+...+n_x+0
Release: ESC+B+0

Code: Setting: 27,66,n_1,n_2,...,n_x,0 DEC 1B,42,n_1,n_2,...,n_x,00 HEX
Release: 27,66,0 DEC 1B,42,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"B"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0)
Release: LPRINT CHR$(27)+"B"+CHR$(0)

Example: (See VT, example 1, on page 5-59)

Comments:
- VT is set from the top of page position.
- Vertical tabs must be designated such that $n_1<n_2<...<n_x$.
- A maximum of 16 tabs may be set.
- ESC+B+n_1+n_2+...+n_x+0 sets vertical tab stops. The VT command on page 5-59 executes the tab designation.
- If the paper feed amount is changed after a VT designation, the VT positions remain as initially set.
- VT setting is released by page length designation commands.
- The maximum value of n is page length minus 1.

VERTICAL TAB UNIT SETTING:

Sets vertical tabulation every "n" lines, beginning at top of page.

Name: ESC+e+1+n

Code: 27,101,1,n DEC 1B,65,01,n HEX

Input Format: LPRINT CHR$(27)+"e"+CHR$(1)+CHR$(n)

Example: (See VT, example 2, on page 5-60)

Comments:
- The VT unit setting is released when n=1 (ESC+e+1+1).
- The maximum length for a VT unit is the page length, and when a VT unit designation exceeds the page length, the setting is ignored.
- If the paper feed amount is changed after a VT unit designation, the VT unit remains as initially set.
- When n=0, data is printed, but the paper is not fed.
- The VT unit setting is released by page length designation command.

VERTICAL TAB EXECUTION:

Executes the vertical TAB as designated by ESC+B+n_1+n_2+...+n_x+0, ESC+b+m+n_1+n_2+...+n_x+0, or ESC+e+1+n.

Name: VT

Code: 11 DEC 0B HEX

Input Format: LPRINT CHR$(11)

Example 1:

```
10 REM VERTICAL TAB SETTING/EXECUTION/RELEASE
20 LPRINT "THIS PAGE IS 10 LINES LONG"
30 LPRINT CHR$(27)+"C"+CHR$(10);
40 LPRINT CHR$(27)+"B"+CHR$(3)+CHR$(7)+CHR$(0);
50 LPRINT "1ST LINE";CHR$(11);
60 LPRINT "3RD LINE";CHR$(11);
70 LPRINT "7TH LINE";CHR$(12);
80 LPRINT CHR$(27)+"B"+CHR$(0);
90 LPRINT "1ST LINE";CHR$(11);
100 LPRINT "3RD LINE";CHR$(11);
110 LPRINT "7TH LINE"
120 END
```

```
THIS PAGE IS 10 LINES LONG
1ST LINE


3RD LINE



7TH LINE


1ST LINE
3RD LINE
7TH LINE
```

Example 2: (See next page)

Example 2:

```
10 REM VT UNIT SETTING/EXECUTION
20 LPRINT "THIS PAGE IS 20 LINES LONG"
30 LPRINT CHR$(27)+"C"+CHR$(20);
40 LPRINT CHR$(27)+"e"+CHR$(1)+CHR$(6);
50 LPRINT "1ST LINE";CHR$(11);
60 LPRINT "7TH LINE";CHR$(11);
70 LPRINT "13TH LINE";CHR$(11);
80 LPRINT "19TH LINE";CHR$(12);
90 LPRINT "1ST LINE (NEXT PAGE)"
100 END
```

```
THIS PAGE IS 20 LINES LONG
1ST LINE




7TH LINE




13TH LINE




19TH LINE

1ST LINE (NEXT PAGE)
```

Comments:

- When TABs are set with VT or VFU setting command and when there is no tab setting on a position exceeding present line, data is printed out and paper is fed to the next top of page position (same as FF).
- When vertical TAB has not been set by ESC+B+n_1+n_2+...+n_x+0, execution of VT causes data in the buffer to be printed and advances the paper one line (same function as LF).

VFU CHANNEL SELECTION:

Selects one of eight channels in the Vertical Format Unit (VFU).

Name: ESC+/+n 0≦n≦7

Code: 27,47,n DEC 1B,2F,n HEX

Input Format: LPRINT CHR$(27)+"/"+CHR$(n)

Example: (See VFU SETTING, pages 5-61, 5-62)

Comments:
- The value of n must be in the range 0≦n≦7 and selects one of eight channels (0–7).
- Channel 0 is the default setting.

VFU SETTING:

Sets the tab position of each channel in the VFU (Vertical Format Unit).

Name:
Setting: ESC+b+m+n_1+n_2+...+n_x+0 0≦m≦7, 1≦x≦16
Release: ESC+b+m+0

Code:
Setting: 27,98,m,n_1,n_2,...,n_x,0 DEC 1B,62,m,n_1,n_2,...,n_x,00 HEX
Release: 27,98,m,0 DEC 1B,62,m,00 HEX

Input Format:
Setting: LPRINT CHR$(27)+"b"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)+...+CHR$($n_x$)+CHR$(0)
Release: LPRINT CHR$(27)+"b"+CHR$(m)+CHR$(0)

Example:

```
10 REM VFU CHANNEL SELECTION
20 REM SET PAGE LENGTH TO 17 LINES
30 LPRINT CHR$(27)+"C"+CHR$(14);
40 REM VFU CHANNEL 1
50 LPRINT CHR$(27)+"b"+CHR$(1);
60 LPRINT CHR$(3)+CHR$(6)+CHR$(0);
70 REM VFU CHANNEL 2
80 LPRINT CHR$(27)+"b"+CHR$(2);
90 LPRINT CHR$(4)+CHR$(8)+CHR$(0);
100 REM VFU CHANNEL 3
110 LPRINT CHR$(27)+"b"+CHR$(3);
120 LPRINT CHR$(5)+CHR$(10)+CHR$(0);
130 REM EXECUTE EACH VFU CHANNEL
140 FOR N=1 TO 3
150 LPRINT "***** THIS LINE IS 'TOP OF PAGE' *****"
160 LPRINT CHR$(27)+"/"+CHR$(N);
170 FOR I=1 TO 2
180 LPRINT CHR$(11);"THIS IS VERTICAL TAB CHANNEL:";N
190 NEXT I
200 LPRINT CHR$(12);
210 NEXT N
220 END
```

(Continued on next page)

```
***** THIS LINE IS 'TOP OF PAGE' *****

THIS IS VERTICAL TAB CHANNEL: 1

THIS IS VERTICAL TAB CHANNEL: 1



***** THIS LINE IS 'TOP OF PAGE' *****

THIS IS VERTICAL TAB CHANNEL: 2

THIS IS VERTICAL TAB CHANNEL: 2



***** THIS LINE IS 'TOP OF PAGE' *****

THIS IS VERTICAL TAB CHANNEL: 3

THIS IS VERTICAL TAB CHANNEL: 3
```

Comments:

- The VFU has eight channels. A maximum of 16 vertical tabs can be set by each channel.
- The VFU is valid for $0 \leqq m \leqq 7$ and selects one channel based on the value of "m".
- Any VFU setting exceeding the page length is ineffective.
- To operate the VFU, input the VT code (11 DEC) after selecting the channel via VFU channel selection command (ESC+/+n).
- The VFU position does not change even if paper feed amount is altered after VFU setting.
- The VFU setting is released by the page length designation commands.
- The vertical tab specified with ESC+B+n_1+n_2+...+n_k+0 is set to VFU channel 0.

CARRIAGE CONTROL

Carriage control commands enable you to control the amount of movement, the direction of movement, or the speed of the carriage.

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS

Code: 8 DEC 08 HEX

Input Format: LPRINT CHR$(8)

Example:

```
10 REM UNDERLINE BY BACKSPACING
20 LPRINT "ABCDE";
30 FOR I=1 TO 5
40 LPRINT CHR$(8);
50 NEXT I
60 LPRINT "_____"
70 END
```

ABCDE

Comments:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the character mode set when the BS code was received.
- See Underlining, example 2, page 5-23.

CARRIAGE RETURN:

Prints all data in buffer.

Name: CR

Code: 13 DEC 0D HEX

Input Format: LPRINT CHR$(13)

Example:

```
10 REM CARRIAGE RETURN
20 LPRINT "ABCDE";
30 LPRINT "FGHIJ";
40 LPRINT "KLMNO";
50 REM NOW ADD CARRIAGE RETURN
60 LPRINT CHR$(13);
70 LPRINT "PQRST"
80 END
```

```
ABCDEFGHIJKLMNO
PQRST
```

Comments:

- Certain computers issue an automatic linefeed with a carriage return. Check your computer manual for details.
- When DIP switch 1-4 is ON the paper is fed automatically (a LF is executed automatically) whenever a CR code is executed.

HOME PRINT HEAD:

Causes print head to return to its home position.

Name: ESC+<

Code: 27,60 DEC 1B,3C HEX

Input Format: LPRINT CHR$(27)+"<"

Example:

```
10 REM HOME THE PRINT HEAD
20 LPRINT "RETURN HEAD TO HOME"
30 LPRINT CHR$(27)+"<";
40 END
```

```
RETURN HEAD TO HOME
```

SINGLE DIRECTION:

Sets single direction (left to right) printing mode.

Name: Setting: ESC+U+n n=1,49,129,177
Release: ESC+U+m m=0,48,128,176

Code: Setting: 27,85,n DEC 1B,55,n HEX
Release: 27,85,m DEC 1B,55,m HEX

Input Format: Setting: LPRINT CHR$(27)+"U"+CHR$(n)
Release: LPRINT CHR$(27)+"U"+CHR$(m)

Example:

```
10 REM SINGLE DIRECTION PRINTING
20 LPRINT CHR$(27)+"U"+CHR$(1);
30 LPRINT "SINGLE DIRECTION PRINTING"
40 LPRINT "SINGLE DIRECTION PRINTING"
50 LPRINT CHR$(27)+"U"+CHR$(0);
60 LPRINT "BI-DIRECTIONAL PRINTING"
70 LPRINT "BI-DIRECTIONAL PRINTING"
80 END
```

```
SINGLE DIRECTION PRINTING
SINGLE DIRECTION PRINTING
BI-DIRECTIONAL PRINTING
BI-DIRECTIONAL PRINTING
```

HALF SPEED PRINTING:

Sets printing to half speed.

Name: Setting: ESC+s+n n=1,49,129,177
Release: ESC+s+m m=0,48,128,176

Code: Setting: 27,115,n DEC 1B,73,n HEX
Release: 27,115,m DEC 1B,73,m HEX

Input Format: Setting: LPRINT CHR$(27)+"s"+CHR$(n)
Release: LPRINT CHR$(27)+"s"+CHR$(m)

Example:

```
10 REM HALF SPEED PRINTING
20 LPRINT "HIGH SPEED PRINTING"
30 LPRINT CHR$(27)+"s"+CHR$(1);
40 LPRINT "HALF SPEED PRINTING"
50 LPRINT CHR$(27)+"s"+CHR$(0);
60 LPRINT "HIGH SPEED PRINTING"
70 END
```

```
HIGH SPEED PRINTING
HALF SPEED PRINTING
HIGH SPEED PRINTING
```

Comment:

- Half speed printing can be set only in the pica, elite, standard density image, double speed double density image, and 979 dots/line image modes.

n-SPACE SKIP:

Skips "n" spaces between present and next character positions.

Name: ESC+f+0+n

Code: 27,102,0,n DEC 1B,66,00,n HEX

Input Format: LPRINT CHR$(27)+"f"+CHR$(0)+CHR$(n)

Example:

```
10 REM n-SPACE CARRIAGE MOVEMENT
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(10);
60 LPRINT "PRINT AND";
70 LPRINT CHR$(27)+"f"+CHR$(0)+CHR$(20);
80 LPRINT "SKIP 20 SPACES"
90 END
```

```
12345678901234567890123456789012345678901234567890
PRINT AND                          SKIP 20 SPACES
```

Comments:

- Spacing size depends upon present character pitch.
- The value of "n" must be in the range 0≦n≦127. If n≧128, the designation is executed with a spacing of n−128.
- When underlining, spaces skipped by ESC+f+0+n are not underlined.
- If the number of spaces to be skipped would cause printing to begin beyond the right margin setting, then those spaces beyond the right margin are ignored.

DATA CONTROL

Data control refers to the format of input data (7 or 8 bits), manipulation of data already in the print buffer (CAN or DEL), setting undefined codes as printable codes, or the readiness of the printer to receive data (DC1 or DC3).

As previously explained, each individual character has a corresponding ASCII code. Such an ASCII code can be expressed in binary notation. In 7-bit binary notation, a combination of seven 0's and 1's makes up a character while in 8-bit binary notation, a combination of eight 0's and 1's makes up a character. In either case, since the rightmost bit is in the $2^0=1$ column, it carries the "least weight" of all bits and is called the Least Significant Bit (LSB). The leftmost bit is in the $2^6=64$ column (7-bit representation) or in the $2^7=128$ column (8-bit representation) and therefore carries the "most weight" of all bits. This bit is called the Most Significant Bit (MSB).

There are computers as well as interfaces which send only 7-bit characters (ASCII codes 0–127). With this printer, however, you may access characters with ASCII codes greater than 127. The software of this printer includes 3 commands to control the MSB.

CANCEL:

Clears all data in the buffer.

Name: CAN

Code: 24 DEC 18 HEX

Input Format: LPRINT CHR$(24)

Example:

```
10 REM CANCEL
20 LPRINT "CANCEL CLEARS";
30 LPRINT CHR$(24);
40 LPRINT "CANCEL CLEARS THE BUFFER"
50 END
```

```
CANCEL CLEARS THE BUFFER
```

REMOTE PRINTER SELECT:

Selects the printer remotely, enabling it to receive data.

Name: DC1 (Device Control 1)

Code: 17 DEC 11 HEX

Input Format: LPRINT CHR$(17)

Example: (See DC3, page 5-68)

Comments:
- Receipt of DC1 while the printer is deselected by DC3 enables the printer to receive data.
- The print buffer data previously received between DC3 and DC1 is lost.

REMOTE PRINTER DESELECT:

Deselects the printer remotely, disabling it from receiving data.

Name: DC3 (Device Control 3)

Code: 19 DEC 13 HEX

Input Format: LPRINT CHR$(19)

Example:

```
10 REM REMOTE SELECT/DESELECT
20 LPRINT "SELECT"
30 LPRINT CHR$(19);
40 LPRINT "DESELECT"
50 LPRINT CHR$(17);
60 LPRINT "SELECT"
70 END
```

```
SELECT
SELECT
```

Comment:
- All data sent in deselect status becomes invalid. In order to return to select status, send DC1 code.

DELETE:

Deletes the last character stored in the buffer.

Name: DEL

Code: 127 DEC 7F HEX

Input Format: LPRINT CHR$(127)

Example:

```
10 REM DELETE
20 LPRINT "COMPUTE";
30 LPRINT CHR$(127);"ING"
40 END

COMPUTING
```

Comments:

- Only ordinary text may be DELeted. Bit image data, spacing between output generated by consecutive TABs, and character mode designations cannot be DELeted.
- The DEL code can be used in Standard and IBM Matrix Printer modes only; it cannot be used in IBM Graphics printer modes.

MSB ON:

Sets the MSB to 1.

Name: ESC+>

Code: 27,62 DEC 1B,3E HEX

Input Format: LPRINT CHR$(27)+">"

Example:

```
10 REM MSB TO 1
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"MSB ON"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+">";
70 FOR I=32 TO 111:PRINT#1,CHR$(I);:NEXT I
80 PRINT#1,CHR$(10);
90 FOR I=112 TO 126:PRINT#1,CHR$(I);:NEXT I
100 FOR I=160 TO 224:PRINT#1,CHR$(I);:NEXT I
110 PRINT#1,CHR$(10);
120 FOR I=225 TO 254:PRINT#1,CHR$(I);:NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
MSB ON
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~
```

Comments:

- ESC+> has no effect on bit image data.
- This setting can be released by ESC+#.
- The output from the sample program above was purposely reduced in order that all characters could properly be typeset for printing of this manual.

MSB OFF:

Sets the MSB to 0.

Name: ESC+=

Code: 27,61 DEC 1B,3D HEX

Input Format: LPRINT CHR$(27)+"="

Example:

```
10 REM MSB TO 0
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"MSB OFF"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"=";
70 FOR I=32 TO 111:PRINT#1,CHR$(I);:NEXT I
80 PRINT#1,CHR$(10);
90 FOR I=112 TO 126:PRINT#1,CHR$(I);:NEXT I
100 FOR I=160 TO 224:PRINT#1,CHR$(I);:NEXT I
110 PRINT#1,CHR$(10);
120 FOR I=225 TO 254:PRINT#1,CHR$(I);:NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
MSB OFF
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmno
pqrstuvwxyz{|}~ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'
abcdefghijklmnopqrstuvwxyz{|}~
```

Comments:

- ESC+= has no effect on bit image data.
- This setting can be released by ESC+#.
- The output from the sample program above was purposely reduced in order that all characters could properly be typeset for printing of this manual.

MSB CANCEL:

Sets printer to receive 8th bit "as is".

Name: ESC+#

Code: 27,35 DEC 1B,23 HEX

Input Format: LPRINT CHR$(27)+"#"

Example:

```
10 REM MSB AS IS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"RECEIVE MSB AS IS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"#";
70 FOR I=32 TO 111:PRINT#1,CHR$(I);:NEXT I
80 PRINT#1,CHR$(10);
90 FOR I=112 TO 126:PRINT#1,CHR$(I);:NEXT I
100 FOR I=160 TO 224:PRINT#1,CHR$(I);:NEXT I
110 PRINT#1,CHR$(10);
120 FOR I=225 TO 254:PRINT#1,CHR$(I);:NEXT I
130 PRINT#1,CHR$(10);
140 CLOSE
150 END
```

```
RECEIVE MSB AS IS
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~
```

Comments:

- This setting has no effect on bit image data.
- The output from the sample program above was purposely reduced in order that all characters could properly be typeset for printing of this manual.

UNDEFINED CODE PRINTING:

Designates undefined codes in locations 0~31 DEC, 128~159 DEC as printing codes for international characters.

Name:
Setting: ESC+I+n n=1,49,129,177
Release: ESC+I+m m=0,48,128,176

Code:
Setting: 27,73,n DEC 1B,49,n HEX
Release: 27,73,m DEC 1B,49,m HEX

Input Format:
Setting: LPRINT CHR$(27)+"I"+CHR$(n)
Release: LPRINT CHR$(27)+"I"+CHR$(m)

Example:

```
10 REM CONTROL CODE SELECTION
20 FOR I=0 TO 1
30 LPRINT CHR$(27)+"I"+CHR$(I);
40 LPRINT "PARAMETER =";I
50 FOR J=0 TO 6
60 LPRINT CHR$(J);
70 NEXT J
80 FOR J=128 TO 134
90 LPRINT CHR$(J);
100 NEXT J
110 NEXT I
120 LPRINT CHR$(10);
130 END
```

```
PARAMETER = 0
PARAMETER = 1
àèùòì°£àèùòì°£
```

Comments:

This command is effective only in standard printer mode.
- The following characters are printed out by this command.
- DC3 is ineffective in undefined code printing mode.

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

- International Characters reside in ASCII locations 0 DEC–31 DEC and 128 DEC–159 DEC. While these characters are normally set as unprintable codes, ESC+I+n sets these as printable characters.

DOWNLOADABLE CHARACTERS

If the printer does not contain all of the characters which you need, you can custom design up to 10K bytes of characters without the buffer option and up to 38K bytes of characters with the buffer option.

Characters are downloadable in the draft and near letter quality fonts. A single downloadable character requires the following number of bytes.

Mode	Bytes/Character
Draft	12
NLQ	47

Draft and near letter quality characters can be downloaded simultaneously. The total number of characters that can be downloaded simultaneously, however, is determined by DIP switches 2-1 and 2-2. Refer below.

WITHOUT 32K BUFFER OPTION

SW2-1	SW2-2	DOWNLOAD AREA (Bytes)	BUFFER (Bytes)
ON	ON	0K	15K
OFF	ON	7K	7K
ON	OFF	7K	7K
OFF	OFF	10K	4K

WITH 32K BUFFER OPTION

SW2-1	SW2-2	DOWNLOAD AREA (Bytes)	BUFFER (Bytes)
ON	ON	0K	47K
OFF	ON	7K	39K
ON	OFF	35K	7K
OFF	OFF	38K	4K

Thus, the more space you choose to allocate to downloadable characters, the less space you have available as a buffer. Examine the following example.

Example: Suppose you wish to download 176 draft characters and 176 near letter quality characters.

Step 1: Determine the total number of bytes required to download the number of characters above.

DRAFT: =176 characters at 12 bytes per character
=176×12
=2112 bytes
NLQ: =176 characters at 47 bytes per character
=176×47
=8272 bytes
TOTAL: =2112+8272
=10384 bytes
=10.14K

Step 2: Since you require more than 10K bytes of storage for your downloadable characters, you must install the buffer option since without this option you may download no more than 10K bytes. Additionally, DIP switch 2-2 must be set to OFF while DIP switch 2-1 can be set to either ON or OFF if you desire 35K or 38K bytes of download area, respectively.

Downloadable character numbers
Followings are just examples. Any other combination of character numbers are possible provided that they are within the download area capacity.

WITHOUT 32K BUFFER OPTION

SW2-1	SW2-2	DRAFT	NLQ	DRAFT+NLQ
ON	ON	0	0	0+0
OFF	ON	256	152	131+119
ON	OFF	256	152	131+119
OFF	OFF	256	217	226+160

WITH 32K BUFFER OPTION

SW2-1	SW2-2	DRAFT	NLQ	DRAFT+NLQ
ON	ON	0	0	0+0
OFF	ON	256	152	131+119
ON	OFF	256×5 sets	152×5 sets	(131+119)×5 sets
OFF	OFF	256×5 sets	165×5 sets	(147+128)×5 sets

DRAFT FONT DOWNLOADING:

Defines download draft font.

Name: ESC+&+0+n+m+a+P_1+P_2+...+P_{11} $0 \leqq n \leqq m \leqq 255$

Code: 27,38,0,n,m,a,P_1,P_2,...,P_{11} DEC
1B,26,00,n,m,a,P_1,P_2,...,P_{11} HEX

Input Format: LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$(a)+CHR$(P_1)
+CHR$($P_2$)+...+CHR$(P_{11})

Example:

```
10 REM DEFINITION OF DOWNLOAD CHARACTERS IN DRAFT MODE
20 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(65)+CHR$(66);
30 REM STORE IN PLACE OF "A" - ASCII 065
40 LPRINT CHR$(139);
50 LPRINT CHR$(0)+CHR$(12)+CHR$(146)+CHR$(65);
60 LPRINT CHR$(34)+CHR$(28)+CHR$(64)+CHR$(0);
70 LPRINT CHR$(128)+CHR$(0)+CHR$(0);
80 REM STORE IN PLACE OF "B" - ASCII 066
90 LPRINT CHR$(11);
100 LPRINT CHR$(0)+CHR$(12)+CHR$(146)+CHR$(65);
110 LPRINT CHR$(34)+CHR$(28)+CHR$(64)+CHR$(0);
120 LPRINT CHR$(128)+CHR$(0)+CHR$(0);
130 REM SELECT DOWNLOAD CHARACTER GENERATOR (CG)
140 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
150 LPRINT "ABABABABAB"
160 END
```

ɣɣɣɣɣɣɣɣɣɣ

Explanation:

To download a character into RAM, you must first design the character. In the matrix below, the circles represent pins which may be fired. You may darken any circle provided no two adjacent horizontal circles are filled in.

	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}
2^7	○	○	○	○	○	○	○	○	○	○	○
2^6	○	○	○	○	○	○	○	○	○	○	○
2^5	○	○	○	○	○	○	○	○	○	○	○
2^4	○	○	○	○	○	○	○	○	○	○	○
2^3	○	○	○	○	○	○	○	○	○	○	○
2^2	○	○	○	○	○	○	○	○	○	○	○
2^1	○	○	○	○	○	○	○	○	○	○	○
2^0	○	○	○	○	○	○	○	○	○	○	○

Once you have designed the character, you must quantify each dot column, P_1–P_{11}, by summing the powers of two represented by each dot. Consider the design of the Greek character γ (gamma).

