UNISYS

AP 9215-1 Printer FX-80™ Emulation

Programming Reference Manual

August 1987
Distribution Code EQ
Printed in Japan
1205705

Priced Item

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Errata Sheet for document:

AP 9215-1 Printer FX-80™ Emulation
Programming Reference Manual
Form Number 1205705
August 1987

Please change the following information in your copy of the manual described above.

****

Throughout the manual, change all references to the "Letter Gothic 16.7 EP" font to read "Letter Gothic 17.1 EP."

********** Page 2-2 **********

Under "FF (Form Feed)," change the second sentence to read as follows:

The active position also moves to the left margin.

********** Page 2-3 **********

Under "LF (Line Feed)," change the second sentence to read as follows:

The active position also moves to the left margin.

********** Page 3-1 **********

Change the second sentence of the first paragraph to read as follows:

These commands specify the form length, left and right margins, and the size of the "perforation skip zone."

********** Page 3-4 **********

Change Note 2 to read as follows:

2 If **Paper Edge** is selected as the page origin, the first two lines of text will print over one another unless the margins are set inside the printable area.

********** Page 3-5 **********

Change Note 1 to read as follows:

1 If **Paper Edge** is selected as the page origin, the first two lines of text will print over one another unless the margins are set inside the printable area.

********** Page 3-7 **********

Change Note 1 to read as follows:

1 In the Epson FX-80, perforation skip is the distance between the last print line and the first print line on the next page and is used to skip over the perforations between sheets of fanfold paper. Although your laser printer does not use fanfold paper, this command allows you to set a bottom margin which is deducted from the form length. For example, if the form length is 66 lines, a perforation skip of 6 lines will result in 60 printed lines per page (66 - 6 = 60). You will get the same number of printed lines per page if the top of form is in the same position and the form length is set at 60 lines with no perforation skip.

Add the following note to the Set Perforation Skip command:

4 If the form length minus the perforation skip is greater than the length of the physical page, then the perforation skip will not leave blank lines at the bottom of each page. For example, suppose the form length is 82 lines, the perforation skip is 6 lines, the Page Origin is set for "Printable Area," and the top of form position is at the first printable line on the physical page. These settings will give you 76 printed lines per page. If you use these settings with legal-size paper (82 printable lines), there will be 76 printed lines on each page with 6 blank lines at the bottom. If you then switch to letter-size paper (63 printable lines), the first 63 lines will print on the first sheet of paper, leaving no bottom margin. Lines 64 through 76 will print at the top of the second sheet of paper.

********** Page 4-3 **********

Change Note 1 to read as follows:

1 This command will also affect the horizontal location of the active position; the active position will move to the left margin on the next line.

********** Page 4-4 **********

Add the following note to the Make n/216-inch Line Feed command:

3 If this command is sent to the printer while one of the most significant bit (MSB) control commands (ESC > or ESC =) is in effect, then the highest bit of the value specified for n will be set or reset.

********** Page 5-2 **********

In the Example for the Set/Clear Horizontal Tab command, change the fourth code from "<15>" and "NAK" to "<19>" and "EM".

Change the last sentence in Note 1 to read as follows:

Changing the left margin will clear the tab settings and bring the default tab settings into effect.

********** Page 6-2 **********

In Line 9 of Table 6-1, the samples of the Superscript print attribute combined with the Condensed and Emphasized attributes are inaccurate. The samples should be raised above the baseline. Replace Line 9 of the table with the following corrected samples:

Superscript	Hhi1Jj	N/A	Hhi1Jj	Hhi1Jj

********** Page 6-6 **********

Change Note 1 to read as follows:

1 The elite mode takes priority over the other basic print widths. Therefore, if you select the elite and condensed modes at the same time, only the elite mode will be effective.

Change Note 2 to read as follows:

2 If you select the elite and proportional attributes at the same time, the proportional mode does not become effective until the elite mode is canceled. You can cancel the elite mode with the CANCEL ELITE MODE (ESC P) command.

Change Note 3 to read as follows:

3 You can use the elite mode with the double-width, super/subscript, double strike, and underlined attributes.

Change the name of the ESC P command from "Select Pica Mode" to "Cancel Elite Mode."

********** Page 8-2 **********

In the descriptions for the Set MSB to 0 and Set MSB to 1 commands, change "<01>" to "<00>" and "<81>" to "<80>".

********** Page 8-4 **********

In the Parameter description for the Select International Character Set command, change the last two sentences to read as follows:

If the value specified for n is not in the range from 0 to 8, this command is ignored.
Countries specified by the value of n (from 0 to 8) and the international character sets for those countries are shown in Appendix B.

********** Page A-2 **********

In line 3, change "Select Pica Mode" to "Cancel Elite Mode."

********** Page C-1 **********

For the Line Termination mode, delete the first two values, "CR=CR, LF=LF" and "CR=NL, LF=LF."

********** Page C-4 **********

Add the following subsection:

Current CPI

In the FX-80 emulation, if the Current CPI mode is set to "Depends on Font," then the cpi value is set according to the current font. In other words, Courier 10 EP is set for 10 cpi, Prestige Elite 12 EP is set for 12 cpi, and Letter Gothic 17.1 EP is set for 17.1 cpi. If the cpi value is changed by command when "Depends on Font" is set, then the font changes automatically to match the specified cpi value.

If the Current CPI mode is set to 10, 12, or 17.1 cpi, the font set by the Current Font setting is always selected. If the font selected does not match the cpi value, then the font is condensed or enlarged automatically to match the cpi value. The font is also condensed or enlarged automatically if the cpi value is changed by command.

********** Glossary-3 **********

In the definition for "Form Feed (FF)," change the third sentence to read as follows:

The active position also moves to the left margin.

********** Glossary-3 **********

In the definition for "Line Feed (LF)," change the third sentence to read as follows:

The active position also moves to the left margin.

****

About This Manual

This manual is the Programming Reference Manual for the AP 9215–1 printer FX–80 emulation. The emulation program is contained in a card which can be inserted in the back of your printer. The style number for the FX–80 emulation card is B 9968–54.

Purpose

This manual explains how to install and use the emulation card that makes your AP 9215–1 laser printer emulate the Epson FX–80 printer.

Scope

This document includes instructions for the installation and removal of the emulation card, and information necessary to use the available features. Also included is information about the resident command set, fonts, interface, and other reference information.

This manual does not describe the special features of your laser printer or the way in which to control its functions from the operation panel. These are described in the *AP 9215–1 Printer Installation and Operations Guide.* Refer to that guide for details on setting printer modes, interpreting error messages, replacing parts, and so forth.

Audience

This manual is intended for use by system administrators, programmers, and others who will use the AP 9215–1 printer with software written for the FX–80.

Prerequisites

Before using this manual, you should be familiar with the operation of the AP 9215–1 printer and should have read the *AP 9215–1 Printer Installation and Operations Guide.*

How to Use this Document

The reader should use this guide for installation of the AP 9215–1 printer Epson FX–80 emulation card. After installation, consult various sections of this manual for reference information.

This manual is intended to be used as a supplement to your printer's installation and operations guide. This manual does not describe the special features of your laser printer, or the way in which to control its functions from the operation panel.

Organization

This manual contains eight sections.

Section 1: Introduction to the FX–80 Emulation

Briefly reviews the procedure for installing and removing the FX–80 emulation card and activating the FX–80 emulation mode.

Section 2: Using Control Codes and Escape Sequences

Explains how control codes and escape sequences are used, describes the available control codes, and explains the conventions used with the escape sequences.

Section 3: Page Formatting Commands

Describes the commands which perform page formatting functions, such as setting margins.

Section 4: Paper Feed Commands

Describes the commands that control the vertical movement of the active position.

Section 5: Tab Commands

Describes the commands for using vertical and horizontal tab stops and VFU channels.

Section 6: Word Processing Commands

Explains how to use the commands which activate or control a variety of print attributes.

Section 7: Bit Image Graphics Commands

Describes the commands that are used to produce graphics by controlling the printing of individual dots.

Section 8: Special Printer Control Commands

Describes the RESET PRINTER command and commands that affect the character set used for printing.

Appendixes provide a summary of the commands; tables with the FX–80 emulation character sets; a description of the mode settings supported in the FX–80 emulation mode; and samples of the FX–80 emulation resident fonts.

Results

This manual should provide readers with the information they need to use the AP 9215–1 printer with most software written for the Epson FX–80 printer.

Related Product Information

AP 9215–1 Printer Installation and Operations Guide (form 1205796).

Conventions Used in This Manual

In this manual, when the format of a command is given (for example, ESC A n), the symbol "n" refers to a binary value.

Hexadecimal numbers are indicated by angle brackets:

<1D>

When examples of commands are given, the hexadecimal code is shown on the first line and the equivalent ASCII character or control code is shown on the second line:

<1B>	<4E>	<35>
ESC	N	5

The angle brackets surrounding the hexadecimal values are used as a visual aid to separate each component of a command. Do not enter the angle brackets.

Contents

Illustrations

Tables

Introduction to the FX–80 Emulation

This section briefly describes printer emulations in general and the FX–80 emulation in particular; reviews the procedure for installing and removing the emulation card; and describes how to activate the FX–80 emulation mode.

What Is a Printer Emulation?

A printer emulation is a program which allows one printer to imitate another. The first printer is then able to work with most software written for the second printer. An emulation program will **not** make one printer **identical** to another. Small differences in printer design usually prevent the emulating printer from functioning in the exact same way as the original printer. These small differences should not prevent you from using the printer emulation for most purposes.

The emulation program that comes with the printer is called the resident emulation. In the AP 9215–1 printer, the resident emulation imitates a Diablo® 630 printer.

The AP 9215–1 is able to emulate other printers through the use of emulation cards. The emulation card is contained in a small, flat plastic package about the size of a credit card. At one end of the package is a connector that has two rows of holes. When the emulation card is inserted in the back of the printer and the Emulation Mode is set to "Option," the AP 9215–1 will emulate the emulation card's printer rather than the Diablo 630. (Instructions for inserting the emulation card and setting the emulation mode appear later in this section.)

Things to be Aware of When Using the FX–80 Emulation

In general, procedures for controlling printer functions from the indicator panel are the same in the FX–80 emulation mode as in the resident Diablo 630 mode. However, you should be aware of the following differences:

Diablo is a registered trademark of XEROX Corporation.

- The FX–80 emulation provides options for the "Nationality" mode that are not provided in the resident Diablo 630 emulation. These options allow you to access characters from the FX–80's international character set.
- The FX–80 emulation mode provides several mode settings that are not provided in the resident Diablo 630 emulation these settings are:
  - Auto Fullpage
  - Zero Font Select
  - Perforation Skip
  - Printer Select
  - Print Mode

  These settings and their functions are described in Appendix C.
- Using the Font Select button or the Current Font mode to select fonts in the FX–80 mode has the same effect on printer operation as selecting a font by an FX–80 command. In other words, print modes are subject to the same system of priorities whether selected by the Font Select button, the Current Font mode, or an FX–80 command.

Note: You can select Diablo 630 resident fonts and font cartridge fonts with the Font Select button, but cannot select them with an FX–80 command. While using a Diablo 630 resident or font cartridge font, if you select a print mode with a higher priority (such as, Elite), printing will default to the Courier 10 EP font (the one used to print in Pica mode) when you clear the higher mode. Print pitch of the Diablo 630 resident and font cartridge fonts depends on the font.

Because of differences between the printing systems of the FX–80 and your laser printer, the following FX–80 commands have no effect and are ignored.

BEL	Bell
ESC i n	Set Incremental Mode
ESC s n	Set/Cancel Half Speed Mode
ESC 8	Disable Paper Out Detection
ESC 9	Enable Paper Out Detection
ESC U n	Select Print Direction
ESC <	Home Printer Head
ESC & NUL	Download Character Set
ESC % n	Select Download Font
ESC :	Copy Font ROM to RAM

Installing the Emulation Card

Caution: Make sure the power to your printer is completely off before installing the emulation card. Installing the card while the power is on may damage the card.

