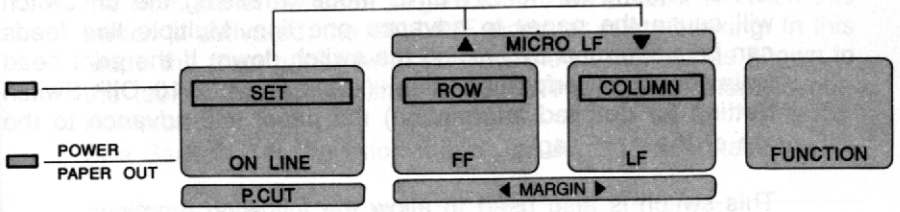
3. Operation

3.1 Front Panel Switches



ON LINE Switch

The ON LINE switch opens and closes the communication lines with the computer. When the power switch is turned on and paper is installed, the printer will power up in the ON LINE mode, and the ON LINE indicator light will be lit. The printer can be switched between the ON LINE and OFF LINE modes by pressing the ON LINE switch.
In the ON LINE mode, the printer is able to receive information from the computer and the ON LINE indicator will be lit. In the OFF LINE mode, the indicator light will be out and the printer can no longer receive data.

This switch is also used in the following functions:

1. **MICRO LINE FEED**
   In the OFF LINE mode or when the printer is not printing in the ON LINE mode, MICRO LINE FEED can be performed by pressing the LF or FF switch while pressing the ON LINE switch. (See LF and FF switch for detailed information.) This is very useful when setting Top of Form with custom forms.

2. **P. CUT**
   The PERFORATION CUT function can be performed with the FUNCTION switch.
   See page 3-3 "PERFORATION CUT" for detailed information.

LF (Line Feed) Switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. Pressing the LF switch will cause the paper to advance one line. Multiple line feeds can be performed by holding the switch down. If the print head is in the skip perforation area, (see Section 2.10 DIP Switch Setting for detailed information) the paper will advance to the top of the next page.

This switch is also used to allow the following functions:

1. **REVERSE MICRO LINE FEED**
   In the OFF LINE mode and when the printer is not printing in the ON LINE mode, REVERSE MICRO LINE FEED can be performed by pressing the LF switch while pressing the ON LINE switch.
2. **Moves carrage toward right**
   In the Function mode, the carriage is move to the right by pressing the LF switch. See Section 3.2 "Function Mode" for detailed information.

FF (Form Feed) Switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. When you press the FF switch, the print head moves to the center and the paper is advanced from its current location to the top of the next page. Then a new top of form is established.

This switch is also used to allow the following functions:

1. **FORWARD MICRO LINE FEED**
   In the OFF LINE mode or when the printer is not printing in the ON LINE mode, FORWARD MICRO LINE FEED can be performed by pressing the FF switch while pressing the ON LINE switch.
2. **Moves carrage toward right**
   In the Function mode, the carriage is move to the left by pressing the FF switch. See Section 3.2 "Function Mode" for detailed information.

FUNCTION Switch

This switch is an alternate switch and used in conjunction with the front panel switches to give them new functions. When this switch is activated, the ON LINE indicator starts blinking. In this mode the front panel switches have new functions as shown in the table below. Press the FUNCTION switch to return to normal mode.
See Section 3.2 "Function mode" for detailed information.

Panel Switch	Alternate Function
LF (COLUMN)	• Advance the Control Table Column position. • Moves carriage toward right.
FF (ROW)	• Advance the Control Table Row position. • Moves carriage toward left.
ON LINE (SET)	• Sets the Control Table position. • PERFORATION CUT*.

* P. CUT (PERFORATION CUT)

The PERFORATION CUT function can be performed with the printer in either OFF LINE or not printing in the ON LINE mode, by pressing the ON LINE switch after the FUNCTION switch. Additionally, the following conditions must be met.

