

USER'S MANUAL

SB-10

by

Star Micronics

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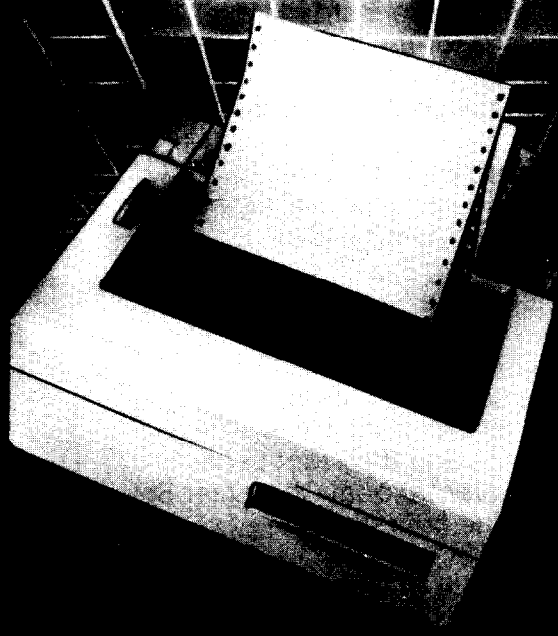
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INTRODUCTION

Congratulations for choosing this printer, one of the finest available at any price. Your new printer will reward you with many years of high-quality document printing, and is backed by Star Micronics' more than 30 years in manufacturing precision parts. You already know that it represents the state of the art in tack-sharp dot matrix printing with its rugged 24-pin print head. Its bidirectional, logic-seeking operation gives you letter-quality hardcopy at 54 cps, and draft-quality print at speeds of up to 144 cps.

Its many features include:

- High-resolution graphics
- Built-in expandable buffer
- An entire range of character sets for printing in eight languages
- A host of specialized printing capabilities found in only the finest printers

And, best of all, your new printer is compatible with the most popular personal computers and software packages—so no matter how sophisticated your applications become, it will continue to meet your needs.

These are just a few of the reasons you chose a product by Star Micronics, one of the most respected names in dot matrix printers. We want you to get the most from your printer with the least effort on your part, so please take a few minutes to read this easy-to-understand guide. You'll find that it will help you produce crisp, clean documents in the shortest time possible.

You will also find that this printer is remarkably simple to set up and operate, and that it's virtually maintenance-free. Enjoy your new Star Micronics printer!

SECTION

1

SETTING UP YOUR PRINTER

WHAT THIS SECTION SHOWS YOU:

- *The Complete Printer Package*
 - *How To Assemble the Printer for Operation*
 - *Features of the Printer*
 - *Dual In-Line Package (DIP) Switches*
 - *How to Load Paper Into the Printer*
 - *How to Print the Self-Test*
-

As you unpack your new printer, please take special care to verify the complete contents of the printer package:

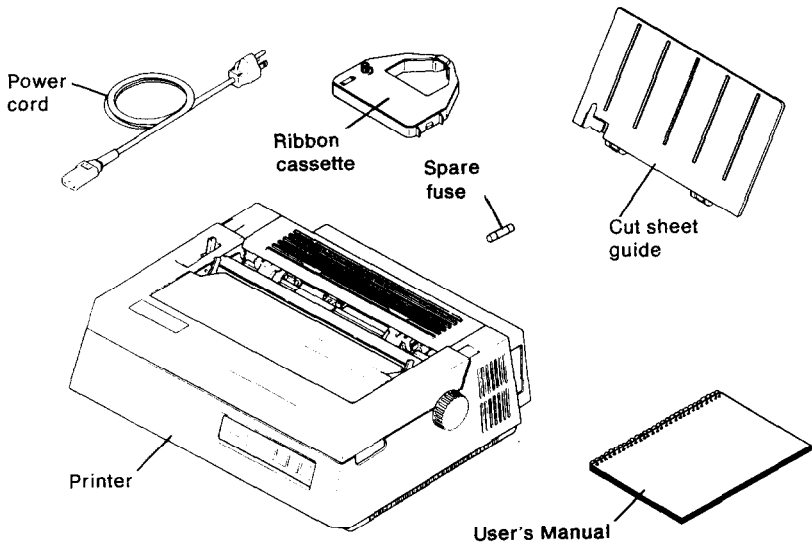


Figure 1-1. The complete printer package

You'll find your Star Micronics warranty and registration card with this book. Please read the warranty carefully, and mail us the completed registration card as soon as possible. We place a high value on the information only you can provide.

This printer has been precision-packed to ensure its arrival in perfect working order. Lift the front cover, and you'll find the packing material used to protect it during shipment. Be sure to remove this interior packing material from the carriage stay before you assemble the printer.

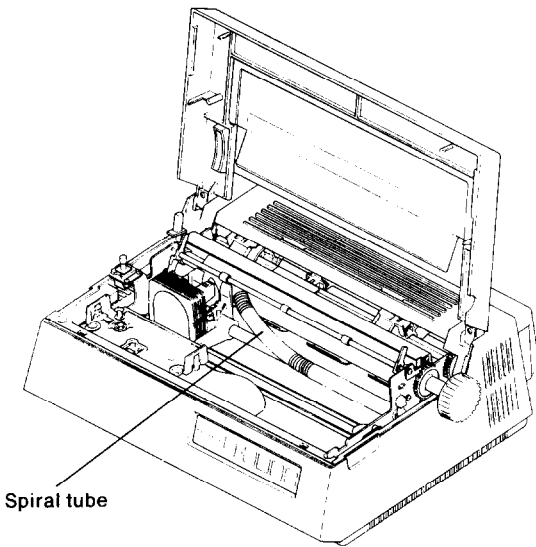


Figure 1-2. Interior packing material.

■ **PLACEMENT OF THE PRINTER**

To ensure the long life and proper operation of your printer, please consider the following suggestions when you select a location near the computer.

- Place the printer on a flat, stable surface.
- Avoid direct sunlight or indoor heat sources; as a general rule, use it only in an environment where you are comfortable.
- Be sure the area is free from dust, dirt, and excess humidity.
- Provide a power source with the correct voltage (there should be no more than 10% variance above or below the voltage specified on the printer's identification plate.)
- Don't plug any other appliances into the outlet occupied by the printer (except the computer).

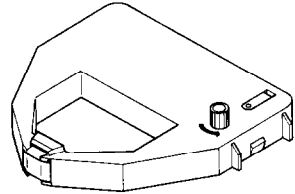
■ HOW TO ASSEMBLE THE PRINTER

Now you're ready to set up your printer for operation. Make sure the printer is turned off before you begin.

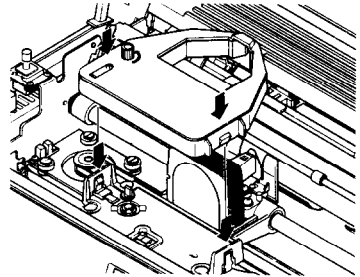
Load the ribbon cassette:

Loading and replacing the one-piece ribbon cassette is a simple and clean procedure:

Turn the knob on the cassette counter-clockwise to tighten the ribbon.



Snap the cassette onto the carriage, as shown in the illustration.



Check to make sure the ribbon lies flat between the print head and the print mask. Again, turn the knob to take up any slack.

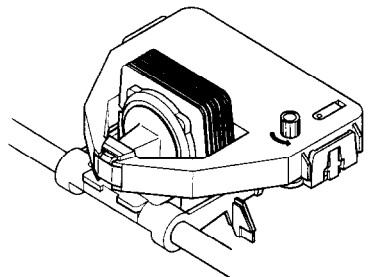


Figure 1-3. Loading the ribbon cassette.

Your printer has been supplied with an extended-use multistrike ribbon cassette. Because this type of ribbon has no end detector, we suggest that you replace it whenever the print quality becomes faded or uneven.