1 Set the power switch on the left side of the printer to the OFF (O) position and wait until the indicator panel lights are completely off.

2 As you face the back of the printer, you will see a slot for the emulation card in the lower left corner. Slide the emulation card into the slot, making sure that the label side of the card is facing right. The end of the card will protrude slightly from the slot.

Activating the FX–80 Emulation Mode

To activate the FX–80 emulation, set the Emulation Mode to "Option." Instructions for doing this follow. For details about setting other printer modes, consult the *AP 9215–1 Printer Installation and Operations Guide.*

Note: Procedures for setting the modes to select interfaces, transmission rates, and so on, in the FX–80 emulation are the same as in the resident Diablo 630 emulation. However, additional modes are provided to emulate the DIP switches of the FX–80.

1 Set the printer power switch to the ON (I) position.

2 Press the On/Off Line button to place the printer in the off-line mode. The On-line indicator will go out and the message "Off Line" will appear in the display panel.

3 Press the Shift and Form Feed buttons simultaneously. The message "Mode Set" will appear in the display panel.

4 Press the Shift and Reset buttons simultaneously. The name of one of the printer modes will appear in the display panel.

5 Press the Form Feed button until "Emulation Mode" appears in the display panel.

6 Press the Test button until "Option" appears in the display panel.

7 Press the Form Feed button to return to the list of default modes.

8 Press the Shift and Form Feed buttons simultaneously. The message "Mode Set: Saved" will appear in the display panel.

9 Press the On/Off Line button to return the printer to on-line mode. The On-line indicator will light. The printer will now use the emulation specified by the emulation card instead of the resident (Diablo 630) emulation. The printer will also default to the emulation card emulation after turning on the printer or performing a hard reset.

Removing the Emulation Card

Caution: Make sure the power to your printer is completely off before removing the emulation card. Removing the card while the power is on may damage the card.

1 Set the printer power switch to the OFF (O) position and wait until the indicator panel lights are completely off.

2 Pull the card out of the slot in the back of the printer.

To return the printer to its resident Diablo 630 emulation mode, follow the procedure for "Activating the FX-80 Emulation Mode," except at step 6 press the Test button until "Internal (D630)" appears in the display panel.

Using Control Codes and Escape Sequences

The AP 9215–1 printer uses special sequences that you can embed in your files to select the various features available. This section explains how control codes and escape sequences are used. It also describes the available control codes and explains the formatting and other conventions used with the escape sequences.

Entering Control Codes and Escape Sequences

The method for entering control codes and escape sequences varies depending on the keyboard, programming language, and software package you are using. Consult your computer or terminal documentation for instructions on entering control codes and escape sequences.

Control codes are embedded in your files by using the Control key, or its equivalent, with an ASCII character. Some keyboards are equipped with keys that already perform these functions. See "Single-Byte Control Codes" later in this section for a description of the available control codes.

The escape control code (ESC) is used with an ASCII character to form an escape sequence. Most escape sequences also include a parameter field whose value determines how the sequence operates.

General Information

Any feature that is activated will remain enabled until it is either disabled with an escape sequence or the printer is reset or turned on. For example, if the automatic underline feature is enabled, it will remain active until it is disabled with the appropriate escape sequence.

Single-Byte Control Codes

BS (Backspace). This code moves the active position to the left by the width of the previous character. The corresponding hexadecimal code is <08>.

CAN (Cancel). This code deletes all text appearing before it on the line. For example, the string "ABC<18>DEF" will print as "DEF". The corresponding hexadecimal code is <18>.

CR (Carriage Return). This character moves the active position to the left margin of the same line. If the Line Termination mode has been set for CR=NL, the active position also moves to the next line. For more information about the printer modes used with the FX–80 emulation, refer to Appendix C of this manual. The corresponding hexadecimal code is <0D>.

DC1 (Select Printer). This code switches the printer to the select state from the deselect state set with DC3. The printer must be in the select state to accept data. If the printer is already in the select state, the DC1 code is ignored. The corresponding hexadecimal code is <11>.

DC2 (Cancel Condensed Mode). This command stops the printing of compressed text (begun with an SI or ESC SI command) and restores printing to whatever current print mode setting has the highest priority. The corresponding hexadecimal code is <12>. For a more detailed description of this command, refer to Section 6 of this manual.

DC3 (Deselect Printer). This code switches the printer to the deselect state. While the printer is in the deselected state, all codes except DC1 are ignored. However, any data already in the printer buffer is saved until the printer is returned to the selected state. The corresponding hexadecimal code is <13>.

DC4 (Cancel Double-Width Single Line Printing). This command stops the printing of double-width text (begun with an SO or ESC SO command). The corresponding hexadecimal code is <14>. For a more detailed description of this command, refer to Section 6 of this manual.

DEL (Delete). This code deletes the previous character. For example, the string "ABC<7F>DEF" will print as "ABDEF". The corresponding hexadecimal code is <7F>.

FF (Form Feed). When the printer receives this code, it prints out any data in the print buffer, ejects the sheet of paper, and advances the active position to the top-of-form on the next page. If the Line Termination mode has been set for LF=NL, the active position also moves to the left margin. The corresponding hexadecimal code is <0C>. For more information about printer modes used with the FX–80 emulation, refer to Appendix C of this manual.

HT (Horizontal Tab). This code advances the active position to the horizontal tab stop (if any) to the right of its current horizontal position. If no horizontal tab stops have been set, this code is ignored. The corresponding hexadecimal code is <09>. For more information about tabs, refer to Section 5 of this manual.

LF (Line Feed). This command moves the active position down by the current line feed pitch. If the Line Termination mode has been set for LF=NL, the active position also moves to the left margin. The corresponding hexadecimal code is <0A>. For a detailed description of this command, refer to Section 4 of this manual.

NUL (Null). When the SELECT CONTROL CODE FUNCTION (ESC I 1) is enabled, this code prints the character "à". It is ignored in all other cases. The corresponding hexadecimal code is <00>.

SI (Set Condensed Mode). This code instructs the printer to print compressed text at 17.16 characters per inch (cpi) using the Letter Gothic 16.7 EP font. The corresponding hexadecimal code is <0F>. For a detailed description of the commands used for printing compressed text, refer to Section 6 of this manual.

SO (Set Double-Width Printing, Single Line). This code instructs the printer to print a single line of characters at twice their Pica or Elite mode widths. The corresponding hexadecimal code is <0E>. For a detailed description of the commands used for double-width printing, refer to Section 6 of this manual.

VT (Vertical Tab). This code advances the active position to the left margin of the line containing the first vertical tab stop (if any) following the current active position. The corresponding hexadecimal code is <0B>. For a detailed description of this command, refer to Section 5 of this manual.

Escape Sequences

The FX–80 emulation uses two kinds of escape sequences: those with parameters and those without parameters. Sequences with parameters include a variable field whose value determines how the sequence operates. Sequences without parameters consist entirely of character constants and always operate in the same way. Both types of sequences begin with the Escape character (hexadecimal code <1B>, or 27 decimal).

All of the escape sequences for the FX–80 emulation are described in the following sections. Each description includes the command name, function, and format. Examples are provided where applicable.

In escape sequences with parameters, the parameter field is represented by the symbol "n". The value for "n" must be a binary value. If the parameter value is not specified, the printer assumes the value is zero.

The command format is represented in its ASCII form. Commands must be sent to the printer in hexadecimal form.

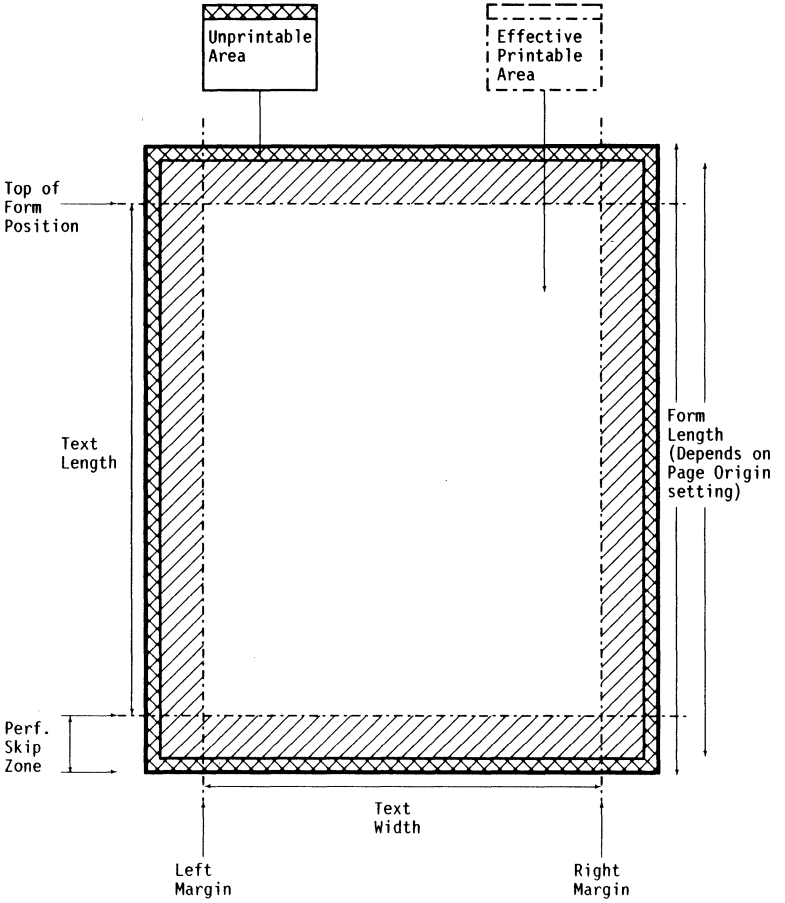
Examples are given in hexadecimal format. Each value is surrounded by angle brackets (<>). The angle brackets are used as a visual aid to separate each component of a command. Do not enter the angle brackets.

Page Formatting Commands

This section describes FX–80 emulation mode commands for formatting the printed page. These commands specify the form length, left and right margins, the location of the top of the form (that is, the amount of space to skip at the top of each page), and the size of the "perforation skip zone" (that is, the amount of space to skip at the bottom of each page).

Figure 3-1 illustrates the printable area and other page format parameters.

Figure 3-1 **Page Format Parameters**



Form Length

The form length is the total amount of space to be included in each printed page. The form length includes the entire area from the top page edge to the bottom page edge.

The form length can be set in terms of either lines per page or inches. When the form length is changed, the current active position becomes the top of the new form, and the current perforation skip zone setting is canceled.

Note: Form length is measured from either the top of the paper or the top of the printable area, depending on the setting of the Page Origin mode. If the Page Origin is set to **Printable Area**, the top and bottom edges are the same as the edges of the printable area. If it is set to **Paper Edge**, they are the same as the edges of the paper. (The default left and right margins are the same as the paper edges regardless of the Page Origin mode setting.)

Set Form Length in Lines

Function This command sets the form length to the number of lines specified by n. It also sets the vertical location of the active position as the top of form and cancels the current perforation skip setting.

Format ESC C n

Parameter

n - The number of lines per form in the range from 1 to 255. The value is determined relative to the Page Origin setting. Table 3-1 lists the default form lengths in lines for each paper size and Page Origin setting.

Example This example sets the form length to 55 lines. The decimal value 55 has been converted to its hexadecimal equivalent, <37>. The ASCII character assigned to that value is "7."

<1B> <43> <37>
ESC C 7

Table 3-1 **Default Form Lengths in Lines**

Paper Size	Lines Per Page (6 lpi)	
	Printable Area	**Paper Edge**
Letter	63	66
A4	66	70
Legal	82	84

Notes:

1 The printer converts the number of lines specified by n to inches (to the nearest 1/300 inch), using the current line feed pitch. The printer stores the form length in inches, so that the form length is not automatically reset when the line spacing is changed. Therefore, if you change the line feed setting, the number of lines per page will change, but the physical length of the form will remain the same.