	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}
2^7	○	○	●	○	○	○	○	○	●	○	○
2^6	○	○	○	●	○	○	●	○	○	○	○
2^5	○	○	○	○	●	○	○	○	○	○	○
2^4	○	○	●	○	○	●	○	○	○	○	○
2^3	○	●	○	○	○	●	○	○	○	○	○
2^2	○	●	○	○	○	●	○	○	○	○	○
2^1	○	○	●	○	●	○	○	○	○	○	○
2^0	○	○	○	●	○	○	○	○	○	○	○

$P_1=0$
$P_2=2^2+2^3=4+8=12$
$P_3=2^1+2^4+2^7=2+16+128=146$
$P_4=2^0+2^6=1+64=65$
$P_5=2^1+2^5=2+32=34$
$P_6=2^2+2^3+2^4=4+8+16=28$
$P_7=2^6=64$
$P_8=0$
$P_9=2^7=128$
$P_{10}=0$
$P_{11}=0$

Program lines 40–70, therefore, use the eleven values P_1–P_{11} to define the shape and size of gamma using the upper 8 pins of the print head. Program lines 90–120 define the same shape and size, but for the lower 8 pins of the print head.

Next you must determine where in RAM the character(s) should be stored. The variables "n" and "m" are used for this purpose. The value specified for "n" indicates that ASCII location into which the first downloaded character will be stored. The value specified for "m" indicates that ASCII location into which the last downloaded character will be stored. If you are storing a single character, then n=m.

In our sample program, we created two gamma characters, one using the upper 8 pins of the print head, and the other using the lower 8 pins. These two distinct characters were stored in the ASCII locations where characters "A" and "B" are normally stored (see program line 20). Since "A" resides in ASCII location 65 DEC and "B" resides in ASCII location 66 DEC, the following program lines are equivalent.

```
20 LPRINT CHR$(27)+"&"+CHR$(0)+"AB";
                    OR
20 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(65)+CHR$(66);
```

Notice that n=65, m=66. Also note that CHR$(65)="A" and CHR$(66)="B".

We must next define the value of "a", which specifies that attribute information. Attribute information contains the following:

- whether the upper 8 pins or the lower 8 pins are to be fired;
- information to be used if the proportional spacing mode is invoked.

The illustration below shows the role of each bit in the specification of the attribute information. Attribute information is stored in one byte.

Bit No.	Function
MSB 7	Bit=1: use upper 8 pins Bit=0: use lower 8 pins
6 5 4	Start of print position (PS) for proportional spacing, 0≦PS≦7,
3 2 1 LSB 0	End of print position (PE) for proportional spacing, 0≦PE≦11, PS<PE

Example: Suppose we wish to create the character below (musical note) in proportional spacing mode.

–	○	○	○	○	○	○	○	○	○	○	○
2^7	○	○	○	○	○	○	●	○	○	○	○
2^6	○	○	○	○	○	○	●	○	●	○	○
2^5	○	○	○	○	○	○	●	○	○	●	○
2^4	○	○	○	○	○	○	●	○	○	●	○
2^3	○	○	○	○	○	○	●	○	○	○	○
2^2	○	○	○	●	○	●	○	○	○	○	○
2^1	○	○	●	○	●	○	●	○	○	○	○
2^0	○	○	○	●	○	●	○	○	○	○	○
	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}

Since print columns are internally counted from 0, the start and end print column should be one less than the actual print column numbers. When printing characters from print column P_3 to P_{11} in proportional spacing mode, PS=2 $(010)_2$ and PE=10 $(1010)_2$. Thus, the attribute byte is as follows:

Bit No.	Binary Form	Function
MSB 7	0	Use lower 8 pins
6 5 4	0 1 0	Start of printing in column 3 (2+1)
3 2 1 LSB 0	1 0 1 0	End of printing in column 11 (10+1)

We then set "a"=$2^1+2^3+2^5$=2+8+32=42
Computing the "values" for P_1–P_{11}, we have:

P_1=0	P_7=250
P_2=0	P_8=0
P_3=2	P_9=64
P_4=5	P_{10}=48
P_5=2	P_{11}=0
P_6=5	

Finally, if we wish to store our musical note in ASCII location 70, then our download setting is as follows:

Input Format:

LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$(a)+CHR$(P_1)+... +CHR$($P_{11}$);

Actual Input

```
10 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(70)+CHR$(70)+CHR$(42);

20 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5)+CHR$(2)+CHR$(5);

30 LPRINT CHR$(250)+CHR$(0)+CHR$(64)+CHR$(48)+CHR$(0);
```

Comments:

- In the previous examples, since we downloaded at least one character, DIP SW2-1 and SW2-2 cannot both be set to ON. Refer to Appendix C.
- The downloadable draft font actually consists of 12 columns of dots, but P_{12} is always set to zero.
- Downloaded draft characters require 12 bytes per character: 1 byte for attribute information and 11 bytes for the character design.
- Avoid using the same pin in two adjacent columns; otherwise, the pin in the second column of the pair will not be fired.
- Avoid continuous printing of such download character that has high dot density. 1 line has 8×11×136 dots (11968 dots/line). Keep the line density within 25% (2992 dots/line).

NLQ FONT DOWNLOADING:

Defines near-letter quality font.

Name: ESC+&+2+n+m+a+P_{1H}+P_{1L}+...+P_{23L} $0 \leqq n \leqq m \leqq 255$

Code: 27,38,2,n,m,a,P_{1H},P_{1L},...,P_{23L} DEC
1B,26,02,n,m,a,P_{1H},P_{1L},...,P_{23L} HEX

Input Format: LPRINT CHR$(27)+"&"+CHR$(2)+CHR$(n)+CHR$(m)+CHR$(a)+CHR$(P_{1H})
+CHR$($P_{1L}$)+... +CHR$(P_{23L})

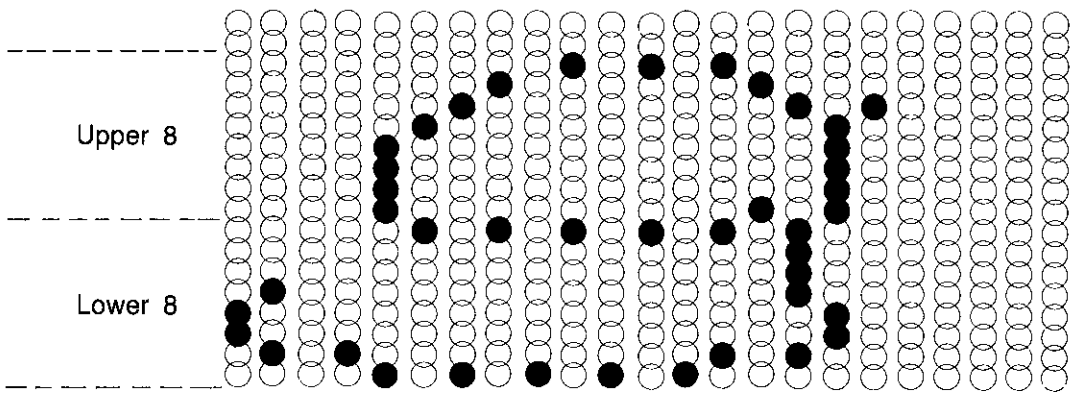
Example:

```
10 REM DEFINITION OF DOWNLOAD CHARACTERS IN NLQ MODE
20 LPRINT CHR$(27)+"&"+CHR$(2)+CHR$(65)+CHR$(65);
30 REM STORE IN PLACE OF "A" - ASCII 065
40 LPRINT CHR$(11);
50 LPRINT CHR$(0)+CHR$(12)+CHR$(0)+CHR$(18)+CHR$(0)+CHR$(0);
60 LPRINT CHR$(0)+CHR$(2)+CHR$(15)+CHR$(1)+CHR$(16)+CHR$(128);
70 LPRINT CHR$(32)+CHR$(1)+CHR$(64)+CHR$(128)+CHR$(0)+CHR$(1);
80 LPRINT CHR$(128)+CHR$(128)+CHR$(0)+CHR$(1)+CHR$(128)+CHR$(128);
90 LPRINT CHR$(0)+CHR$(1)+CHR$(128)+CHR$(130)+CHR$(65)+CHR$(0);
100 LPRINT CHR$(32)+CHR$(242)+CHR$(31)+CHR$(12)+CHR$(32)+CHR$(0);
110 LPRINT CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
120 LPRINT CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
130 REM SELECTS DOWNLOAD CHARACTER GENERATOR (CG)
140 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(2);
150 LPRINT "AAAAAAAAAA"
160 END
```

9999999999

Explanation:

An NLQ font downloaded character uses 23 columns and 16 rows of dots. Since a given column contains 16 dots, each column is divided into 2 bytes. For example, column 1 is labeled P_{1H} for the upper 8 dots and P_{1L} for the lower 8 dots. Similarly, column 23 is labeled P_{23H} for the upper 8 dots and P_{23L} for the lower 8 dots. Column 24 is always set to zero; thus, we are working with P_{1H}–P_{23H} and P_{1L}–P_{23L}. Additionally, since each column contains 16 dots which overlap, the printing of an entire character is accomplished with two passes of the print head.



Then

P_{1H} =0	P_{1L} =12	P_{16H} =32	P_{16L} =242
P_{2H} =0	P_{2L} =18	P_{17H} =31	P_{17L} =12
P_{3H} =0	P_{3L} =0	P_{18H} =32	P_{18L} =0
P_{4H} =0	P_{4L} =2	P_{19H} =0	P_{19L} =0
P_{5H} =15	P_{5L} =1	P_{20H} =0	P_{20L} =0
P_{6H} =16	P_{6L} =128	P_{21H} =0	P_{21L} =0
P_{7H} =32	P_{7L} =1	P_{22H} =0	P_{22L} =0
P_{8H} =64	P_{8L} =128	P_{23H} =0	P_{23L} =0
P_{9H} =0	P_{9L} =1		
P_{10H} =128	P_{10L} =128		
P_{11H} =0	P_{11L} =1		
P_{12H} =128	P_{12L} =128		
P_{13H} =0	P_{13L} =1		
P_{14H} =128	P_{14L} =130		
P_{15H} =65	P_{15L} =0		

Program lines 50–120, therefore, use the values P_{1H}–P_{23H} and P_{1L}–P_{23L} to define the shape and size of the character using the lower 8 pins of the print head.

As shown in program line 20, this single character is stored in ASCII location 65, where the character "A" normally resides.

Downloading NLQ font characters requires 1 byte of attribute information which is input as the value of "a". The illustration below shows the role of each bit in the specification of attribute information.

Bit No.	Function
MSB 7	Bit=1: use upper 8 pins Bit=0: use lower 8 pins
6 5 4	Start of print position (PS) for proportional spacing, 0≦PS≦7
3 2 1 LSB 0	End of print position (PE) for proportional spacing, 0≦PE≦11, PS<PE

The values PS and PE of NLQ attribute information are specified with 2 columns set equal to one. For example, when n and m are print start and end column numbers, PS=(n−1)/2 and PE=(m−1)/2.

Again, the start and end print column specifications should be one less than the actual print column numbers. In this case, PS=0(000)$_2$ and PE=11(1011)$_2$. Thus, the attribute byte is as follows.

Bit No.	Binary Form	Function
MSB 7	0	Use lower 8 pins
6	0	Start of printing in column 1 (0×2+1)
5	0	
4	0	
3	1	End of printing in column 24 [(11+1)×2]
2	0	
1	1	
LSB 0	1	

We then set "a"=$2^3+2^1+2^0$=8+2+1=11
Refer to program lines 40–120.

Comments:
- In our example, since we downloaded a character, DIP SW2-1 and SW2-2 cannot both be set to ON. Refer to Appendix C.
- Downloaded NLQ font characters require 47 bytes per character: 1 byte for attribute information and 46 bytes for the character design.
- Avoid using the same pin in two adjacent columns; otherwise the pin in the second column of the pair will not be fired.

ROM CHARACTER GENERATOR SELECTION:

Selects the character generator in the internal ROM.

Name: ESC+%+0+n n=0 or n=2

Code: 27,37,0,n DEC 1B,25,00,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(0)+CHR$(n)

Example: (See page 5-82.)

Comments:
- "n" specifies the ROM CG mode.
  n=0: Draft font
  n=2: NLQ font
- Upon receipt of this command the downloadable font print mode is cleared.
- Font change by this command is ineffective when selecting mode by PRINT MODE SELECTOR except in "Pgm".

DOWNLOAD CHARACTER GENERATOR SELECTION:

Selects the download character set previously defined.

Name: ESC+%+1+n n=0 or n=2

Code: 27,37,1,n DEC 1B,25,01,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(n)

Example:

```
10 REM DOWNLOAD CHARACTER GENERATOR SELECTION
20 REM ROM CG SET COPY
30 LPRINT CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
40 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(33)+CHR$(33);
50 REM DOWNLOAD TO "!" IN DRAFT FONT
60 LPRINT CHR$(42);
70 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
80 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
90 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
100 REM SELECTS DOWNLOAD CG
110 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(2);
120 LPRINT "SELECTS NLQ FONT DOWNLOAD CG !!!"
130 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
140 LPRINT "SELECTS DRAFT FONT DOWNLOAD CG !!!"
150 REM SELECTS DRAFT FONT CHARACTERS
160 LPRINT CHR$(27)+"%"+CHR$(0)+CHR$(0);
170 LPRINT "SELECTS DRAFT FONT ROM CG !!!"
180 END
```

```
SELECTS NLQ FONT DOWNLOAD CG !!!
SELECTS DRAFT FONT DOWNLOAD CG ♪♪♪
SELECTS DRAFT FONT ROM CG !!!
```

Comments:

- "n" indicates downloadable font which is printed.
  n=0: Draft font
  n=2: NLQ font
- Upon receipt of this command the printer will be set to downloadable print mode, until it receives the ROM CG selection command (ESC+%+0+n). The unit will print out downloadable font (in the designated mode) after receiving the print mode change command, such as ESC+x+0 (draft font designation), ESC+x+1 (Courier NLQ font designation) or ESC+x+2 (Bold PS NLQ font designation).
- Font change of this command is ineffective when selecting mode by PRINT MODE SELECTOR except in "Pgm".

ROM CHARACTER GENERATOR SET COPY:

Copies internal ROM CG font into downloadable font area.

Name: ESC+:+0+0+0

Code: 27,58,0,0,0 DEC 1B,3A,00,00,00 HEX

Input Format: LPRINT CHR$(27)+" : "+CHR$(0)+CHR$(0)+CHR$(0)

Example:

```
10 REM ROM CG SET COPY
20 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(33)+CHR$(33);
30 REM STORE IN PLACE OF "!" -- ASCII 33
40 LPRINT CHR$(42);
50 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
60 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
70 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
80 REM SELECT DOWNLOAD CG
90 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
100 LPRINT "DOWNLOAD CG              !!!"
110 REM ROM CG SET COPY
120 LPRINT CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
130 LPRINT "COPIED DOWNLOAD CG      !!!"
140 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(33)+CHR$(33);
150 REM STORE IN PLACE OF "!" ONCE AGAIN
160 LPRINT CHR$(42);
170 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
180 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
190 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
200 LPRINT "DOWNLOADED TO CHR$(33) !!!"
210 END
```

```
                          ♪♪♪
COPIED DOWNLOAD CG        !!!
DOWNLOADED TO CHR$(33)    ♪♪♪
```

Comments:

- All ROM CG font in draft and NLQ modes are copied to the downloadable font area.
- Downloadable font can be copied regardless of the downloadable font capacity.
- Usable capacity of downloadable font does not decrease by using ROM CG set copying.
- Upon receipt of the command, all previous downloaded font will be changed to ROM CG font. The usable capacity of downloadable font returns to the initial state.
- When altering only part of the ROM CG, use this command before font downloading.
- ESC+:+0+0+0 copies ROM CG font to any downloadable character set regardless of ESC+y+n.

DOWNLOAD CHARACTER SET PARTITION:

Partitions the download area for up to 5 distinct downloadable character sets.

Name: ESC+y+n n=0,1,2,3,4

Code: 27,121,n DEC 1B,79,n HEX

Input Format: LPRINT CHR$(27)+"y"+CHR$(n)

Example:

```
10 REM DOWNLOAD CHARACTER SET PARTITION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
50 REM STORE IN PLACE OF "!" WITH DOWNLOAD AREA 0-4
60 FOR M=0 TO 4
70 PRINT#1,CHR$(27)+"y"+CHR$(M);
80 PRINT#1,CHR$(27)+"&"+CHR$(0)+CHR$(33)+CHR$(33);
90 FOR I=1 TO 12
100 READ X
110 PRINT#1,CHR$(X);
120 NEXT I
130 NEXT M
140 PRINT#1,"NORMAL CG                    !!!"
150 PRINT#1,CHR$(10);
160 REM SELECTS DOWNLOAD CG & DOWNLOAD AREA
170 PRINT#1,CHR$(27)+"%"+CHR$(1)+CHR$(0);
180 FOR M=0 TO 4
190 PRINT#1,CHR$(27)+"y"+CHR$(M);
200 PRINT#1,"DOWNLOAD CG ( AREA =";M;")     !!!"
210 PRINT#1,CHR$(10);
220 NEXT M
230 CLOSE
240 END
250 DATA 56,0,0,0,2,5,2,5,250,0,0,0
260 DATA 42,0,0,2,5,2,5,250,0,64,48,0
270 DATA 56,0,0,0,2,5,0,5,250,0,0,0
280 DATA 56,0,0,0,95,160,64,160,64,0,0,0
290 DATA 10,2,5,2,5,250,0,194,5,194,5,250
```

```
NORMAL CG                          !!!
DOWNLOAD CG ( AREA = 0 )           ♩♩♩
DOWNLOAD CG ( AREA = 1 )           ♪♪♪
DOWNLOAD CG ( AREA = 2 )           ♩♩♩
DOWNLOAD CG ( AREA = 3 )           ♪♪♪
DOWNLOAD CG ( AREA = 4 )           ♫♫♫
```

Comments:

- This command enables you to create up to 5 distinct downloadable character sets and have them reside in separate portions of the download area. Due to addressing limitations, you may not download in excess of 512 characters in one character set (Draft 256+NLQ 256). The size of any one partition need not be specified in advance.
- This command is operational only when the 32K buffer option is installed and DIP switch 2-2 is set to OFF.
- If downloadable characters are created without first specifying the partition value "n" with the ESC+y+n command, "n" is assumed equal to 0.
- Refer to page 5-73 for downloadable character area sizes.

MISCELLANEOUS

BELL:

Sounds buzzer for approximately 0.2 second.

Name: BEL

Code: 7 DEC 07 HEX

Input Format: LPRINT CHR$(7)

Example:

```
10 REM SOUND BUZZER 10 TIMES
20 FOR I=1 TO 10
30 LPRINT CHR$(7);
40 NEXT I
50 END
```

Comment:

- If DIP switch 2-5 is set to OFF, the buzzer will not sound.

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC

Code: 27 DEC 1B HEX

Input Format: LPRINT CHR$(27)

Comment:

- Cannot be generated by the ESC key on certain computers.

NULL:

Last byte of certain multi-byte printer control codes.

Name: NUL

Code: 0 DEC 00 HEX

Input Format: LPRINT CHR$(0)

RESET PRINTER:

Initializes printer, causing data in the print buffer, but not in the receive buffer, to be cleared.

Name: ESC+@

Code: 27,64 DEC 1B,40 HEX

Input Format: LPRINT CHR$(27)+"@"

Example:

```
10 REM RESET PRINTER
20 LPRINT CHR$(27)+"n";
30 LPRINT CHR$(27)+"W"+CHR$(1);
40 LPRINT "HELLO! GOODBYE!"
50 LPRINT CHR$(27)+"@";
60 LPRINT "HELLO! GOODBYE!"
70 END
```

```
H E L L O !   G O O D B Y E !
HELLO! GOODBYE!
```

Comment:

- Refer to Section 3.4 for an explanation of printer initialization.

PAPER-OUT DETECTION:

Enables paper-out detector.

Name: Setting: ESC+9
Release: ESC+8

Code: Setting: 27,57 DEC 1B,39 HEX
Release: 27,56 DEC 1B,38 HEX

Input Format: Setting: LPRINT CHR$(27)+"9"
Release: LPRINT CHR$(27)+"8"

Comments:

- Enabling of the paper-out detector causes printing to stop 13 lines from the bottom of the page. P.O. status is then established.
- Disabling of the paper-out detector causes printing to continue after paper end.

INCREMENTAL (VIEW) PRINTING:

Prints each character after it is entered, feeding the paper to show the printed character beyond the scale plate.

Name: Setting: ESC+i+n n=1,49,129,177
Release: ESC+i+m m=0,48,128,176

Code: Setting: 27,105,n DEC 1B,69,n HEX
Release: 27,105,n DEC 1B,69,m HEX

Input Format: Setting: LPRINT CHR$(27)+"i"+CHR$(n)
Release: LPRINT CHR$(27)+"i"+CHR$(m)

Example:

```
10 REM INCREMENTAL (VIEW) PRINTING
20 LPRINT "STANDARD PRINTING IN EFFECT"
30 LPRINT CHR$(27)+"i"+CHR$(1);
40 LET A$="INCREMENTAL"
50 FOR I=1 TO 11
60 LET B$=MID$(A$,I,1)
70 LPRINT B$;:FOR J=1 TO 5000:NEXT J
80 NEXT I
90 LPRINT CHR$(27)+"i"+CHR$(0);
100 LPRINT CHR$(10);
110 LPRINT "STANDARD PRINTING IN EFFECT ONCE AGAIN"
120 END
```

```
STANDARD PRINTING IN EFFECT
INCREMENTAL
STANDARD PRINTING IN EFFECT ONCE AGAIN
```

Comments:

- Printing is performed unidirectionally (left to right).
- If data is entered at intervals of less than 0.1 sec, printout is performed continuously.

5.2 Mixing Print Modes

This printer provides a variety of print modes. Table 5.9 illustrates printing modes which may be mixed through the proper control codes. Table 5.10 illustrates which print modes set by the selector switch may be mixed with print mode control codes.

Y=Yes N=No	Pica	Elite	Proportional Spacing	Mikron	Compressed	NLQ Font	Double Width	Emphasized	Double Print	Underline	Superscript	Subscript
Pica	—	*1	*1	*1	*1	Y	Y	Y	Y	Y	Y	Y
Elite	*1	—	*1	*1	*1	Y	Y	Y	Y	Y	Y	Y
Proportional Spacing	*1	*1	—	*1	*1	Y	Y	*5	Y	Y	Y	Y
Mikron	*1	*1	*1	—	*1	Y	Y	*2	Y	Y	Y	Y
Compressed	*1	*1	*1	*1	—	Y	Y	*2	Y	Y	Y	Y
NLQ Font	Y	Y	Y	Y	Y	—	Y	Y	*3	Y	Y	Y
Double Width	Y	Y	Y	Y	Y	Y	—	Y	Y	Y	Y	Y
Emphasized	Y	Y	*5	*2	*2	Y	Y	—	Y	Y	Y	Y
Double Print	Y	Y	Y	Y	Y	*3	Y	Y	—	Y	*4	*4
Underline	Y	Y	Y	Y	Y	Y	Y	Y	Y	—	Y	Y
Superscript	Y	Y	Y	Y	Y	Y	Y	Y	*4	Y	—	N
Subscript	Y	Y	Y	Y	Y	Y	Y	Y	*4	Y	N	—

Table 5.9 Mixing Print Modes—Control Codes Only

*1. Although different character pitches cannot be set simultaneously, they may be mixed on a single line.
*2. Only emphasized characters are printed.
*3. Since near letter quality characters are printed with a double pass, the double print designation is ignored.
*4. Since Super/Subscript characters are printed with a double pass, the double print designation is ignored.
*5. In proportional spacing mode, emphasized characters will be printed out automatically. Therefore, the emphasized designation is ignored.

Note: All character modes can be mixed on a single line.