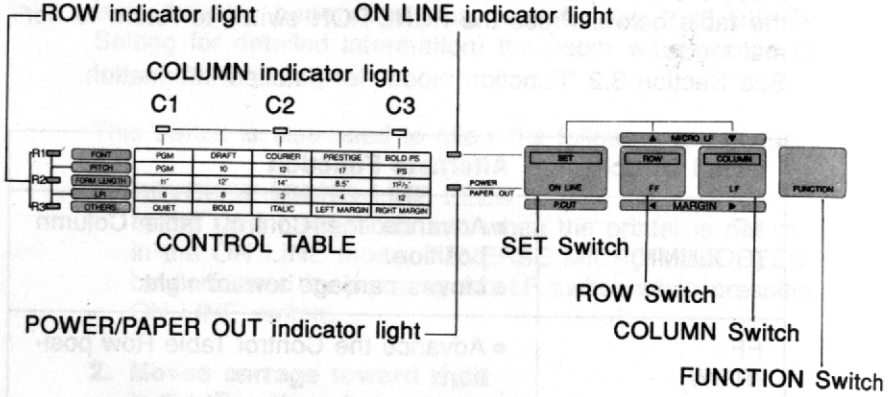
–Paper feed selector is in the "T" position, and the paper is installed from rear.
–Printer is not accepting data in the receive buffer.

Pressing FUNCTION switch again resets the printer to the condition it was in before the FUNCTION switch was initially pressed.

Note:
- The PERFORATION CUT function is available only when the paper feed selector is in "T" position and the paper is installed from rear. If you install the paper from bottom with "T", the printer will not be able to accept the paper correctly.

3.2 Function Mode

To enter the Function mode, turn the power ON and press the FUNCTION switch. The ON LINE indicator will start blinking. In this mode, the front panel switches have new functions.



Setting the EZ-Set Operator Panel

ROW Switch (FF Switch)

In Function mode, pressing this switch will cause the Control Table's current row position to advance one row (shown by indicators R1, R2, R3). This switch is usable in all modes except printing. Refer to the table on next page.

COLUMN Switch (LF Switch)

In Function mode, pressing this switch will cause the Control Table's current column position (shown by indicators C1 to C3) to advance to the next column. Refer to the table on next page.

SET Switch (ON LINE Switch)

In Function mode, pressing this switch sets the current Control Table position item.

Note:
- The FUNCTION switch is not usable when the printer is printing.

In the Function mode, the ROW indicator lights and COLUMN indicator lights on the front panel indicate the Control Table condition. The COLUMN indicator blinks to show the position of the function, and when SET is pressed, the column indicator lights continuously. When two of the COLUMN indicator lights are on at the same time, it designates the column between active lights, as shown in table below.

Selects type	ROW lights
FONT	R1 ON R2 ■ R3 ■
PITCH	R1 ON R2 ON R3 ■
FORM LENGTH	R1 ■ R2 ON R3 ■

Selects type	ROW lights
LPI	R1 ■ R2 ON R3 ON
OTHERS	R1 ■ R2 ■ R3 ON
PANEL STATUS PRINT	R1 ON R2 ON R3 ON

COLUMN lights				
C1 C2 C3 ON ■ ■	C1 C2 C3 ON ON ■	C1 C2 C3 ■ ON ■	C1 C2 C3 ■ ON ON	C1 C2 C3 ■ ■ ON
PGM*	DRAFT	COURIER	PRESTIGE	BOLD PS
PGM*	10cpi	12cpi	17cpi	P.S
11"*	12"	14"	8.5"	11 2/3"
6*	8	3	4	12
QUIET	BOLD	ITALIC	LEFT MARGIN	RIGHT MARGIN

ON = ON ■ = OFF

Notes:
- * is initial setting when printer switched ON.
- COLUMN indicator lights will not reflect printer conditions set by software override.
- Other initial settings when printer switched ON:
  - Quiet mode ... OFF
  - Bold ... OFF
  - Left margin ... 0 column (10 cpi)
  - Italic ... OFF
  - Right margin ... 80 column (10 cpi)

Selecting the Print Font, Print Pitch, Form Length, LPI and Bold or Italic print

To select or change font, pitch, form length, lines per inch, bold or italic print, use the ROW switch to select the appropriate row. Then press the column switch to advance the column position to the desired one. Pressing the SET switch makes the actual selection.