2 If **Paper Edge** is selected as the page origin, the first two lines of text and the first four characters of each line will print over one another unless margins are set inside the printable area.

3 If you set the form length shorter than the page length, each page will print when the active position reaches the page length and the area at the bottom of the page will be blank.

4 If you set the form length greater than the page length, each page will print on two sheets of paper, with data on the first sheet printed to the bottom limit, and data on the second sheet printed to the point at which total data for the two sheets passes the form length.

5 If a form length of 0 lines is specified, the command is ignored.

Set Form Length in Inches

Function This command sets the form length to the number of inches specified by n. It also sets the vertical location of the active position as the top of form and cancels the current perforation skip setting.

Format ESC C NUL n

Parameter

n - The form length in inches in the range from 1 to 22. The value must be an integer (for example, 10 or 11, but not 10.5). The value is determined relative to the Page Origin setting. Table 3-2 lists the default form lengths in inches for each paper size and Page Origin setting.

Example This example sets the form length to 9 inches. The decimal value 9 has been converted to its hexadecimal equivalent, <09>. The ASCII control code assigned to that value is "HT."

<1B> <43> <00> <09>
ESC C NUL HT

Table 3-2 **Default Form Lengths in Inches**

Paper Size	Printable Area	Paper Edge
Letter	10.5	11.0
A4	11.33	11.693
Legal	13.67	14.0

Notes:

1 If **Paper Edge** is selected as the page origin, the first two lines of text and the first four characters of each line will print over one another unless margins are set inside the printable area.

2 If you set the form length shorter than the page length, each page will print when the active position reaches the form length and the area at the bottom of the page will be blank.

3 If you set the form length greater than the page length, each page will print on two sheets of paper, with data on the first sheet printed to the bottom limit, and data on the second sheet printed to the point at which total data for the two sheets passes the form length.

4 If a form length of 0 inches is specified, the sequence is ignored.

Set Left Margin

Function This command sets the left margin to the position whose column number is specified for n.

Format ESC l n

Parameter

n - The column number of the left margin.

Notes:

1 Once set, the left margin's distance from the left page edge remains the same even if the character pitch is changed.

2 The value that is specified by n must be to the left of the right margin by the width of at least one double-width pica character. It must also be at least one double-width pica character's width to the right of the left page edge.

Set Right Margin

Function This command sets the right margin to the position whose column number is specified for n.

Format ESC Q n

Parameter

n - The column number of the right margin.

Notes:

1 Once set, the right margin's distance from the left page edge remains the same even if the character pitch is changed.

2 The value that is specified by n must be to the right of the left margin by the width of at least one double-width pica character. It must also be at least one double-width pica character's width to the left of the right page edge.

Set Perforation Skip

Function This command allows you to set the perforation skip value (see Note 1).

Format ESC N n

Parameter

n - The number of lines to skip at the bottom of the page in the range from 0 to 127.
If the value specified for this parameter is greater than 127 or the current form length, this command is ignored.

Example The following sequence sets a perforation skip of 5 lines. The decimal value 5 has been converted to its hexadecimal equivalent, <05>. The ASCII control code assigned to that value is "ENQ."

<1B> <4E> <05>
ESC N ENQ

Notes:

1 In the Epson FX–80, perforation skip is the distance between the last print line and the first print line on the next page and is used to skip over the perforations between sheets of fanfold paper. Although your laser printer does not use fanfold paper, this command allows you to set a bottom margin which, together with the top margin, is deducted from the form length. For example, if the top of form is five lines from the top of the Page Origin and the form length is 66 lines, a perforation skip of 6 lines will result in 55 printed lines per page (66 - 5 - 6 = 55). You would get the same number of printed lines per page if the top of form was in the same position and the form length was set at 60 lines with no perforation skip (60 - 5 - 0 = 55).

2 Once perforation skip is set, the amount it advances the active position is not affected if the line feed pitch is changed.

3 Perforation skip is automatically canceled whenever the form length is changed. Therefore, if you wish to use perforation skip, set it **after** setting the form length.

Cancel Perforation Skip

Function This command cancels the perforation skip set by the ESC N n sequence.

Format ESC O

Paper Feed Commands

The line feed pitch determines the amount of vertical movement for the Line Feed command (LF). The power-on default line feed pitch is six lines per inch. You can change the line feed pitch with the Mode Set button on the indicator panel. (For details concerning mode settings, refer to the *AP 9215-1 Printer Installation and Operations Guide.*) You can also change the line feed pitch using any of the following commands.

Command	Pitch
ESC 0	1/8 inch
ESC 1	7/72 inch
ESC 2	1/6 inch
ESC 3 n	n/216 inch
ESC A n	n/72 inch

These commands do not **cause** a line feed; they define the amount by which the active position moves vertically when an LF command is sent. Once set, the line feed pitch remains in effect until changed by another line feed pitch command or by the RESET command, ESC @.

You can also use the following commands to move the active position vertically without changing the line feed pitch.

Command	Function
ESC J n	Moves the active position down by n/216 inch.
ESC j n	Moves the active position up by n/216 inch.

Set 1/8-inch Line Spacing

Function This command sets the line feed pitch to 1/8 inch.

Format ESC 0

Set 7/72-inch Line Spacing

Function This command sets the line feed pitch to 7/72 inch.

Format ESC 1

Set 1/6-inch Line Spacing

Function This command sets the line feed pitch to 1/6 inch.

Format ESC 2

Set n/216-inch Line Spacing

Function This command sets the line feed pitch to n/216 inch.

Format ESC 3 n

Parameter

n - The value, in 1/216-inch units, of the line feed pitch.

Example The following example sets a line feed pitch value of 7/216 inch. The decimal value 7 has been converted to its hexadecimal equivalent <07>. The ASCII control code assigned to <07> is BEL.

<1B> <33> <07>
ESC 3 BEL

Set n/72-inch Line Spacing

Function This command sets the line feed pitch to n/72 inch.

Format ESC A n

Parameter

n - The value, in 1/72-inch units, of the line pitch.

Example The following command sets a line pitch value of 7/72 inch. The decimal value 7 has been converted to its hexadecimal equivalent <07>. The ASCII control code assigned to <07> is BEL.

<1B> <41> <07>
ESC A BEL

Line Feed

Function This command moves the active position down by the current line feed pitch.

Format LF

Notes:

1 This command may affect the horizontal location of the active position depending on the setting of the Line Termination mode (see Mode Setting Table, Appendix C). If LF=LF is selected, the horizontal position is unchanged; if LF=NL is selected, the active position moves to the left margin on the next line.

2 This command cancels the double-width mode set by SO or ESC SO. It does not cancel the double-width printing mode set by ESC W.

Make n/216-inch Line Feed

Function This command executes a single line feed of n/216 inch without resetting the line feed pitch.

Format ESC J n

Parameter

n - The line feed distance, in 1/216-inch units. Specify n = 24 (1/9-inch feed) when printing 8-bit bit image graphics.

Example The following example executes a single line feed of 20/216-inch. The decimal value 20 has been converted to its hexadecimal equivalent <14>. The ASCII control code assigned to <14> is DC4.

<1B> <4A> <14>
ESC J DC4

Notes:

1 The line feed specified by this command is executed without regard to the perforation skip. Therefore, you can use this command to move the active position cursor into the perforation skip zone (below the bottom margin).

2 This command does not cancel double-width printing set with the SO or ESC SO commands.

Make n/216-inch Reverse Line Feed

Function This command moves the active position up by n/216 inch.

Format ESC j n

Parameter

n - The distance of the reverse line feed, in the range from 0 to 255.

Example The following example executes a single line feed of 24/216-inch. The decimal value 24 has been converted to its hexadecimal equivalent <18>. The ASCII control code assigned to <18> is CAN.

<1B> <6A> <18>
ESC j CAN

Notes:

1 If the value specified for n exceeds the distance between the current active position and the top page limit, the active position will only move up as far as the top page limit.

2 If this command is sent to the printer while one of the most significant bit (MSB) control commands (ESC > or ESC =) is in effect, then the highest bit of the value specified for n will be set or reset.

3 This command does not cancel double-width printing set with the SO or ESC SO commands.

Tab Commands

The FX–80 emulation mode allows you to set vertical and horizontal tab stops, making it possible to move the active position directly to any predesignated point on the page. You can set up to 32 horizontal tab stops.

You can store vertical tab stop settings for different formats in groups called Vertical Format Unit (VFU) channels. You can select these channels by command at any time, making it possible to use different arrangements of vertical tab stops on different pages.

This section describes the commands for using vertical and horizontal tab stops and VFU channels.

Horizontal Tab

Function This code advances the active position to the first horizontal tab stop (if any) to the right of the current position.

Format HT

Notes:

1 When the power is turned on, default tab stops are set at every eighth print column, beginning with column 8.

2 If all tab stops have been cleared, this command is ignored.

Set/Clear Horizontal Tab

Function This command sets horizontal tab stops according to the values of n or clears all horizontal tab stops if the n parameters are omitted. Tabs must be specified in ascending order.

Format ESC D n1 n2 ... nk NUL

Parameters

k - The total number of horizontal tabs being set, in the range from 1 to 32.

n - The positions of horizontal tab stops, in ascending order.

Example The following example sets tab stops at columns 10, 25, and 60. The decimal values 10, 25, and 60 have been converted into their hexadecimal equivalents.

<1B>	<44>	<0A>	<15>	<3C>	<00>
ESC	D	LF	NAK	<	NUL

Notes:

1 The printer stores the positions of tab stops as absolute distances from the current left margin, not as column numbers. Therefore, changing the character pitch does not shift the positions of tab stops. Changing the left margin will shift the tab stop positions.

2 The command will terminate automatically if you specify more than 32 tabs or a value less than the preceding parameter. If you specify more than 32 tabs, stops are set for the first 32 positions, n33 is ignored, and data from n34 on is handled as print data. If you specify a value less than the preceding parameter, tab stops are set for the preceding positions and the remaining data is handled as print data.

3 When the printer is powered-on or reset (ESC @), horizontal tab stops are set at every eighth print column, beginning with column 8.

Vertical Tab

Function This code advances the print position to the left margin of the vertical tab stop (if any) following its current vertical position.

Format VT

Notes:

1 This code cancels double-width printing set by the SO or ESC SO commands.

2 When the power is turned on or the printer is reset with ESC @, vertical tab stops are set at every line. Therefore, if no vertical tab stops are set, this command performs in the same manner as the line feed code.

3 If vertical tab stops have been set, but none are present between the current active position and the page end, the page is printed out and the active position moves to the top-of-form position on the next page.

4 If all vertical tab stops are cleared with the ESC B NUL command, the VT code is ignored.

Set/Clear Vertical Tab

Function This command sets vertical tab stops at lines specified by the n parameters or clears all vertical tab stops if the n parameters are omitted.

Format ESC B n1 n2 ... nk NUL

Parameters

k - The total number of vertical tabs being set, in the range from 1 to 16.

n - The positions of vertical tab stops in ascending order.

Example The following example sets tab stops at lines 10, 25, and 60. The decimal values 10, 25, and 60 have been converted to their hexadecimal equivalents.

<1B>	<42>	<0A>	<15>	<3C>	<00>
ESC	B	LF	NAK	<	NUL

Notes:

1 The printer stores the positions of vertical tab stops as absolute distances from the top line of the page, not as line numbers. Therefore, changing the line spacing after setting the tabs does not shift the positions of tab stops.

2 The command will terminate automatically if you specify more than 16 tabs or a value less than the preceding parameter. If you specify more than 16 tabs, stops are set for the first 16 positions and data from n17 on is ignored until the printer encounters the NUL at the end of the command. If you specify a value less than the preceding parameter, tab stops are set for the preceding positions and the remaining parameters are ignored.

3 When the printer is powered-on or reset (ESC @), vertical tab stops are set at every line.

Select VFU Channel

Function This command selects one of the printer's eight VFU channels. Subsequently, vertical tab code (VT) operation is determined by vertical tab stops in the channel selected.