NOTE: Always make sure the printer is off before removing or replacing the ribbon cassette. If the printer has been in operation, be careful not to touch the print head or metal housing on the carriage—they will be very hot. Use both hands to remove the cassette, grasping it by the edges.

Attach the cut sheet guide:

This plastic guide is used to feed single-sheet paper or business forms into the printer. (If you are using perforated “tractor-feed” paper, you won’t need it at this time.)

To attach the guide, insert its two tabs into the notches on the back cover of the printer.

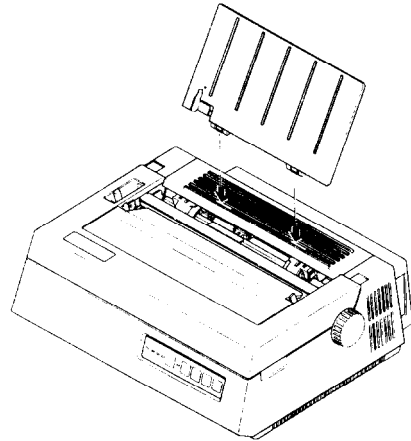


Figure 1-4. Assembly of the cut sheet guide.

Connect the power cord to the printer:

Begin by inserting the cord into the three-prong connector on the back of your printer.

NOTE: Make sure the power switch is off before connecting the power cord to a wall outlet.

Plug the power cord into your 120 VAC power source. We highly recommend that you use a surge protector between the printer and power source. This simple device—available at your local computer store—prevents any potentially damaging fluctuations from reaching

your printer. If you're not using a surge protector, make sure that your printer and computer are the only devices plugged into the AC outlet.

■ FEATURES OF THE PRINTER

The simple steps you've just performed have readied the printer for operation. Before you turn on the printer, take a few minutes to become familiar with its features.

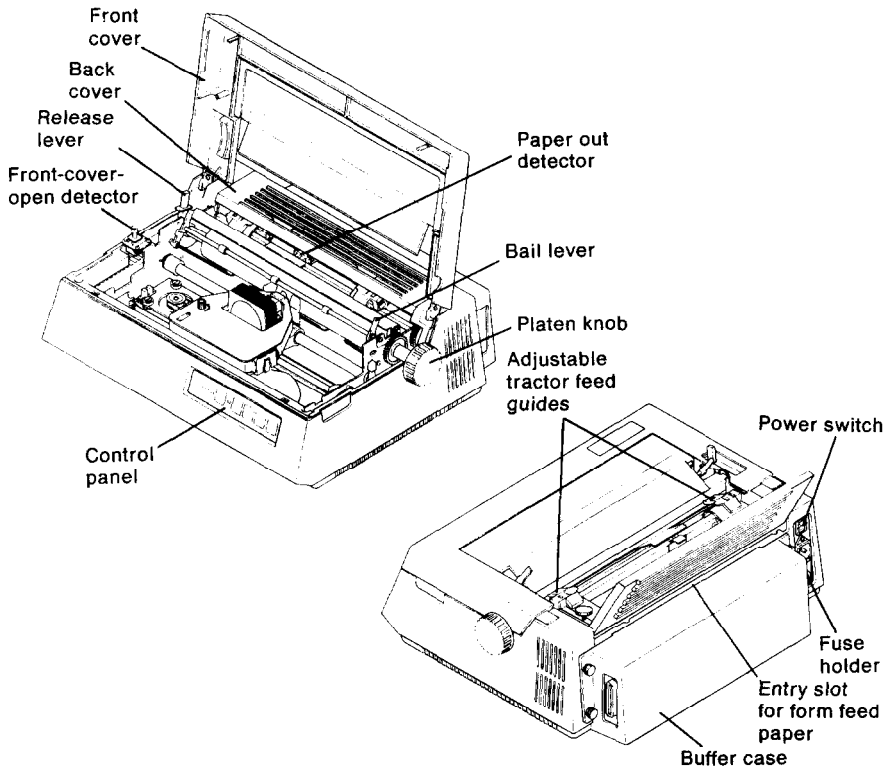


Figure 1-5. Features of the printer

Release lever: Adjusts tension on paper. Has two settings: "friction" (closed) for single sheets and "tractor" (open) for form feed paper.

Paper out detector: Sounds alarm and puts printer into "Pause" mode when it senses end of paper during operation. Adjust DIPswitch 1-1 to the OFF setting to override this function.

Bail lever: Opens and closes paper bail.

Back cover: Flips open to access built-in tractor feed mechanism.

Platen knob: Allows manual adjustment of paper against platen.

Control panel: Contains indicators and touch controls to monitor and operate printer (see Figure 1-6).

Front cover: Protects interior mechanisms and reduces noise. (Must be closed before printer will operate.)

Front cover open detector: Puts printer into "Pause" mode when cover is opened during operation.

Power switch: Turns printer on or off.

Fuse holder: Contains 5MT 2 amp fuse.

Buffer case: Contains optional buffer and parallel or serial interface.

Interface connector: Connects cable (parallel or serial, depending on configuration) to your computer.

Entry slot for form feed paper: Feeds paper to the tractor feed guides.

Adjustable tractor feed guides: Directs form feed paper to the platen.

■ THE CONTROL PANEL

Now take a closer look at the control panel on your printer. This panel contains all the controls and indicators you will need for the routine operation and monitoring of the printer

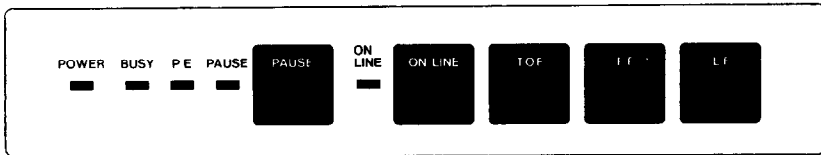


Figure 1-6. The printer control panel.

Power lamp: Glows green to indicate power on.

Busy lamp: Indicates buffer is temporarily full, and printer is unable to accept new data. Light goes out when buffer has cleared all stored information. Your computer should automatically send new data to the printer.

Paper empty (PE) lamp: Signals you to add paper. Printer stops when paper runs out, and resumes printing at the same location after new paper is added.

Pause lamp: Indicates pause button has been activated or front cover has been opened. Printing resumes when condition is cleared.

Pause button: Pressing this button interrupts printing. This feature is useful for inserting or adjusting paper, replacing the ribbon cassette or checking printed copy while a page is in progress. Press this button a second time to reactivate printer.

On line lamp: This lamp glows green, when the printer is "on-line" and ready to accept data transmissions from the computer.

On line button: When "on-line" the printer will accept data and instructions from your computer. The TOF, FF and LF switches are inoperative while the printer is on-line. When "off-line" data transmissions are disabled and the control panel switches are enabled.

Top of form (TOF) button: Used to set the starting point for single-sheet or form feed paper.

Form feed (FF) button: Used to manually advance form feed paper.

Line feed (LF) button: Press to advance paper one line at a time. Press and hold to advance paper continuously.

■ DUAL IN-LINE PACKAGE (DIP) SWITCHES

In addition to the features you have just seen, your printer also has 18 Dual In-line Package (DIP) switches to help determine the way it handles information from your computer. Before examining the DIP switches, turn off the printer.

To find the DIP switches, lift the cover and manually move the carriage to the far left. On the right-hand side of the printer's interior you'll see a small rubber cover. Carefully pull the cover back; the DIP switches are directly below it. These switches are preset at the factory, so please leave them in their present position for the time being.