Note:
- In Draft Download font and 12 Dot Graphic font, the italic print is ineffective.
- Font and Pitch selections through software commands are effective only when the printer is in the PGM mode.
- The setting of Form Length and LPI also can be changed through software commands, which override the Control Table settings. Changes through software commands will not be reflected through the Control Table indicators.

Setting/Releasing the Quiet mode

The Quiet mode is used to reduce the printing noise. When the Control Table is in the 5th ROW position and the column position is in the quiet mode, the SET switch is an alternate action switch which sets and releases Quiet mode. A blinking light indicates Quiet mode is not in effect.

Setting the LEFT/RIGHT MARGIN

When the Control Table is in the LEFT or RIGHT MARGIN position, pressing SET switch load the printer to enter the MARGIN Set Mode. The LF, FF and SET switch has the following functions.

Panel switch	Function
LF (COLUMN)	Moves carriage toward right
FF (ROW)	Moves carriage toward left
ON LINE (SET)	Sets left/right margin position

In this mode, press and hold down the LF or FF switch to move the carriage to a desired right or left margin position. Press the SET switch to set the left or right margin and exit the Margin Set Mode.

Note:
- You can set either left or right margin first.
- When the carriage is moved by using LF and FF switches, if it reaches the end of the platen, the carriage will move rapidly to the opposite side.
  This is helpful in moving the carriage to the second margin position when the first is far from it.
- Settings can be changed through software commands.

MEMO LOAD

This printer can use single sheets, envelopes and continuous fanfold paper. You can insert a single sheet or envelope without removing the continuous paper:

1. First, tear off the printed pages of the continuous fanfold paper. Verify paper feed selector is in "T" position.
2. Turn the power ON and press the FUNCTION switch. The ON LINE indicator will start blinking. This indicates the printer is in Function mode.
3. Pull the paper bail lever toward you. The continuous fanfold paper will go back partway and stop. The ON LINE indicator will stop blinking and the printer automatically goes back to normal mode.
4. Move the paper feed selector to "F" position.
5. Raise the top cover and insert the single sheet behind the platen. Use the markings and paper guide on the top cover as a guide.
6. Pull the paper bail release lever toward the front of the printer to wrap the paper automatically around the platen.
7. Press down and hold the Line Feed switch (LF) or rotate the platen knob to advance the paper.
8. To align the paper horizontally or vertically, set the PAPER FEED selector to the "T" position. This releases the pinch rollers and allows the paper to be positioned manually as required. Set the selector back to "F" before printing . Then push the paper bail release lever toward the rear.

Now you can print on the single sheet.

When printing on the single sheet is done, remove it by rotating the platen knob or pulling the paper bail release lever. Move the paper feed selector to "T" position and pull the paper bail release lever toward you to advance fanfold paper to the print start position.

3.3 Detectors

Out of Paper Detector

The out of paper detector is located under the platen and senses the absence of paper. When an out of paper condition occurs, printing stops, the printer goes to the OFF LINE mode, the PAPER OUT light starts blinking.To continue printing to the end of current page when out of paper condition occurs, press the ON LINE switch repeatedly until the page is completed. To start printing the next page, install new paper and press the ON LINE switch. The printer will resume printing.

Note:
- The out of paper detector can be disabled by a software command.

Overheat Detector

If the printer is printing continuously for extended periods of time, the print head may become overheated. When this occurs, an internal protective circuit will cause the printer to pause until the head temperature decreases sufficiently, at which time the printer will automatically resume printing without loss of data. This feature is included to extend the life of the print head.