Format ESC / n

Parameter

n - The selected VFU channel, in the range from 0 to 7. Values outside that range are ignored.
The default VFU channel is channel 0.

Set VFU Channel Tab Stops

Function This command sets vertical tab stops at the line positions specified by n in the VFU channel specified by m. If the n parameters are omitted (ESC b m NUL), all vertical tab stops in the specified VFU channel are cleared.

Format ESC b m n1 n2 ... nk NUL

Parameters

k - The number of vertical tab positions in the range from 1 to 16.

m - The VFU channel designation in the range 0 to 7.

n - The vertical tab stop positions.

Example The following example sets tab stops for VFU channel 2 at lines 15 and 30. The decimal values 15 and 30 have been converted to their hexadecimal equivalents.

<1B>	<62>	<02>	<0F>	<1E>	<00>
ESC	b	STX	SI	RS	NUL

Notes:

1 The printer stores the positions of vertical tab stops as absolute distances from the top line of the page, not as line numbers. Therefore, changing the line spacing after setting the tabs does not shift the tab stop positions.

2 The command will terminate automatically if you specify more than 16 tabs or a value less than the preceding parameter. If you specify a value less than the preceding parameter, tab stops are set for the preceding positions and the remaining parameters are ignored.

3 When the printer is powered-on or reset (ESC @), vertical tab stops are set at every line.

4 You can set Channel 0 tabs with either this command or ESC B.

Word Processing Commands

This section describes commands for setting and changing character widths and other word processing attributes in the FX–80 emulation mode.

Basic character widths are pica (which prints at 10 cpi using the Courier 10 EP font), elite (which prints at 12 cpi using the Prestige Elite 12 EP font), and condensed (which prints at 17.16 cpi using the Letter Gothic 16.7 EP font). Fonts are selected automatically upon changing the print width. You can expand the basic print widths by selecting double-width printing or compress them by selecting condensed printing.

FX–80 emulation also provides a variety of commands for changing print attributes other than character width. These make it possible to print text in emphasized (shadow), double-strike (bold), superscript/subscript, proportional, underlined, or italic form. You can specify combinations of the attributes with the ESC ! n command.

Tables 6-1 and 6-2 show samples of different print attribute combinations for the pica and elite modes. Combinations marked "N/A" are not available in the FX–80 emulation. These tables do not include all possible print attribute combinations.

Table 6-1 **Sample Print Attribute Combinations, Pica Mode**

	Normal	Proport.	Condensed	Emphasized
Normal	HhIiJj	HhIiJj	HhIiJj	**HhIiJj**
Proportional	HhIiJj	HhIiJj	N/A	HhIiJj
Condensed	HhIiJj	N/A	HhIiJj	**N/A**
Emphasized	**HhIiJj**	HhIiJj	**N/A**	**HhIiJj**
Double Strike	HhIiJj	**HhIiJj**	HhIiJj	**HhIiJj**
Double Width	**Hh I**	**HhI**	HhI	**Hh I**
Italic	*HhIiJj*	*HhIiJj*	*HhIiJj*	***HhIiJj***
Underline	HhIiJj	HhIiJj	HhIiJj	**HhIiJj**
Superscript	HhIiJj	N/A	HhIiJj	HhIiJj
Subscript	HhIiJj	N/A	HhIiJj	HhIiJj

Table 6-1 **Sample Print Attribute Combinations, Pica Mode (Continued)**

Double Strike	Double Width	Italic	Underline	Superscript	Subscript
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhI	*HhIiJj*	HhIiJj	N/A	N/A
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhI	HhI	*HhI*	HhI	HhI	HhI
HhIiJj	*HhI*	*HhIiJj*	*HhIiJj*	*HhIiJj*	*HhIiJj*
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhI	*HhIiJj*	HhIiJj	HhIiJj	HhIiJj

Table 6-2 **Sample Print Attribute Combinations, Elite Mode**

	Normal	Double Strike	Double Width
Normal	HhIiJj	HhIiJj	HhI
Double Strike	HhIiJj	HhIiJj	HhI
Double Width	HhI	HhI	HhI
Italic	*HhIiJj*	*HhIiJj*	*HhI*
Underline	HhIiJj	HhIiJj	HhI
Superscript	HhIiJj	HhIiJj	HhI
Subscript	HhIiJj	HhIiJj	HhI

Table 6-2 **Sample Print Attribute Combinations, Elite Mode (Continued)**

Italic	Underline	Superscript	Subscript
HhIiJj	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhIiJj	HhIiJj	HhIiJj
HhI	HhI	HhI	HhI
HhIiJj	*HhIiJj*	*HhIiJj*	*HhIiJj*
HhIiJj	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhIiJj	HhIiJj	HhIiJj
HhIiJj	HhIiJj	HhIiJj	HhIiJj

Note: In the FX–80 emulation, it is not possible to modify elite printing with the proportional, condensed, or emphasized mode. Therefore, these modes have not been included in Table 6-2.

Select Elite Mode

Function This sequence switches printing to the elite mode.

Format ESC M

Notes:

1 The elite mode takes priority over the other basic print widths, pica (10 cpi) and condensed. Therefore, if you select the elite, pica, and condensed modes at the same time, only the elite mode will be effective.

2 If you select the elite and proportional attributes at the same time, the proportional mode does not become effective until the elite mode is canceled. You can cancel the elite mode by selecting the pica mode (ESC P).

3 You can use the elite mode with the double-width, super/subscript, emphasized, and underlined attributes.

Select Pica Mode

Function This command cancels the elite printing mode and switches printing to pica. No other print modes or attributes are affected.

Format ESC P

Set Double-Width Printing (Single Line)

Function Use this command to print a single line of expanded characters. Characters print at twice their pica or elite mode widths.

Formats SO
or
ESC SO

Cancel Double-Width Single Line Printing

Function This command cancels double-width single line printing.

Formats DC4
or
ESC DC4

Note: Double-width single line printing (SO or ESC SO) is also canceled by CR, LF, FF, VT, ESC W 0, ESC ! n (SELECT PRINT MODE COMBINATION), and ESC @ (RESET). It is not canceled by line feeds made by ESC J or ESC j. Therefore, only use this command to print a single line of double-width characters. Use the ESC W n command to print multiple lines of double-width characters.

Set/Cancel Double-Width Printing (Continuous)

Function Use this command to activate or cancel continuous double-width printing.

Format ESC W n

Parameter

n - n = 1: Activate continuous double-width printing
n = 0: Cancel continuous double-width printing

Note: This command is not affected by line feeds, form feeds, or other codes that change the vertical location of the active position.

Set Condensed Mode

Function This command compresses text. In this mode, characters print at 17.16 cpi using the Letter Gothic 16.7 EP font. This matches the character spacing used for "compressed" printing with the Epson FX–80.

Formats SI
or
ESC SI

Note: If you select the Letter Gothic 16.7 EP font by pressing the Font Select button, characters are also printed at 17.16 cpi.

Cancel Condensed Mode

Function This command cancels condensed printing and restores printing to whatever current print mode setting has the highest priority.

Format DC2

Notes:

1 You can also cancel condensed printing with the SELECT PRINT MODE COMBINATION (ESC ! n) when the condensed mode bit is set to 0.

2 If you send ESC E, ESC p, or ESC M while the condensed mode is activated, condensed printing stops. Condensed printing becomes effective again (unless canceled by DC2) when the other mode is canceled.

Select/Cancel Emphasized Printing

Function These commands start and end emphasized printing. Characters are printed twice with the smallest possible horizontal space between them. This mode has the same effect on characters as the Diablo 630 emulation "shadow" mode.

Formats

1. ESC E
   This format starts emphasized printing.
2. ESC F
   This format stops emphasized printing.

Note: If the printer receives ESC E while printing in either elite or proportional mode, emphasized printing does not start until the elite or proportional mode is canceled.

Select/Cancel Double-Strike Mode

Function These commands begin and end double-strike, or boldface, printing.

Formats

1. ESC G
   This format starts double-strike printing.
2. ESC H
   This format stops double-strike printing.

Select/Cancel Italic Mode

Function This command starts and stops printing of characters in the italics character set.

Formats

1. ESC 4
   This format starts printing in italics.
2. ESC 5
   This format stops printing in italics.

Start/End Underlining

Function This command activates or cancels automatic underlining of printed text.

Format ESC - n
Note: The "-" is a hyphen (<2D>).

Parameter

n - n = 1: Activate underlining
n = 0: Cancel underlining

Start Superscript/Subscript

Function This command activates superscript or subscript printing.

Format ESC S n

Parameter

n - n = 0: Print superscript text
n = 1: Print subscript text

Cancel Superscript/Subscript

Function This command cancels superscript and subscript printing.

Format ESC T

Note: If you send the ESC T command when neither superscript nor subscript printing is in effect, the command will be ignored.

Set/Cancel Proportional Mode

Function This command activates or cancels proportional printing.

Format ESC p n

Parameter

n - n = 1: Activate proportional printing
n = 0: Cancel proportional printing

Note: If you select the proportional mode while printing in the elite mode, proportional printing does not become effective until the elite mode is canceled.

Select Print Mode Combination

Function This command specifies one or more print modes according to the value specified for n.

Format ESC ! n

Parameter

n - The total of the value(s) for the desired print mode(s) indicated in Table 6-3.

Example To select the elite mode with double-width, italicized printing, add the values for those three modes (1, 32, and 64) and set the value of n to the total (97). In this example, the decimal value 97 has been converted to its hexadecimal equivalent, <61>. The ASCII character assigned to that value is "a."

<1B>	<21>	<61>
ESC	!	a

Table 6-3 **Values for Selecting Print Mode Combinations**

Print Mode	Decimal Value
Underline	128
Italic	64
Double-Width	32
Double-Strike	16
Emphasized	8
Condensed	4
Proportional	2
Elite	1
Pica	0

Note: Modes set by this command take priority over those set by other code sequences.

Bit Image Graphics Commands

Bit image graphics allow you to bypass the printer's character fonts and directly control the settings of individual dots on the page. This section describes the FX–80 emulation mode commands for printing bit image graphics.

When printing in the bit image mode, the binary value of each bit of image data sent to the printer determines the setting of a single dot, with "1" bits printed in black and "0" bits printed in white. Figure 7-1 shows the relationship between the settings of bits in the binary data and the image which is printed.

Figure 7-1 **Relationship Between Bits and Printed Dots**

Byte	1	2	3	4	5	6	7	8	9	
Bit										
7	o	o	o	o	o	o	o	o	o	
6	o	o	o	o	o	o	o	o	o	
5	o	o	o	o	o	o	o	o	o	
4	o	o	o	o	o	o	o	o	o	
3	o	o	o	o	o	o	o	o	o	
2	o	o	o	o	o	o	o	o	o	
1	o	o	o	o	o	o	o	o	o	
0	o	o	o	o	o	o	o	o	o	Dots printed

With the Epson FX–80 printer, the horizontal spacing between dots and the speed of bit image printing depend on which command is used. Densities available are 60, 120, and 240 dots per inch (dpi).

The FX–80 emulation mode supports all of the FX–80 bit image graphics commands, and the bit image graphics printed by your printer in the emulation mode have the same vertical and horizontal dimensions as when they are used with the FX–80 itself. However, there are two significant differences in bit image printing between the Epson FX–80 printer and the emulation mode.

- With the Epson FX–80, each dot appears on the paper as a discrete image. This is not always true when your printer is used in the FX–80 emulation mode. Any vertical or horizontal row of contiguous black dots will print as a bar, rather that as a string of individual dots. Consequently, you cannot vary the apparent density of printed images by varying the dot density.
- With the Epson FX–80, it is not possible to print horizontally adjacent black dots at the higher densities. This restriction does not exist when using your printer in the FX–80 emulation mode.

Six commands are provided for printing bit image graphics at different dot densities. A seventh command changes the densities provided by the others.