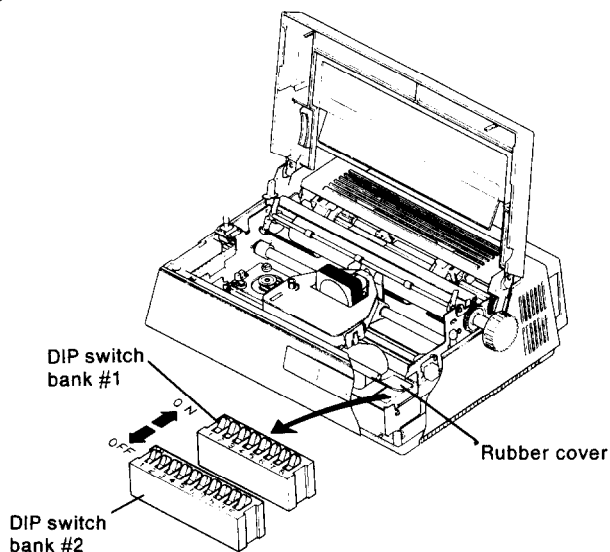


Figure 1-7. Dual In-line Package (DIP) Switches.

The DIP switches are used to control the many functions of your printer, including:

- Character pitch
- Form length
- Line spacing
- Paper-out detector

- Letter-quality/draft-quality print selection

- International Character Sets

Throughout this manual, we'll show you how to use these switches to tailor the printer's printing to your exact specifications. (For more information on the positioning of the DIP switches, please see Appendix D.)

■ HOW TO LOAD PAPER INTO THE PRINTER

As you become acquainted with your printer, you'll appreciate it more and more for the conveniences it offers you—especially its ability to accept single-sheet and form-feed paper without requiring any external devices. Read on, and you'll discover how to use both kinds of paper in it.

Single-sheet loading:

This printer is designed to print on standard-size stationery, multilayer business forms, and almost any other kind of cut-sheet paper. We'll show you how to load paper of varying thicknesses later in this section. For now, all you need is a standard 8 1/2-by-11-inch sheet of paper.

- If you haven't installed the cut-sheet guide yet, please do it now. (Please refer to Fig.1-4.)
- You can use the adjustable metal slide on the paper guide to set your left margin. The positions are as follows:

Table.1-1 Slide positions for determining the left margin

SLIDE POSITION	PRINT DISTANCE FROM LEFT MARGIN
left edge	.64 in.
center	.25 in.
right edge	.05 in.

When you have set the metal slide for the margin you want, you're ready to insert the paper.

- Turn the power switch off.
- Open the paper bail by pulling the lever toward you.
- Insert a sheet of paper straight down into the printer, turning the platen knob clockwise (away from you). Open the cover and roll the paper onto the platen.
- Close the paper bail by pushing the lever away from you.
- Close the cover and align the top edge of the paper with the cutting edge of the shield. Turn the printer on.

When the paper is in this position, printing begins at about 2 inches from the top of the page. You can adjust the start-point as you wish, by using the Line Feed button to advance the paper one line at a time. Remember to first put the printer into the "Pause" mode by pressing the "Pause" button.

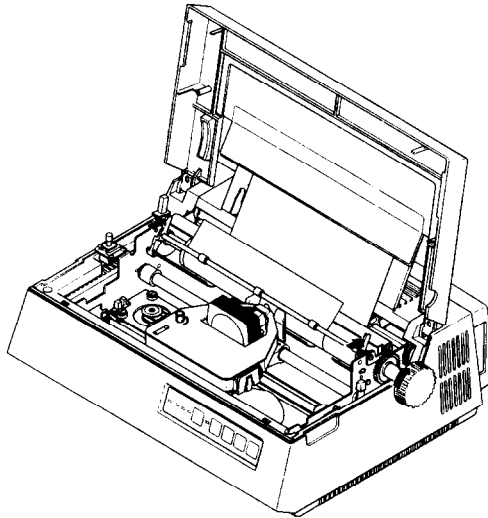


Figure 1-8. Loading single-sheet paper.

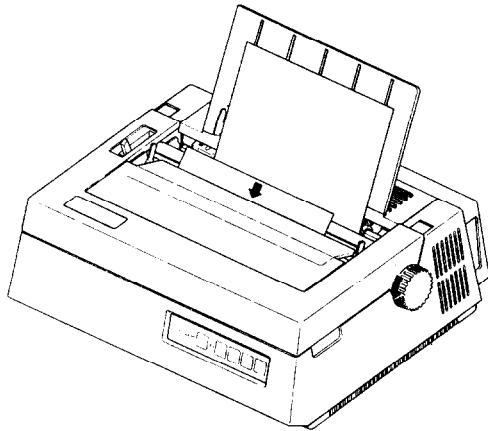


Figure 1-9. Aligning the page with the cutting edge of the shield.

Form-feed loading:

Your printer's built-in tractor feed device is one of the most convenient features ever offered in a printer. It works with standard form-feed paper as well as with laser-perforated, form-feed bond paper— so you can produce top quality documents with a swift, continuous feed. Here's how it works:

- Turn off the power switch to avoid damaging the gears and raise the hinged back cover. (If you have attached the cut-sheet guide, you'll need to remove it now.)
- Loosen the clamp screws and flip up the covers on each of the tractor units.
- Insert the form-feed paper through the slot beneath the back cover of the printer; line up the tractor units with the sprocket holes in the paper.
- Press the paper into place on the sprockets, and snap the covers down on the tractor units. Tighten the knobs.

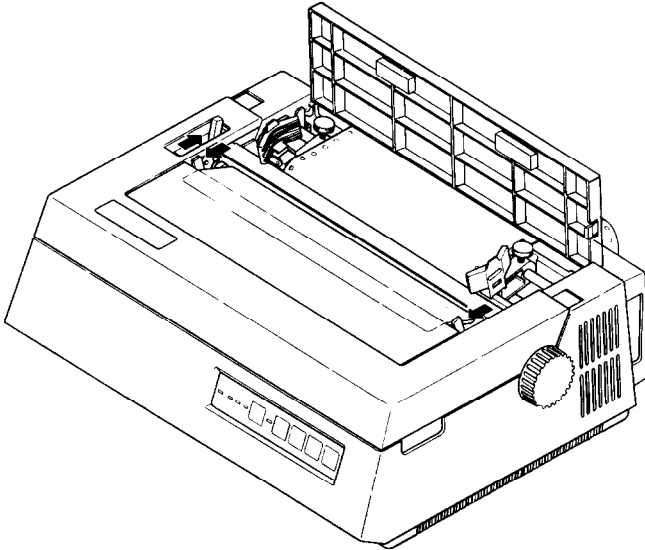


Figure 1-10. Inserting form feed paper into the printer.

- Open the paper bail (pull the lever toward you). Set the paper release lever in the "tractor" position (open) by pushing the lever away from you.
- Advance the paper into printing position by turning the platen knob clockwise. (You may want to open the front cover first, to be sure the paper clears the cutting edge.)

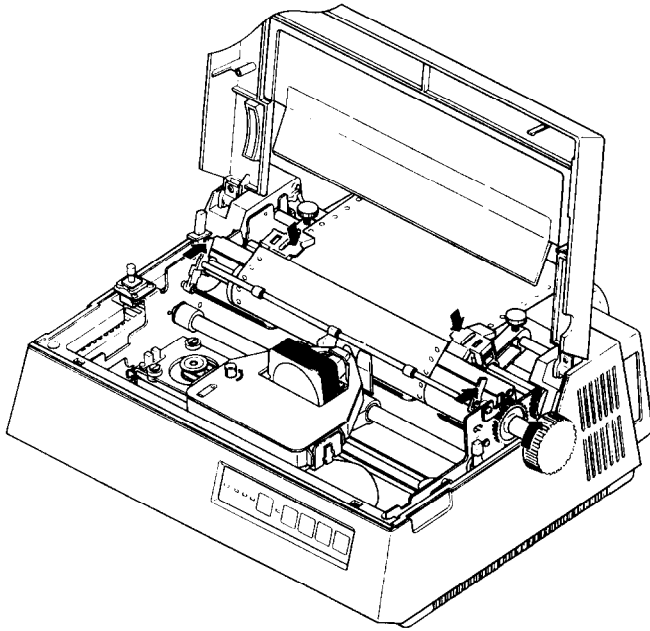


Figure 1-11. Form feed paper correctly loaded.

- Close the paper bail and the front and back covers; turn the printer on.