CONTROL CODE

SELECTOR

Y=Yes N=No	Pica	Elite	Proportional spacing	Mikron	Compressed	NLQ Font	Double Width	Emphasized	Double Print	Underline	Superscript	Subscript	10 NLQ	12 NLQ	Italic
10 DRAFT (Pgm)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
12 DRAFT	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y
15 DRAFT	N	N	N	N	N	N	Y	*2	Y	Y	Y	Y	N	N	Y
17 DRAFT	N	N	N	N	N	N	Y	*2	Y	Y	Y	Y	N	N	Y
PS DRAFT	N	N	N	N	N	N	Y	*3	Y	Y	Y	Y	N	N	Y
10 Courier	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	—	N	Y
12 Courier	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	N	—	Y
15 Courier	N	N	N	N	N	—	Y	*2	*1	Y	Y	Y	N	N	Y
17 Courier	N	N	N	N	N	—	Y	*2	*1	Y	Y	Y	N	N	Y
PS Courier	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	N	N	Y
10 Bold PS	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	—	N	Y
12 Bold PS	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	N	—	Y
15 Bold PS	N	N	N	N	N	—	Y	*2	*1	Y	Y	Y	N	N	Y
17 Bold PS	N	N	N	N	N	—	Y	*2	*1	Y	Y	Y	N	N	Y
PS Bold PS	N	N	N	N	N	—	Y	Y	*1	Y	Y	Y	N	N	Y

Table 5.10 Mixing Print Modes—Selector Switch Control Codes

*1. Since near letter quality characters are printed with a double pass, the double print designation is ignored.
*2. If 15 or 17 pitch characters are selected through software, then ESC+E sets emphasis printing. If 15 or 17 pitch characters are selected by the selector switch, then ESC+E is ignored and 15 or 17 pitch characters will be printed.
*3. In PS DRAFT mode, emphasized characters will be printed out automatically. Therefore, the emphasized designation is ignored.

5.3 DIP Switches and Control Codes

As explained in Section 3.3, DIP switch settings are read into printer memory when this printer is powered up. Certain printer functions set by these DIP switches can also be set by issuing the appropriate control commands. Table 5.11 illustrates those DIP switch functions which can also be set through software. THE CONTROL COMMAND WILL ALWAYS OVERRIDE THE CORRESPONDING DIP SWITCH SETTING(S).

SWITCH NUMBER	FUNCTION	SETTING	
		DIP SW	SOFTWARE
SW1-1 SW1-2 SW1-3	Selection of printer mode ●Standard ●IBM-PC Matrix ●IBM-PC Graphics I ●IBM-PC Graphics II	SW1-1 SW1-2 SW1-3 ON ON ON OFF ON ON ON OFF ON OFF OFF ON	 ESC+m+0 ESC+m+1 ESC+m+2 ESC+m+3
SW1-5	Selection of skip perforation ●Skip perforation [1 inch (25.4 mm)] ●No skip	 ON OFF	 ESC+N+n ESC+O
SW1-6 SW1-7 SW1-8	Selection of International Char. Set ●USA ●France ●Germany ●England ●Denmark I ●Sweden ●Italy ●Spain	SW1-6 SW1-7 SW1-8 ON ON ON OFF ON ON ON OFF ON OFF OFF ON ON ON OFF OFF ON OFF ON OFF OFF OFF OFF OFF	 ESC+R+0 ESC+R+1 ESC+R+2 ESC+R+3 ESC+R+4 ESC+R+5 ESC+R+6 ESC+R+7
SW2-3	Selection of P.O. detector ●Inactive ●Active	 ON OFF	 ESC+8 ESC+9

Table 5.11 Software Control of DIP Switch Functions

Note:

- Japan (ESC+R+8), Norway (ESC+R+9), and Denmark II (ESC+R+10) international character sets are software-selectable only.
- The Auto Line Feed (DIP SW1-4) setting enables the printer to issue a line feed after a carriage return. By inserting LPRINT CHR$(10) in the appropriate portions of a program, you can also issue a line feed after a carriage return. Refer to the LF designation, page 5-47.

6.1 Control Codes

In this section, print examples except some outputs with ("Print mode selector="Pgm") are made by setting the print mode selector to "10" and "BOLD PS".

PRINT MODE

PROGRAMMABLE PITCH:

Sets a character pitch at 10, 12, 15, 17, or proportional spacing.

Name: ESC+w+n n=0,1,2,3,4

Code: 27,119,n DEC 1B,77,n HEX

Input Format: LPRINT CHR$(27)+"w"+CHR$(n)

Example:

```
10 REM  PROGRAMABLE PITCH
20 FOR L=1 TO 2
30 IF L=1 THEN LPRINT "DRAFT FONT:":GOTO 50
40 LPRINT CHR$(27)+"x1";"NEAR LETTER QUALITY FONT:"
50 FOR I=0 TO 4
60 LPRINT CHR$(27)+"w"+CHR$(I);
70 IF I=4 THEN 110
80 READ X
90 LPRINT "CHARACTERS PER INCH =";X
100 NEXT I
110 LPRINT "proportional spacing"
120 LPRINT CHR$(10);:RESTORE
130 NEXT L
140 LPRINT CHR$(27)+"x"+CHR$(0);CHR$(27)+"w"+CHR$(0);
150 DATA 10,12,15,17
160 END
```

(Print mode selector="Pgm")

```
DRAFT FONT:
CHARACTERS PER INCH = 10
CHARACTERS PER INCH = 12
CHARACTERS PER INCH = 15
CHARACTERS PER INCH = 17
proportional spacing
NEAR LETTER QUALITY FONT:
CHARACTERS PER INCH = 10
CHARACTERS PER INCH = 12
CHARACTERS PER INCH = 15
CHARACTERS PER INCH = 17
proportional spacing
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- Pitches are set as follows:
  - n=0: 10 characters per inch (25.4 mm) HMI=12
  - n=1: 12 characters per inch (25.4 mm) HMI=10
  - n=2: 15 characters per inch (25.4 mm) HMI=8
  - n=3: 17 characters per inch (25.4 mm) HMI=7
  - n=4: proportional spacing
- This command releases any previous character pitch settings.
- If emphasized printing has been invoked and ESC+w+2 (15 pitch) or ESC+w+3 (17 pitch) is executed, emphasized printing is released and 15 pitch (or 17 pitch) characters are printed.
- Execution of ESC+w+n alters character pitch only and does not affect the character font.

PROPORTIONAL SPACING (PS) MODE:

Sets printing using proportional spacing between characters.

Name: Setting: ESC+P
Release: ESC+Q

Code: Setting: 27,80 DEC 1B,50 HEX
Release: 27,81 DEC 1B,51 HEX

Input Format: Setting: LPRINT CHR$(27)+"P"
Release: LPRINT CHR$(27)+"Q"

Example:

```
10 REM  PROPORTIONAL SPACING MODE
20 LPRINT CHR$(27)+"x"+CHR$(2);
30 LPRINT CHR$(27)+"P";
40 LPRINT "PROPORTIONAL PRINTING MODE"
50 LPRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG."
60 LPRINT "the quick brown fox jumps over the lazy dog."
70 LPRINT CHR$(27)+"Q"
80 LPRINT "NORMAL PRINTING MODE"
90 LPRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG."
100 LPRINT "the quick brown fox jumps over the lazy dog."
110 LPRINT CHR$(27)+"x"+CHR$(0);
120 END
```

(Print mode selector="Pgm")

```
PROPORTIONAL PRINTING MODE
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG.
the quick brown fox jumps over the lazy dog.

NORMAL PRINTING MODE
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG.
the quick brown fox jumps over the lazy dog.
```

Comments:

- This command is operational only when the print mode selector is set to "Pgm".
- In proportional spacing mode, the SP spacing amount is determined by the current HMI. The BS spacing amount is equal to that of the character or SP immediately input prior to executing BS.
- Proportional spacing can also be set by the pitch selector switch.
- ESC+Q releases proportional spacing. The subsequent spacing amount is determined by the HMI.
- Proportional spacing is not released by ESC+X.

HORIZONTAL MOTION INDEX (HMI) SET:

Sets the amount of carriage spacing after printing or spacing, to (n−1)/120 inch (0.21 mm).

Name: ESC+US+n 1≦n≦126

Code: 27,31,n DEC 1B,1F,n HEX

Input Format: LPRINT CHR$(27)+CHR$(31)+CHR$(n)

Example:

```
10 REM  HORIZONTAL MOTION INDEX (HMI)
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR I=7 TO 16
50 READ H$
60 PRINT#1,CHR$(27)+CHR$(31)+CHR$(I);
70 PRINT#1,"(HMI) n =";I;";";I-1;"/ 120 INCH";
80 PRINT#1,"  (";H$;" mm)";CHR$(13);CHR$(10);
90 NEXT I
100 DATA 1.27,1.48,1.69,1.91,2.12
110 DATA 2.33,2.54,2.75,2.96,3.18
120 CLOSE
130 END
```

```
(HMI) n=7 ; 6/120 INCH (1.27 mm)
(HMI) n = 8 ; 7 / 120 INCH (1.48 mm)
(HMI) n = 9 ; 8 / 120 INCH (1.69 mm)
(HMI) n = 10 ; 9 / 120 INCH (1.91 mm)
(HMI) n = 11 ; 10 / 120 INCH (2.12 mm)
(HMI) n = 12 ; 11 / 120 INCH (2.33 mm)
(HMI) n = 13 ; 12 / 120 INCH (2.54 mm)
(HMI) n = 14 ; 13 / 120 INCH (2.75 mm)
(HMI) n = 15 ; 14 / 120 INCH (2.96 mm)
(HMI) n = 16 ; 15 / 120 INCH (3.18 mm)
```

Comments:

HMI is the distance between characters to be printed or the distance that the carriage moves when SP code is executed. This distance is defined in multiples of 1/120 inch (0.21 mm).

For example, in 10 pitch which 10 characters per inch can be printed, the distance between characters is 1/10 inch. Therefore, HMI is 12 indicated by multiples of 1/120 inch. Minimum HMI is 0, maximum is 125 (1.04 inch nominal). HMI is set freely among these values by this command. When HMI=0, no carriage movement occurs.

- When the printer is powered up 10 pitch is automatically set.
- HMI affects SP, BS, HT and ESC+HT+n.
- ESC+S resets HMI to that specified by the pitch selector switch.
- Changing the HMI does not affect the left/right margin.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

HORIZONTAL MOTION INDEX (HMI) RESET:

Resets HMI to value defined by the pitch selector switch.

Name: ESC+S

Code: 27,83 DEC 1B,53 HEX

Input Format: LPRINT CHR$(27)+"S"

Example:

```
10 REM  RESET HMI
20 LPRINT CHR$(27)+"x"+CHR$(2);
30 LPRINT CHR$(27)+CHR$(31)+CHR$(25);
40 LPRINT "HMI IS NOW 24/120 INCH"
50 LPRINT CHR$(27)+"S";
60 LPRINT "RESET HMI TO THAT DESIGNATED BY THE PITCH SELECTOR"
70 END
```

(Print mode selector="Pgm")

```
H M I   I S   N O W   2 4 / 1 2 0   I N C H
RESET HMI TO THAT DESIGNATED BY THE PITCH SELECTOR
```

Comments:

- ESC+S does not reset VMI.
- Resetting the HMI does not affect the left/right margin.

VERTICAL MOTION INDEX (VMI) SET:

Sets line spacing pitch to (n−1)/48 inch.

Name: ESC+RS+n 1≦n≦126

Code: 27,30,n DEC 1B,1E,n HEX

Input Format: LPRINT CHR$(27)+CHR$(30)+CHR$(n)

Example:

```
10 REM  VERTICAL MOTION INDEX (VMI)
20 FOR I=4 TO 9
30 READ V$
40 LPRINT CHR$(27)+CHR$(30)+CHR$(9)
50 LPRINT CHR$(27)+CHR$(30)+CHR$(I);
60 FOR J=1 TO 3
70 LPRINT "--- (VMI) n =";I;";";I-1;"/ 48 INCH";
80 LPRINT "  (";V$;" mm)"
90 NEXT J
100 NEXT I
110 DATA 1.59,2.12,2.65,3.18,3.70,4.23
120 END
```

```
--- (VMI) n = 4 ; 3 / 48 INCH  (1.59 mm)
--- (VMI) n = 4 ; 3 / 48 INCH  (1.59 mm)
--- (VMI) n = 4 ; 3 / 48 INCH  (1.59 mm)

--- (VMI) n = 5 ; 4 / 48 INCH  (2.12 mm)
--- (VMI) n = 5 ; 4 / 48 INCH  (2.12 mm)
--- (VMI) n = 5 ; 4 / 48 INCH  (2.12 mm)

--- (VMI) n = 6 ; 5 / 48 INCH  (2.65 mm)
--- (VMI) n = 6 ; 5 / 48 INCH  (2.65 mm)
--- (VMI) n = 6 ; 5 / 48 INCH  (2.65 mm)

--- (VMI) n = 7 ; 6 / 48 INCH  (3.18 mm)
--- (VMI) n = 7 ; 6 / 48 INCH  (3.18 mm)
--- (VMI) n = 7 ; 6 / 48 INCH  (3.18 mm)

--- (VMI) n = 8 ; 7 / 48 INCH  (3.70 mm)
--- (VMI) n = 8 ; 7 / 48 INCH  (3.70 mm)
--- (VMI) n = 8 ; 7 / 48 INCH  (3.70 mm)

--- (VMI) n = 9 ; 8 / 48 INCH  (4.23 mm)
--- (VMI) n = 9 ; 8 / 48 INCH  (4.23 mm)
--- (VMI) n = 9 ; 8 / 48 INCH  (4.23 mm)
```

Comments:

VMI is the distance between lines, or the distance that the paper (platen) moves for LF code. This distance is defined in multiples of 1/48 inch (0.53 mm).

For example, when 6 lines are printed in an inch, the distance between lines is 1/6 inch. Therefore VMI is 8 indicated by multiples of 1/48 inch. Minimum VMI is 0, maximum is 125 (2.60 inch nominal). VMI is set freely among these values by this command. When VMI=0, no paper movement occurs.

- When the printer is powered up, 1/6 inch line feed is set.
- VMI affects LF, VT, ESC+LF, ESC+U, ESC+D, ESC+FF+n and ESC+VT+n.
- Changing the VMI does not affect the top/bottom margin.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

BI-DIRECTIONAL PRINTING MODE:

Sets bi-directional printing.

Name: Setting: ESC+/
Release: ESC+\

Code: Setting: 27,47 DEC 1B,2F HEX
Release: 27,92 DEC 1B,5C HEX

Input Format: Setting: LPRINT CHR$(27)+"/"
Release: LPRINT CHR$(27)+"\"

Example:

```
10 REM  SINGLE DIRECTION & BI-DIRECTIONAL PRINTING
20 LPRINT CHR$(27)+"\";
30 FOR I=1 TO 5
40 LPRINT "SINGLE-DIRECTION"
50 NEXT I
60 LPRINT
70 LPRINT CHR$(27)+"/";
80 FOR I=1 TO 5
90 LPRINT "BI-DIRECTIONAL"
100 NEXT I
110 END
```

```
SINGLE-DIRECTION
SINGLE-DIRECTION
SINGLE-DIRECTION
SINGLE-DIRECTION
SINGLE-DIRECTION

BI-DIRECTIONAL
BI-DIRECTIONAL
BI-DIRECTIONAL
BI-DIRECTIONAL
BI-DIRECTIONAL
```

Comments:

- Bi-directional printing means that printing occurs during the left-to-right movement of carriage as well as on the right-to-left return trip.
- In single direction printing mode, the carriage is only moved left-to-right or only moved right-to-left.
- In bi-directional printing mode, the carriage is moved by the shortest way.

BACKWARD PRINTING MODE:

Prints data from right to left.

Name: Setting: ESC+6
Release: ESC+5

Code: Setting: 27,54 DEC 1B,36 HEX
Release: 27,53 DEC 1B,35 HEX

Input Format: Setting: LPRINT CHR$(27)+"6"
Release: LPRINT CHR$(27)+"5"

Example:

```
10 REM  FORWARD & BACKWARD PRINTING
20 LPRINT CHR$(27)+"\";
30 LPRINT "SET SINGLE DIRECTION PRINTING MODE"
40 LPRINT "BI-DIRECTIONAL PRINTING BY BACKWARD PRINTING"
50 LPRINT
60 FOR I=1 TO 2
70 LPRINT CHR$(27)+"5";
80 LPRINT "FORWARD PRINTING";CHR$(10);
90 LPRINT CHR$(27)+"6";
100 LPRINT "GNITNIRP DRAWKCAB";CHR$(10);
110 NEXT I
120 END
```

```
SET SINGLE DIRECTION PRINTING MODE
BI-DIRECTIONAL PRINTING BY BACKWARD PRINTING

FORWARD PRINTING
BACKWARD PRINTING
FORWARD PRINTING
BACKWARD PRINTING
```

Comments:

- Backward printing is released by CR code.
- In backward printing, the SP code moves the carriage right-to-left while the BS code moves the carriage left-to-right.
- Tabulation, bit image data, CR, and paper feed functions are unaffected by backward printing.
- Any data to be printed to the left of the left margin is overprinted at the left margin.

AUTOMATIC LINE FEED MODE:

Automatically executes a Line Feed following a Carriage Return.

Name: Setting: ESC+"
Release: ESC+#

Code: Setting: 27,34 DEC 1B,22 HEX
Release: 27,35 DEC 1B,23 HEX

Input Format: Setting: LPRINT CHR$(27)+CHR$(34)
Release: LPRINT CHR$(27)+"#"

Example 1:

```
10 REM  AUTO LINE FEED MODE
20 LPRINT CHR$(27)+CHR$(34);
30 FOR I=1 TO 3
40 LPRINT "AUTO LINE FEED MODE ON";CHR$(13);
50 NEXT I
60 LPRINT CHR$(27)+"#";
70 FOR I=1 TO 3
80 LPRINT "AUTO LINE FEED MODE OFF";CHR$(13);
90 NEXT I
100 END
```

```
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE OFF
```

Example 2:

```
10 REM  AUTO LINE FEED MODE (for IBM-PC)
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+CHR$(34);
50 FOR I=1 TO 3
60 PRINT#1,"AUTO LINE FEED MODE ON";CHR$(13);
70 NEXT I
80 PRINT#1,CHR$(27)+"#";
90 FOR I=1 TO 3
100 PRINT#1,"AUTO LINE FEED MODE OFF";CHR$(13);
110 NEXT I
120 CLOSE
130 END
```

```
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE ON
AUTO LINE FEED MODE OFF
```

Comments:

- DIP switch 1-4 also controls the auto line feed function (refer to Section 3.3). Setting this switch to the ON position is equivalent to executing the ESC+" command. Similarly, setting the switch to the OFF position is equivalent to executing the ESC+# command.
- Lines 20, 30, 120, and all PRINT# statements in the above sample BASIC program (Example 2) are necessary for those computers which automatically execute a LF following a CR.
- LF is tied to CR in this mode.
- ESC+" is effective when the DIP switch 1-4 is OFF.

AUTOMATIC CARRIAGE RETURN MODE:

Automatically executes a carriage return following a line feed.

Name: Setting: ESC+?
Release: ESC+!

Code: Setting: 27,63 DEC 1B,3F HEX
Release: 27,33 DEC 1B,21 HEX

Input Format: Setting: LPRINT CHR$(27)+"?"
Release: LPRINT CHR$(27)+"!"

Example:

```
10 REM  AUTO CARRIAGE RETURN MODE
20 LPRINT CHR$(27)+"?";
30 FOR I=1 TO 3
40 LPRINT "AUTO CR MODE ON";CHR$(10);
50 NEXT I
60 LPRINT CHR$(27)+"!"
70 FOR I=1 TO 3
80 LPRINT "AUTO CR MODE OFF";CHR$(10);
90 NEXT I
100 END
```

```
AUTO CR MODE ON
AUTO CR MODE ON
AUTO CR MODE ON

AUTO CR MODE OFF
                  AUTO CR MODE OFF
                                    AUTO CR MODE OFF
```

Comments:

- CR is tied to LF in this mode.
- BOLD, SHADOW and GRAPHICS modes are not released by this CR.

GRAPHICS MODE:

Sets graphics mode.

Name: Setting: ESC+3
Release: ESC+4

Code: Setting: 27,51 DEC 1B,33 HEX
Release: 27,52 DEC 1B,34 HEX

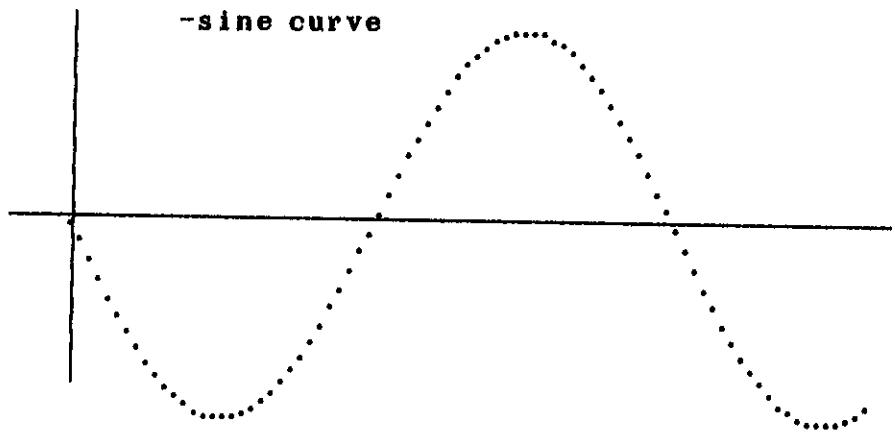
Input Format: Setting: LPRINT CHR$(27)+"3"
Release: LPRINT CHR$(27)+"4"

Comments:

- Graphics mode is released by CR.
- Horizontal movement commands should be used consciously to move the print position, because the print position does not automatically move after a character has been printed in graphics mode.
- In graphics mode, SP and BS move the carriage 1/60 inch (0.42 mm) instead of HMI, and LF and ESC+LF feed the paper 1/48 inch (0.53 mm) instead of VMI.
- The amount of paper feed by executing ESC+U or ESC+D is a half of VMI as well as normal printing mode.

Example:

```
10 REM  GRAPHICS MODE
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+CHR$(9)+CHR$(10);"-sine curve"
50 PRINT#1,CHR$(27)+"3";
60 X=15
70 FOR I=0 TO 8.3 STEP .1
80 X=X+3
90 Y=SIN(I)*49+49
100 PRINT#1,CHR$(27)+CHR$(9)+CHR$(1);
110 PRINT#1,CHR$(27)+CHR$(11)+CHR$(1);
120 FOR J=1 TO X
130 PRINT#1," ";
140 NEXT J
150 FOR J=1 TO Y
160 PRINT#1,CHR$(10);
170 NEXT J
180 PRINT#1,".";
190 NEXT I
200 PRINT#1,CHR$(27)+"4";
210 PRINT#1,CHR$(27)+CHR$(9)+CHR$(4);
220 PRINT#1,CHR$(27)+CHR$(11)+CHR$(1);
230 PRINT#1,CHR$(27)+CHR$(30)+CHR$(5);
240 FOR I=1 TO 23
250 PRINT#1,"|";CHR$(8);CHR$(10);
260 NEXT I
270 PRINT#1,CHR$(27)+CHR$(30)+CHR$(8);
280 PRINT#1,CHR$(27)+CHR$(11)+CHR$(8);CHR$(13);
290 PRINT#1,CHR$(27)+CHR$(31)+CHR$(6);
300 FOR I=1 TO 110
310 PRINT#1,"-";
320 NEXT I
330 CLOSE
340 END
```



PRINT SUPPRESSION MODE:

All printable characters are replaced to SP.

Name: ESC+7

Code: 27, 55 DEC 1B, 37 HEX

Input Format: LPRINT CHR$(27)+"7"

Example:

```
10 REM  PRINT SUPPRESSION MODE
20 LPRINT "ESC+7 ENABLES PRINT SUPPRESSION MODE"
30 LPRINT "ESC+7 ENABLES ";
40 LPRINT CHR$(27)+"7";
50 LPRINT CHR$(27)+"E";
60 LPRINT "PRINT SUPPRESSION MODE"
70 LPRINT "CR CODE CLEARS PRINT SUPPRESSION MODE"
80 END
```

```
ESC+7 ENABLES PRINT SUPPRESSION MODE
ESC+7 ENABLES
CR CODE CLEARS PRINT SUPPRESSION MODE
```

Comments:

- Print suppression mode is released by CR.
- In print suppression mode, all printable characters are replaced to SP, but single or multi byte control codes are effective.

NEAR LETTER QUALITY FONT:

Selects near letter quality font printing.

Name:
Courier NLQ Setting: ESC+x+n n=1,49,129,177
Bold PS NLQ Setting: ESC+x+n n=2,50,130,178
Release: ESC+x+m m=0,48,128,176

Code:
Setting: 27,120,n DEC 1B,78,n HEX
Release: 27,120,m DEC 1B,78,m HEX

Input Format:
Setting: LPRINT CHR$(27)+"x"+CHR$(n)
Release: LPRINT CHR$(27)+"x"+CHR$(m)

Example:

```
10 REM  NEAR LETTER QUALITY FONT
20 LPRINT "PRINTING USING THE DRAFT FONT"
30 LPRINT CHR$(27)+"x"+CHR$(1);
40 LPRINT "PRINTING USING THE COURIER NLQ FONT"
50 LPRINT CHR$(27)+"x"+CHR$(2);
60 LPRINT "PRINTING USING THE BOLD PS NLQ FONT"
70 LPRINT CHR$(27)+"x"+CHR$(0);
80 LPRINT "PRINTING USING THE DRAFT FONT"
90 END
```

(Print mode selector="Pgm")

```
PRINTING USING THE DRAFT FONT
PRINTING USING THE COURIER NLQ FONT
PRINTING USING THE BOLD PS NLQ FONT
PRINTING USING THE DRAFT FONT
```

Comments:

- This command sets near letter quality printing in whichever pitch is set at the time.
- Near letter quality characters are printed with two passes of the print head.
- Sub/superscript characters can be printed in the near letter quality font.
- This command is operational only when the print mode selector is set to "Pgm".
- Font are set as follows:
  - n=0: Draft font
  - n=1: Courier NLQ font
  - n=2: Bold PS NLQ font

SUPERSCRIPT FONT:

Selects superscript font with characters printed on the top-half of the line. Characters are reduced to ½ their original height.

Name: Setting: ESC+s+n n=0,48,128,176
Release: ESC+t

Code: Setting: 27,115,n DEC 1B,73,n HEX
Release: 27,116 DEC 1B,74 HEX

Input Format: Setting: LPRINT CHR$(27)+"s"+CHR$(n)
Release: LPRINT CHR$(27)+"t"

Example: (See SUBSCRIPT.)

Comments:
- Superscript characters are normal width.
- To print very small characters, such as exponents, set superscript and 17 CPI modes simultaneously.
- Superscript characters can be printed in the near-letter-quality mode.
- ESC+t also releases the subscript print setting.
- See subscript comments.

SUBSCRIPT FONT:

Selects subscript font with characters printed on the bottom-half of the line. Characters are reduced to ½ their original height.

Name: Setting: ESC+s+m m=1,49,129,177
Release: ESC+t

Code: Setting 27,115,m DEC 1B,73,m HEX
Release: 27,116 DEC 1B,74 HEX

Input Format: Setting: LPRINT CHR$(27)+"s"+CHR$(m)
Release: LPRINT CHR$(27)+"t"

Example:

```
10 REM  SUPER/SUB SCRIPT
20 LPRINT CHR$(27)+"E";
30 LPRINT CHR$(27)+"s"+CHR$(0);
40 LPRINT "ABCDEFGHIJKLMN - SUPERSCRIPT"
50 LPRINT CHR$(27)+"s"+CHR$(1);
60 LPRINT "ABCDEFGHIJKLMN - SUBSCRIPT"
70 LPRINT CHR$(27)+"t";
80 LPRINT "ABCDEFGHIJKLMN"
90 LPRINT CHR$(27)+"R";
100 END
```

```
ABCDEFGHIJKLMN - SUPERSCRIPT
ABCDEFGHIJKLMN - SUBSCRIPT
ABCDEFGHIJKLMN
```

Comments:
- Subscript characters are normal width.
- To print very small characters, such as exponents, set subscript and compressed modes simultaneously.
- Subscript characters can be printed in the near letter quality mode.
- ESC+t also releases the subscript print setting.
- In both the subscript and superscript mode, the printer performs double-strike, single direction printing. Following the first pass of the print head, the paper is fed 1/216 inch (0.12 mm), and the line is printed again. The printer automatically compensates for the paper feed to maintain the proper line count.

INTERNATIONAL CHARACTER SET:

Selects any one of 11 international character sets.

Name: ESC+r+n 0≦n≦10

Code: 27,114,n DEC 1B,72,n HEX

Input Format: LPRINT CHR$(27)+"r"+CHR$(n)

Example:

```
10 REM  SELECT GERMAN CHARACTERS
20 LPRINT "SAMPLE USA CHARACTERS:"
30 LPRINT "# $ @ [ \ ] ^ ` { : } ~"
40 LPRINT CHR$(10);
50 LPRINT CHR$(27)+"r"+CHR$(2);
60 LPRINT "SAMPLE GERMAN CHARACTERS:"
70 LPRINT "# $ @ [ \ ] ^ ` { : } ~"
80 END

SAMPLE USA CHARACTERS:
# $ @ [ \ ] ^ ` { : } ~

SAMPLE GERMAN CHARACTERS:
# $ § Ä ö Ü ^ ` ä : ü ß
```

Comments:

- Table 6.1 illustrates allocation of international characters to their respective locations.
- International character sets 0–7 can be set with DIP switches 1-6, 1-7, and 1-8.
- Character sets 8, 9, and 10 may be accessed through software ONLY.

	n	35D 23H	36D 24H	64D 40H	91D 5BH	92D 5CH	93D 5DH	94D 5EH	96D 60H	123D 7BH	124D 7CH	125D 7DH	126D 7EH
USA	0	#	$	@	[	\	]	^	`	{	|	}	~
FRANCE	1	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	2	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ENGLAND	3	£	$	@	[	\	]	^	`	{	|	}	~
DENMARK I	4	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	6	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	7	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
JAPAN	8	#	$	@	[	¥	]	^	`	{	|	}	~
NORWAY	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
DENMARK II	10	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

Table 6.1 International Character Set Locations

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name: Setting: SO
Release: DC4

Code: Setting: 14 DEC 0E HEX
Release: 20 DEC 14 HEX

Input Format: Setting: LPRINT CHR$ (14)

Release : LPRINT CHR$(20)

Example:

```
10 REM  DOUBLE WIDTH PRINTING - SINGLE LINE
20 LPRINT "NORMAL"
30 LPRINT CHR$(14);
40 LPRINT "DOUBLE WIDTH"
50 LPRINT "...RELEASED BY A (CR)"
60 LPRINT CHR$(14);
70 LPRINT "DOUBLE WIDTH";
80 LPRINT CHR$(20);
90 LPRINT "...ALSO RELEASED BY DC4"
100 END
```

```
NORMAL
DOUBLE WIDTH
...RELEASED BY A (CR)
DOUBLE WIDTH...ALSO RELEASED BY DC4
```

Comments:

- Single-line double width printing is released when:
  —CR is executed.
  —the printer is initialized
  —DC4, ESC+X executed

BIT IMAGE (GRAPHICS)

The **bit image** (graphics) mode enables you to control the firing of each pin of the print head to create virtually any graphics design you desire.

Dot density (dot resolution) refers to the maximum number of dots which can be printed on a given line. This printer enables you to access a variety of dot densities through specific control commands. The various dot densities and corresponding control commands appear in Table 6.2.

Command	Function	Dot Density
ESC+k+n_1+n_2	Standard density designation	60
ESC+l+n_1+n_2	Double density designation	120
ESC+y+n_1+n_2	Double speed, double density designation	120
ESC+z+n_1+n_2	Quadruple density designation	240
ESC+*+m+n_1+n_2	8-Pin Mode Selection: m=0 (Standard) m=1 (Double) m=2 (Double speed, double density) m=3 (Quadruple density) m=4 m=5 m=6 m=7	 60 120 120 240 80 72 90 144
ESC+^+m+n_1+n_2	9-Pin Mode Selection: m=0 (Standard) m=1 (Double) m=2 (Double speed, double density) m=3 (Quadruple density) m=4 m=5 m=6 m=7	 60 120 120 240 80 72 90 144

Table 6.2 Dot Resolution (Dots per inch)

STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode (816 dots per line/60 dots per inch (25.4 mm)).

Name: ESC+k+n_1+n_2

Code: 27,107,n_1,n_2 DEC 1B,6B,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"k"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM  STANDARD DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"STANDARD DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"k"+CHR$(64)+CHR$(1);
70 FOR I=1 TO 20
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(13);CHR$(10);
140 CLOSE
150 END
```

```
STANDARD DENSITY GRAPHICS
```

DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+l+n_1+n_2

Code: 27,108,n_1,n_2 DEC 1B,6C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"l"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM  DOUBLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"DOUBLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"l"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(13);CHR$(10);
140 CLOSE
150 END
```

```
DOUBLE DENSITY GRAPHICS
```

DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+y+n_1+n_2

Code: 27,121,n_1,n_2 DEC 1B,79,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"y"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM  DOUBLE SPEED, DOUBLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"DOUBLE SPEED, DOUBLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"y"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(13);CHR$(10);
140 CLOSE
150 END
```

```
DOUBLE SPEED, DOUBLE DENSITY GRAPHICS
```

Comment:

- Horizontally adjacent dots cannot be printed.

QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode (3264 dots per line/240 dots per inch (25.4 mm)).

Name: ESC+z+n_1+n_2

Code: 27,122,n_1,n_2 DEC 1B,7A,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"z"+CHR$(n_1)+CHR$($n_2$)

Example:

```
10 REM QUADRUPLE DENSITY GRAPHICS
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"QUADRUPLE DENSITY GRAPHICS"
50 PRINT#1,CHR$(10);
60 PRINT#1,CHR$(27)+"z"+CHR$(144)+CHR$(1);
70 FOR I=1 TO 25
80 PRINT#1,CHR$(1)+CHR$(1)+CHR$(3)+CHR$(3);
90 PRINT#1,CHR$(7)+CHR$(7)+CHR$(15)+CHR$(15);
100 PRINT#1,CHR$(31)+CHR$(31)+CHR$(63)+CHR$(63);
110 PRINT#1,CHR$(127)+CHR$(127)+CHR$(255)+CHR$(255);
120 NEXT I
130 PRINT#1,CHR$(13);CHR$(10);
140 CLOSE
150 END
```

QUADRUPLE DENSITY GRAPHICS

Comment:

- Horizontally adjacent dots cannot be printed.

8-PIN BIT IMAGE MODE SELECTION:

Selects one of eight 8-pin bit image graphic modes.

Name: ESC+✳+m+n_1+n_2 0≦m≦7

Code: 27,42,m,n_1,n_2 DEC 1B,2A,m,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"✳"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)

Example:

```
10 REM  8-PIN BIT IMAGE SELECTION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR M=0 TO 7
50 PRINT#1,"IMAGE MODE =";M
60 PRINT#1,CHR$(10);
70 PRINT#1,CHR$(27)+"*"+CHR$(M)+CHR$(200);CHR$(0);
80 FOR I=1 TO 25
90 PRINT#1,STRING$(4,CHR$(15));
100 PRINT#1,STRING$(4,CHR$(240));
110 NEXT I
120 PRINT#1,CHR$(13);CHR$(10);
130 NEXT M
140 PRINT#1,CHR$(10);
150 CLOSE
160 END
```

```
IMAGE MODE = 0
IMAGE MODE = 1
IMAGE MODE = 2
IMAGE MODE = 3
IMAGE MODE = 4
IMAGE MODE = 5
IMAGE MODE = 6
IMAGE MODE = 7
```

Comments:

- Table 6.3 illustrates the various modes based upon the values of m.

Value of m	Mode	Dot Density
0	Standard density	816 dpl/ 60 dpi
1	Double density	1632 dpl/120 dpi
2	Double speed, double density	1632 dpl/120 dpi
3	Quadruple density	3264 dpl/240 dpi
4	1088 dot density	1088 dpl/ 80 dpi
5	979 dot density	979 dpl/ 72 dpi
6	1224 dot density	1224 dpl/ 90 dpi
7	1958 dot density	1958 dpl/144 dpi

Table 6.3 Dot Density

- Both the vertical and horizontal dot pitch in the 979 dot density mode equal 1/72 inch (0.35 mm), thereby producing a 1:1 aspect ratio.
- The following settings are equivalent:
  - —ESC+k+n_1+n_2 and ESC+✳+0+n_1+n_2
  - —ESC+l+n_1+n_2 and ESC+✳+1+n_1+n_2
  - —ESC+y+n_1+n_2 and ESC+✳+2+n_1+n_2
  - —ESC+z+n_1+n_2 and ESC+✳+3+n_1+n_2

9-PIN BIT IMAGE MODE SELECTION:

Selects one of eight 9-pin bit image graphic modes.

Name: ESC+^+m+n_1+n_2 0≦m≦7

Code: 27,94,m,n_1,n_2 DEC 1B,5E,m,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"^"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)

Example:

```
10 REM  9-PIN BIT IMAGE SELECTION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 FOR N=0 TO 7
50 PRINT#1,"IMAGE MODE =";N
60 PRINT#1,CHR$(10);
70 PRINT#1,CHR$(27)+"^"+CHR$(N)+CHR$(180);CHR$(0);
80 FOR I=1 TO 10
90 PRINT#1,CHR$(0);CHR$(128);CHR$(0);CHR$(128);
100 PRINT#1,CHR$(1);CHR$(128);CHR$(1);CHR$(128);
110 PRINT#1,CHR$(3);CHR$(128);CHR$(3);CHR$(128);
120 PRINT#1,CHR$(7);CHR$(128);CHR$(7);CHR$(128);
130 PRINT#1,CHR$(15);CHR$(128);CHR$(15);CHR$(128);
140 PRINT#1,CHR$(31);CHR$(128);CHR$(31);CHR$(128);
150 PRINT#1,CHR$(63);CHR$(128);CHR$(63);CHR$(128);
160 PRINT#1,CHR$(127);CHR$(128);CHR$(127);CHR$(128);
170 PRINT#1,CHR$(255);CHR$(128);CHR$(255);CHR$(128);
180 NEXT I
190 PRINT#1,CHR$(13);CHR$(10);
200 NEXT N
210 PRINT#1,CHR$(10);
220 CLOSE
230 END
```

```
IMAGE MODE = 0
IMAGE MODE = 1
IMAGE MODE = 2
IMAGE MODE = 3
IMAGE MODE = 4
IMAGE MODE = 5
IMAGE MODE = 6
IMAGE MODE = 7
```

VERTICAL MOVEMENT

Vertical movement commands include forward and reverse line feeds, forward and reverse half-line feeds variable line feeds and form feeds.

LINE FEED:

Prints data in buffer, then executes a single line feed.

Name: LF

Code: 10 DEC 0A HEX

Input Format: LPRINT CHR$(10)

Example:

```
10 REM  LINE FEED (LF)
20 FOR I=1 TO 5
30 LPRINT "LINE FEED";
40 LPRINT CHR$(10);
50 NEXT I
60 END
```

```
LINE FEED
          LINE FEED
                    LINE FEED
                              LINE FEED
                                        LINE FEED
```

Comments:

- The amount of paper feed depends on current vertical motion index (VMI).
- Form Feed is executed when exceeding the bottom margin.
- In graphics mode, LF feed the paper 1/48 inch (0.53 mm) instead of VMI.

REVERSE LINE FEED:

Prints all data in buffer and executes a single reverse line feed.

Name: ESC+LF

Code: 27,10 DEC 1B,0A HEX

Input Format: LPRINT CHR$(27)+CHR$(10)

Example:

```
10 REM  REVERSE LINE FEED
20 FOR I=1 TO 5
30 LPRINT CHR$(10);
40 NEXT I
50 FOR I=1 TO 5
60 LPRINT "REV LF";I;
70 LPRINT CHR$(27)+CHR$(10);
80 NEXT I
90 END
```

```
                                        REV LF 5
                                  REV LF 4
                            REV LF 3
                      REV LF 2
REV LF 1
```

Comments:

- The amount of paper feed depends upon the most recent VMI setting.
- Reverse line feed can move the paper beyond the top margin.

FORWARD/REVERSE HALF-LINE FEED:

Prints all data in buffer and executes a forward/reverse half-line feed.

Name: Forward: ESC+U
Reverse: ESC+D

Code: Forward: 27,85 DEC 1B,55 HEX
Reverse: 27,68 DEC 1B,44 HEX

Input Format: Forward: LPRINT CHR$(27)+"U"
Reverse: LPRINT CHR$(27)+"D"

Example:

```
10 REM  FORWARD HALF-LINE FEED & REVERSE HALF-LINE FEED
20 LPRINT "THIS IS ";
30 LPRINT CHR$(27)+"U";
40 LPRINT "SUB";
50 LPRINT CHR$(27)+"D";
60 LPRINT "SCRIPT BY FORWARD HALF-LINE FEED"
70 LPRINT
80 LPRINT "THIS IS ";
90 LPRINT CHR$(27)+"D";
100 LPRINT "SUPER";
110 LPRINT CHR$(27)+"U";
120 LPRINT "SCRIPT BY REVERSE HALF-LINE FEED"
130 END
```

```
THIS IS SUBSCRIPT BY FORWARD HALF-LINE FEED
THIS IS SUPERSCRIPT BY REVERSE HALF-LINE FEED
```

Comments:

- The feeding amount depends on a half of VMI.
- When VMI is 0 or 1, these commands are ignored.

FORM FEED:

Prints all data in buffer and feeds paper to next top margin.

Name: FF

Code: 12 DEC 0C HEX

Input Format: LPRINT CHR$(12)

Example:

```
10 REM  FORM FEED (FF)
20 LPRINT CHR$(27)+CHR$(12)+CHR$(3);
30 LPRINT "THIS PAGE IS 3 LINES LONG"
40 FOR I=1 TO 4
50 LPRINT CHR$(12);
60 LPRINT "EXECUTE FORM FEED";CHR$(13);
70 NEXT I
80 END
```

```
THIS PAGE IS 3 LINES LONG

EXECUTE FORM FEED

EXECUTE FORM FEED

EXECUTE FORM FEED

EXECUTE FORM FEED
```

Comment:

- The form length is designated by ESC+FF+n.

VERTICAL TAB:

Prints all data in buffer and feeds paper to the next vertical tab stop position from current print line.

Name: VT

Code: 11 DEC 0B HEX

Input Format: LPRINT CHR$(11)

Example:

```
10 REM  VERTICAL TAB STOP
20 FOR I=1 TO 10
30 LPRINT "LINE";I
40 NEXT I
50 LPRINT CHR$(27)+CHR$(11)+CHR$(3);CHR$(27)+"-";
60 LPRINT CHR$(27)+CHR$(11)+CHR$(7);CHR$(27)+"-";
70 LPRINT CHR$(27)+CHR$(11)+CHR$(9);CHR$(27)+"-";
80 LPRINT CHR$(27)+CHR$(11)+CHR$(1);
90 LPRINT SPC(10);"TOP OF FORM"
100 LPRINT CHR$(11);SPC(10);"VT1"
110 LPRINT CHR$(11);SPC(10);"VT2"
120 LPRINT CHR$(11);SPC(10);"VT3"
130 END
```

```
LINE 1     TOP OF FORM
LINE 2
LINE 3     VT1
LINE 4
LINE 5
LINE 6
LINE 7     VT2
LINE 8
LINE 9     VT3
LINE 10
```

Comments:

- This command is ineffective when vertical tab stops have not been set below current print line.
- Form Feed is executed when exceeding the bottom margin.
- When a vertical tab stop has been set, the position of that tab stop is affected by a change in the VMI.

ABSOLUTE VERTICAL TAB:

Prints all data in buffer and feeds paper to line position designated.

Name: ESC+VT+n $1 \leqq n \leqq 126$

Code: 27,11,n DEC 1B,0B,n HEX

Input Format: LPRINT CHR$(27)+CHR$(11)+CHR$(n)

Example:

```
10 REM  ABSOLUTE VERTICAL TAB
20 FOR I=1 TO 10
30 LPRINT "LINE";I
40 NEXT I
50 LPRINT CHR$(27)+CHR$(11)+CHR$(1);SPC(10);"1ST LINE";
60 LPRINT CHR$(27)+CHR$(11)+CHR$(8);"8TH LINE";
70 LPRINT CHR$(27)+CHR$(11)+CHR$(3);"3RD LINE";
80 LPRINT CHR$(27)+CHR$(11)+CHR$(10);"10TH LINE"
90 END
```

```
LINE 1     1ST LINE
LINE 2
LINE 3                        3RD LINE
LINE 4
LINE 5
LINE 6
LINE 7
LINE 8              8TH LINE
LINE 9
LINE 10                                 10TH LINE
```

Comments:

- The absolute vertical tab value can exceed the top (bottom) margin.
- The line position of the top of form is 1.
- When VMI is 0, this command is ignored.
- If $n \geqq 128$, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

FORMATTING

Formatting commands refer to the format of the printed page. Included are all margin setting, all tab settings, and the page length setting.

LEFT MARGIN SET:

Sets left margin at the current carriage position.

Name: ESC+9

Code: 27,57 DEC 1B,39 HEX

Input Format: LPRINT CHR$(27)+"9"

Example:

```
10 REM  SET LEFT MARGIN
20 FOR I=1 TO 6
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(27)+CHR$(9)+CHR$(10);CHR$(27)+"9"
60 FOR I=1 TO 2
70 LPRINT "LEFT MARGIN IS SET AT 10 COLUMNS"
80 NEXT I
90 LPRINT CHR$(27)+CHR$(9)+CHR$(20);CHR$(27)+"9"
100 FOR I=1 TO 2
110 LPRINT "LEFT MARGIN IS SET AT 20 COLUMNS"
120 NEXT I
130 LPRINT CHR$(27)+CHR$(9)+CHR$(15);CHR$(27)+"9"
140 FOR I=1 TO 2
150 LPRINT "LEFT MARGIN IS SET AT 15 COLUMNS"
160 NEXT I
170 END
```

```
12345678901234567890123456789012345678901234567890123456789012345678901234567890
          LEFT MARGIN IS SET AT 10 COLUMNS
          LEFT MARGIN IS SET AT 10 COLUMNS

                    LEFT MARGIN IS SET AT 20 COLUMNS
                    LEFT MARGIN IS SET AT 20 COLUMNS

                LEFT MARGIN IS SET AT 15 COLUMNS
                LEFT MARGIN IS SET AT 15 COLUMNS
```

Comments:

- First, using horizontal movement commands, move the print position to the desired position, then set the left margin. Any previously set left margin is released.
- The left margin may not be set to the right of the right margin.
- Printing may not be done to the left of the left margin.
- The absolute horizontal tab can be used to exceed the left margin.
- Changing the HMI does not affect the left margin.
- Changing the left margin does not affect horizontal tab stop.
- In backward printing mode, the print position cannot exceed the left margin.

RIGHT MARGIN SET:

Sets right margin at the current print position.

Name: ESC+0

Code: 27,48 DEC 1B,30 HEX

Input Format: LPRINT CHR$(27)+"0"

Example:

```
10 REM  SET RIGHT MARGIN
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(27)+CHR$(9)+CHR$(40);CHR$(27)+"0"
60 LPRINT "RIGHT MARGIN IS SET AT 40 COLUMNS"
70 FOR I=1 TO 50
80 LPRINT "A";
90 NEXT I
100 LPRINT
110 LPRINT CHR$(27)+CHR$(9)+CHR$(50);CHR$(27)+"0"
120 LPRINT "RIGHT MARGIN IS SET AT 50 COLUMNS"
130 FOR I=1 TO 60
140 LPRINT "B";
150 NEXT I
160 LPRINT
170 END
```

```
1234567890123456789012345678901234567890123456789012345678901234567890
RIGHT MARGIN IS SET AT 40 COLUMNS
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAA

RIGHT MARGIN IS SET AT 50 COLUMNS
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
BBBBBBBBBB
```

Comments:

- First, using horizontal movement commands, move the print position to the desired position, then set the right margin. Any previously set right margin is released.
- The right margin may not be set to the left of the left margin.
- Printing may not be done to the right of the right margin.
- The absolute horizontal tab can be used to exceed the right margin.
- Changing the HMI does not affect the right margin.
- Changing the right margin does not affect horizontal tab stop.

TOP MARGIN SET:

Sets top margin at the current paper position.