Print Bit Image Graphics: Single-Density/Double-Density (Half Speed)/ Double-Density (Full Speed)/ Quadruple-Density

Function

These commands initiate printing in the bit image graphics mode. Table 7-1 shows horizontal dot densities and the maximum number of bytes of graphic data that can be included in a single line with each command.

Table 7-1 **Horizontal Byte Densities and Byte Maximums for Each Bit Image Graphics Command**

ESC K	60 dpi	480 bytes
ESC L	120 dpi	960 bytes
ESC Y	120 dpi	960 bytes
ESC Z	240 dpi	1920 bytes

Format

ESC K n1 n2 *graphics-data* (Single-Density)
ESC L n1 n2 *graphics-data* (Double-Density, half speed)
ESC Y n1 n2 *graphics-data* (Double-Density, full speed)
ESC Z n1 n2 *graphics-data* (Quadruple-Density)

Parameters

n1 and **n2** - A 16-bit hexadecimal number that indicates the number of data bytes to be printed as bit image graphics. n2 is the most significant byte of the number, and n1 is the least significant byte. Therefore, the total number of bytes to be printed as graphic images is equal to (n2 x 256) + n1.

graphics-data - The actual data bytes (as many as are specified by n1 and n2) that tell the printer which dots to print.
Each byte specifies the dot pattern for one vertical column in a graphic image line. There are 8 dots in each column; Bit 7 represents the top dot in each column. Each byte is expressed as a single binary number. The decimal values of each parameter are:

Bit 7 = 128
Bit 6 = 64
Bit 5 = 32
Bit 4 = 16
Bit 3 = 8
Bit 2 = 4
Bit 1 = 2
Bit 0 = 1

For each dot to be printed in a given dot column, add the decimal value for the corresponding bit to obtain the total value for that column's data byte. For example, to print the top dot and the second dot from the bottom, add 128 and 2, and specify the byte as 130 (1000 0010 binary). The value of each byte can range from 0 (no dots printed) to 255 (all dots printed).

Examples

1. The following example uses the ESC K sequence to print five columns of graphic data at a density of 60 dpi. Each column consists of a solid vertical line (1111 1111 binary = 255 decimal = FF hexadecimal). Thus, this command causes the printer to print a bar 1/12 (5/60) inch long. Note that there is no ASCII character assigned to the <FF> value.

```
<1B> <4B>  <05>  <00>  <FF> <FF>
 ESC   K    ENQ   NUL
<FF> <FF>  <FF>
```

2. The following example uses the ESC L sequence to print six columns of graphic data at a density of 120 dpi. Each column consists of alternating black and white dots (1010 1010 binary = 170 decimal = AA hexadecimal). Thus, this command causes the printer to print a bar 1/20 (6/120) inch long. Note that there is no ASCII character assigned to the <AA> value.

```
<1B> <4C>  <06>  <00>  <AA> <AA>
 ESC   L    ACK   NUL
<AA> <AA> <AA>  <AA>
```

3. The following example uses the ESC Y sequence to print seven columns of graphic data at a density of 120 dpi. Alternating columns are either solid black (1111 1111 binary = 255 decimal = FF hexadecimal) or blank (0000 0000 binary = 0 decimal = 00 hexadecimal). Note that there is no ASCII character or control code assigned to the <FF> value.

```
<1B> <59>  <07>  <00>  <FF> <00>
 ESC   Y    BEL   NUL        NUL
<FF> <00>  <FF>  <00>  <FF>
       NUL        NUL
```

4. The following example uses the ESC Z sequence to print seven columns of graphic data at a density of 240 dpi. Alternating columns are either solid black (1111 1111 binary = 255 decimal = FF hexadecimal) or blank (0000 0000 binary = 0 decimal = 00 hexadecimal). Note that there is no ASCII character or control code assigned to the <FF> value.

```
<1B> <5A> <07> <00> <FF> <00>
 ESC   Z   BEL  NUL       NUL
<FF> <00> <FF> <00> <FF>
      NUL       NUL
```

Notes:

1 Dots are vertically spaced 1/72-inch apart, so that each column specified by an eight-bit byte is 8/72 (1/9) inch high. Therefore, it is recommended that you use a 1/9-inch line spacing when printing bit-image graphics. (See Section 4 for details about line spacing.)

2 In this mode, bit image graphics can be printed on the same line with text data. However, if bit image graphics printing reaches the printer's current right margin before the specified number of bytes of data have been printed, graphics data extending beyond the right margin is ignored.

Select Bit Image Graphics Mode

Function This command switches printing to the bit image graphics mode specified by m.

Format ESC * m n1 n2 *graphics-data*

Parameters

m - The bit image graphics mode value.
Table 7-2 shows the bit image mode values as well as their associated densities and the maximum number of bytes of graphic data that can be included in a single sequence. If a value for m other than the one listed is specified, the entire sequence is ignored.

Table 7-2 **Bit Image Graphics Mode Values**

m	Bit Image Graphics Mode	Dots/ inch	Dots/ line
0	Single-density (ESC K)	60	480
1	Double-density, half speed (ESC L)	120	960
2	Double density, full speed (ESC Y)	120	960
3	Quadruple-density (ESC Z)	240	1920
4	CRT graphics	80	640
5	Plotter graphics	72	576
6	CRT graphics II	90	720

n1 and **n2** - A 16-bit hexadecimal number that indicates the number of data bytes to be printed as bit image graphics. n2 is the most significant byte of the number, and n1 is the least significant byte. Therefore, the total number of bytes to be printed as graphic images is equal to (n2 x 256) + n1.

graphics-data - The actual data bytes (as many as are specified by n1 and n2) that tell the printer which dots to print.
Each byte specifies the dot pattern for one vertical column in a graphic image line. There are 8 dots in each column; Bit 7 represents the top dot in each column. Each byte is expressed as a single binary number. The decimal values of each parameter are:

Bit 7 = 128
Bit 6 = 64
Bit 5 = 32
Bit 4 = 16
Bit 3 = 8
Bit 2 = 4
Bit 1 = 2
Bit 0 = 1

For each dot to be printed in a given dot column, add the decimal value for the corresponding bit to obtain the total value for that column's data byte. For example, to print the top dot and the second dot from the bottom, add 128 and 2, and specify the byte as 130 (1000 0010 binary). The value of each byte can range from 0 (no dots printed) to 255 (all dots printed).

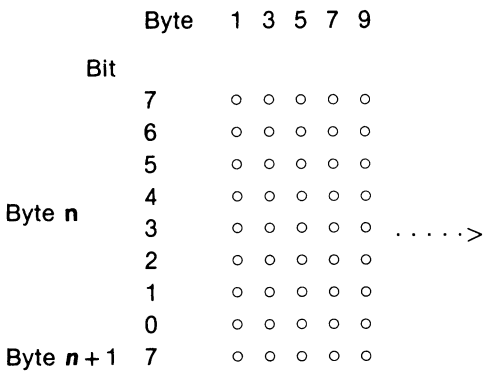
Note: If bit image printing reaches the current right margin before the specified number of bytes of bit image data has been printed, data extending beyond the right margin is ignored.

Print 9-dot Bit Image Graphics

Function

This command switches printing to the 9-dot bit image mode. In this mode, each dot column contains 9 dots, and the settings of the dots in each column are determined by a pair of graphic data bytes. The first byte of each pair determines the settings of the upper 8 dots in the same manner as with the bit image commands described earlier in this section. The second byte of each pair determines the setting of the bottom dot. (Only the most significant bit of the second byte in the pair is effective; bits 0 to 6 are ignored.) Figure 7-2 illustrates this relationship.

Figure 7-2 **Relationship Between Bits and Printed Dots, 9-Dot Mode**



Format ESC — m n1 n2 *graphics-data*

Parameters

m - Density for printing in 9-dot bit image graphics mode.
m = 0: Single-density (60 dpi)
m = 1: Double-density (120 dpi)
If any other value is specified for m, the entire sequence is ignored.

n1 and **n2** - A 16-bit hexadecimal number that indicates the number of bit image graphics columns (**not** the number of bytes, as in 8-dot graphics). n2 is the most significant byte of the number, and n1 is the least significant byte. Therefore, the total number of columns is equal to (n2 x 256) + n1.

graphics-data - The actual data bytes that tell the printer which dots to print. Two bytes specify the dot pattern for one vertical column in a graphic image line. Therefore, there will be twice as many bytes as columns specified by n1 and n2.
There are 9 dots in each column. Bit 7 of the first byte represents the top dot in each column. Bit 7 of the second byte represents the bottom dot of the column; bits 0 to 6 of the second byte are ignored.
Each byte is expressed as a single binary number. The decimal values of each parameter are:

First Byte	Second Byte
Bit 7 = 128	Bit 7 = 128
Bit 6 = 64	
Bit 5 = 32	
Bit 4 = 16	
Bit 3 = 8	
Bit 2 = 4	
Bit 1 = 2	
Bit 0 = 1	

For each dot to be printed in a given dot column, add the decimal value for the corresponding bit to obtain the total value for that column's data byte. For example, to print the top dot and the third dot from the top, add 128 and 32, and specify the byte as 160 (1010 0000 binary). The value of each byte can range from 0 (no dots printed) to 255 (all dots printed).

Example The following example prints five columns of graphic data at a density of 60 dpi. Each column consists of a solid vertical line composed of two bytes. The first byte in each column has a value of 255 decimal (1111 1111 binary = FF hexadecimal). The second byte in each column has a value of 128 decimal (1000 0000 binary = 7F hexadecimal). Thus, this command causes the printer to print a bar 1/12 (5/60) inch long. Note that there are no ASCII characters assigned to the <7F> and <FF> values.

```
<1B> <5E> <00> <05> <00> <FF>
 ESC   ^   NUL  ENQ  NUL
<7F> <FF> <7F> <FF> <7F> <FF>
<7F> <FF> <7F>
```

Change Bit Image Sequence Function

Function This command changes the bit image graphics modes selected by ESC K, ESC L, ESC Y, and ESC Z.

Format ESC ? n1 n2

Parameters

n1 - The mode sequence to be changed.
n1 = K: ESC K
n1 = L: ESC L
n1 = Y: ESC Y
n1 = Z: ESC Z

n2 - The function to be performed according to Table 7-3. If a value other than one shown in Table 7-3 is specified, the entire sequence is ignored.

Table 7-3 **Bit Image Graphics Mode Values**

n2	Bit Image Graphics Mode	Dots/ inch	Dots/ line
0	Single-density	60	480
1	Double-density	120	960
2	Double density	120	960
3	Quadruple-density	240	1920
4	CRT graphics	80	640
5	Plotter graphics	72	576
6	CRT graphics II	90	720

Special Printer Control Commands

This section describes escape sequences that provide special printer controls not described in earlier sections. The first command, RESET PRINTER, returns the printer to its default mode settings. The remaining commands affect the character set used for printing.

Reset Printer

Function This command resets, or initializes, the printer to the default mode settings. If there is any unprinted data in the printer when this sequence is received, the data is printed out before the reset becomes effective.

Format ESC @

Set MSB to 0

Function This commands resets the most significant bit (MSB, that is, bit 7) of all codes received to 0. When printing text in this mode, characters assigned to ASCII codes <01> to <7F> are printed whenever the printer receives codes in the range from <81> to <FF>.

Format ESC =

Note: This mode has no effect on codes received during bit image printing.

Set MSB to 1

Function This command sets the MSB of all codes received to 1. When printing text in this mode, characters assigned to ASCII codes <81> to <FF> are printed whenever the printer receives codes in the range from <01> to <7F>.

Format ESC >

Notes:

1 This mode has no effect on codes received during bit image printing.

2 If this code is sent to the printer after selecting the expanded ASCII code set with ESC 6, all control codes will be disabled. This will make it impossible to control the printer by software.

Cancel MSB Control

Function This command cancels MSB control set with ESC = or ESC >.

Format ESC #

Character Code Set Extension

Function This command makes it possible to print characters assigned to single-byte control codes in the range from 128 to 159 and 255. Control codes and printable characters assigned to those codes are as shown in Appendix B.