You can now check the operation of the automatic tractor feed. Press the Form Feed (FF) button to advance the paper to the next page, after pressing the "Pause" button.

■ **ADJUSTING THE PRINT HEAD GAP**

This printer is designed to accommodate paper of varying thicknesses, as well as multilayer forms. You can easily ensure correct printing with a simple adjustment to the print head gap.

- Lift the front cover, and find the red lever just in front of the platen knob.

FOR THICK (HEAVYWEIGHT) PAPER OR CARD STOCK: Pull the lever toward you to widen the gap.

FOR THIN (LIGHTWEIGHT) PAPER: Push the lever away from you to narrow the print head gap.

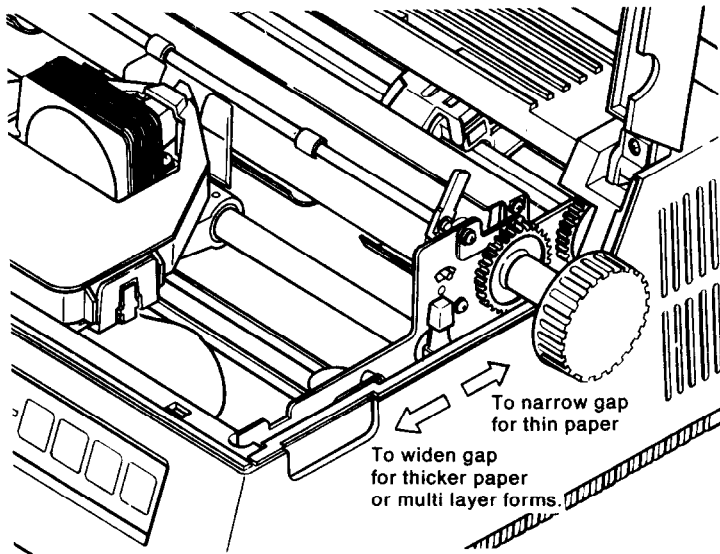


Figure 1-12. Adjust the print head gap.

By experimenting with this lever, you will learn which position will yield the highest quality print for the paper you're using.

■ **HOW TO PRINT THE SELF-TEST**

Eager to see the beautiful, high-density dot matrix characters your new printer can produce? We thought so!

You can easily view a sample of its work by printing the self-test. The self-test confirms both the correct operation of the printer and the proper loading of paper and ribbon cassette.

You won't need to connect your computer to print the self-test—just be sure the printer is plugged into a power source and is turned off.

- Insert a sheet of paper (or form-feed paper) as you learned in "How to Load Paper Into the Printer."
- Press and hold the Line Feed (LF) button, and at the same time, turn the power switch on.
- When the printer begins printing, you can release the Line Feed button.

NOTE: Always be sure the ribbon cassette is in place and there is paper in the printer when you begin printing.

The printer will print a five-line sample of letters, numbers and symbols in the letter-quality and draft-quality modes.

- To eject the page, press the Pause button; then press Form Feed (FF).

Now take a close look. Beautiful, isn't it? And this is only the beginning. . .

■ **CONNECT THE INTERFACE CABLE TO YOUR COMPUTER**

You'll be printing in just minutes, once you've connected the printer to your computer with an interface cable. Three kinds of interfaces are available with this printer: parallel, serial, and an interface called IEEE-488. You will probably be using a parallel interface, the easiest connection to make:

- Turn off the printer and computer.
- Plug one end of the cable into the parallel interface connector on the printer; plug the other end into the parallel connector on your computer.

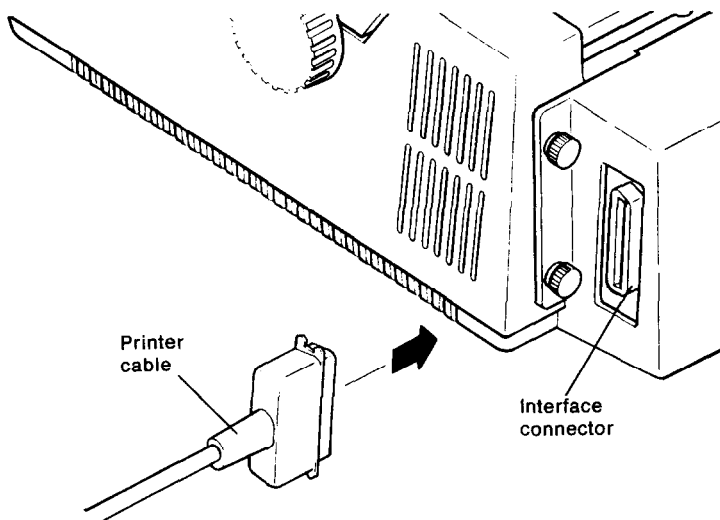


Figure 1-13. The parallel interface connection.

There's only one way to attach the connector, so you can't go wrong.

(For information on serial and IEEE-488 interfaces, please see your Star dealer.)



In the next section, you'll see how easy it is to use the printer with your favorite word processing programs.

MEMO

2

WORD PROCESSING WITH THE PRINTER

WHAT THIS SECTION SHOWS YOU:

- *How to Use ASCII Codes for the Features You Want*
 - *Installing Your Word Processing Package*
-

If you're already familiar with ASCII codes, you may want to skip to the next part in this section, where you'll begin using them in your word processing program. For those who are new to codes, read on and we'll show you how to use them to get the most from your printer.

■ AN INTRODUCTION TO ASCII CODES

When you get into your car to go for a drive, the first thing you do is shift into gear. If your car has automatic transmission, you won't have to shift as often as you would with a manual transmission—but in either case, of course, your car gets you where you're going.

Printing with your computer is similar to driving in that you'll "shift" every now and then to take advantage of your printer's variety of features—only you'll use codes from your computer to do the shifting. Now, whether you use codes often or seldom can depend on both your software package and your printing needs, as you will see. But first, let's take a look at what codes are, and how you will enter them through your keyboard.

Like a typewriter, your printer understands each character on the keyboard, whether it's a letter, a number, or a symbol. But since there aren't any keys marked "Letter-Quality", "Expanded Print", or "Boldface", you will activate each of these features by entering a code; that is, a short series of keystrokes through the keyboard.

Most computers, printers, and peripheral devices understand specific types of codes known as ASCII codes. ASCII (pronounced "ask-key") stands for the American Standard Code for Information Interchange. This standard code provides a common ground for computers and related devices to "talk" to each other, and transfer data in a way that each can understand. And though there is an ASCII code for each letter, number, and symbol that we use (please see Appendices C and E) you will probably not need to know them for your day-to-day applications. However, you will want to use ASCII codes to activate the special functions of your printer, so let's take a closer look at how they work.

Each ASCII code is available in a number of different forms for programmers and software writers, as well as for those of us whose main applications are word processing and spreadsheets. For example, the code for each different function can be entered in both its decimal and hexadecimal forms, as shown in Table 2-1 below.

Table 2-1. Examples of decimal and hexadecimal codes.

FUNCTION	DECIMAL CODE	HEXADECIMAL CODE
Select the Draft-Quality Mode	27 53	1B 35

Decimal codes

The decimal code is a common representation of ASCII codes, and is used mainly for writing programs in BASIC. Decimal codes are so named because their values are expressed using the decimal—or "base 10"—numbering system. Although you may not need them very often, we have included the decimal codes for each of the printer's functions, and you can find them in Appendix A of this manual.

If you are writing in BASIC, you will notice that we also provide the complete BASIC command used to "capture" each decimal code using the character string function, or CHR\$. (For an in-depth look at programming in BASIC, please turn to Section 6.)

Hexadecimal codes

The name for the hexadecimal code comes from its expression using the hexadecimal—or "base 16"—numbering system. Hexadecimal codes are used mainly by assembly language programmers, but they can come in handy when you're "installing" any one of the printer's functions into your word processing program. For example, if you use any other form of ASCII code as you install the "activate superscript" function into WordStar, your software will respond by displaying on your screen the equivalent of the code in its hexadecimal form. Then, comparing the hexadecimal value on the screen

with the corresponding hexadecimal value in Appendix B, you can confirm that you're entering the code correctly.