Name: ESC+T

Code: 27,84 DEC 1B,54 HEX

Input Format: LPRINT CHR$(27)+"T"

Example:

```
10 REM  SET TOP MARGIN
20 FOR I=1 TO 3
30 FOR J=1 TO 5
40 LPRINT "LINE";J
50 NEXT J
60 NEXT I
70 LPRINT CHR$(27)+CHR$(11)+CHR$(1);
80 LPRINT CHR$(27)+CHR$(12)+CHR$(5);
90 LPRINT SPC(10);"THIS PAGE IS 5 LINES LONG"
100 LPRINT
110 LPRINT CHR$(27)+"T";SPC(10);"SET TOP MARGIN AT 3RD LINE"
120 FOR I=1 TO 8
130 LPRINT SPC(10);"PRINTABLE AREA"
140 NEXT I
150 END
```

```
LINE 1     THIS PAGE IS 5 LINES LONG
LINE 2
LINE 3     SET TOP MARGIN AT 3RD LINE
LINE 4     PRINTABLE AREA
LINE 5     PRINTABLE AREA
LINE 1
LINE 2
LINE 3     PRINTABLE AREA
LINE 4     PRINTABLE AREA
LINE 5     PRINTABLE AREA
LINE 1
LINE 2
LINE 3     PRINTABLE AREA
LINE 4     PRINTABLE AREA
LINE 5     PRINTABLE AREA
```

Comments:

- First, using vertical movement commands, move the paper to the desired position, then set the top margin. Any previously set top margin is released.
- The top margin may not be set below the bottom margin.
- Printing may not be done above the top margin without after the absolute vertical tab executed.
- The absolute vertical tab can be used to exceed the top margin.
- Changing the VMI does not affect the top margin.
- Changing the top margin does not affect vertical tab stop.
- ESC+C releases both the top and bottom margins.
- Reverse Line Feeds (ESC+LF and ESC+D) which would cause the paper to move above the top margin are possible.

BOTTOM MARGIN SET:

Sets bottom margin at the current paper position.

Name: ESC+L

Code: 27,76 DEC 1B,4C HEX

Input Format: LPRINT CHR$(27)+"L"

Example:

```
10 REM  SET BOTTOM MARGIN
20 FOR I=1 TO 3
30 FOR J=1 TO 5
40 LPRINT "LINE";J
50 NEXT J
60 NEXT I
70 LPRINT CHR$(27)+CHR$(11)+CHR$(1);
80 LPRINT CHR$(27)+CHR$(12)+CHR$(5);
90 LPRINT SPC(10);"THIS PAGE IS 5 LINES LONG"
100 LPRINT
110 LPRINT CHR$(27)+"L";SPC(10);"SET BOTTOM MARGIN AT 3RD LINE"
120 FOR I=1 TO 6
130 LPRINT SPC(10);"PRINTABLE AREA"
140 NEXT I
150 END
```

```
LINE 1     THIS PAGE IS 5 LINES LONG
LINE 2
LINE 3     SET BOTTOM MARGIN AT 3RD LINE
LINE 4
LINE 5
LINE 1     PRINTABLE AREA
LINE 2     PRINTABLE AREA
LINE 3     PRINTABLE AREA
LINE 4
LINE 5
LINE 1     PRINTABLE AREA
LINE 2     PRINTABLE AREA
LINE 3     PRINTABLE AREA
LINE 4
LINE 5
```

Comments:

- First, using vertical movement commands, move the paper to the desired position, then set the bottom margin. Any previously set bottom margin is released.
- The bottom margin may not be set above the top margin.
- Printing may not be done below the bottom margin without after the absolute vertical tab executed.
- The absolute vertical tab should be used to exceed the bottom margin.
- Changing the VMI does not affect the bottom margin.
- Changing the bottom margin does not affect vertical tab stop.
- ESC+C releases both the top and bottom margins.
- If Line Feeds (LF and ESC+U) are executed below the bottom margin the new line position will be the top margin of the next page.

TOP/BOTTOM MARGIN CLEAR:

Clears top and bottom margins.

Name: ESC+C

Code: 27,67 DEC 1B,43 HEX

Input Format: LPRINT CHR$(27)+"C"

Example:

```
10 REM  CLEAR TOP/BOTTOM MARGINS
20 FOR I=1 TO 4
30 FOR J=1 TO 4
40 LPRINT "LINE";J
50 NEXT J
60 NEXT I
70 LPRINT CHR$(27)+CHR$(11)+CHR$(1);
80 LPRINT CHR$(27)+CHR$(12)+CHR$(4);
90 LPRINT SPC(10);"THIS PAGE IS 4 LINES LONG"
100 LPRINT CHR$(27)+"T";SPC(10);"SET TOP MARGIN AT 2ND LINE"
110 LPRINT CHR$(27)+"L";SPC(10);"SET BOTTOM MARGIN AT 3RD LINE"
120 FOR I=1 TO 3
130 LPRINT SPC(10);"PRINTABLE AREA"
140 NEXT I
150 LPRINT CHR$(27)+"C";
160 LPRINT SPC(10);"CLEAR TOP/BOTTOM MARGINS"
170 FOR I=1 TO 5
180 LPRINT SPC(10);"PRINTABLE AREA"
190 NEXT I
200 END
```

```
LINE 1     THIS PAGE IS 4 LINES LONG
LINE 2     SET TOP MARGIN AT 2ND LINE
LINE 3     SET BOTTOM MARGIN AT 3RD LINE
LINE 4
LINE 1
LINE 2     PRINTABLE AREA
LINE 3     PRINTABLE AREA
LINE 4
LINE 1
LINE 2     PRINTABLE AREA
LINE 3     CLEAR TOP/BOTTOM MARGINS
LINE 4     PRINTABLE AREA
LINE 1     PRINTABLE AREA
LINE 2     PRINTABLE AREA
LINE 3     PRINTABLE AREA
LINE 4     PRINTABLE AREA
```

Comments:

- This command does not clear right and left margins.
- ESC+C does not affect page length and line position.

FORM LENGTH:

Sets the number of lines per page to n.

Name: ESC+FF+n 1≦n≦126

Code: 27,12,n DEC 1B,0C,n HEX

Input Format: LPRINT CHR$(27)+CHR$(12)+CHR$(n)

Example:

```
10 REM  SET PAGE LENGTH
20 LPRINT CHR$(27)+CHR$(12)+CHR$(3);
30 FOR I=1 TO 2
40 LPRINT "THIS PAGE IS 3 LINES LONG"
50 LPRINT CHR$(12);
60 NEXT I
70 LPRINT CHR$(27)+CHR$(12)+CHR$(6);
80 FOR I=1 TO 2
90 LPRINT "THIS PAGE IS 6 LINES LONG"
100 LPRINT CHR$(12);
110 NEXT I
120 LPRINT "NEXT PAGE"
130 END
```

```
THIS PAGE IS 3 LINES LONG

THIS PAGE IS 3 LINES LONG

THIS PAGE IS 6 LINES LONG



THIS PAGE IS 6 LINES LONG



NEXT PAGE
```

Comments:

- Executing a Form Length command releases any previously set form length, top and bottom margins, and all vertical tab stops.
- The current line position is set as top of form.
- Changing VMI does not affect form length.
- When VMI is 0, this command is ignored.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

HORIZONTAL TAB STOP SET/CLEAR:

Sets horizontal TAB stop at the current print position.

Name: Setting: ESC+1

Release: ESC+8

Code: Setting: 27,49 DEC 1B,31 HEX

Release: 27,56 DEC 1B,38 HEX

Input Format: Setting: LPRINT CHR$(27)+"1"

Release: LPRINT CHR$(27)+"8"

Example:

```
10 REM  HORIZONTAL TAB STOP SET/CLEAR
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(27)+CHR$(9)+CHR$(5);CHR$(27)+"1";
60 LPRINT CHR$(27)+CHR$(9)+CHR$(15);CHR$(27)+"1";
70 LPRINT CHR$(27)+CHR$(9)+CHR$(40);CHR$(27)+"1"
80 LPRINT CHR$(9);"HT1";CHR$(9);"HT2";CHR$(9);"HT3"
90 LPRINT CHR$(27)+CHR$(9)+CHR$(15);CHR$(27)+"8";
100 LPRINT "CLEAR THIS HTAB"
110 LPRINT CHR$(9);"HT1";CHR$(9);"HT2";CHR$(9);"HT3"
120 END
```

```
12345678901234567890123456789012345678901234567890
    HT1         HT2                              HT3
                CLEAR THIS HTAB
    HT1                                          HT2HT3
```

Comments:

- Up to 60 horizontal tab stops may be in force at one time.
- First, using horizontal movement commands, move the print position to the desired position, then set the horizontal tab stop.
- ESC+2 releases all horizontal and vertical tab stops.
- Horizontal tab stops are not affected by the changing of left/right margins.
- ESC+8 releases only one tab stop at the present print position.

VERTICAL TAB STOP SET:

Sets vertical TAB stop at the current print position.

Name: ESC+−

Code: 27,45 DEC 1B,2D HEX

Input Format: LPRINT CHR$(27)+"−"

Example:

```
10 REM  SET VERTICAL TAB STOP
20 FOR I=1 TO 10
30 LPRINT "LINE";I
40 NEXT I
50 LPRINT CHR$(27)+CHR$(11)+CHR$(3);SPC(10);
60 LPRINT CHR$(27)+"-";"SET VT1"
70 LPRINT CHR$(27)+CHR$(11)+CHR$(7);SPC(10);
80 LPRINT CHR$(27)+"-";"SET VT2"
90 LPRINT CHR$(27)+CHR$(11)+CHR$(9);SPC(10);
100 LPRINT CHR$(27)+"-";"SET VT3"
110 LPRINT CHR$(27)+CHR$(11)+CHR$(1);
120 LPRINT SPC(10);"TOP OF FORM"
130 LPRINT CHR$(11);SPC(20);"vt1"
140 LPRINT CHR$(11);SPC(20);"vt2"
150 LPRINT CHR$(11);SPC(20);"vt3"
160 END
```

```
LINE 1      TOP OF FORM
LINE 2
LINE 3      SET VT1     vt1
LINE 4
LINE 5
LINE 6
LINE 7      SET VT2     vt2
LINE 8
LINE 9      SET VT3     vt3
LINE 10
```

Comments:

- Up to 60 vertical tab stops may be in force at one time.
- First, using horizontal movement commands, move the print position to the desired position, then set the horizontal tab stop.
- ESC+2 releases all horizontal and vertical tab stops.
- Vertical tab stops are not affected by the changing of top/bottom margins.

ALL HORIZONTAL/VERTICAL TAB STOPS CLEAR:

Clears all horizontal and vertical TAB stops.

Name: ESC+2

Code: 27,50 DEC 1B,32 HEX

Input Format: LPRINT CHR$(27)+"2"

Example:

```
10 REM  CLEAR ALL TAB STOPS
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT
60 FOR I=1 TO 11
70 LPRINT "LINE";I+1
80 NEXT I
90 FOR I=1 TO 4
100 LPRINT CHR$(27)+CHR$(9)+CHR$(I*10);CHR$(27)+"1";
110 LPRINT CHR$(27)+CHR$(11)+CHR$(I*3);CHR$(27)+"-";
120 LPRINT CHR$(27)+CHR$(11)+CHR$(1);CHR$(13);
130 NEXT I
140 FOR I=1 TO 4
150 LPRINT CHR$(9);CHR$(11);"TAB";I;
160 NEXT I
170 LPRINT CHR$(13);CHR$(10);
180 LPRINT CHR$(27)+"2"
190 LPRINT "CLEAR ALL TABULATIONS"
200 FOR I=1 TO 4
210 LPRINT CHR$(9);CHR$(11);"TAB";I;
220 NEXT I
230 LPRINT
240 END
```

```
1234567890123456789012345678901234567890123456789012345678901234567890
LINE 2
LINE 3    TAB 1
LINE 4
LINE 5
LINE 6                TAB 2
LINE 7
LINE 8
LINE 9                                TAB 3
LINE 10
LINE 11
LINE 12                                                TAB 4


CLEAR ALL TABULATIONS
TAB 1 TAB 2 TAB 3 TAB 4
```

See Also: ESC+1 (Page 6-35), ESC+- (Page 6-36).

WORD PROCESSING

OFFSET SELECTION:

Increases or decreases the amount of spacing by the setting of n. Especially effective in PS mode, because HMI is not active in PS mode.
The offset value is designated by n, as shown below.

Name: ESC+DC1+n (1≦n≦126)
where the value of offset is designated by (n), as below.

n	1	2	3	...	62	63	64	65	66	67	...	125	126
offset	1	2	3	...	62	63	0	−1	−2	−3	...	−61	−62

unit: 1/120 inch (0.21 mm)

Code: 27,17,n DEC 1B,11,n HEX

Input Format: LPRINT CHR$(27)+CHR$(17)+CHR$(n)

Example:

```
10 REM  OFFSET SELECTION
20 LPRINT CHR$(27)+"x"+CHR$(2);
30 LPRINT CHR$(27)+"P";
40 LPRINT "OFFSET = 3"
50 LPRINT CHR$(27)+CHR$(17)+CHR$(3);
60 LPRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG."
70 LPRINT "OFFSET = -3"
80 LPRINT CHR$(27)+CHR$(17)+CHR$(67);
90 LPRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG."
100 LPRINT "OFFSET = 0"
110 LPRINT CHR$(27)+CHR$(17)+CHR$(64);
120 LPRINT "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG."
130 END
```

(Print mode selector="Pgm")

```
OFFSET = 3
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG.
OFFSET = -3
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG.
OFFSET = 0
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG.
```

Comments:

- In PS mode, the offset value is added to the amount of spacing which is executed after printing a character.
- When the offset value is negative, the total amount of spacing cannot be negative.
- ESC+DC1+n is released by CR or ESC+X.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

BOLD/SHADOW PRINTING MODE:

Name:	Setting BOLD:	ESC+O	
	Setting SHADOW:	ESC+W	
	Release:	ESC+&	
Code:	Setting BOLD:	27,79 DEC	1B,4F HEX
	Setting SHADOW:	27,87 DEC	1B,57 HEX
	Release:	27,38 DEC	1B,26 HEX
Input Format:	Setting BOLD:	LPRINT CHR$(27)+"O"	
	Setting SHADOW:	LPRINT CHR$(27)+"W"	
	Release:	LPRINT CHR$(27)+"&"	

Example:

```
10 REM  BOLD/SHADOW PRINTING
20 LPRINT CHR$(27)+"x"+CHR$(1);
30 FOR I=1 TO 3
40 LPRINT "THIS IS ";CHR$(27)+"O";"BOLD ";CHR$(27)+"&";"PRINTING"
50 NEXT I
60 LPRINT
70 FOR I=1 TO 3
80 LPRINT "THIS IS ";CHR$(27)+"W";"SHADOW ";CHR$(27)+"&";"PRINTING"
90 NEXT I
100 LPRINT
110 END
```

(Print mode selector="Pgm")

```
THIS IS BOLD PRINTING
THIS IS BOLD PRINTING
THIS IS BOLD PRINTING

THIS IS SHADOW PRINTING
THIS IS SHADOW PRINTING
THIS IS SHADOW PRINTING
```

Comments:

- In bold printing mode draft font is printed with horizontal double density, near letter quality font with double printing at the same position.
- In shadow printing mode both of draft and near letter quality fonts are double printed with 1/120 inch (0.21 mm) space between the first and the second printing.
- Bold/shadow printing mode is released by CR.
- If the BOLD, SHADOW printing commands are entered, that command entered most recently takes priority over the others.
- ESC+X releases all word processing modes including bold/shadow printing modes.

UNDERLINING MODE:

Name: Setting : ESC+E
Release: ESC+R

Code: Setting : 27,69 DEC 1B,45 HEX
Release: 27,82 DEC 1B,52 HEX

Input Format: Setting : LPRINT CHR$(27)+"E"
Release: LPRINT CHR$(27)+"R"

Example:

```
10 REM UNDERLINING
20 LPRINT CHR$(27)+"E";
30 FOR I=1 TO 3
40 LPRINT "UNDERLINE BY ESC+E"
50 NEXT I
60 LPRINT
70 LPRINT CHR$(27)+"R";
80 LPRINT "RELEASE UNDERLINE PRINTING"
90 END
```

```
UNDERLINE BY ESC+E
UNDERLINE BY ESC+E
UNDERLINE BY ESC+E

RELEASE UNDERLINE PRINTING
```

Comments:

- ESC+X releases all word processing modes including underlining modes.
- Printing underline is started when ESC+R, ESC+X, CR, LF or printing buffer full is detected.

WORD PROCESSING MODE RELEASE:

Releases double width, shadow, bold, underline, offset selection.

Name: ESC+X

Code: 27,88 DEC 1B,58 HEX

Input Format: LPRINT CHR$(27)+"X"

Example:

```
10 REM WORD PROCESSING MODE RELEASE
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27);"W";
50 PRINT#1,CHR$(27);"E";
60 PRINT#1,"THIS SENTENCE IS PRINTED IN SHADOW, UNDERLINE MODES";
70 PRINT#1,CHR$(13);CHR$(10);
80 PRINT#1,CHR$(27)+"X";CHR$(13);CHR$(10);
90 PRINT#1,"RELEASE SHADOW, UNDERLINE MODES";
100 PRINT#1,CHR$(13);CHR$(10);
110 CLOSE
120 END
```

THIS SENTENCE IS PRINTED IN SHADOW, UNDERLINE MODES

RELEASE SHADOW, UNDERLINE MODES

See Also: SO (Page 6-16), ESC+O (Page 6-39), ESC+W (Page 6-39), ESC+E (Page 6-40), ESC+DC1+n (Page 6-38).

Comment:

- ESC+X does not clear proportional spacing mode, HMI, VMI, and tab settings.

HORIZONTAL MOVEMENT

Horizontal movement commands refer to the movement of the print position.

CARRIAGE RETURN:

Prints data in buffer.

Name: CR

Code: 13 DEC 0D HEX

Input Format: LPRINT CHR$(13)

Example 1:

```
10 REM  CARRIAGE RETURN
20 LPRINT "/////";
30 LPRINT CHR$(13);
40 LPRINT "\\\\\"
50 END
```

XXXXX

Example 2:

```
10 REM  CARRIAGE RETURN (for IBM-PC)
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,"/////";
50 PRINT#1,CHR$(13);
60 PRINT#1,"\\\\\"
70 CLOSE
80 END
```

XXXXX

Comments:

- Certain computers generate a LF together with a CR. If your output appears as: /////
  \\\\\ your computer probably issues an automatic line feed with each carriage return. Use the OPEN and PRINT# statements (as in the above example 2) on such computers to suppress this line feed.
- Printer DIP switch 1-4 (Auto Line Feed) must be set to OFF (suppress LF) for the above example to work.

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS

Code: 8 DEC 08 HEX

Input Format: LPRINT CHR$(8)

Example:

```
10 REM  OVER STRIKE BY BACKSPACE (BS)
20 LPRINT "BACKSPACE";
30 FOR I=1 TO 5
40 LPRINT CHR$(8);
50 NEXT I
60 LPRINT "====="
70 END
```

```
BACKSPACE
```

Comments:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the pitch or HMI set when the BS code was received.
- Backspacing to the left (right) of the left (right) margin cannot be executed.

1/120 INCH BACKSPACE:

Prints data in buffer and backspaces 1/120 inch (0.21 mm) before printing next character.

Name: ESC+BS

Code: 27,8 DEC 1B,08 HEX

Input Format: LPRINT CHR$(27)+CHR$(8)

Example:

```
10 REM  1/120 INCH BACKSPACE
20 LPRINT " 1/120 INCH BACKSPACE";
30 FOR I=1 TO 20
40 LPRINT CHR$(8);
50 NEXT I
60 LPRINT CHR$(27)+CHR$(8);
70 LPRINT "1/120 INCH BACKSPACE"
80 END
```

```
 1/120 INCH BACKSPACE
```

Comment:

- 1/120 inch backspacing to the left of the left margin cannot be executed.

HORIZONTAL TAB:

Executes the horizontal TAB to the next horizontal tab stop position previously set.

Name: HT

Code: 9 DEC 09 HEX

Input Format: LPRINT CHR$(9)

Example:

```
10 REM  HORIZONTAL TAB STOP
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT CHR$(27)+CHR$(9)+CHR$(5);CHR$(27)+"1";
60 LPRINT CHR$(27)+CHR$(9)+CHR$(15);CHR$(27)+"1";
70 LPRINT CHR$(27)+CHR$(9)+CHR$(40);CHR$(27)+"1"
80 LPRINT CHR$(9);"HT1";CHR$(9);"HT2";CHR$(9);"HT3"
90 LPRINT CHR$(9);"HT1";CHR$(9);"HT2";CHR$(9);"HT3"
100 END
```

```
12345678901234567890123456789012345678901234567890
    HT1       HT2                           HT3
    HT1       HT2                           HT3
```

Comments:

- This command is ineffective when horizontal tab stops have not been set.
- When a horizontal tab stop has been set, the position of that tab stop is affected by a change in the HMI.
- If the value of the horizontal TAB exceeding the right margin, all data within correct printing range will be printed according to the HT setting(s). A single line feed is executed.

ABSOLUTE HORIZONTAL TAB:

Print position designated.

Name: ESC+HT+n 1≦n≦126

Code: 27,9,n DEC 1B,09,n HEX

Input Format: LPRINT CHR$(27)+CHR$(9)+CHR$(n)

Example:

```
10 REM  ABSOLUTE HORIZONTAL TAB
20 FOR I=1 TO 5
30 LPRINT "1234567890";
40 NEXT I
50 LPRINT
60 LPRINT CHR$(27)+CHR$(9)+CHR$(25);"25 COLUMNS"
70 LPRINT CHR$(27)+CHR$(9)+CHR$(5);"5 COLUMNS"
80 LPRINT CHR$(27)+CHR$(9)+CHR$(40);"40 COLUMNS"
90 LPRINT CHR$(27)+CHR$(9)+CHR$(18);"18 COLUMNS"
100 END
```

```
1234567890123456789012345678901234567890123456789012345678901234567890
                          25 COLUMNS
    5 COLUMNS
                                                  40 COLUMNS
                  18 COLUMNS
```

Comments:

- The absolute horizontal tab value can exceed the right (left) margin.
- When HMI is 0, this command is ignored.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, this command is ignored.

DOWNLOADABLE CHARACTERS

If the printer does not contain all of the characters which you need, you can custom design up to 10K bytes of characters without the buffer option and up to 38K bytes of characters with the buffer option.

Characters are downloadable in the draft and near letter quality fonts. Refer to Standard/IBM pinter mode on page 5-73.

ROM CHARACTER GENERATOR SELECTION:

Selects the character generator in the internal ROM.

Name: ESC+%+0+n n=0 or n=2

Code: 27,37,0,n DEC 1B,25,00,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(0)+CHR$(n)

Example: (See page 6-48.)

Comments:

- "n" specifies the ROM CG mode.
  n=0: Draft font
  n=2: NLQ font
- Upon receipt of this command the downloadable font print mode is cleared.
- Font change by this command is ineffective when the print mode selector is not at "Pgm".

DOWNLOAD CHARACTER GENERATOR SELECTION:

Selects the download character set previously defined.

Name: ESC+%+1+n n=0 or n=2

Code: 27,37,1,n DEC 1B,25,01,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(n)

Example:

```
10 REM  DOWNLOAD CHARACTER GENERATOR SELECTION
20 REM  ROM CG SET COPY
30 LPRINT CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
40 LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(33)+CHR$(33);
50 REM  DOWNLOAD TO "!" IN DRAFT FONT
60 LPRINT CHR$(42);
70 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
80 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
90 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
100 REM  SELECTS DOWNLOAD CG
110 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(2);
120 LPRINT "SELECTS NLQ FONT DOWNLOAD CG !!!"
130 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
140 LPRINT "SELECTS DRAFT FONT DOWNLOAD CG !!!"
150 REM  SELECTS DRAFT FONT CHARACTERS
160 LPRINT CHR$(27)+"%"+CHR$(0)+CHR$(0);
170 LPRINT "SELECTS DRAFT FONT ROM CG !!!"
180 END
```

(Print mode selector="Pgm")

```
SELECTS NLQ FONT DOWNLOAD CG !!!
SELECTS DRAFT FONT DOWNLOAD CG ♪♪♪
SELECTS DRAFT FONT ROM CG !!!
```

Comments:

- "n" indicates downloadable font which is printed.
  n=0: Draft font
  n=2: NLQ font
- Upon receipt of this command the printer will be set to downloadable print mode, until it receives the ROM CG selection command (ESC+%+0+n). The unit will print out downloadable font (in the designated mode) after receiving the print mode change command, such as ESC+x+0 (draft font designation), ESC+x+1 (Courier NLQ font designation) or ESC+x+2 (Bold PS NLQ font designation).
- Font change of this command is ineffective when the print mode selector is not at "Pgm".

DRAFT FONT DOWNLOADING:

Defines download draft font.