Format ESC 6

Note: The characters shown in Appendix B apply only to the printer's internal fonts. Different characters are printed if this command is used while printing with a cartridge font.

Cancel Extended Character Code Set

Function This command cancels the setting made by ESC 6.

Format ESC 7

Select Control Code Function

Function This command makes it possible to print characters assigned to single-byte control codes other than those that activate printer control functions.

Format ESC I n

Parameter

n - n = 1: Print characters assigned to unused control codes (see Appendix B).
n = 0: Ignore these codes.

Notes:

1 The characters shown in Appendix B will print only when this command is used with the FX–80 emulation's internal fonts. Different characters are printed if this command is used while printing with a cartridge font.

2 If the extended ASCII set is selected with ESC 6, characters in the supplementary ASCII set are printed instead of those shown in Appendix B.

Select International Character Set

Function This command prints data using the character set designated by parameter n. When the printer is reset (ESC @), the character set is determined by the "Nationality" mode setting (see Appendix C).

Format ESC R n

Parameter

n - The character set to use for printing.
n = 0: U.S.A.
n = 1: France
n = 2: Germany
n = 3: England
n = 4: Denmark
n = 5: Sweden
n = 6: Italy
n = 7: Spain
n = 8: Japan
If the value specified for n is not in the range from 0 to 10, this command is ignored.
Countries specified by the value of n (from 0 to 10) and the international character sets for those countries are shown in Appendix B.

Note: When italic printing (ESC 4) is enabled, these characters print in italics.

Command Summary

Single-Byte Control Codes	Code
Backspace	BS
Cancel	CAN
Carriage Return	CR
Select Printer	DC1
Cancel Condensed Mode	DC2
Deselect Printer	DC3
Cancel Double-Width Single Line Printing	DC4
Delete	DEL
Form Feed	FF
Horizontal Tab	HT
Line Feed	LF
Null	NUL
Set Condensed Mode	SI
Set Double-Width Printing (Single Line)	SO
Vertical Tab	VT

Page Formatting Commands	Sequence
Set Form Length in Lines	ESC C n
Set Form Length in Inches	ESC C NUL n
Set Left Margin	ESC l n
Set Right Margin	ESC Q n
Set Perforation Skip	ESC N n
Cancel Perforation Skip	ESC O

Paper Feed Commands	Sequence
Set 1/8-inch Line Spacing	ESC 0
Set 7/72-inch Line Spacing	ESC 1
Set 1/6-inch Line Spacing	ESC 2
Set n/216-inch Line Spacing	ESC 3 n
Set n/72-inch Line Spacing	ESC A n
Line Feed	LF
Make n/216-inch Line Feed	ESC J n
Make n/216-inch Reverse Line Feed	ESC j n

Tab Commands	Sequence
Horizontal Tab	HT
Set/Clear Horizontal Tab	ESC D n1 n2 ... nk NUL
Vertical Tab	VT
Set/Clear Vertical Tab	ESC B n1 n2 ... nk NUL
Select VFU Channel	ESC / n
Set VFU Channel Tab Stops	ESC b m n1 n2 ... nk NUL

Word Processing Commands	**Sequence**
Select Elite Mode	ESC M
Select Pica Mode	ESC P
Set Double-Width Printing (Single Line)	SO or ESC SO
Cancel Double-Width Single Line Printing	DC4 or ESC DC4
Set/Cancel Double-Width Printing (Continuous)	ESC W n
Set Condensed Mode	SI or ESC SI
Cancel Condensed Mode	DC2
Select Emphasized Printing	ESC E
Cancel Emphasized Printing	ESC F
Select Double-Strike Mode	ESC G
Cancel Double-Strike Mode	ESC H
Select Italic Mode	ESC 4
Cancel Italic Mode	ESC 5
Start/End Underlining	ESC - n
Start Superscript/Subscript	ESC S n
Cancel Superscript/Subscript	ESC T
Set/Cancel Proportional Mode	ESC p n
Select Print Mode Combination	ESC ! n

Bit Image Graphics Commands	**Sequence**
Print Single-Density Bit Image Graphics	ESC K n1 n2 *graphics-data*
Print Double-Density Bit Image Graphics (Half Speed)	ESC L n1 n2 *graphics-data*
Print Double-Density Bit Image Graphics (Full Speed)	ESC Y n1 n2 *graphics-data*
Print Quadruple-Density Bit Image Graphics	ESC Z n1 n2 *graphics-data*
Select Bit Image Graphics Mode	ESC * m n1 n2 *graphics-data*
Print 9-dot Bit Image Graphics	ESC ^ m n1 n2 *graphics-data*
Change Bit Image Sequence Function	ESC ? n1 n2

Special Printer Control Commands	Sequence
Reset Printer	ESC @
Set MSB to 0	ESC =
Set MSB to 1	ESC >
Cancel MSB Control	ESC #
Character Code Set Extension	ESC 6
Cancel Extended Character Code Set	ESC 7
Select Control Code Function	ESC I n
Select International Character Set	ESC R n

FX-80 Emulation Character Sets

Table B-1 **US ASCII Character Code Table (Primary Set)**

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
00	000	NUL	20	032		40	064	@	60	096	`
01	001	SOH	21	033	!	41	065	A	61	097	a
02	002	STX	22	034	"	42	066	B	62	098	b
03	003	ETX	23	035	#	43	067	C	63	099	c
04	004	EOT	24	036	$	44	068	D	64	100	d
05	005	ENQ	25	037	%	45	069	E	65	101	e
06	006	ACK	26	038	&	46	070	F	66	102	f
07	007	BEL	27	039	'	47	071	G	67	103	g
08	008	BS	28	040	(	48	072	H	68	104	h
09	009	HT	29	041	)	49	073	I	69	105	i
0A	010	LF	2A	042	*	4A	074	J	6A	106	j
0B	011	VT	2B	043	+	4B	075	K	6B	107	k
0C	012	FF	2C	044	,	4C	076	L	6C	108	l
0D	013	CR	2D	045	-	4D	077	M	6D	109	m
0E	014	SO	2E	046	.	4E	078	N	6E	110	n
0F	015	SI	2F	047	/	4F	079	O	6F	111	o
10	016	DLE	30	048	0	50	080	P	70	112	p
11	017	DC1	31	049	1	51	081	Q	71	113	q
12	018	DC2	32	050	2	52	082	R	72	114	r
13	019	DC3	33	051	3	53	083	S	73	115	s
14	020	DC4	34	052	4	54	084	T	74	116	t
15	021	NAK	35	053	5	55	085	U	75	117	u
16	022	SYN	36	054	6	56	086	V	76	118	v
17	023	ETB	37	055	7	57	087	W	77	119	w
18	024	CAN	38	056	8	58	088	X	78	120	x
19	025	EM	39	057	9	59	089	Y	79	121	y
1A	026	SUB	3A	058	:	5A	090	Z	7A	122	z
1B	027	ESC	3B	059	;	5B	091	[	7B	123	{
1C	028	FS	3C	060	<	5C	092	\	7C	124	|
1D	029	GS	3D	061	=	5D	093	]	7D	125	}
1E	030	RS	3E	062	>	5E	094	^	7E	126	~
1F	031	US	3F	063	?	5F	095	_	7F	127	

Table B-2 **US ASCII Character Code Table (Secondary Set)**

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
80	128	NUL	A0	160		C0	192	@	E0	224	`
81	129	SOH	A1	161	!	C1	193	A	E1	225	a
82	130	STX	A2	162	"	C2	194	B	E2	226	b
83	131	ETX	A3	163	#	C3	195	C	E3	227	c
84	132	EOT	A4	164	$	C4	196	D	E4	228	d
85	133	ENQ	A5	165	%	C5	197	E	E5	229	e
86	134	ACK	A6	166	&	C6	198	F	E6	230	f
87	135	BEL	A7	167	'	C7	199	G	E7	231	g
88	136	BS	A8	168	(	C8	200	H	E8	232	h
89	137	HT	A9	169	)	C9	201	I	E9	233	i
8A	138	LF	AA	170	*	CA	202	J	EA	234	j
8B	139	VT	AB	171	+	CB	203	K	EB	235	k
8C	140	FF	AC	172	,	CC	204	L	EC	236	l
8D	141	CR	AD	173	-	CD	205	M	ED	237	m
8E	142	SO	AE	174	.	CE	206	N	EE	238	n
8F	143	SI	AF	175	/	CF	207	O	EF	239	o
90	144	DLE	B0	176	0	D0	208	P	F0	240	p
91	145	DC1	B1	177	1	D1	209	Q	F1	241	q
92	146	DC2	B2	178	2	D2	210	R	F2	242	r
93	147	DC3	B3	179	3	D3	211	S	F3	243	s
94	148	DC4	B4	180	4	D4	212	T	F4	244	t
95	149	NAK	B5	181	5	D5	213	U	F5	245	u
96	150	SYN	B6	182	6	D6	214	V	F6	246	v
97	151	ETB	B7	183	7	D7	215	W	F7	247	w
98	152	CAN	B8	184	8	D8	216	X	F8	248	x
99	153	EM	B9	185	9	D9	217	Y	F9	249	y
9A	154	SUB	BA	186	:	DA	218	Z	FA	250	z
9B	155	ESC	BB	187	;	DB	219	[	FB	251	{
9C	156	FS	BC	188	<	DC	220	\	FC	252	|
9D	157	GS	BD	189	=	DD	221	]	FD	253	}
9E	158	RS	BE	190	>	DE	222	^	FE	254	~
9F	159	US	BF	191	?	DF	223	_	FF	255	0

Table B-3 **Character Set Accessed by ESC 6 (Primary Set)**

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
00	000	NUL	20	032		40	064	@	60	096	`
01	001	SOH	21	033	!	41	065	A	61	097	a
02	002	STX	22	034	"	42	066	B	62	098	b
03	003	ETX	23	035	#	43	067	C	63	099	c
04	004	EOT	24	036	$	44	068	D	64	100	d
05	005	ENQ	25	037	%	45	069	E	65	101	e
06	006	ACK	26	038	&	46	070	F	66	102	f
07	007	BEL	27	039	'	47	071	G	67	103	g
08	008	BS	28	040	(	48	072	H	68	104	h
09	009	HT	29	041	)	49	073	I	69	105	i
0A	010	LF	2A	042	*	4A	074	J	6A	106	j
0B	011	VT	2B	043	+	4B	075	K	6B	107	k
0C	012	FF	2C	044	,	4C	076	L	6C	108	l
0D	013	CR	2D	045	-	4D	077	M	6D	109	m
0E	014	SO	2E	046	.	4E	078	N	6E	110	n
0F	015	SI	2F	047	/	4F	079	O	6F	111	o
10	016	DLE	30	048	0	50	080	P	70	112	p
11	017	DC1	31	049	1	51	081	Q	71	113	q
12	018	DC2	32	050	2	52	082	R	72	114	r
13	019	DC3	33	051	3	53	083	S	73	115	s
14	020	DC4	34	052	4	54	084	T	74	116	t
15	021	NAK	35	053	5	55	085	U	75	117	u
16	022	SYN	36	054	6	56	086	V	76	118	v
17	023	ETB	37	055	7	57	087	W	77	119	w
18	024	CAN	38	056	8	58	088	X	78	120	x
19	025	EM	39	057	9	59	089	Y	79	121	y
1A	026	SUB	3A	058	:	5A	090	Z	7A	122	z
1B	027	ESC	3B	059	;	5B	091	[	7B	123	{
1C	028	FS	3C	060	<	5C	092	\	7C	124	|
1D	029	GS	3D	061	=	5D	093	]	7D	125	}
1E	030	RS	3E	062	>	5E	094	^	7E	126	~
1F	031	US	3F	063	?	5F	095	_	7F	127	

Table B-4 Character Set Accessed by ESC 6 (Secondary Set)