It's important to remember that decimal and hexadecimal codes are simply different expressions of the same ASCII code—and there are other expressions of ASCII codes as well.

“Escape” codes and “Control” codes

Many ASCII codes can be entered quickly and easily into your software package with the use of either the escape key or the control key—in conjunction with other keys on your computer keyboard. Escape codes and control codes have their decimal and hexadecimal equivalents, as shown in Table 2-2. (When you see the <ESC> instruction, you are to press the escape key before typing the companion character; “^” instructs you to hold the control key down while typing the companion character.)

Table 2-2. Examples of escape and control codes.

FUNCTION	ESCAPE	CONTROL	DECIMAL	HEXADECIMAL
Select the Draft-Quality Mode	<ESC> 5	—	27 53	1B 35
Set Print Pitch to Pica	<ESC> P —	— ^R	27 80 18	1B 50 12

■ WORD PROCESSING FOR ALL PURPOSES

This printer is designed to perform the entire range of printing functions with all commercially available word processing packages. And whether you're penning the next blockbuster novel or just writing home to Mom, we think it will more than meet your needs.

Word processing packages usually have an internal program for setting up—or “installing”—your printer, and dealers will often perform this installation at no extra charge. But to give you a better understanding of the process, the following pages offer some general advice about installing your word processing programs.

■ PROVIDING INFORMATION TO YOUR WORD PROCESSING PACKAGE

If your word processing package has an installation program, the first thing it will want to know is the kind of printer you are using. Some installation programs present you with a list of specific brands and models of printers. If you don't see this printer on the list, you should still feel free to experiment with any of the dot matrix models on the list.

Another option you have is to type in a “generic” name, such as “standard”, “simple”, “teletype”, or “vanilla”. These options all

allow you to send your text "simply" to the printer. You can then send codes for special features as you need them. (The software manual will advise you on how to do this.)

Your best option, however, is with a program that offers a "custom" installation for printers. Custom installations usually require some highly detailed information about the way your printer works, but they give the best results. Following are the basic categories of information you'll need for a custom installation program.

•**Do you have a backspacing printer?**

Yes

•**What printer driver are you using?**

Primary list device

•**How many strikes are used for boldface printing?**

2 strikes

•**What is the communications protocol?**

No protocol for the parallel interface

•**What is the initialization code?**

DECIMAL: 27 64

HEXADECIMAL: 1B 40

•**What is the carriage return/line feed code sequence?**

DECIMAL: 13

HEXADECIMAL: 0D

(DIP switch 1-8 should be turned on)

Pitch size/characters per inch

As you know, this printer is a multiple-pitch machine, capable of printing in the pica (10-cpi), elite (12-cpi), and condensed (16.7 cpi) modes. Pica is the default setting for your printer, but you can change the default to elite if you wish, by entering the escape code <ESC> M or by turning off DIP switch 1-6.

Proportional spacing

Your printer can print proportionally spaced characters in the letter-quality mode.

Characters per line: When the printer is set to print in pica, it will print 80 characters per line. When set for the elite pitch, its line size is 96 characters per line. In the proportional mode, it prints approximately 80 characters per line.

Boldface and "Emphasized" printing modes

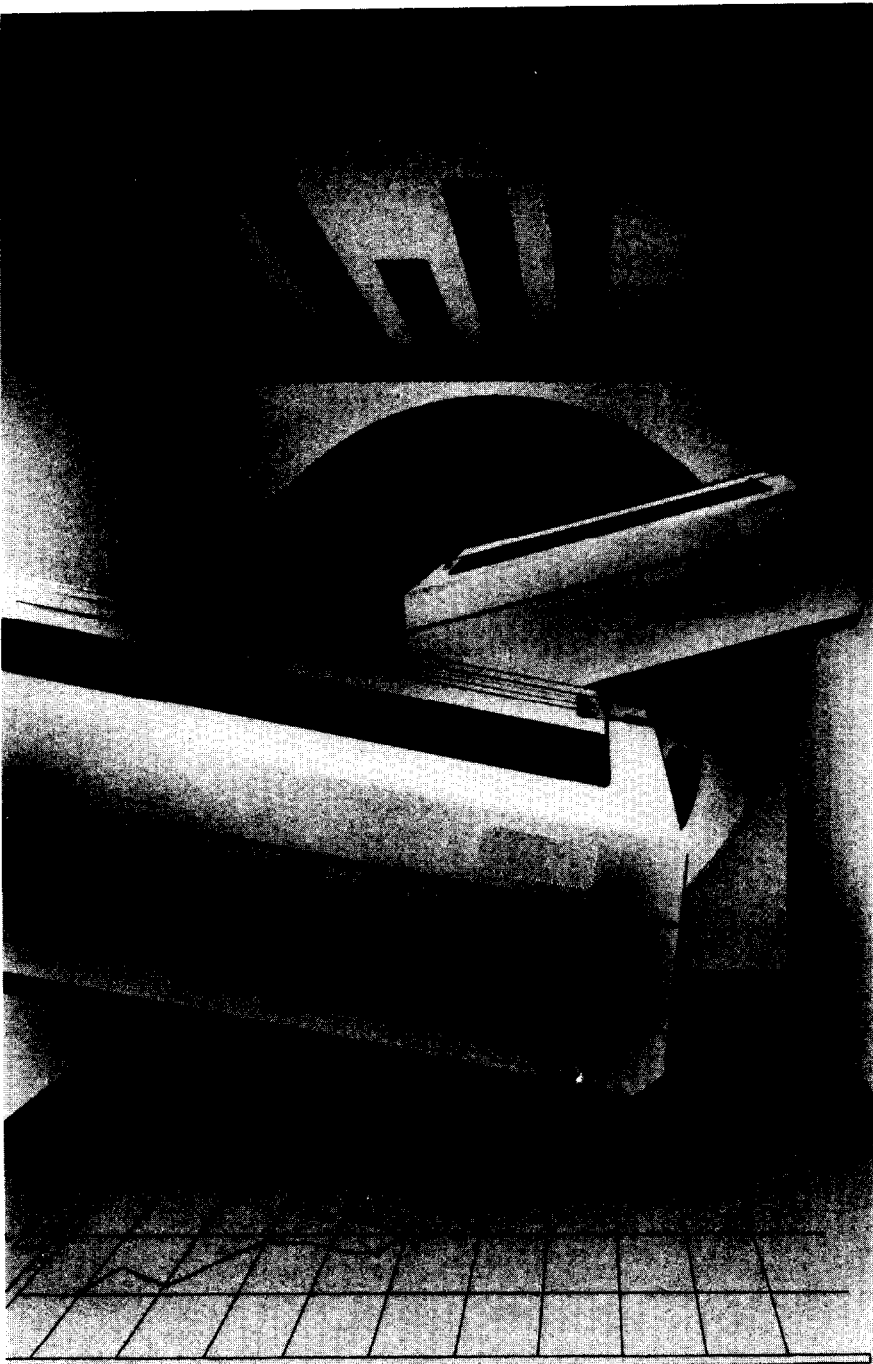
Please review the code sequences shown in Section 4 for these functions.

The above categories contain the basic information your word processing package needs to know about this printer. In addition, Appendix B contains a guide for a typical installation of WordStar, one of the most popular word processors on the market.

Remember, your software manual is the primary source of information for printing with your word processing package. But if you're ever in need, your dealer is there to lend a hand.



In the next section, we'll show you how to print several popular spreadsheet programs with your printer. Stay tuned!



GETTING THE MOST FROM YOUR SPREADSHEET PACKAGE

WHAT THIS SECTION SHOWS YOU:

- *How to Print Reports Using Three Popular Spreadsheet Programs*
-

Next to word processing, the spreadsheet has become the most widely accepted microcomputer application for use in both home and business. And it's an area where your printer really shines. Its ability to print in the condensed modes—as well as in pica and elite—gives you a new level of flexibility in electronic spreadsheets. As a result, you can print eye-catching reports in a greater variety of formats than ever before.