Name: ESC+$+0+n+m+a+$P_1$+$P_2$+...+$P_{11}$ $0 \leqq n \leqq m \leqq 255$

Code: 27,36,0,n,m,a,P_1,P_2,...,P_{11} DEC
1B,24,00,n,m,a,P_1,P_2,...,P_{11} HEX

Input Format: LPRINT CHR$(27)+"$"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$(a)+CHR$($P_1$)
+CHR$($P_2$)+...+CHR$(P_{11})

Example:

```
10 REM  DEFINITION OF DOWNLOAD CHARACTERS IN DRAFT MODE
20 LPRINT CHR$(27)+"$"+CHR$(0)+CHR$(65)+CHR$(66);
30 REM  STORE IN PLACE OF "A" - ASCII 065
40 LPRINT CHR$(139);
50 LPRINT CHR$(0)+CHR$(12)+CHR$(146)+CHR$(65);
60 LPRINT CHR$(34)+CHR$(28)+CHR$(64)+CHR$(0);
70 LPRINT CHR$(128)+CHR$(0)+CHR$(0);
80 REM  STORE IN PLACE OF "B" - ASCII 066
90 LPRINT CHR$(11);
100 LPRINT CHR$(0)+CHR$(12)+CHR$(146)+CHR$(65);
110 LPRINT CHR$(34)+CHR$(28)+CHR$(64)+CHR$(0);
120 LPRINT CHR$(128)+CHR$(0)+CHR$(0);
130 REM  SELECT DOWNLOAD CHARACTER GENERATOR (CG)
140 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
150 LPRINT "ABABABABAB"
160 END
```

(Print mode selector="Pgm")

Explanation: (See page 5-75~5-78)

Comments: (See page 5-78)

NLQ FONT DOWNLOADING:

Defines near-letter quality font.

Name: ESC+$ +2+n+m+a+P_{1H}+P_{1L}+...+P_{23L} $0 \leqq n \leqq m \leqq 255$

Code: 27,36,2,n,m,a,P_{1H},P_{1L},...,P_{23L} DEC
1B,24,02,n,m,a,P_{1H},P_{1L},...,P_{23L} HEX

Input Format: LPRINT CHR$(27)+"$"+CHR$(2)+CHR$(n)+CHR$(m)+CHR$(a)+CHR$($P_{1H}$)
+CHR$($P_{1L}$)+... +CHR$(P_{23L})

Example:

```
10 REM  DEFINITION OF DOWNLOAD CHARACTERS IN NLQ MODE
20 LPRINT CHR$(27)+"$"+CHR$(2)+CHR$(65)+CHR$(65);
30 REM  STORE IN PLACE OF "A" - ASCII 065
40 LPRINT CHR$(11);
50 LPRINT CHR$(0)+CHR$(12)+CHR$(0)+CHR$(18)+CHR$(0)+CHR$(0);
60 LPRINT CHR$(0)+CHR$(2)+CHR$(15)+CHR$(1)+CHR$(16)+CHR$(128);
70 LPRINT CHR$(32)+CHR$(1)+CHR$(64)+CHR$(128)+CHR$(0)+CHR$(1);
80 LPRINT CHR$(128)+CHR$(128)+CHR$(0)+CHR$(1)+CHR$(128)+CHR$(128);
90 LPRINT CHR$(0)+CHR$(1)+CHR$(128)+CHR$(130)+CHR$(65)+CHR$(0);
100 LPRINT CHR$(32)+CHR$(242)+CHR$(31)+CHR$(12)+CHR$(32)+CHR$(0);
110 LPRINT CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
120 LPRINT CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
130 REM  SELECT DOWNLOAD CHARACTER GENERATOR (CG)
140 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(2);
150 LPRINT "AAAAAAAAAA"
160 END
```

(Print mode selector="Pgm")

9999999999

Explanation: (See page 5-79~5-81)

Comments: (See page 5-81)

ROM CHARACTER GENERATOR SET COPY:

Copies internal ROM CG font into downloadable font area.

Name: ESC+:+0+0+0

Code: 27,58,0,0,0 DEC 1B,3A,00,00,00 HEX

Input Format: LPRINT CHR$(27)+" : "+CHR$(0)+CHR$(0)+CHR$(0)

Example:

```
10 REM  ROM CG SET COPY
20 LPRINT CHR$(27)+"$"+CHR$(0)+CHR$(33)+CHR$(33);
30 REM  STORE IN PLACE OF "!" - ASCII 033
40 LPRINT CHR$(42);
50 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
60 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
70 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
80 REM  SELECT DOWNLOAD CG
90 LPRINT CHR$(27)+"%"+CHR$(1)+CHR$(0);
100 LPRINT "DOWNLOAD CG            !!!"
110 REM  ROM CG SET COPY
120 LPRINT CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
130 LPRINT "COPIED DOWNLOAD CG     !!!"
140 LPRINT CHR$(27)+"$"+CHR$(0)+CHR$(33)+CHR$(33);
150 REM  STORE IN PLACE OF "!" - ONCE AGAIN
160 LPRINT CHR$(42);
170 LPRINT CHR$(0)+CHR$(0)+CHR$(2)+CHR$(5);
180 LPRINT CHR$(2)+CHR$(5)+CHR$(250)+CHR$(0);
190 LPRINT CHR$(64)+CHR$(48)+CHR$(0);
200 LPRINT "DOWNLOADED TO CHR$(33) !!!"
210 END
```

(Print mode selector="Pgm")

```
                          ♪♪♪
COPIED DOWNLOAD CG        !!!
DOWNLOADED TO CHR$(33)    ♪♪♪
```

Comments:

- All ROM CG font in draft and NLQ modes are copied to the downloadable font area.
- Downloadable font can be copied regardless of the downloadable font capacity.
- Usable capacity of downloadable font does not decrease by using ROM CG set copying.
- Upon receipt of the command, all previous downloaded font will be changed to ROM CG font. The usable capacity of downloadable font returns to the initial state.
- When altering only part of the ROM CG, use this command before font downloading.
- ESC+:+0+0+0 copies ROM CG font to any downloadable character set regardless of ESC+;+n.

DOWNLOAD CHARACTER SET PARTITION:

Partitions the download area for up to 5 distinct downloadable character sets.

Name: ESC+;+n n=0,1,2,3,4

Code: 27,59,n DEC 1B,3B,n HEX

Input Format: LPRINT CHR$(27)+";"+CHR$(n)

Example:

```
10 REM  DOWNLOAD CHARACTER SET PARTITION
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT#1,CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
50 REM  STORE IN PLACE OF "!" - WITH DOWNLOAD AREA 0-4
60 FOR M=0 TO 4
70 PRINT#1,CHR$(27)+";"+CHR$(M);
80 PRINT#1,CHR$(27)+"$"+CHR$(0)+CHR$(33)+CHR$(33);
90 FOR I=1 TO 12
100 READ X
110 PRINT#1,CHR$(X);
120 NEXT I
130 NEXT M
140 PRINT#1,"NORMAL CG                    !!!"
150 PRINT#1,CHR$(10);
160 REM  SELECTS DOWNLOAD CG & DOWNLOAD AREA
170 PRINT#1,CHR$(27)+"%"+CHR$(1)+CHR$(0);
180 FOR M=0 TO 4
190 PRINT#1,CHR$(27)+";"+CHR$(M);
200 PRINT#1,"DOWNLOAD CG ( AREA =";M;")   !!!"
210 PRINT#1,CHR$(10);
220 NEXT M
230 CLOSE
240 END
250 DATA 56,0,0,0,2,5,2,5,250,0,0,0
260 DATA 42,0,0,2,5,2,5,250,0,64,48,0
270 DATA 56,0,0,0,2,5,0,5,250,0,0,0
280 DATA 56,0,0,0,95,160,64,160,64,0,0,0
290 DATA 10,2,5,2,5,250,0,194,5,194,5,250
```

(Print mode selector="Pgm")

```
NORMAL CG                    !!!
DOWNLOAD CG ( AREA = 0 )     ♩♩♩
DOWNLOAD CG ( AREA = 1 )     ♪♪♪
DOWNLOAD CG ( AREA = 2 )     ♩♩♩
DOWNLOAD CG ( AREA = 3 )     ♯♯♯
DOWNLOAD CG ( AREA = 4 )     ♫♫♫
```

Comments:

- This command enables you to create up to 5 distinct downloadable character sets and have them reside in separate portions of the download area. Due to addressing limitations, you may not download in excess of 512 characters in one character set (Draft 256+NLQ 256). The size of any one partition need not be specified in advance.
- This command is operational only when the 32K buffer option is installed and DIP switch 2-2 is set to OFF.
- If downloadable characters are created without first specifying the partition value "n" with the ESC+;+n command, "n" is assumed equal to 0.
- Refer to page 5-73 for downloadable character area sizes.

MISCELLANEOUS

REMOTE RESET:

Initializes the printer causing all data in the buffer to be printed.

Name: ESC+CR+P or ESC+SUB+I

Code: 27,13,80 or 27,26,73 DEC 1B,0D,50 or 1B,1A,49 HEX

Input Format: LPRINT CHR$(27)+CHR$(13)+"P"
or
LPRINT CHR$(27)+CHR$(26) +"I"

Example:

```
10 REM  REMOTE RESET
20 REM  RELEASE FORMATTING, HORIZONTAL/VERTICAL MOVING,
30 REM  PRINT CONDITIONING AND WORD PROCESSING COMMANDS
40 WIDTH "LPT1:",255
50 OPEN "LPT1:" AS #1
60 PRINT#1,CHR$(27)+CHR$(9)+CHR$(10);CHR$(27)+"1";
70 PRINT#1,CHR$(27)+CHR$(9)+CHR$(25);CHR$(27)+"0";"R";
80 PRINT#1,CHR$(27)+"E";CHR$(13);CHR$(10);
90 PRINT#1,CHR$(27)+"W";
100 PRINT#1,"SET";CHR$(9);"HT,RIGHT MARGIN,SHADOW PRINTING";
110 PRINT#1,CHR$(27)+CHR$(13)+"P";CHR$(13);CHR$(10);CHR$(10);
120 PRINT#1,CHR$(9);"'REMOTE RESET' INITIALIZES THE PRINTER"
130 CLOSE
140 END
```

```
                                R
SET       HT,RIGHT MARGIN,
SHADOW PRINTING

'REMOTE RESET' INITIALIZES THE PRINTER
```

Comment:

- ESC+CR+P causes the printer to be initialized after all data in buffer are processed.
- ESC+SUB+I and ESC+CR+P command are the same function.

SPECIAL CHARACTER 1:

Prints special character 1 rather than the standard unprintable character with ASCII code 127 DEC (7F HEX).

Name: ESC+Z

Code: 27,90 DEC 1B,5A HEX

Input Format: LPRINT CHR$(27)+"Z"

Example: (See ESC+Y below)

SPECIAL CHARACTER 2:

Prints special character 2 rather than the standard character with ASCII code 32 DEC (20 HEX).

Name: ESC+Y

Code: 27,89 DEC 1B,59 HEX

Input Format: LPRINT CHR$(27)+"Y"

Example:

```
10 REM  SPECIAL CHARACTER 1 AND 2
20 FOR I=1 TO 5
30 LPRINT "ESC+Z(ASCII CODE:127) = ";
40 LPRINT CHR$(27)+"Z";
50 LPRINT "      ";
60 LPRINT "ESC+Y(ASCII CODE:32) = ";
70 LPRINT CHR$(27)+"Y"
80 NEXT I
90 END
```

```
ESC+Z(ASCII CODE:127) = ¬      ESC+Y(ASCII CODE:32) = £
ESC+Z(ASCII CODE:127) = ¬      ESC+Y(ASCII CODE:32) = £
ESC+Z(ASCII CODE:127) = ¬      ESC+Y(ASCII CODE:32) = £
ESC+Z(ASCII CODE:127) = ¬      ESC+Y(ASCII CODE:32) = £
ESC+Z(ASCII CODE:127) = ¬      ESC+Y(ASCII CODE:32) = £
```

ESCAPE CODE:

First byte of each multi-byte printer control code.

Name: ESC

Code: 27 DEC 1B HEX

Input Format: LPRINT CHR$(27)

Comment:

- ESC cannot be generated by the ESC key on certain computers.

BELL:

Sounds buzzer for approximately 0.2 second.

Name: BEL

Code: 7 DEC 07 HEX

Input Format: LPRINT CHR$(7)

Example:

```
10 REM SOUND BUZZER 10 TIMES
20 FOR I=1 TO 10
30 LPRINT CHR$(7);
40 NEXT I
50 END
```

Comment:

- If DIP switch 2-5 is set to OFF, the buzzer will not sound.

INCREMENTAL (VIEW) PRINTING:

Prints each character after it is entered, feeding the paper to show the printed character beyond the scale plate.

Name:
Setting: ESC+i+n n=1,49,129,177
Release: ESC+i+m m=0,48,128,176

Code:
Setting: 27,105,n DEC 1B,69,n HEX
Release: 27,105,n DEC 1B,69,m HEX

Input Format:
Setting: LPRINT CHR$(27)+"i"+CHR$(n)
Release: LPRINT CHR$(27)+"i"+CHR$(m)

Example:

```
10 REM INCREMENTAL (VIEW) PRINTING
20 LPRINT "STANDARD PRINTING EFFECT"
30 LPRINT CHR$(27)+"i"+CHR$(1);
40 LET A$="INCREMENTAL"
50 FOR I=1 TO 11
60 LET B$=MID$(A$,I,1)
70 LPRINT B$;:FOR J=1 TO 5000:NEXT J
80 NEXT I
90 LPRINT CHR$(27)+"i"+CHR$(0);
100 LPRINT CHR$(13);CHR$(10);
110 LPRINT "STANDARD PRINTING IN EFFECT ONCE AGAIN"
120 END
```

```
STANDARD PRINTING EFFECT
INCREMENTAL

STANDARD PRINTING IN EFFECT ONCE AGAIN
```

Comment:

- Printing is performed unidirectionally.

6.2 Mixing Print Modes

This printer provides a variety of print modes. Table 6.4 illustrates printing modes which may be mixed through the proper control codes. Table 6.5 illustrates which print modes set by the selector switch may be mixed with print mode control codes.

Y=Yes N=No	Pica	Elite	Proportional Spacing	Mikron	Compressed	NLQ Font	Double Width Printing	Bold Printing	Shadow Printing	Underline	Superscript	Subscript
Pica	—	*1	*1	*1	*1	Y	Y	Y	Y	Y	Y	Y
Elite	*1	—	*1	*1	*1	Y	Y	Y	Y	Y	Y	Y
Proportional Spacing	*1	*1	—	*1	*1	Y	Y	Y	Y	Y	Y	Y
Mikron	*1	*1	*1	—	*1	Y	Y	*2	Y	Y	Y	Y
Compressed	*1	*1	*1	*1	—	Y	Y	*2	Y	Y	Y	Y
NLQ Font	Y	Y	Y	Y	Y	—	Y	Y	Y	Y	Y	Y
Double Width Printing	Y	Y	Y	Y	Y	Y	—	Y	Y	Y	Y	Y
Bold Printing	Y	Y	Y	*2	*2	Y	Y	—	Y	Y	Y	Y
Shadow Printing	Y	Y	Y	Y	Y	Y	Y	Y	—	Y	Y	Y
Underline	Y	Y	Y	Y	Y	Y	Y	Y	Y	—	Y	Y
Superscript	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	—	N
Subscript	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	—

Table 6.4 Mixing Print Modes—Control Codes Only

*1. Although different character pitches cannot be set simultaneously, they may be mixed on a single line.
*2. Bold mode is ineffective.

Note: All character modes can be mixed on a single line.

CONTROL CODE

SELECTOR (Y=Yes N=No)	Pica	Elite	Proportional Spacing	Mikron	Compressed	NLQ Font	Double Width	Bold Printing	Shadow Printing	Underline	Superscript	Subscript
10 DRAFT (Pgm)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
12 DRAFT	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
15 DRAFT	N	N	N	N	N	N	Y	*1	Y	Y	Y	Y
17 DRAFT	N	N	N	N	N	N	Y	*1	Y	Y	Y	Y
PS DRAFT	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
10 Courier	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y
12 Courier	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y
15 Courier	N	N	N	N	N	—	Y	*1	Y	Y	Y	Y
17 Courier	N	N	N	N	N	—	Y	*1	Y	Y	Y	Y
PS Courier	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y
10 Bold PS	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y
12 Bold PS	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y
15 Bold PS	N	N	N	N	N	—	Y	*1	Y	Y	Y	Y
17 Bold PS	N	N	N	N	N	—	Y	*1	Y	Y	Y	Y
PS Bold PS	N	N	N	N	N	—	Y	Y	Y	Y	Y	Y

Table 6.5 Mixing Print Mode—Selector Switch and Control Codes

*1. In 15 or 17 pitch mode, bold printing is ineffective.

6.3 DIP Switches and Control Codes

As explained in Section 3.3, DIP switch settings are read into printer memory when this printer is powered up. Certain printer functions set by these DIP switches can also be set by issuing the appropriate control commands. Table 6.6 illustrates those DIP switch functions which can also be set through software. THE CONTROL COMMAND WILL ALWAYS OVERRIDE THE CORRESPONDING DIP SWITCH SETTING(S).

SWITCH NUMBER	FUNCTION	SETTING	
		DIP SWITCH	SOFTWARE
SW1-4	Auto Line Feed •CR+CF •CR	 ON OFF	 ESC+" ESC+#
SW1-6 SW1-7 SW1-8	Selection of International Char. Set •USA •France •Germany •England •Denmark I •Sweden •Italy •Spain	SW1-6 SW1-7 SW1-8 ON ON ON OFF ON ON ON OFF ON OFF OFF ON ON ON OFF OFF ON OFF ON OFF OFF OFF OFF OFF	 ESC+r+0 ESC+r+1 ESC+r+2 ESC+r+3 ESC+r+4 ESC+r+5 ESC+r+6 ESC+r+7

Table 6.6 Software Control of DIP Switch Functions

Note:

- Japan (ESC+r+8), Norway (ESC+r+9), and Denmark II (ESC+r+10) international character sets are software-selectable only.
- The Auto Line Feed (DIP SW 1-4) setting enables the printer to issue a line feed after a carriage return. By inserting LPRINT CHR$(10) in the appropriate portions of a program, you can also issue a line feed after a carriage return. Refer to the LF designation, page 6-23.

PARALLEL INTERFACING

7.1 Parallel Interfacing

Communication with a computer is accomplished through a parallel interface based on the Centronics standard.

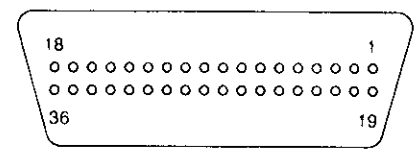
Specifications:

- data transfer speed: 1000 cps minimum
- synchronization: external STROBE pulse
- logic levels: TTL
- handshaking: BUSY and $\overline{\text{ACK}}$ signals
- connector type: 57-30360 (AMPHENOL) or equivalent
- cable: use a shielded cable 3 meters or less in length.

When the printer is processing data, the BUSY signal is high. The printer will not accept new data from the computer. After the processing is completed, the BUSY signal goes low. (The BUSY signal is also high when the printer is OFF LINE). When this occurs, the $\overline{\text{ACK}}$ signal goes low indicating to the computer that the data has been processed and the printer is ready to accept more data. This handshaking routine occurs each time a character is sent to the printer.

	BUSY	SLCT	PO	$\overline{\text{ERROR}}$
ON LINE	LOW	HIGH	LOW	HIGH
OFF LINE	HIGH	LOW	LOW	LOW
PAPER OUT	HIGH	LOW	HIGH	LOW

Table 7.1 Printer Status Signals



Note: This is not a 57-30360 connector.

Figure 7.1 Parallel Interface Connector (Printer side)

Signal pin	Return side pin	Signal	Direction
1	19	$\overline{\text{STB}}$	Input
2	20	DATA 1	Input
3	21	DATA 2	
4	22	DATA 3	
5	23	DATA 4	
6	24	DATA 5	
7	25	DATA 6	
8	26	DATA 7	
9	27	DATA 8	
10	28	$\overline{\text{ACK}}$	Output
11	29	BUSY	Output
12		PO	Output
13		SLCT	Output
14		$\overline{\text{AUTO FEED XT}}$	Input
15			
16		SG	
17		FG	
18		+5 V	Output
31	30	$\overline{\text{PRIME}}$	Input
32		$\overline{\text{ERROR}}$	Output
33		SG	
34			
35			
36			

Figure 7.2 Pin Configuration

7.2 Connector pin signals

Notes:

1. "INPUT" refers to a signal coming into the printer. "OUTPUT" denotes a signal exiting the printer.
2. "RETURN" denotes the return side wire of a twisted pair cable and is connected to signal ground.
3. All interface signals are at TTL levels.

$\overline{\text{STB}}$... STROBE

- This is a synchronizing input signal to read data into the printer.
- This signal is normally high. Data is read in when it goes low.
- The pulse must be low for at least 1 microsecond.

DATA 1–DATA 8

- These are the input signals which carry the 8 data bits of information.
- The signal is read in synchronization with the STROBE pulse. A high level indicates a logical "1".
- The signal must be present 0.5 microsecond before and after the STROBE pulse.

$\overline{\text{ACK}}$... ACKNOWLEDGE

- This is an output signal to the computer indicating that the printer is ready to receive the next block of data. It is sent out when the BUSY signal drops from high to low. Therefore, it can be thought of as a data request pulse.
- The signal is normally high. When the condition becomes true, the signal goes low.
- The $\overline{\text{ACK}}$ signal is automatically sent whenever the printer is switched ON LINE.

BUSY

- This output signal indicates the status of the printer. The signal is high when the printer is busy and cannot receive data.
- The signal is high under the following conditions:
  1. receive buffer full
  2. printer is processing data
  3. printer is OFF LINE
  4. printer is in an error condition

PO... PAPER OUT

- This output signal indicates that paper out detector detects the absence of paper.
- The signal is normally low and goes high during a "Paper Out" condition.

SLCT... SELECT

- SELECT is an output signal which indicates the ON LINE or OFF LINE state of the printer. The signal is high in the ON LINE state and low when OFF LINE.
- The printer enters the ON LINE state:
  1. when the printer is turned on
  2. when $\overline{\text{PRIME}}$ is received
  3. when the RESET command is received
  4. when the ON LINE switch is pressed

- The printer enters the OFF LINE state:
  1. when the printer is out of paper
  2. when the printer is switched OFF LINE

AUTO FEED XT ($\overline{\text{AFXT}}$)

- This input signal determines if a line feed (LF) command will be added to each carriage return (CR).
- When $\overline{\text{AFXT}}$ is low, CR+LF action occurs. When $\overline{\text{AFXT}}$ is high, only a carriage return is performed.

- DIP SW1-4 can alter the response by the printer to an $\overline{\text{AFXT}}$ signal. If SW1-4 is ON, the printer will perform a CR+LF regardless of the level of the incoming signal. When SW1-4 is OFF, this automatic action is disabled.

SG... SIGNAL GROUND

- The twisted pair return wires (pins 19–30) are connected to signal ground.

FG... FRAME GROUND

- Frame ground is the same as chassis ground.

+5 V

This is for evaluation only. It should not be used to supply power for external equipment.

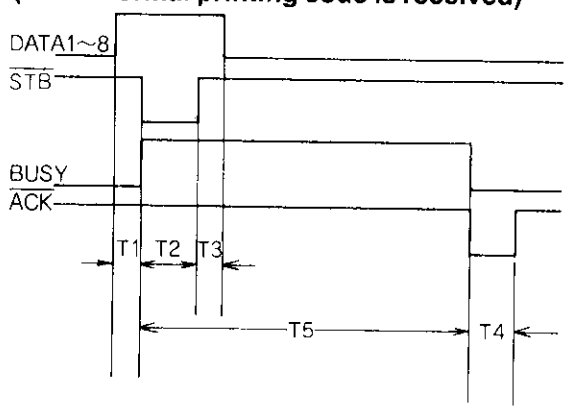
$\overline{\text{PRIME}}$

This input signal is used to initialize the printer. The signal is normally high and goes low to reset the printer. It can be received anytime during printer operation.

$\overline{\text{ERROR}}$

This output signal is an "error" or "fault" condition. Normally high, this signal goes low when an error occurs. An error condition can be caused by:
1. a "Paper Out" condition.
2. the printer is OFF LINE
3. an overload condition exists

Timing Chart
(When normal printing code is received)



T1... 0.5μs (Min)
T2... 1μs (Min)
T3... 0.5μs (Min)
T4... 5μs (Max)
T5... 1ms or less when not buffer full
1s or less when buffer full

Figure 7.3 Timing Diagram

SERIAL INTERFACING

8.1 Serial Interfacing

Data input:
7 bit or 8 bit serial; 1 start bit, data bits (7 or 8), parity bit and stop bit.