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
80	128	à	A0	160		C0	192	@	E0	224	`
81	129	è	A1	161	!	C1	193	A	E1	225	a
82	130	ù	A2	162	"	C2	194	B	E2	226	b
83	131	ò	A3	163	#	C3	195	C	E3	227	c
84	132	ì	A4	164	$	C4	196	D	E4	228	d
85	133	°	A5	165	%	C5	197	E	E5	229	e
86	134	£	A6	166	&	C6	198	F	E6	230	f
87	135	¡	A7	167	'	C7	199	G	E7	231	g
88	136	¿	A8	168	(	C8	200	H	E8	232	h
89	137	Ñ	A9	169	)	C9	201	I	E9	233	i
8A	138	ñ	AA	170	*	CA	202	J	EA	234	j
8B	139	¤	AB	171	+	CB	203	K	EB	235	k
8C	140	₧	AC	172	,	CC	204	L	EC	236	l
8D	141	Å	AD	173	-	CD	205	M	ED	237	m
8E	142	å	AE	174	.	CE	206	N	EE	238	n
8F	143	ç	AF	175	/	CF	207	O	EF	239	o
90	144	Ş	B0	176	0	D0	208	P	F0	240	p
91	145	β	B1	177	1	D1	209	Q	F1	241	q
92	146	Æ	B2	178	2	D2	210	R	F2	242	r
93	147	æ	B3	179	3	D3	211	S	F3	243	s
94	148	Ø	B4	180	4	D4	212	T	F4	244	t
95	149	ø	B5	181	5	D5	213	U	F5	245	u
96	150	¨	B6	182	6	D6	214	V	F6	246	v
97	151	Ä	B7	183	7	D7	215	W	F7	247	w
98	152	Ö	B8	184	8	D8	216	X	F8	248	x
99	153	Ü	B9	185	9	D9	217	Y	F9	249	y
9A	154	ä	BA	186	:	DA	218	Z	FA	250	z
9B	155	ö	BB	187	;	DB	219	[	FB	251	{
9C	156	ü	BC	188	<	DC	220	\	FC	252	|
9D	157	É	BD	189	=	DD	221	]	FD	253	}
9E	158	é	BE	190	>	DE	222	^	FE	254	~
9F	159	¥	BF	191	?	DF	223	_	FF	255	0

Table B-5 **Character Set Accessed by ESC I (Primary Set)**

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
00	000	à	20	032		40	064	@	60	096	`
01	001	è	21	033	!	41	065	A	61	097	a
02	002	ù	22	034	"	42	066	B	62	098	b
03	003	ò	23	035	#	43	067	C	63	099	c
04	004	ì	24	036	$	44	068	D	64	100	d
05	005	°	25	037	%	45	069	E	65	101	e
06	006	£	26	038	&	46	070	F	66	102	f
07	007	BEL	27	039	'	47	071	G	67	103	g
08	008	BS	28	040	(	48	072	H	68	104	h
09	009	HT	29	041	)	49	073	I	69	105	i
0A	010	LF	2A	042	*	4A	074	J	6A	106	j
0B	011	VT	2B	043	+	4B	075	K	6B	107	k
0C	012	FF	2C	044	,	4C	076	L	6C	108	l
0D	013	CR	2D	045	-	4D	077	M	6D	109	m
0E	014	SO	2E	046	.	4E	078	N	6E	110	n
0F	015	SI	2F	047	/	4F	079	O	6F	111	o
10	016	$	30	048	0	50	080	P	70	112	p
11	017	DC1	31	049	1	51	081	Q	71	113	q
12	018	DC2	32	050	2	52	082	R	72	114	r
13	019	DC3	33	051	3	53	083	S	73	115	s
14	020	DC4	34	052	4	54	084	T	74	116	t
15	021	ø	35	053	5	55	085	U	75	117	u
16	022	¨	36	054	6	56	086	V	76	118	v
17	023	Ä	37	055	7	57	087	W	77	119	w
18	024	CAN	38	056	8	58	088	X	78	120	x
19	025	Ü	39	057	9	59	089	Y	79	121	y
1A	026	ä	3A	058	:	5A	090	Z	7A	122	z
1B	027	ESC	3B	059	;	5B	091	[	7B	123	{
1C	028	ü	3C	060	<	5C	092	\	7C	124	|
1D	029	É	3D	061	=	5D	093	]	7D	125	}
1E	030	é	3E	062	>	5E	094	^	7E	126	~
1F	031	¥	3F	063	?	5F	095	_	7F	127	

Table B-6 **Character Set Accessed by ESC I (Secondary Set)**

Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char	Hex	Dec	Char
80	128	à	A0	160		C0	192	@	E0	224	`
81	129	è	A1	161	!	C1	193	A	E1	225	a
82	130	ù	A2	162	"	C2	194	B	E2	226	b
83	131	ò	A3	163	#	C3	195	C	E3	227	c
84	132	ì	A4	164	$	C4	196	D	E4	228	d
85	133	°	A5	165	%	C5	197	E	E5	229	e
86	134	£	A6	166	&	C6	198	F	E6	230	f
87	135	BEL	A7	167	'	C7	199	G	E7	231	g
88	136	BS	A8	168	(	C8	200	H	E8	232	h
89	137	HT	A9	169	)	C9	201	I	E9	233	i
8A	138	LF	AA	170	*	CA	202	J	EA	234	j
8B	139	VT	AB	171	+	CB	203	K	EB	235	k
8C	140	FF	AC	172	,	CC	204	L	EC	236	l
8D	141	CR	AD	173	-	CD	205	M	ED	237	m
8E	142	SO	AE	174	.	CE	206	N	EE	238	n
8F	143	SI	AF	175	/	CF	207	O	EF	239	o
90	144	$	B0	176	0	D0	208	P	F0	240	p
91	145	DC1	B1	177	1	D1	209	Q	F1	241	q
92	146	DC2	B2	178	2	D2	210	R	F2	242	r
93	147	DC3	B3	179	3	D3	211	S	F3	243	s
94	148	DC4	B4	180	4	D4	212	T	F4	244	t
95	149	ø	B5	181	5	D5	213	U	F5	245	u
96	150	¨	B6	182	6	D6	214	V	F6	246	v
97	151	Ä	B7	183	7	D7	215	W	F7	247	w
98	152	CAN	B8	184	8	D8	216	X	F8	248	x
99	153	Ü	B9	185	9	D9	217	Y	F9	249	y
9A	154	ä	BA	186	:	DA	218	Z	FA	250	z
9B	155	ESC	BB	187	;	DB	219	[	FB	251	{
9C	156	ü	BC	188	<	DC	220	\	FC	252	|
9D	157	É	BD	189	=	DD	221	]	FD	253	}
9E	158	é	BE	190	>	DE	222	^	FE	254	~
9F	159	¥	BF	191	?	DF	223	_	FF	255	0

Table B-7 **Multinational Character Substitutions**

Note: Characters in Table B-7 are accessed with the ESC R command.

Code: Hex:	23h	24h	40h	5Bh	5Ch	5Dh	5E	60h	7Bh	7Ch	7Dh	7Eh
Decimal:	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	$	@	[	\	]	^	`	{	|	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
U.K.	£	$	@	[	\	]	^	`	{	|	}	~
Denmark I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₧	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
Japan	#	$	@	[	¥	]	^	`	{	|	}	~

Mode Setting Table

Table C-1 shows the mode settings that are supported in the Proprinter emulation mode. The procedure for changing mode settings is the same as that used when the printer in the resident Diablo 630 mode. For that procedure, consult the *AP 9215-1 Printer Installation and Operations Guide.*

Table C-1 **Proprinter Emulation Mode Settings**

Mode	Values
Host Interface	Parallel, ACK In Busy Parallel, ACK Out Busy Serial, DTR Serial, DTR + XON/XOFF Serial, XON/XOFF
Emulation Mode	Resident Option
Print Orientation	WP-portrait WP-landscape DP-portrait DP-landscape
Line Termination	CR=CR LF=LF CR=NL LF=LF CR=CR LF=NL CR=NL LF=NL
Current LPI	6 LPI 3 LPI 8 LPI Depends on font
Current CPI	10 CPI 12 CPI 17.1 CPI Depends on font

Current Font	Courier 10 PC Prestige Elite 12 PC Letter Gothic 16.7 PC
Nationality	U.S.A.
Baud Rate	150 baud 300 baud 600 baud 1200 baud 2400 baud 4800 baud 9600 baud 19200 baud
Serial Data Form	7 bits 1 stop none 7 bits 1 stop odd 7 bits 1 stop even 7 bits 1 stop mark 7 bits 1 stop space 7 bits 2 stop none 7 bits 2 stop odd 7 bits 2 stop even 7 bits 2 stop mark 7 bits 2 stop space 8 bits 1 stop none 8 bits 1 stop odd 8 bits 1 stop even 8 bits 2 stop none 8 bits 2 stop odd 8 bits 2 stop even
Serial I/F Mode	Full duplex mode Half duplex mode
Page Origin	Printable area Paper edge
Auto Fullpage	Enable Disable
Zero Font Select	Zero Font Slash Font
Character Set	Character Set 1 Character Set 2

Descriptions of Additional Proprinter Emulation Mode Settings

Those mode settings which are common to both the Proprinter and Diablo 630 emulations are described in the *AP 9215-1 Printer Installation and Operations Guide.* The Proprinter emulation has additional mode settings which emulate DIP switches on the Proprinter. Descriptions of these settings follow.

Auto Fullpage

This setting determines whether printer operation is in the full bit map mode or the partial bit map mode.

When you use partial bit map printing, text data prints faster than in the full bit map mode. However, the size of bit map memory limits the amount of graphics data that you can print in one page.

When you use full bit map printing, there is no limitation on the amount of graphics data that you can include in a given print page. However, total printer memory must be at least 1.5 megabytes.

For full bit map printing select "Enable." For partial bit map printing, select "Disable."

Note: With software packages that print high density graphics, you may lose some data if you do not use the full bit map mode.

Zero Font Select

This setting determines the symbol that is printed when the printer receives the ASCII code for zero (<30>). When set to "zero font," the printer uses normal zeroes (0). When set to "Slash Font," the printer uses slashed zeroes (0).

Character Set

This setting determines the default character set. These character sets are shown in Appendix B.

The ESC 6 and ESC 7 commands override this setting.

set to "Zero Font," the printer uses normal zeroes (0). When set to "Slash Font," the printer uses slashed zeroes (Ø).

Perforation Skip

This setting determines the default perforation skip setting.

When the setting is "Enable," a default perforation skip of one inch goes into effect. When the active position is less than or equal to one inch from the bottom of the form, the printer executes a Form Feed. (The location of the bottom of the form is determined by the Page Origin mode.)

When the setting is "Disable," no perforation skip is in effect. The printer does not execute a Form Feed until the active position passes the bottom of the form.

The SET/CANCEL PERFORATION SKIP commands described in Section 3 override this setting.

Printer Select

This setting determines whether the printer responds to SELECT PRINTER and DESELECT PRINTER commands from the computer. When set to "Enable," the printer will not respond to these commands. When set to "Disable," the printer will respond to these commands.

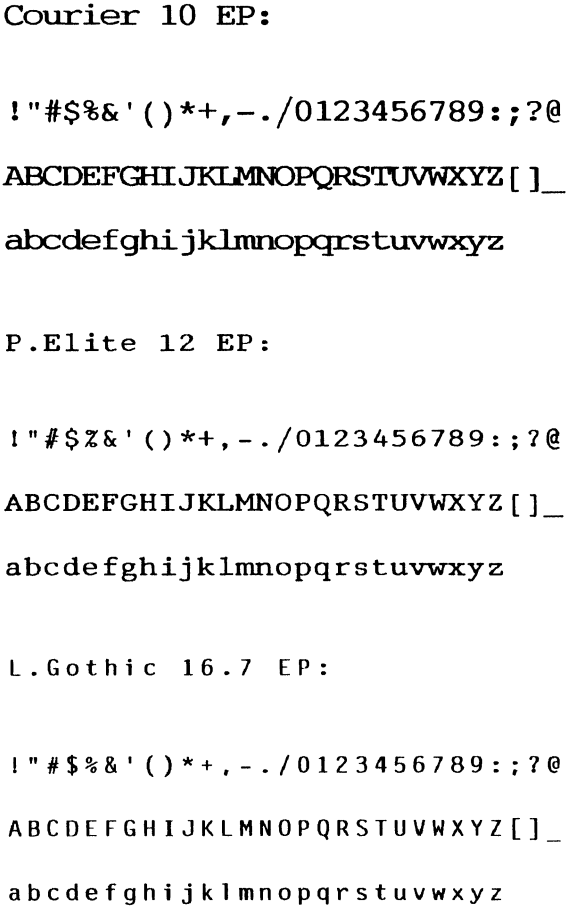
Print Mode

This setting determines the default print mode. When set to "Normal," the default print mode is normal. When set to "Emphasized," the default print mode is emphasized.