■ **PRINTING COMMANDS AND PARAMETERS FOR THREE POPULAR SPREADSHEETS**

There are, of course, many more spreadsheets on the market than can be adequately described in the pages of this manual. But we have gathered the necessary information to help you achieve optimum results for three of the most popular packages: VisiCalc, SuperCalc, and Lotus 1-2-3. Now, whether you use these particular programs or similar versions of them, you'll find that this information—along with your software manual—will help give your spreadsheet printouts a truly professional appearance.

■ **VISICALC**

Although this early entry into the electronic spreadsheet market now has a number of sophisticated competitors, VisiCalc remains a perennial favorite among personal computer users. First, let's

review the command structure necessary to print VisiCalc reports with your printer.

VisiCalc setup codes

VisiCalc's setup option allows you to use the advanced features of your printer by first sending the proper codes to it. (In the following examples, the control character is entered by typing the “^”, or caret.) To get to the setup mode, type “/P”. Here are the codes you'll need to know for the setup options available to you:

- ^C - This code signals you to send the character immediately following as a printer code. For example, to print in the condensed mode (using the code ^O), you'll first enter ^C, then ^O.
- ^E - Used to send escape codes to the printer. Whenever you want to use an escape code, type ^E instead of hitting the escape key—then enter the remaining characters in the code.
- ^R - This code sends a carriage return/line feed to the printer. Use the ^R whenever you need to skip a line on your spreadsheet.
- ^L - This code sends a form feed command to the printer. When you enter ^L, the printer advances to the beginning of the next page.
- ^H - Use the ^H whenever you need to send a code in its hexadecimal form. For example, to activate the condensed mode, type ^H0F.

As you plan the design of your VisiCalc report, we encourage you to experiment with the many options offered by your printer. To use the different pitch sizes—pica, elite and condensed—as well as their expanded versions, you'll first switch to the draft-quality mode with the code ^E5. Table 3-1 illustrates the number of available columns per page for each pitch size, along with the corresponding setup codes.

Table 3-1. The various draft-quality pitch sizes and their VisiCalc setup codes.

Pitch Size	Columns Per Line	Setup Code
Pica	80	^EP
Elite	96	^EM
Condensed	132	^C^O
Pica Expanded	40	^EP^EW^H01
Elite Expanded	48	^EM^EW^H01
Condensed Expanded	66	^C^O^EW^H01

Remember, in the expanded mode, your printer prints characters at twice their normal width.

The VisiCalc print command

After you've designed your spreadsheet and entered all the necessary information, you print with the VisiCalc /P command. As described in the software manual, this command is used to delineate the size of the spreadsheet (or section of the whole), from the active cell in the upper left-hand corner to the boundary you will choose in the lower right-hand corner.

Normally, when you plan a very large printout—one that wouldn't fit on a single page—other printers would require you to divide the spreadsheet into separate segments, each with a separate printing operation. But with condensed print mode, you'll be able to fit an entire 132-column report on a single 8 inch-wide sheet of paper!

■ **SUPERCALC**

Another popular spreadsheet, SuperCalc allows you to easily use all of your printer's advanced features. When you have completed the design of your SuperCalc spreadsheet, you can get to the SuperCalc setup mode by typing /O (for "output"). Next you'll type D followed by the word ALL; this tells SuperCalc to print the report exactly as it appears on the screen.

The SuperCalc setup codes

To get to the setup menu, press the return key and type S; when the setup menu appears, again press S (for "manual setup codes"). You can now send escape codes and control codes to the printer exactly as they appear in Appendix A. Table 3-2 illustrates your options in the draft-quality mode (for more on SuperCalc setup codes, please see the software manual).

Table 3-2. SuperCalc setup codes for the draft-quality pitch sizes.

Pitch Size	Columns Per Line	Setup Code
Pica	80	<ESC> P
Elite	96	<ESC> M
Condensed	132	^O

Remember, in the expanded mode, this printer prints characters at twice their normal width.

SuperCalc automatically prints as much of your spreadsheet as will fit on a page; any material in excess of the page limit will be printed on additional pages.

■ **LOTUS 1-2-3**

One of the most popular "integrated" software products, Lotus 1-2-3 combines spreadsheet, word processing and database applications in a single package. However, the process of printing a spreadsheet is very similar to that used in VisiCalc and SuperCalc.

The Lotus print commands

As described in the Lotus manual, the printing procedure is begun with the command /PP. After you enter this code, a menu of other printing choices appears on your screen, including:

- Range - Defines the section of the worksheet you want to print.
- Line - Allows the insertion of a blank line in your report by sending a carriage return/line feed instruction to the printer.
- Page - Advances printing to the beginning of a new page.
- Options - Displays a menu of various format options.
- Clear - Erases all previously chosen print options for this particular report.
- Align - Communicates to Lotus 1-2-3 that the paper in the printer is at the top of the page. This code is used after inserting a new sheet or advancing the paper with a form feed command.
- Go - Prints the worksheet as defined by Range.
- Quit - Ends the print mode and returns Lotus to the "Ready" mode (see your manual for details).

The Lotus Options menu

In addition to the print commands, Lotus 1-2-3 provides an Options menu to give you a number of formatting selections. Included in this menu are selections for headers and footers (lines printed at the top and bottom of the page, respectively). With each of these options, you may also choose to insert the page number and/or date, and even divide the header or footer into three separate sections.

Also included in the Options menu is the setup option, which allows you to enter codes to specify the pitch size for the report. When you choose this option, the words "enter character string" next appear on the screen. You can now enter the code you want, as illustrated in Table 3-3.

Lotus is different from other spreadsheets in that it uses decimal codes. In the following examples, the "\", or backslash, precedes the control code (instead of the control key). When entering an escape code, you first enter \027, the decimal equivalent of the escape

key. (If you are in the LQ mode, you can switch to draft mode with the code \027 \053.)

Table 3-3. Lotus 1-2-3 setup codes for draft mode pitch sizes.

Pitch Size	Columns Per Line	Setup Codes
Pica	80	\027 \080
Elite	96	\027 \077
Condensed	132	\015
Pica Expanded	40	\027 \080 \027 \087 \001
Elite Expanded	48	\027 \077 \027 \087 \001
Condensed Expanded	66	\015 \027 \087 \001

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

In the following sections, we'll show you more of the features you'll use to create professional-quality documents with your printer.



SECTION

4

EXPLORING PRINT FEATURES

WHAT THIS SECTION SHOWS YOU:

- *How to Put Emphasis into Your Letter-Quality Text*
 - *Using the Draft-Quality Mode for Speed and Versatility*
 - *Combining Features With the Macro Instruction*
 - *How to Use the International Character Sets*
-

As you know, your printer will print letter-quality type at 60 characters per second and draft-quality type as fast as 144 characters per second. With this powerful machine, you can produce smart-looking drafts at high speed, and exceptionally fine copies of your work at speeds still faster than most daisywheel printers.

But you won't really appreciate how advanced your printer is until you see the many other ways it can print. For a sample of this versatility, please see Figure 4-1 below.

**LETTER QUALITY WITH PICA PITCH
AND PROPORTIONAL SPACING.**
DOUBLE-STRIKE PRINTING
EMPHASIZED PRINTING
UNDERLINING TEXT
PICA ELITE AND CONDENSED.

Figure 4-1. The printer's range of print features.

In this section, you'll learn how to use the variety of print features available to you, and how to combine them to create your own style. And you'll find out why this is the only printer your computer will ever need!

■ THE LETTER-QUALITY (LQ) MODE

Although DQ is the original factory default setting, you can change the default to the Letter-Quality (LQ) mode either by turning OFF DIP switch 1-5 (turn this back ON to reactivate DQ) or by entering the codes through your word processing program (see the "Draft-Quality Mode" later in this section). But before you begin experimenting in DQ, let's take a look at the options you have in the letter-quality mode.