Data input codes:
Characters; ASCII
Graphics; 8 bit

Transmission speed:
75, 110, 134.5, 300, 1200, 2400, 4800 or 9600 baud

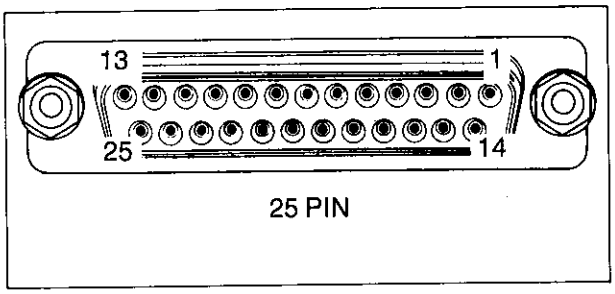


Figure 8.1 RS-232C Connector Pin Assignment

Signal Pin	Signal	Direction
1	FG	
2	TXD	OUTPUT
3	RXD	INPUT
7	SG	
20	DTR	OUTPUT

Cable:
Use a shielded cable 3 meters or less in length.

8.2 Signal Descriptions

FG...Frame Ground

- Frame ground is the same as chassis ground.

TXD...Transmit Data

- Outputs serial data to the computer. SPACE indicates "0" data; MARK indicates "1" data.

RXD...Receive Data

- Inputs serial data from the computer. SPACE indicates "0" data; MARK indicates "1" data.

SG...Signal Ground

- Connected to signal ground of printers circuit baud.

DTR...Data Terminal Ready

- This signal indicates that the printer is busy.
- When this signal is in the SPACE condition (+ side, EIA level), the printer is ready for data reception when DIP SW 3-8 is set to OFF.

8.3 Designation of Signal Polarity for Reverse Channel (or DTR)

This signal is sent to inform the computer that data reception is not possible at the present time, even though the printer might be on-line. Printer and computer polarities can be matched by setting DIP switch 3-8. Refer to page 3-4.

ON: This signal in "SPACE" informs the computer that the printer cannot receive transmitted data.

OFF: This signal in "MARK" informs the computer that the printer cannot receive transmitted data.

DIP switch 3-8 is set OFF prior to shipping from the factory.
MARK logic "1" (−27 V to −3 V)
SPACE logic "0" (3 V to 27 V)

Protocol

This printer supports two types of protocol: XON/XOFF and DTR. DTR protocol uses a DTR signal to indicate the condition of the printer, while XON/XOFF protocol uses an ASCII code corresponding to XON/XOFF.

DTR Protocol

When the input buffer is reduced to less than 16 bytes, the printer indicates that data reception is no longer possible by setting the DTR to the "MARK" condition. In this condition, the computer is forced to stop transmitting data. Should the computer continue transmitting, all excessive data will be ignored by the printer. The DTR is also set to "MARK" when the printer is off-line. When the input buffer is restored to a level of 288 bytes (when DIP switch 3-7 is OFF) or more, the DTR changes to the "SPACE" condition.

XON/XOFF Protocol

When the input buffer is reduced to less than 16 bytes, the printer outputs the XOFF character. When this character is output, the computer is forced to stop transmitting data. Should the computer continue transmitting, all excessive data will be ignored by the printer. The XOFF character is also output when the printer is off-line. The XON character is output when the input buffer is restored to a level of 288 bytes (when DIP switch 3-7 is OFF) or more, when the power is turned on, or when the printer goes from the off-line to the on-line condition.

XON=11 HEX (17 DEC)
XOFF=13 HEX (19 DEC)

MAINTENANCE

The printer does not require any routine maintenance. However, reasonable care of the printer will extend its life. The following preventive and periodic measures are recommended:

9.1 Preventive Maintenance

- Keep all liquids away from the printer. Accidental spillage of a liquid into the printer can cause severe damage.
- Do not block the air flow around the printer. Do not place books, paper, or other items on top of the printer.
- Special care should be taken to protect the printer if it is used in an unfriendly environment such as a machine shop, a dusty or sandy area, etc.
- When transporting the printer, be sure the carriage stopper is in place. This will help prevent damage to the print head.
- The life of the print head can be extended by observing a few simple precautions.
- Do not operate the printer without paper and a ribbon cassette installed.
- Avoid continuous use of the same pins (underline, semi-graphics, etc.) without allowing the print head time to cool.
- Do not obstruct the movement of the print head while in operation.
- If the printer is not going to be used for an extended period, unplug the power cord.

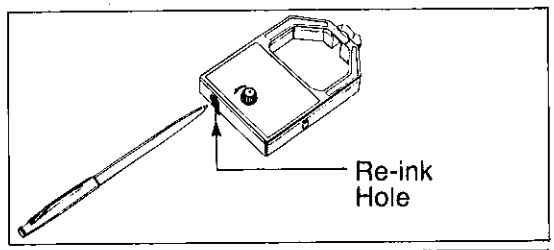
9.2 Periodic Maintenance

Cleaning the unit is the most important action the user can perform. The frequency of cleaning is dependent upon the environment.

- Turn the power OFF.
- Clean the case and covers with a soft cloth. Use any mild commercial cleaner.
- Remove the top and the smoked plastic covers. Vacuum or dust the inside area of the unit. Be very careful not to damage the flex ribbon cable and the carriage drive belt.
- The platen should be cleaned with denatured alcohol only.
- The carriage guide bar can be lubricated with a very light oil.
- If the printer should need servicing return the unit to an authorized Panasonic service center. Do not attempt to repair the unit. There are no user-repairable assemblies in the printer.

Ribbon Cassette

A single ribbon permits the printing of about 3 million characters. When the printing starts to fade, gently push the counter spring in the ribbon cassette hole with the tip of a ballpoint pen or other object. Once the ribbon cassette is mounted onto the carriage and printing is performed for a short time, the characters become thicker.



Note:
Do not re-ink the ribbon before printing starts to fade. If the ribbon has too much ink the characters may smear when printed.

- Wear and tear of the print head pins may cause serious damage of the ribbon and printing to fade. In such case the printer needs servicing.

9.3 Troubleshooting

Most problems associated with the printer can be traced to improper setup, installation, or cabling. Table 9.1 will assist the user in identifying and correcting some of the more common problems. If you need additional help, contact the store from which the unit was purchased.

SYMPTOM	POSSIBLE CAUSE	PROBABLE SOLUTION
Printer Dead	No AC power Fuse blown	Check Power Cord Replace fuse
Power on but printer not printing	Printer not ON LINE	Press ON LINE switch
Printer won't go ON LINE	Out of Paper; front cover open	Replace paper; close cover
Paper out sensor inoperative	Selector switch in "F"; SW2-3 ON	Normal condition; Set SW2-3 OFF
Paper slips around platen	Paper feed selector in "T" position	Set selector "F"
Head moves but does not print	Ribbon not installed correctly	Re-insert ribbon
Paper bunches up around platen paper wrinkles when using tractor feed	No reverse tension on paper. Selector switch is in "F" position.	Set paper supply lower than printer. Set selector to "T"
Cannot change form length	Cut sheet feeder switch SW2-6 is ON	Set SW2-6 OFF
Printout double-spaced	Auto line feed switch ON	Set DIP switch SW1-4 as required
Cannot print ASCII characters with code above 127	7 bit/8 bit switch set incorrectly	Set DIP switch SW2-7 as required
Wrong character set printed	Wrong character set selected	Set DIP switch SW1-1, SW1-2, SW1-3 required
Cannot change print mode from computer	Print mode switch set incorrectly	Normal condition Refer to Section 3.1

Table 9.1 Troubleshooting

APPENDIX A

Standard Mode Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p			SP	*0*	*@*	*P*	'	*p*
1		DC1	!	1	A	Q	a	q		DC1	*!*	*1*	*A*	*Q*	*a*	*q*
2		DC2	"	2	B	R	b	r		DC2	*"*	*2*	*B*	*R*	*b*	*r*
3		DC3	#	3	C	S	c	s		DC3	*#*	*3*	*C*	*S*	*c*	*s*
4		DC4	$	4	D	T	d	t		DC4	*$*	*4*	*D*	*T*	*d*	*t*
5			%	5	E	U	e	u			*%*	*5*	*E*	*U*	*e*	*u*
6			&	6	F	V	f	v			*&*	*6*	*F*	*V*	*f*	*v*
7	BEL		'	7	G	W	g	w	BEL		*'*	*7*	*G*	*W*	*g*	*w*
8	BS	CAN	(	8	H	X	h	x	BS	CAN	*(*	*8*	*H*	*X*	*h*	*x*
9	HT		)	9	I	Y	i	y	HT		*)*	*9*	*I*	*Y*	*i*	*y*
A	LF		*	:	J	Z	j	z	LF		*	*:*	*J*	*Z*	*j*	*z*
B	VT	ESC	+	;	K	[	k	{	VT	ESC	+	*;*	*K*	*[*	*k*	*{*
C	FF		,	<	L	\	l	|	FF		,	<	*L*	\	*l*	*|*
D	CR		-	=	M	]	m	}	CR		-	=	*M*	*]*	*m*	*}*
E	SO		.	>	N	^	n	~	SO		.	>	*N*	^	*n*	~
F	SI		/	?	O	_	o	DEL	SI		*/*	*?*	*O*	_	*o*	DEL

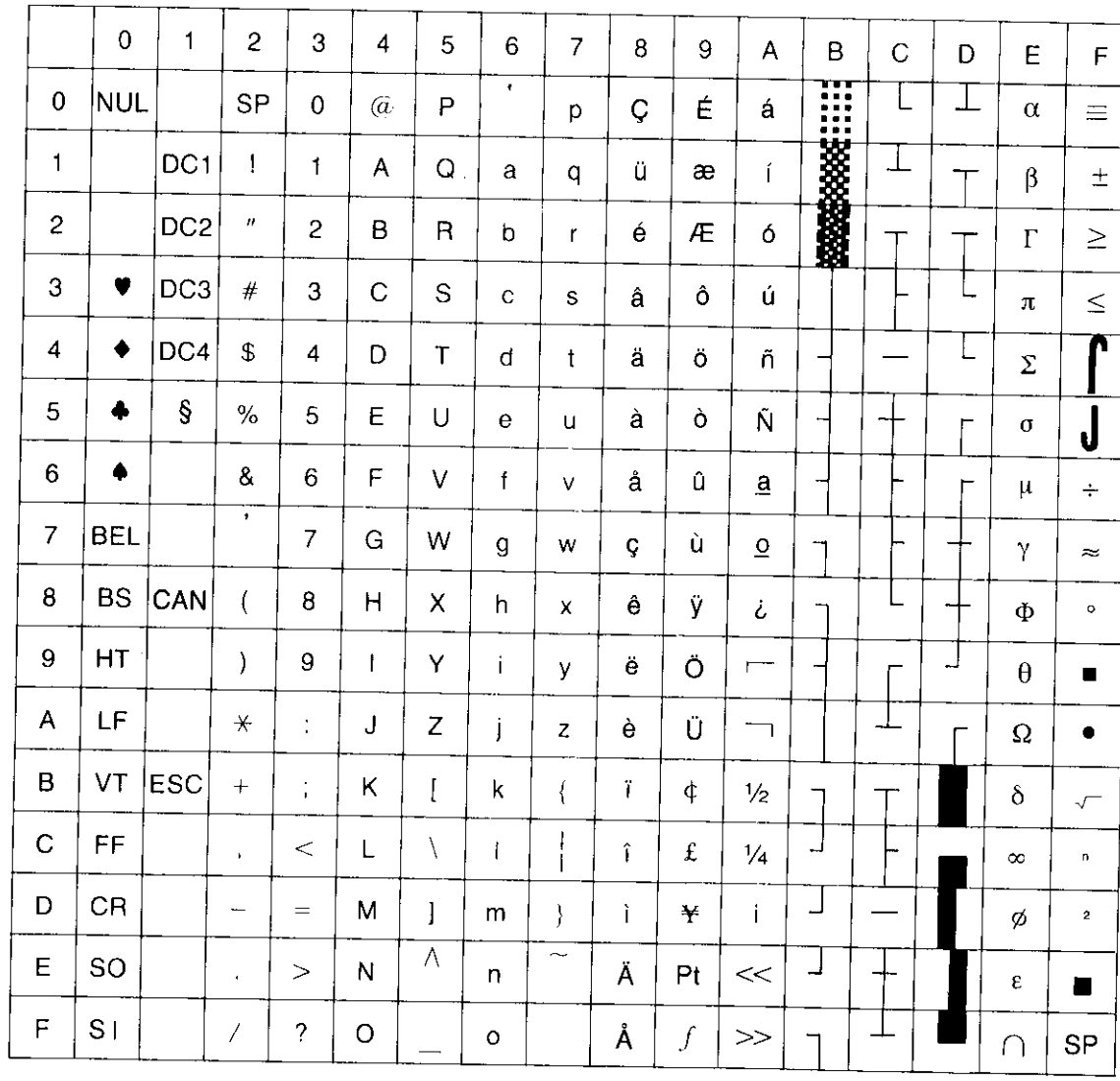
IBM Matrix Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p								
1		DC1	!	1	A	Q	a	q		DC1						
2		DC2	"	2	B	R	b	r		DC2						
3		DC3	#	3	C	S	c	s		DC3						
4		DC4	$	4	D	T	d	t		DC4						
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7	BEL		'	7	G	W	g	w	BEL							
8	BS	CAN	(	8	H	X	h	x	BS	CAN						
9	HT		)	9	I	Y	i	y	HT							
A	LF		*	:	J	Z	j	z	LF							
B	VT	ESC	+	;	K	[	k	{	VT	ESC						
C	FF		,	<	L	\	l	|	FF						
D	CR		-	=	M	]	m	}	CR							
E	SO		.	>	N	^	n	~	SO							
F	SI		/	?	O	_	o	DEL	SI							

IBM Graphics Set G1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	‘	p			á	▒	└	┴	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	▒	┴	┬	β	±
2		DC2	"	2	B	R	b	r		DC2	ó	▒	┬	┬	Γ	≥
3		DC3	#	3	C	S	c	s		DC3	ú		├	└	π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ	┐	─	└	Σ	⌠
5			%	5	E	U	e	u			Ñ	┐	┼	┌	σ	⌡
6			&	6	F	V	f	v			a	┐	├	┌	μ	÷
7	BEL		'	7	G	W	g	w	BEL		o	┐	├	┼	γ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	┐	└	┼	Φ	°
9	HT		)	9	I	Y	i	y	HT		⌐	┐	┌		θ	■
A	LF		*	:	J	Z	j	z	LF		¬	┐	┴	┌	Ω	•
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	┐	┬	▌	δ	√
C	FF		,	<	L	\	l	¦	FF		¼	┘	├	▌	∞	ⁿ
D	CR		-	=	M	]	m	}	CR		¡	┘	─	▌	ø	²
E	SO		.	>	N	^	n	~	SO		<<	┘	┼	▌	ε	■
F	SI		/	?	O	_	o		SI		>>	┐	┴	▌	∩	SP

IBM Graphics Set G2



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p	Ç	É	á	▒	└	┴	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	┴	┬	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▒	┬	┬	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ú	▒	├	└	π	≤
4	♦	DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	└	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	┤	┼	┌	σ	⌡
6	♠		&	6	F	V	f	v	å	û	ª	┤	├	┌	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	┐	├	┼	γ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	┐	└	┼	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	┤	┌	┘	θ	■
A	LF		*	:	J	Z	j	z	è	Ü	¬	┘	┴	┌	Ω	•
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	┐	┬	▉	δ	√
C	FF		,	<	L	\	l	¦	î	£	¼	┘	├	▉	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	¥	¡	┘	─	▉	∅	²
E	SO		.	>	N	^	n	~	Ä	Pt	<<	┘	┼	▉	ε	■
F	SI		/	?	O	_	o		Å	ƒ	>>	┐	┴	▉	∩	SP

Daisy Printer Mode Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p			SP	0	@	P	`	p
1		DC1	!	1	A	Q	a	q		DC1	!	1	A	Q	a	q
2			"	2	B	R	b	r			"	2	B	R	b	r
3			#	3	C	S	c	s			#	3	C	S	c	s
4		DC4	$	4	D	T	d	t		DC4	$	4	D	T	d	t
5			%	5	E	U	e	u			%	5	E	U	e	u
6			&	6	F	V	f	v			&	6	F	V	f	v
7	BEL		'	7	G	W	g	w	BEL		'	7	G	W	g	w
8	BS		(	8	H	X	h	x	BS		(	8	H	X	h	x
9	HT		)	9	I	Y	i	y	HT		)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{	VT	ESC	+	;	K	[	k	{
C	FF		,	<	L	\	l	|	FF		,	<	L	\	l	|
D	CR		-	=	M	]	m	}	CR		-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~	SO	RS	.	>	N	^	n	~
F		US	/	?	O	_	o	DEL		US	/	?	O	_	o	

International Character Set

	n	35D 23H	36D 24H	64D 40H	91D 5BH	92D 5CH	93D 5DH	94D 5EH	96D 60H	123D 7BH	124D 7CH	125D 7DH	126D 7EH
USA	0	#	$	@	[	\	]	^	`	{	|	}	~
FRANCE	1	#	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	2	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ENGLAND	3	£	$	@	[	\	]	^	`	{	|	}	~
DENMARK I	4	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	6	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	7	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
*JAPAN	8	#	$	@	[	¥	]	^	`	{	|	}	~
*NORWAY	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
*DENMARK II	10	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

*Accessible only through software

*Italic International Character Set

LOCATION		CHAR.	LOCATION		CHAR.	LOCATION		CHAR.	LOCATION		CHAR.
DEC	HEX		DEC	HEX		DEC	HEX		DEC	HEX	
128	80	*à*	137	89	*Ñ*	146	92	*Æ*	155	9B	*ö*
129	81	*è*	138	8A	*ñ*	147	93	*æ*	156	9C	*ü*
130	82	*ù*	139	8B	*¤*	148	94	*Ø*	157	9D	*É*
131	83	*ò*	140	8C	*Pt*	149	95	*ø*	158	9E	*é*
132	84	*ì*	141	8D	*Å*	150	96	*¨*	159	9F	*¥*
133	85	*°*	142	8E	*å*	151	97	*Ä*	255	FF	*Ø*
134	86	*£*	143	8F	*ç*	152	98	*Ö*			
135	87	*¡*	144	90	*§*	153	99	*Ü*			
136	88	*¿*	145	91	*ß*	154	9A	*ä*			

*Accessible only in Standard Mode

APPENDIX B

Proportional Spacing Tables

ASCII Characters

Normal Characters

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

Italic Characters

ASCII code	Char.	Width	ASCII code	Char.	Width
128	*à*	11	192	*@*	12
129	*è*	11	193	*A*	12
130	*ù*	11	194	*B*	12
131	*ò*	11	195	*C*	12
132	*ì*	8	196	*D*	12
133	*°*	8	197	*E*	12
134	*£*	12	198	*F*	12
135	*¡*	10	199	*G*	12
136	*¿*	11	200	*H*	12
137	*Ñ*	12	201	*I*	10
138	*ñ*	12	202	*J*	12
139	*¤*	12	203	*K*	12
140	*Pt*	12	204	*L*	10
141	*Å*	12	205	*M*	12
142	*å*	11	206	*N*	12
143	*ç*	11	207	*O*	12
144	*§*	12	208	*P*	12
145	*ß*	11	209	*Q*	12
146	*Æ*	12	210	*R*	12
147	*æ*	12	211	*S*	12
148	*Ø*	12	212	*T*	12
149	*ø*	11	213	*U*	12
150	*¨*	9	214	*V*	12
151	*Ä*	12	215	*W*	12
152	*Ö*	12	216	*X*	12
153	*Ü*	12	217	*Y*	12
154	*ä*	11	218	*Z*	12
155	*ö*	11	219	*[*	11
156	*ü*	12	220	**	7
157	*É*	12	221	*]*	11
158	*é*	11	222	*^*	10
159	*¥*	12	223	*_*	12
160	*SPACE*	12	224	*'*	5
161	*!*	10	225	*a*	11
162	*"*	10	226	*b*	11
163	*#*	12	227	*c*	11
164	*$*	11	228	*d*	12
165	*%*	12	229	*e*	11
166	*&*	12	230	*f*	12
167	*'*	6	231	*g*	11
168	*(*	8	232	*h*	11
169	*)*	8	233	*i*	9
170	***	12	234	*j*	10
171	*+*	12	235	*k*	11
172	*,*	7	236	*l*	9
173	*–*	12	237	*m*	11
174	*.*	7	238	*n*	10
175	*/*	10	239	*o*	11
176	*0*	12	240	*p*	11
177	*1*	12	241	*q*	11
178	*2*	12	242	*r*	10
179	*3*	12	243	*s*	11
180	*4*	12	244	*t*	10
181	*5*	12	245	*u*	11
182	*6*	12	246	*v*	10
183	*7*	12	247	*w*	13
184	*8*	12	248	*x*	12
185	*9*	12	249	*y*	12
186	*:*	7	250	*z*	12
187	*;*	7	251	*{*	10
188	*<*	10	252	*|*	9
189	*=*	11	253	*}*	10
190	*>*	9	254	*~*	12
191	*?*	11	255	*Ø*	12

Unit: 1/120 inch (0.21 mm)

IBM Graphic Characters

Normal Characters

ASCII code	Char.	Width
3	♥	12
4	♦	12
5	♣	12
6	♠	12
21	§	10
128	Ç	12
129	ü	11
130	é	12
131	â	12
132	ä	12
133	à	12
134	å	12
135	ç	11
136	ê	12
137	ë	12
138	è	12
139	ï	8
140	î	8
141	ì	8
142	Ä	12
143	Å	12
144	É	12
145	æ	12
146	Æ	12
147	ô	10
148	ö	10
149	ò	10
150	û	11
151	ù	11
152	ÿ	11
153	Ö	12
154	Ü	12
155	¢	11
156	£	12
157	¥	12
158	Pt	12
159	*f*	12
160	á	12
161	í	8
162	ó	10
163	ú	11
164	ñ	11
165	Ñ	12
166	a	12
167	o	12
168	¿	12
169	⌐	12
170	¬	12
171	½	12
172	¼	12
173	¡	5
174	<<	12
175	>>	12
224	α	12
225	β	12
226	Γ	12
227	π	12
228	Σ	12
229	σ	12
230	μ	12
231	γ	12
232	Φ	12
233	θ	12
234	Ω	12

ASCII code	Char.	Width
235	δ	12
236	∞	12
237	φ	12
238	ε	12
239	∩	12
240	≡	12
241	±	12
242	≥	12
243	≤	12
246	÷	12
247	≈	12
248	°	8
249	∙	12
250	·	12
251	√	12
252	n	8
253	2	8
254	■	12
255	SP	12

Italic Characters

ASCII code	Char.	Width
3	♥	12
4	♦	12
5	♣	12
6	♠	12
21	§	12
128	Ç	12
129	ü	12
130	é	11
131	â	11
132	ä	11
133	à	11
134	å	11
135	ç	11
136	ê	11
137	ë	11
138	è	11
139	ï	8
140	î	10
141	ì	8
142	Ä	12
143	Å	12
144	É	12
145	æ	12
146	Æ	12
147	ô	11
148	ö	11
149	ò	11
150	û	11
151	ù	11
152	ÿ	11
153	Ö	12
154	Ü	12
155	¢	11
156	£	12
157	¥	12
158	Pt	12
159	*f*	12
160	á	11
161	í	8
162	ó	11
163	ú	11
164	ñ	12
165	Ñ	12
166	a	12
167	o	12
168	¿	11
169	⌐	12
170	¬	12
171	½	12
172	¼	12
173	¡	10
174	<<	12
175	>>	12
224	α	12
225	β	12
226	Γ	12
227	π	12
228	Σ	12
229	σ	12
230	μ	12
231	γ	12
232	Φ	12
233	θ	12
234	Ω	12

ASCII code	Char.	Width
235	δ	12
236	∞	12
237	φ	12
238	ε	12
239	∩	12
240	≡	12
241	±	12
242	≥	12
243	≤	12
246	÷	12
247	≈	12
248	°	8
249	∙	12
250	·	12
251	√	12
252	n	8
253	2	8
254	■	12
255	SP	12

Unit: 1/120 inch (0.21 mm)