The print mode commands described in Section 6 override this setting.

FX-80 Emulation Card Fonts

Figure D-1 **FX-80 Emulation Card Fonts**



Notes:

1 Figure D-1 shows only samples of the FX–80 emulation card fonts and does not include all available characters.

2 The actual fonts on your emulation card may display slight changes in style from the fonts shown here.

Glossary

An acronym or name in parentheses at the beginning of a definition in this glossary indicates the following:

- ANDIPS: The definition is taken from the *American National Dictionary for Information Processing Systems* (American National Standards Committee X3, Information Processing Systems, 1982).
- ISO: The definition is approved by the International Organization for Standardization Technical Committee 97, Subcommittee 1.
- Kroenke: The definition is taken from *Business Computer Systems: An Introduction* by David M. Kroenke (Mitchell: Santa Cruz, California, 1981).

active position (AP). A numerical pointer that at any given time indicates the location of one dot within the maximum printable area.

American Standard Code for Information Interchange (ASCII). An 8-bit code in which seven bits indicate the character and the eighth bit verifies the character's accuracy.

AP. Active position.

ASCII. American Standard Code for Information Interchange (pronounced askey).

Backspace (BS). A single-byte ASCII control code. In the FX–80 emulation, the Backspace moves the active position to the left by the width of the previous character. The corresponding hexadecimal code is <08>.

baud rate. The speed of data transmission from a computer to a peripheral device, such as a printer, or from one device to another, measured in bits per second.

binary. A system of numbers that has two as its base and uses only combinations of the digits zero (0) and one (1).

binary digit. *synonym for* bit.

bit. 1. The smallest unit of information transfer recognized by a computer, having a value of either zero (0) or one (1). Characters are composed of seven or eight bits. 2. (ISO) *Synonymous with* binary digit.

bit image graphics. Graphics produced by controlling the printing of individual dots.

BS. Backspace.

buffer. (Kroenke) An area of printer memory used as a temporary holding place for data.

byte. A computer storage unit equivalent to eight bits (one character) of information.

CAN. Cancel.

Cancel (CAN). A single byte ASCII control code. In the FX–80 emulation, a Cancel deletes all text appearing before it on the line. For example, the string "ABC<18>DEF" will print as "DEF". The corresponding hexadecimal code is <18>.

Carriage Return (CR). A single-byte ASCII control code. In the FX-80 emulation, the Carriage Return moves the active position to the left margin of the same line. If the Line Termination mode has been set for CR=NL, the active position also moves to the next line. The corresponding hexadecimal code is <0D>.

character pitch. In printing, a measure of the number of characters that can fit in an inch. Sometimes referred to simply as "pitch."

character set. A group of characters that are mapped to locations in the printer's memory.

command. An instruction to the printer to perform a specific action.

control code. A single-byte ASCII character that can be embedded in a file to instruct the printer to perform a certain action.

cpi. Characters per inch.

cps. Characters per second.

CR. Carriage Return.

default. A predetermined value the system uses, or action the system takes, unless it receives an instruction to use an alternate value or perform an alternate action.

DEL. Delete.

Delete (DEL). A single-byte ASCII control code. In the FX–80 emulation, a Delete code removes the previous character. For example, the string "ABC<7F>DEF" will print as "ABDEF". The corresponding hexadecimal code is <7F>.

DIP switch. *See* dual inline pack switch.

dpi. Dots per inch.

dual inline pack (DIP) switch. A device found on many printers, including the Epson FX-80, which controls various format and data communications functions. On the AP 9215–1 printer, the functions of the DIP switches are handled by the Mode Set button.

effective printable area. 1. The area on a sheet of paper to which printing is restricted as determined by form length, perforation skip, top of form, and left and right margin settings. 2. *Contrast with* maximum printable area, unprintable area.

elite type. 1. A typeface that prints at 12 characters per inch (12 pitch). 2 *See also* pica type.

emulate. 1. (ANDIPS, ISO) To imitate one system with another, primarily by hardware, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system. 2. Specifically in this manual, to imitate the command set of another printer.

emulation. *See* printer emulation, resident emulation.

emulation card. 1. A small card packaged in plastic which contains the command set of another printer. When the card is installed in the AP 9215-1 printer, it allows the AP 9215–1 to imitate the other printer and use its commands. 2. *See also* printer emulation.

ESC. Escape.

Escape (ESC). A single-byte ASCII control code. In the FX–80 emulation, the escape code initiates an escape sequence. The corresponding hexadecimal code is <1B>.

escape sequence. A series of characters beginning with the control code ESC (<1B>) that activates a printer function.

FF. Form feed.

font. 1. A group of characters (letters, number, symbols, and so on) that share certain characteristics, such as size and style. An example of a font is Courier 10. 2. *See also* typeface, resident font.

Form Feed (FF). A single-byte ASCII control code. In the FX–80 emulation, the Form Feed prints out any data in the printer buffer, ejects the sheet of paper, and advances the active position to the top margin on the next page. If the Line Termination mode has been set for LF=NL, the active position also moves to the left margin. The corresponding hexadecimal code is <0C>.

form length. The total amount of space the printer includes in each printed page. The form length includes the entire area from the top page edge to the bottom page edge.

full duplex. 1. Pertaining to a mode of data communication which allows independent, simultaneous transmission and reception of data. 2. *Contrast with* half duplex.

h. Hexadecimal.

half duplex. 1. Pertaining to a mode of data communication in which transmission is alternating and unidirectional (one way at a time). 2. *Contrast with* full duplex.

hard reset. *Synonym for* reset.

hex. Hexadecimal.

hexadecimal (h or hex). A number based on 16 digits. Hexadecimal means 16: (HEX=6) + (DEC=10). Programmers use hexadecimal numbers as a shorthand method for representing binary numbers. Each four bits of binary is converted to a single hexadecimal digit.

horizontal tab (HT). A single-byte ASCII control code. In the FX–80 emulation, the Horizontal Tab advances the active position to the horizontal tab stop (if any) to the right of its current horizontal position. The corresponding hexadecimal code is <09>.

HT. Horizontal tab.

landscape. 1. In printing, a page orientation in which the lines of type run parallel to the long side of the page. 2. *Contrast with* portrait.

least significant byte. 1. Of a pair of bytes, the one which contributes the lesser value. 2. *Contrast with* most significant byte.

LF. Line feed.

Line Feed (LF). A single-byte ASCII control code. In the FX–80 emulation, the Line Feed moves the active position down by the current line feed pitch. If the Line Termination mode has been set for LF=NL, the active position also moves to the left margin. The corresponding hexadecimal code is <0A>.

line feed pitch. A measure of the number of lines that can be printed in a vertical inch.

lpi. Lines per inch.

maximum printable area. 1. The area on a sheet of paper within which it is physically possible to print. 2. *Contrast with* effective printable area, unprintable area.

monospacing. 1. A method of printing text so that the amount of horizontal space for each character is equal regardless of its width. 2. *Contrast with* proportional spacing.

most significant bit (MSB). In an eight-bit byte, the bit that contributes the most value to the byte (bit 7 if the bits are numbered 0 to 7).

most significant byte. 1. Of a pair of bytes, the one which contributes the greater value. 2. *Contrast with* least significant byte.

MSB. Most significant bit.

NUL. Null.

Null (NUL). A single-byte ASCII control code. The corresponding hexadecimal code is <00>.

orientation. 1. In printing, the way the lines of type appear in relation to the sides of the page. 2. *See also* portrait, landscape.

override. To take precedence over, as when one printer command *overrides* another.

page orientation. *See* orientation.

parameter. A variable or constant value that a system needs to execute and operation.

perforation skip. In printers which use fanfold (continuous) paper, the distance between the last print line on one page and the first print line on the next. The printer uses this measurement to skip over the perforations between the sheets of paper. In the FX-80 emulation for the AP 9215-1 laser printer, this distance marks the bottom margin.

pica type. 1. A typeface that prints at 10 characters per inch (10 pitch). 2. *See also* elite type.

pitch. *See* character pitch, line feed pitch.

point. In printing, a unit of measure equal to 1/72 inch.

portrait. 1. In printing, the page orientation in which the lines of type run parallel to the short side of the page. 2. *Contrast with* landscape.

primary character set. 1. Generally, characters located at hexadecimal code positions <20> through <7F>. The primary character set usually consists of the standard alphabet in both upper and lower case letters, the numbers 0 through 9, and standard symbols, such as the asterisk (*) and ampersand (&). 2. *Contrast with* secondary character set.

printable area. 1. The rectangular portion of a sheet of paper that is able to receive print. In the AP 9215-1 printer, the printable area is less than the full paper size to allow for differences in mechanical tolerances in the print engine (registration and skew) and for sheet to sheet variations in the paper itself. 2. *See also* effective printable area, maximum printable area, unprintable area.

printer emulation. 1. A program which allows one printer to imitate another. 2. *See also* resident emulation.

proportional spacing. 1. A method of printing text so that the amount of horizontal space for each character is proportional to its width. For example, more space is allotted to the letter W than the letter I. 2. *Contrast with* monospacing.

reset. 1. In this manual, to restore all printer modes and settings to the values they hold when the printer's power is turned on. 2. *Synonymous with* hard reset.

resident emulation. 1. The command set that comes with the printer. For the AP 9215-1, the resident emulation imitates a Diablo 630 printer. 2. *See also* printer emulation.

resident font. 1. A font that is provided in the memory of the printer or printer emulation. 2. *See also* font.

secondary character set. 1. Generally, characters located at hexadecimal code positions <A0> through <FF>. The more unusual symbols, accents, and diacritical marks are usually in the secondary character set. 2. *Contrast with* primary character set.

Shift In (SI). A single-byte ASCII control code. In the FX–80 emulation, this code instructs the printer to print compressed text at 17.16 characters per inch (cpi) using the Letter Gothic 16.7 font. The corresponding hexadecimal code is <0F>.

Shift Out (SO). A single-byte ASCII control code. In the FX–80 emulation, this code instructs the printer to print a single line of characters at twice their Pica or Elite mode widths. The corresponding hexadecimal code is <0E>.

SI. Shift In.

SO. Shift Out

text length. The number of lines that can be printed between the top margin and the point at which printing moves to the next page.

top of form position. The amount of space the printer skips at the top of each page.

typeface. 1. A group of characters (letters, numbers, symbols, and so on) that share certain design characteristics. Courier is an example of a typeface. 2. *See also* font.

unprintable area. 1. The area on a sheet of paper within which it is impossible to print. This area allows for differences in mechanical tolerances in the print engine (registration and skew) and for sheet to sheet variations in the paper itself. 2. *Contrast with* effective printable area, maximum printable area.

Vertical Format Unit (VFU) channels. In the FX-80 emulation, a means of storing vertical tab stop settings for a particular format.

Vertical Tab (VT). A single-byte ASCII control code that advances the active position to the left margin of the line containing the first vertical tab stop (if any) following the current active position. The corresponding hexadecimal code is <0B>.

VFU channels. Vertical Format Unit channels.

VT. Vertical tab.

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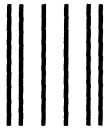

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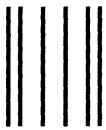

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