Double-Strike printing

Whenever you want to make a word or phrase stand out in text, a good way do it is with the double-strike feature. When you activate double-strike printing, your printer does exactly that: it prints each character twice. The example below shows how double-striking can set off your text from normal LQ printing.

**THIS LINE IS LETTER QUALITY,
AND DOUBLE-STRIKE PRINTING.
NOW, TURN TO NORMAL PRINTING.**

Figure 4-2. An example of double-strike printing.

Of course, when you begin double-strike printing, everything you print will be double-struck until you turn this feature off—so you'll need the codes for how to activate double-striking as well as how to cancel it. Here they are:

Table 4-1. The codes for double-strike printing.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Activate Double-Strike	<ESC> G	27 71	1B 47
Cancel Double-Strike	<ESC> H	27 72	1B 48

Emphasized printing

Another effective method to make a portion of text stand out against the rest is with the "Emphasized" print feature. To get emphasized print, your printer prints a line once, shifts the carriage about 1/120th of an inch, and prints the line again. Because emphasized print has a "double image", it really calls attention to itself.

**THIS LINE IS LETTER QUALITY,
AND EMPHASIZED PRINTING.
NOW, TURN TO NORMAL PRINTING.**

Figure 4-3. An example of emphasized print.

Like most of the print features, the emphasized mode will—once activated—remain on until you turn it off. Here are the codes:

Table 4-2. The codes for emphasized printing.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Activate Emphasized Print	<ESC> E	27 69	1B 45
Cancel Emphasized Print	<ESC> F	27 70	1B 46

Underlining text

The underlining feature offers you a third, more subtle way to accent your text:

THIS IS UNDERLINED LQ PRINTING.

Figure 4-4. An example of underlined text.

Here are the commands you'll need to start and stop the underlining feature:

Table 4-3. The codes for underlining text.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Activate Underlining	<ESC> - 1	27 45 1	1B 2D 01
Cancel Underlining	<ESC> - 0	27 45 0	1B 2D 00

Proportional printing

When the printer is in the LQ mode, it is able to print text with proportional spacing (yielding approximately 80 characters per inch). This means that each character gets precisely the amount of space it needs. For example, the letter "m" is given twice the amount of space used for the "i", since it's twice as wide.

Proportional spacing is used in newspapers, magazines and many books because it gives a polished appearance to the finished page.

**LETTER QUALITY CHARACTERS CAN PRINT
WITH PROPORTIONAL SPACING OR NORMAL PICA PITCH.**

Figure 4-5. An example of proportional printing.

Table 4-4. The codes for proportional printing

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Activate Proportional	<ESC> p 1	27 112 1	1B 70 01
Cancel Proportional	<ESC> p 0	27 112 0	1B 70 00

■ **THE DRAFT-QUALITY MODE**

You'll probably want to use the draft-quality mode whenever you need to print a fast draft of your work, but when you see all the capabilities this mode offers, we think you'll use it even more often. To switch from LQ to DQ you have two choices:

- Turn on DIP switch 1-5, or
- Enter the proper code through your word processing program (shown in Table 4-5).

Table 4-5. Codes for the LQ and DQ modes.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Activate DQ	<ESC> 5	27 53	1B 35
Return to LQ	<ESC> 4	27 52	1B 34

If you plan to use both the LQ and DQ modes frequently, you will probably want to program the necessary codes right into your word processor's installation program.

In the draft mode, you can use the same features you learned earlier in this manual to accent your text: double-strike, emphasized, underlined and expanded print. You'll use the same codes to turn these features on and off. Now let's see some of the other things the draft mode can do for you.

■ **VARIETY OF PITCH SIZES**

If you have already read Section 3, you'll know how many variations in pitch size can help in designing a spreadsheet to your exact

specifications. You can also use pitch size to integrate different kinds of text into a printed page. The following are descriptions of the available draft-quality pitch sizes.

Pica pitch

As we have said, pica printing yields 10 characters per inch and 80 characters per line. Pica is commonly used in business letters, thesis papers, reports, —and in general, wherever it's important that your document be easy to read or scan.

The pica pitch is the default setting in the draft mode, but you can change the default to elite, either by turning off DIP switch 1-6 or by sending the correct codes to the printer. We'll show you how to do this in a moment, but first, take a look at what draft-quality pica printing looks like using all the "accent" features available with your printer:

```
SUBJECT: ORDERING STATIONERY SUPPLIES
I would like to place an order for stationery
supplies from your mail order catalog.
Enclosed is my order form and a check for $247.
Please process this order as soon as possible.
Thank you.
```

Figure 4-6. Pica printing in the draft mode.

If you use either the elite pitch or the condensed pitch and wish to return to pica, you can reactivate this setting in one of two ways:

- Turn on DIP switch 1-6 (if you had previously turned it off), or
- Enter the following codes through your word processor:

Table 4-6. The codes used to activate pica printing.

ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
<ESC>P	27 80	1B 50

Elite pitch

As we mentioned earlier in the manual, the elite setting will print 12 characters per inch and 96 characters per line. Elite is often used for longer documents, but it's also found in formal and informal correspondence, and has many other uses as well. Though you may not notice much difference between the elite and pica pitches, elite allows you to fit more text on the page.

SUBJECT: ORDERING STATIONERY SUPPLIES
 I would like to place an order for stationery supplies from your mail order catalog.
 Enclosed is my order form and a check for \$247.
 Please process this order as soon as possible.
 Thank you.

Figure 4-7. Elite printing in the draft mode.

To access the elite pitch:

- Turn off DIP switch 1-6 (if it had been turned on), or
- Enter one of the following codes through your software:

Table 4-7. The codes used to activate elite printing.

ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
<ESC> M	27 77	1B 4D

Condensed pitch

The printer's condensed pitch has a number of important uses: spreadsheets, tables, charts— and wherever you need to fit a lot of information into a small space. The condensed pitch gives you 16.7 characters per inch, and 132 characters per line. To activate the condensed pitch, please use the codes given in Table 4-8.

SUBJECT: ORDERING STATIONERY SUPPLIES
 I would like to place an order for stationery supplies from your mail order catalog.
 Enclosed is my order form and a check for \$247.
 Please process this order as soon as possible.
 Thank you.

Figure 4-8. Condensed printing in the draft mode.

Table 4-8. The codes to activate condensed printing.

ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
<SI>	15	0F
<ESC> <SI>	27 15	1B 0F

■ COMBINING FEATURES WITH THE MACRO COMMAND

As you gain in experience with your printer, you will undoubtedly develop a flair for combining its many print styles. For example, you might want to combine expanded, pica, and letter-quality, or try condensed and expanded print with underlining. Whatever your preference for combined styles, this printer makes them easy to use with the macro instruction command.

The macro instruction is named for its ability to compress a number of separate commands into one single instruction. Here's how it works: first, you define the "macro" by entering the code <ESC> +, followed by all the control codes you wish to combine; you can use a maximum of 16 possible control codes. Then, terminate the macro instruction by entering the code <RS>. The macro instruction you just programmed in will be there for your use until you turn the printer off or enter a new macro.

Whenever you want to use the macro, you can enter the code <ESC>? to call it up.

Table 4-9. The codes for the macro instruction.

FUNCTION	ESCAPE CODE
Define Macro Instruction	<ESC> + n1 n2...<RS>
Use Macro Instruction	<ESC> ?

■ INTERNATIONAL CHARACTER SETS

You might find that you're perfectly content with the 96 standard American characters provided in the default character set. But you'll be interested to know that your printer can also print the special characters commonly used in England, Germany, France, Italy, Sweden, Denmark and Spain!

If you do plan to use these characters regularly, you will want to reset your DIP switches as shown in Table 4-10 below.

If you plan to use international character sets only on occasion, however, you will probably want to access them by sending a code through your word processor (illustrated in Table 4-11). Please refer to Appendix E for a complete listing of the codes for each international character.