3.4 Initialization

The printer is initialized under the following conditions:

the AC power is turned ON
the $\overline{\text{PRIME}}$ signal is received
the RESET command is received

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

- the print buffer is cleared
- the receive buffer is cleared (Except RESET PRINTER command)
- the download character buffer is cleared by a $\overline{\text{PRIME}}$ signal in Standard Mode. The download character buffer is not affected by $\overline{\text{PRIME}}$ in IBM Mode or RESET PRINTER command in Standard Mode.
- the DIP switches are read and printer modes set (Except RESET PRINTER command)
- horizontal tabs are set every 8 columns
- vertical tab settings are cleared
- all modes set by control and escape commands will be cleared (Except download font and NLQ selected by IBM Mode in $\overline{\text{PRIME}}$ signal)
- present form position is designated as top of form
- the Self Test mode is cleared
- the Control Table settings are read and set (Control Table settings are not changed by $\overline{\text{PRIME}}$ signal or RESET PRINTER command*)
- the print head goes to the home position (Except RESET PRINTER command)

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

3.5 Hex. Dump

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

4. Software Introduction

4.1 Introduction

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

$(01001011)_2$–Binary
$4B_{HEX}$, $4B_H$–Hexadecimal
75_{DEC}, 75_D–Decimal

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

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

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

4.2 Control Codes

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

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

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

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

4.3 Entering Control Codes through Commercial Software Packages

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

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

- Brand/Model of printer being used.
- I/O port being used (e.g.: LPT1:)
- Baud rate, parity, etc. if a serial interface is being used.

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

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

4.4 Entering Control Codes Directly from the Keyboard

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

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

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

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

- Have you indicated to the computer that output is to the printer and not the screen? For example, PR#1, causes subsequent PRINT statements on the Apple computer to PRINT to the printer and not the screen. LPRINT does the same in Microsoft BASIC.
- Is the printer on line? If not, press the green ON LINE button on the front panel.
- Is the interface cable plugged into the computer and printer?
- When using a serial interface, all settings (baud rate, protocol, etc.) on the printer the same as on the computer?

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

4.5 Entering Control Codes from Within a Program

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

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

```
50 LPRINT CHR$(15)
```

Chapters will show you how to enter each of the control commands which this printer uses.

4.6 Entering Hexadecimal Code

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

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

Refer to Appendix A.

4.7 Control Codes

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

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

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

The table on page 4-6 "Input Format" shows equivalent methods of entering multi-byte control commands for most computers.

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

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

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

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


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

	Two-Byte Command
Function	Set Pica Pitch
Name	ESC+P
Code	27,80$_{DEC}$
Input Format 1	LPRINT CHR$(27)+CHR$(80);
Input Format 2	LPRINT CHR$(27);CHR$(80);
Input Format 3	LPRINT CHR$(27)CHR$(80);

	Three-Byte Command
Function	Set Double Width Printing
Name	ESC+W+1
Code	27,87,1$_{DEC}$
Input Format 1	LPRINT CHR$(27)+CHR$(87)+CHR$(1);
Input Format 2	LPRINT CHR$(27);CHR$(87);CHR$(1);
Input Format 3	LPRINT CHR$(27)CHR$(87)CHR$(1);

Input Formats

This printer has two print modes. They are Epson FX-86e/FX-800 and IBM Proprinter II. Software commands of each mode are covered in the corresponding chapter.

4.8 Special Code for IBM PC series

Since LPRINT command on IBM PC generates LF together with CR, PRINT #1 instead of LPRINT is used to prevent this, and the following two lines of BASIC program are necessary at the top of a program. For details refer to your BASIC manual.

```
10 WIDTH "LPT1:", 255
20 OPEN "LPT1:" AS #1
```

PRINT #1 does not generate CR and LF, therefore a CR and LF must be used when they are required.