APPENDIX C

DIP Switch Settings

SWITCH NUMBER	FUNCTION	ON	OFF	POSITION WHEN SHIPPED
SW1-1 SW1-2 SW1-3	Printer Mode	See Printer Mode Chart		ON ON ON
SW1-4	Auto Line Feed	CR+LF	CR Only	OFF
SW1-5	Skip Perforation	1 inch (25.4 mm) skip	No skip	OFF
SW1-6 SW1-7 SW1-8	International Character Set	See International Character Set Chart		ON ON ON
SW2-1 SW2-2	Buffer Size	See Buffer Size Chart		ON OFF
SW2-3	Paper Out Detector	Disabled	Enabled	OFF
SW2-4	Zero Font	Ø	0	OFF
SW2-5	Alarm	Enabled	Disabled	ON
SW2-6	Cut Sheet Feeder Option	Installed	Not Installed	OFF
SW2-7	7 bit/8 bit	7 bit	8 bit	OFF
SW2-8	Interface	Serial	Parallel	OFF
SW3-1 SW3-2 SW3-3	Baud rate	See Baud Rate Chart		ON ON OFF
SW3-4	Parity check	Valid	Invalid	OFF
SW3-5	Parity bit	Even	Odd	OFF
SW3-6	Protocol	DTR	XON/XOFF	ON
SW3-7	Buffer full recovery	152	288	OFF
SW3-8	Flag polarity	Reversed	Normal	OFF

SW1-1	SW1-2	SW1-3	PRINTER MODE
ON	ON	ON	**Standard Mode** ASCII = 96 Italic ASCII = 96 International = 32 Italic International = 32
OFF	ON	ON	**IBM-PC Matrix Mode** ASCII = 96 Block Graphics = 64 International Characters = 32
ON	OFF	ON	**IBM-PC Graphics-G1** ASCII = 96 Special Characters = 95
OFF	OFF	ON	**IBM-PC Graphics-G2** ASCII = 96 Special Characters = 132
ON	ON	OFF	**Daisy Printer Mode** ASCII = 96 Italic ASCII = 96 International = 32 Italic International = 32

Printer Mode

SW1-5	SW1-6	SW1-7	INTERNATIONAL CHARACTER SET
ON	ON	ON	USA
OFF	ON	ON	FRANCE
ON	OFF	ON	GERMANY
OFF	OFF	ON	ENGLAND
ON	ON	OFF	DENMARK I
OFF	ON	OFF	SWEDEN
ON	OFF	OFF	ITALY
OFF	OFF	OFF	SPAIN

Int'l Character Sets

SW3-1	SW3-2	SW3-3	BAUD RATE (BPS)
ON	ON	ON	75
OFF	ON	ON	110
ON	OFF	ON	134.5
OFF	OFF	ON	300
ON	ON	OFF	1200
OFF	ON	OFF	2400
ON	OFF	OFF	4800
OFF	OFF	OFF	9600

Baud Rate

		15K BUFFER		47K BUFFER	
SW2-1	SW2-2	BUFFER	DOWNLOAD	BUFFER	DOWNLOAD
ON	ON	15K	0K	47K	0K
OFF	ON	7K	7K	39K	7K
ON	OFF	7K	7K	7K	35K
OFF	OFF	4K	10K	4K	38K

Buffer Size

APPENDIX D

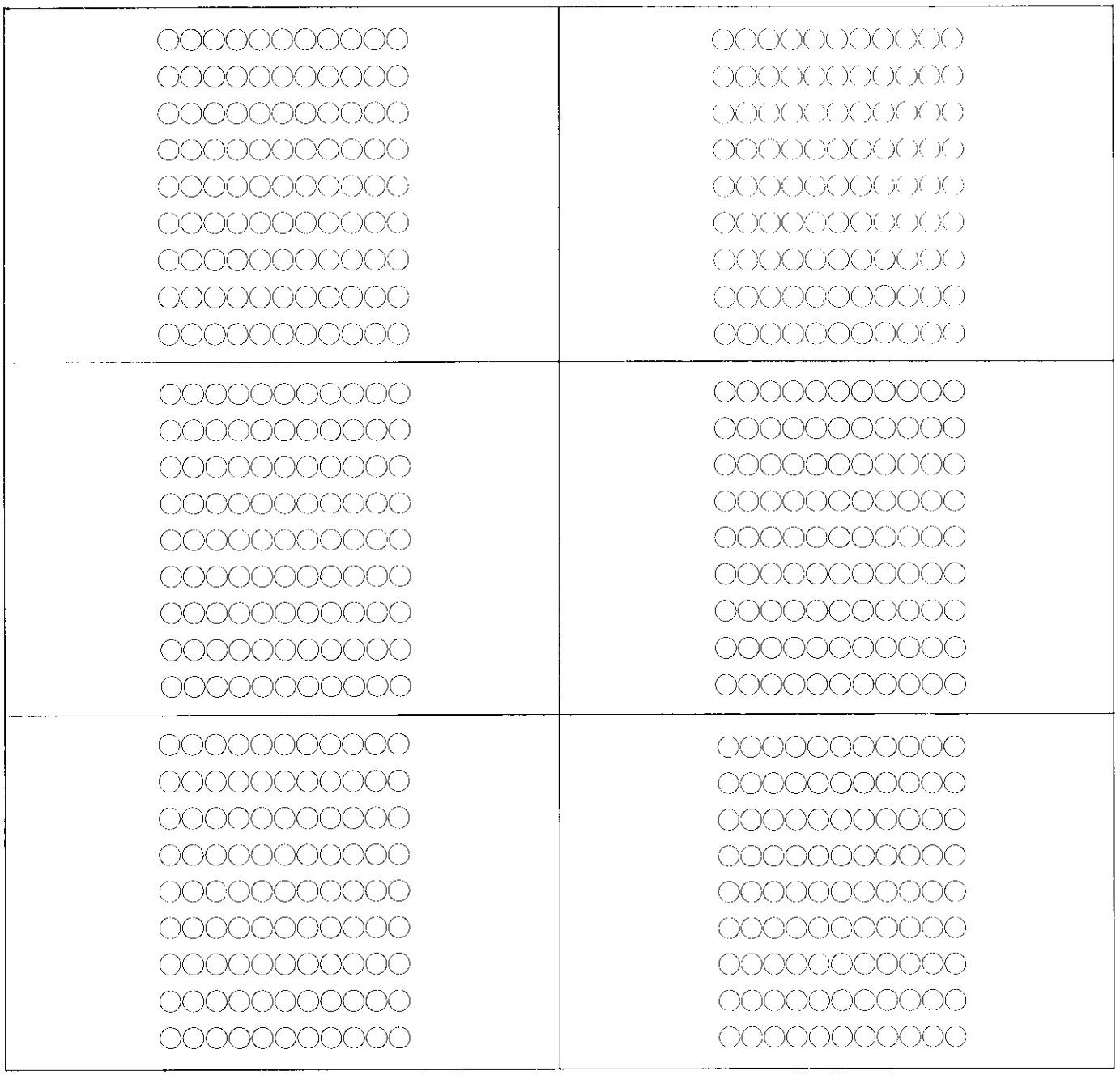
Control Code Table

MNEMONIC	ASCII CONTROL TERM	WHAT TO ENTER	DECIMAL CODE	HEX CODE
NUL	null	CTRL @	0	00
SOH	start of heading	CTRL A	1	01
STX	start of text	CTRL B	2	02
ETX	end of text	CTRL C	3	03
EOT	end of transmission	CTRL D	4	04
ENQ	enquiry	CTRL E	5	05
ACK	acknowledge	CTRL F	6	06
BEL	bell	CTRL G	7	07
BS	backspace	CTRL H	8	08
HT	horizontal tabulation	CTRL I	9	09
LF	line feed	CTRL J	10	0A
VT	vertical tabulation	CTRL K	11	0B
FF	form feed	CTRL L	12	0C
CR	carriage return	CTRL M	13	0D
SO	shift out	CTRL N	14	0E
SI	shift in	CTRL O	15	0F
DLE	data link escape	CTRL P	16	10
DC1	device control 1	CTRL Q	17	11
DC2	device control 2	CTRL R	18	12
DC3	device control 3	CTRL S	19	13
DC4	device control 4	CTRL T	20	14
NAK	negative acknowledge	CTRL U	21	15
SYN	synchronous idle	CTRL V	22	16
ETB	end transmission blk	CTRL W	23	17
CAN	cancel	CTRL X	24	18
EM	end of medium	CTRL Y	25	19
SUB	substitute	CTRL Z	26	1A
ESC	escape	CTRL [	27	1B
FS	file separator	CTRL \	28	1C
GS	group separator	CTRL]	29	1D
RS	record separator	CTRL ^	30	1E
US	unit separator	CTRL _	31	1F

APPENDIX E

Download Character Matrix Blanks: Draft

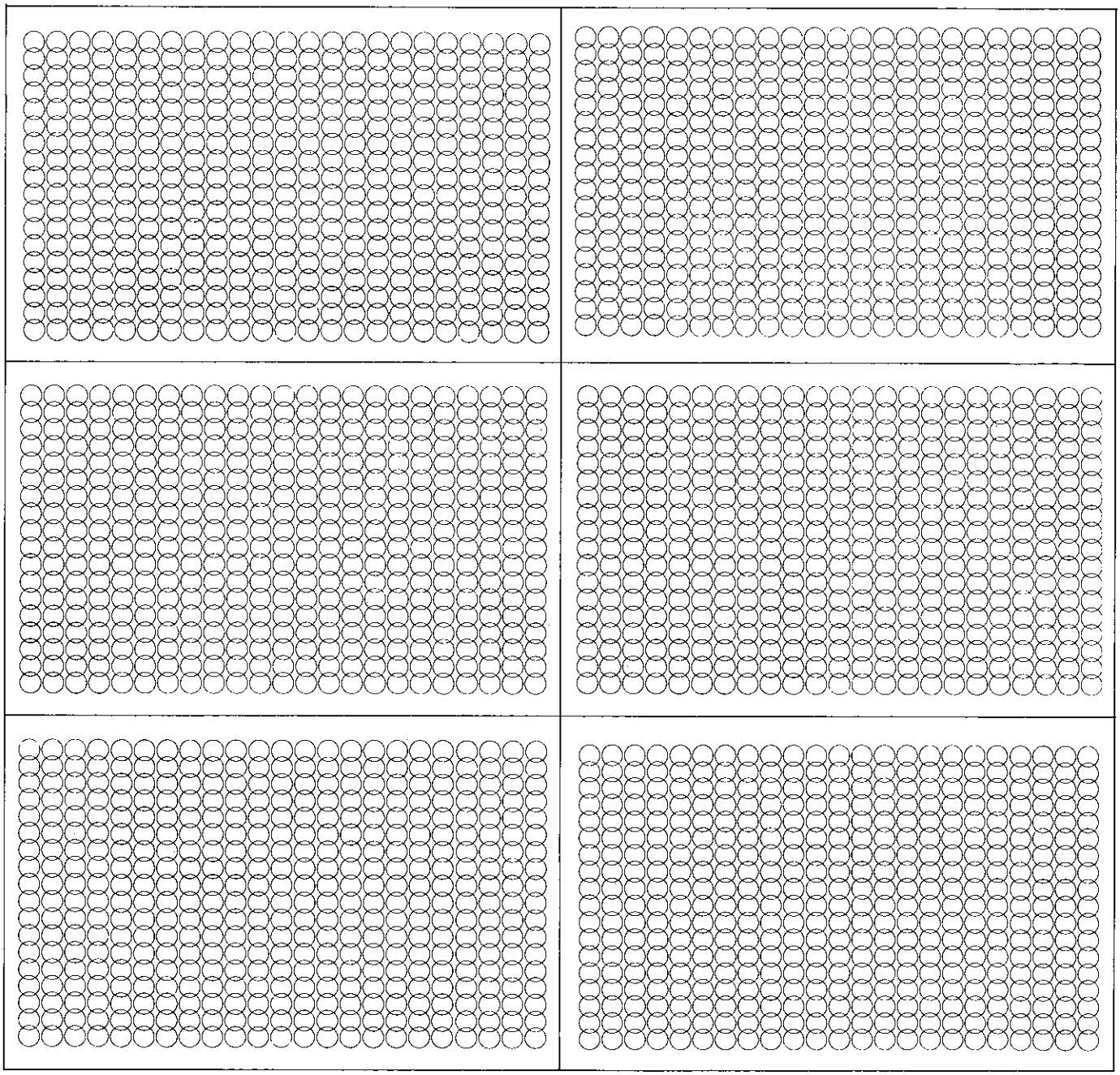
–9×11–



Make copies of this page first.
Then use blank matrices to design your download characters.

Download Character Matrix Blanks: NLQ

–18×23–



Make copies of this page first.
Then use blank matrices to design your download characters.

APPENDIX F

Software Commands (Standard/IBM printer mode)

FONT SELECTION

Name	Function	Page
ESC+4	Selects Italic printing	5-1
ESC+5	Releases Italic printing	5-1
ESC+x+1	Selects Courier NLQ printing	5-2
ESC+x+2	Selects Bold PS NLQ printing	5-2
ESC+x+0	Releases Courier and Bold PS NLQ printing	5-2
ESC+S+1	Selects subscript printing	5-3
ESC+S+0	Selects superscript printing	5-3
ESC+T	Releases sub/superscript printing	5-3

CHARACTER PITCH SELECTION

Name	Function	Page
ESC+P	Sets 10 cpi (pica pitch) printing	5-4
ESC+M	Sets 12 cpi (elite pitch) printing	5-5
ESC+n	Sets 10 cpi NLQ printing	5-6
ESC+o	Sets 12 cpi NLQ printing	5-7
SI	Sets 17 cpi (compressed) printing	5-8
ESC+SI	Sets 17 cpi (compressed) printing	5-8
DC2	Releases compressed printing	5-8
ESC+p+1	Sets proportional spacing	5-9
ESC+p+0	Releases proportional spacing	5-9
ESC+w+n	Sets 10, 12, 15, 17 cpi or proportional spacing	5-12
ESC+!+n	Sets certain pitches based upon value of n	5-13

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+E	Sets emphasis printing	5-19
ESC+F	Releases emphasis printing	5-19
ESC+G	Sets double printing	5-20
ESC+H	Releases double printing	5-20
SO	Sets single-line double width printing	5-21
DC4	Releases single-line double width printing	5-21
ESC+SO	Sets single-line double width printing	5-21
ESC+W+1	Sets double width printing	5-22
ESC+W+0	Releases double width printing	5-22
ESC+−+1	Sets underlining	5-23
ESC+−+0	Releases underlining	5-23
ESC+!+n	Sets highlighting based upon value of n	5-24

Software Commands (Standard/IBM printer mode)

CHARACTER SET SELECTION

BIT IMAGE (GRAPHICS) MODE SELECTION

PAPER FEED SELECTION

Execution

Software Commands (Standard/IBM printer mode)

PAGE FORMAT CONTROL

Name	Function	Page
ESC+C+0+n	Sets page length in inches	5-51
ESC+C+n	Sets page length in lines	5-52
ESC+I+n	Sets left margin	5-53
ESC+Q+n	Sets right margin	5-54
ESC+N+n	Sets skip perforation	5-55
ESC+O	Releases skip perforation setting	5-55

TABULATION

Horizontal

Name	Function	Page
ESC+D+n_1+...+n_x+0	Sets horizontal tab	5-56
ESC+D+0	Releases horizontal tab	5-56
HT	Executes horizontal tab	5-57
ESC+e+0+n	Sets horizontal tab every "n" positions	5-56

Vertical

Name	Function	Page
ESC+B+n_1+...+n_x+0	Sets vertical tab	5-58
ESC+B+0	Releases vertical tab	5-58
ESC+e+1+n	Sets vertical tab every "n" lines	5-58
VT	Executes vertical tab	5-59
ESC+/+n	Sets VFU channel	5-61
ESC+b+m+n_1+...+n_x+0	Sets VFU tabulation	5-61
ESC+b+m+0	Releases VFU tabulation	5-61

CARRIAGE CONTROL

Name	Function	Page
BS	Prints, then backspaces one character	5-63
CR	Prints a line, then returns carriage	5-64
ESC+<	Homes the print head	5-64
ESC+U+1	Sets single direction printing	5-65
ESC+U+0	Releases single direction printing	5-65
ESC+s+1	Sets half speed printing	5-65
ESC+s+0	Releases half speed printing	5-65
ESC+f+0+n	Skips "n" positions on a line	5-66

Software Commands (Standard/IBM printer mode)

DATA CONTROL

DOWNLOADABLE CHARACTER SELECTION

MISCELLANEOUS

Software Commands (Daisy printer mode)

PRINT MODE

Software Commands (Daisy printer mode)

BIT IMAGE (GRAPHICS) MODE SELECTION

VERTICAL MOVEMENT

Software Commands (Daisy printer mode)

FORMATTING

Name	Function	Page
ESC+9	Sets the left margin	6-29
ESC+0	Sets the right margin	6-30
ESC+T	Sets the top margin	6-31
ESC+L	Sets the bottom margin	6-32
ESC+C	Clears the top and bottom margins	6-33
ESC+FF+n	Sets the number of lines per page	6-34
ESC+1	Sets horizontal tab stop	6-35
ESC+8	Clears horizontal tab stop	6-35
ESC+–	Sets vertical tab stop	6-36
ESC+2	Clears all horizontal and vertical tab stops	6-37

WORD PROCESSING

Name	Function	Page
ESC+DC1+n	Sets offset value	6-38
ESC+O	Sets bold printing	6-39
ESC+W	Sets shadow printing	6-39
ESC+&	Releases bold/shadow printing	6-39
ESC+E	Sets underlining	6-40
ESC+R	Releases underlining	6-40
ESC+X	Disables all word processing mode	6-41

HORIZONTAL MOVEMENT

Name	Function	Page
CR	Prints all data in buffer	6-42
BS	Backspaces width of a character	6-43
ESC+BS	Backspaces 1/120 inch (0.21 mm)	6-44
HT	Executes horizontal tab	6-45
ESC+HT+n	Executes absolute horizontal tab	6-46

Software Commands (Daisy printer mode)

DOWNLOADABLE CHARACTER SELECTION

MISCELLANEOUS

APPENDIX G

Paper

1. Continuous paper

A list of the paper which may be used with this unit is provided below.

Width: 4~15.5 inches (102~394 mm) continuous paper with perforations on either side.

Quality and number of sheets: up to 4 sheets can be used; the relationship between the paper quality and number of sheets is given below.

Types of paper	Sheets	Thickness (continuous paper weight in pounds)	Remarks
Fine-quality paper	1	14~17	
Non-carbon paper	2	11~14 (17)	(17) is only for the last sheet.
	3		
	4		
Multi-layer paper with carbon	2		

- The multi-layer paper with carbon is such that the inserted carbon sheet is equivalent to a sheet of paper and so the maximum number of sheets of such paper is 2.

- The "continuous paper weight" represents the weight of 500 sheets [17×22 inches (432×559 mm)] in pounds.

2. Single Sheet

Width: 4~16.5 inches (102~419 mm)
Height: 5~14.3 inches (127~363 mm)
Thickness (paper weight in pounds): 11~24 pounds (Only 1 sheet).

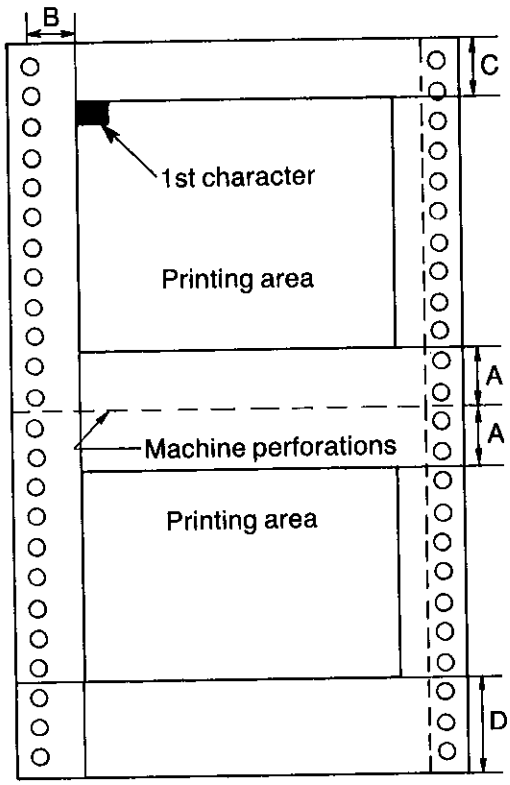
- The printer will handle papers up to 0.013 inch (0.32 mm) thickness, providing they roll smoothly and easily around the platen. Multiple copies will be readable up to 4 copies of 14 lb. weight paper with chemical release paper.

- Paper should be within operating temperature and humidity range at least 24 hours prior to use.

APPENDIX H

Printing Area

1. Continuous paper

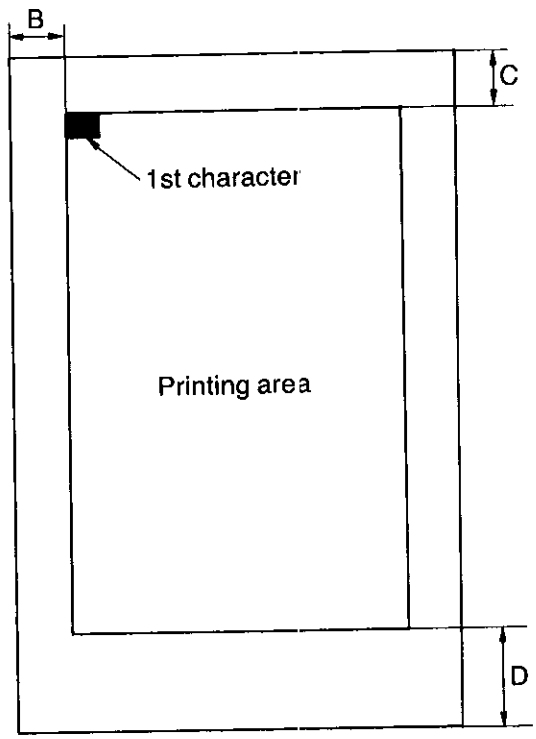


A: 1 inch (25.4 mm)
B: 0.85 inches (21.6 mm)
C: 1 inch (25.4 mm)
D: 2.2 inches (55.9 mm)

Notes:

A: Value A indicates the positions near the machine perforations where the lines may slip.
B: Value B indicates the position where the first character is printed. (When the left tractor is set on the left end.)
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where no more paper (13 lines remaining) is detected.

2. Single Sheet



B: 1.46 inches (37 mm)
C: 1 inch (25.4 mm)
D: 1 inch (25.4 mm)

Notes:

B: Value B indicates the position where the first character is printed. (When the paper is positioned to far left.)
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where the paper is released from engagement of the pinch rollers.

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Daisy Printer Mode

FOR KX-P1595

TECHNICAL SUPPORT CALLS

If you have read this manual and tried the troubleshooting procedures and you are still having difficulty please contact the store from which the unit was purchased.

You may also call the end user technical support telephone number which is operational during east coast business hours (9:00 AM to 5:00 PM).

The end user technical support number is: 1-800-222-0584

OPTIONS & SUPPLIES

*Please contact your local Panasonic printer dealer for availability.

KX-P42: 32K Buffer Chip
With this chip 5 distinct character sets of NLQ or Draft can be downloaded or full total 47K bytes will be used as buffer memory.

KX-P22: Bottom Feed Tractor
This tractor is specially designed for KX-P1595 to provide bottom paper feeding capability suitable for high volume output and multi-part forms.

KX-P32: Auto-Cut Sheet Feeder

KX-P120: Ribbon Cartridge (Black)
This ribbon cartridge comes with KX-P1595 which is specially designed for the high speed printer.
(3 million characters life)

KX-P110: Ribbon Cartridge (Black)

KX-P111: Ribbon Cartridge (Brown)

KX-P112: Ribbon Cartridge (Blue)

KX-P113: Ribbon Cartridge (Red)

Note: KX-P110, 111, 112 and 113 may also be used on the KX-P1595, however, ribbon life may be reduced.

Panasonic Industrial Company, Computer Products Div.
Division of Matsushita Electric Corporation of America
One Panasonic Way, Secaucus, New Jersey 07094

Panasonic Hawaii, Inc. (PHI)
91-238 Kauhi St. Ewa Beach, Honolulu, Hawaii 96808-0774

Panasonic Sales Company
Ave. 65 De Infanteria, KM9.7 Victoria Industrial Park Carolina, Puerto Rico 00630

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