Table 4-10. DIP switch settings for the International Character Sets.

COUNTRY	SWITCH 2-1	SWITCH 2-2	SWITCH 2-3
USA	ON	ON	ON
France	OFF	ON	ON
Germany	ON	OFF	ON
England	OFF	OFF	ON
Denmark	ON	ON	OFF
Sweden	OFF	ON	OFF
Italy	ON	OFF	OFF
Spain	OFF	OFF	OFF

Table 4-11. Codes used to activate the International Character Sets.

ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
<ESC> R <i>n</i>	27 82 <i>n</i>	1B 52 <i>n</i>

COUNTRY

USA = 0 France = 1 Germany = 2 England = 3

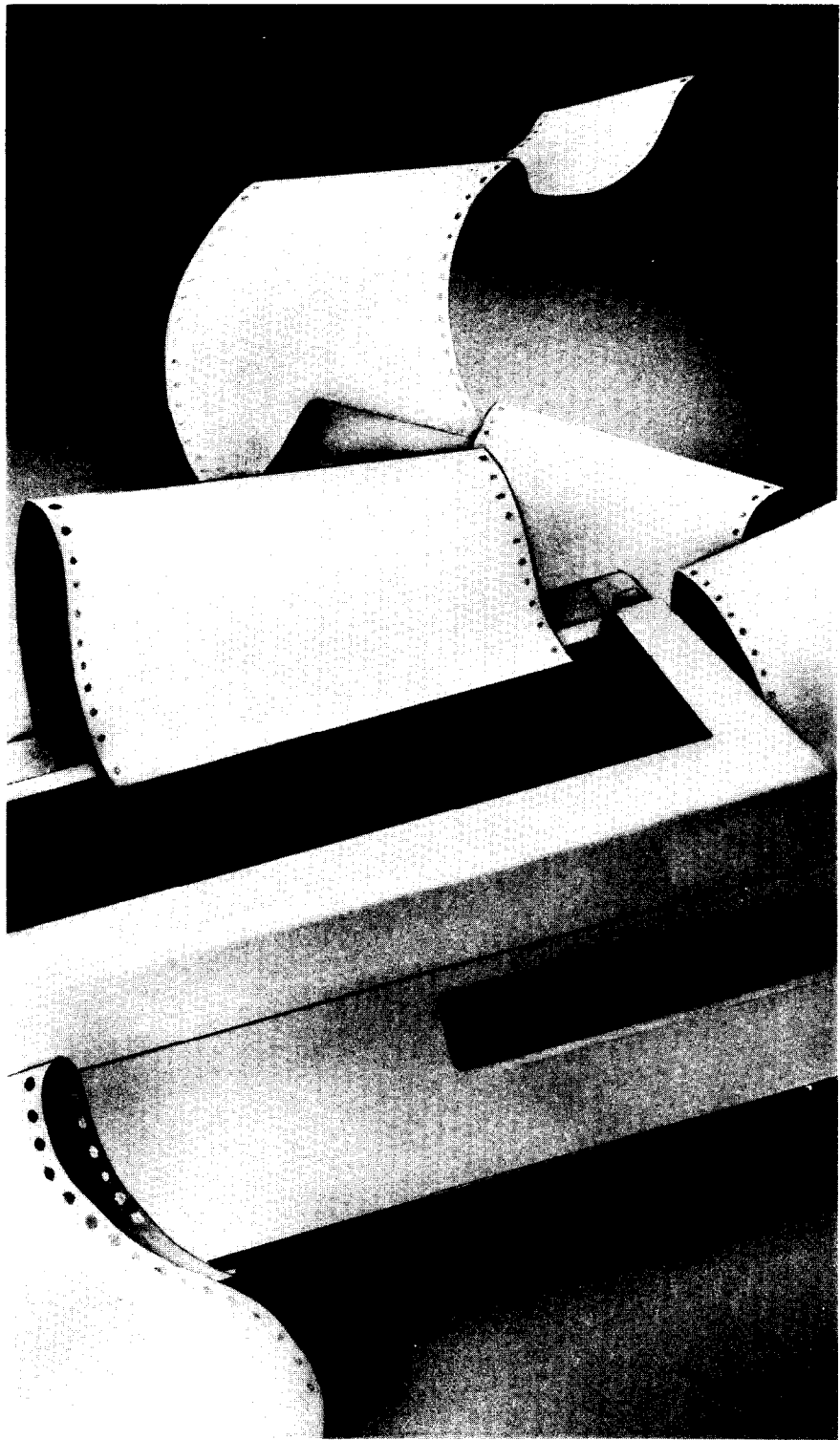
Denmark = 4 Sweden = 5 Italy = 6 Spain = 7

Whenever you're finished using an international character set, you can return to the one you normally use by again entering the proper code and country number.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

We know there's enough material in this section to keep you busy for quite a while. But you won't want to miss Section 5, where we'll show you how to design a document format to your own specifications.

MEMO



SECTION

5

CREATING PAGE FORMATS

WHAT THIS SECTION SHOWS YOU:

- *How to Set the Left and Right Margins*
 - *How to Determine the Page Length, and the Number of Lines Per Page, and the Top and Bottom Margins*
 - *How to Control Line Spacing*
 - *Superscripts and Subscripts*
 - *Setting and Using Vertical and Horizontal Tabs*
-

In Section 4, we showed you the wide range of printing capabilities offered by your printer. Now let's take a look at how you can fit these elements into a good-looking format that's right for you. Actually, your word processing program will probably perform most of the functions you'll read about in this section. But if you ever need to set any of these parameters, the necessary instructions are given in the following pages. By the way, you will also be able to use the macro instruction (described in Section 4) for the formatting commands set out in this section.

■ SETTING THE LEFT AND RIGHT MARGINS

As you learned in Section 1, you can control the left margin of your document by moving either the cut sheet guide or the adjustable tractor feed guides. The power-on default setting for the left margin is always at the same far left position, so you know where printing will begin if you use either of these methods. Your word processor will automatically set the right margin for you.

However, you can—if you wish—set the left and right margins to your own specifications by sending the proper codes (Table 5-1). These instructions will remain in effect until you either turn off the printer or send new codes to cancel them. In the codes illustrated

in table 5-1, you will need to enter a specific value for “*n*” to signify the positions of the left and right margins. In each case, you may substitute any number between 1 and 132—just make sure that the left margin has a smaller value than the right margin. After you have set the margins, the printer will automatically perform the carriage return and line feed.

Table 5-1. Setting the left and right margins.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Set Left Margin	<ESC>I <i>n</i>	27 108 <i>n</i>	1B 6C <i>n</i>
Set Right Margin	<ESC>Q <i>n</i>	27 81 <i>n</i>	1B 51 <i>n</i>

■ **CHOOSING THE PAGE LENGTH AND NUMBER OF LINES PER PAGE**

Your printer is preset to print 66 lines per page on an 11-inch form, but you can reconfigure these settings either through DIP switch 1-2 (“on” for 11-inch forms, “off” for 12-inch forms), or by entering the proper codes illustrated in Table 5-2.

When you send the code to control the page length in inches, you can substitute for “*n*” any number between 1 and 32. All subsequent pages will be printed in the same page format until you turn off the printer or send a code to cancel this setting.

You can also set the page length by programming in the number of lines per page. Using the codes given in Table 5-2, you may instruct the printer to print any number of lines per page from 1 to 127.

■ **SETTING THE TOP AND BOTTOM MARGINS**

The top margin determines where the printer begins printing on a page, and the bottom margin tells it where to stop printing and proceed to the next page. As you learned in Section 1, when you align paper with the cutting edge on the front cover, printing will begin about 2 inches down the page. The bottom margin will be determined by your settings for both page length and number of lines per page.

If you wish, you can also program your top and bottom margins just as you did with the left and right margins, by sending the proper codes. Your printer will continue to observe your newly defined top and bottom margins until you turn the printer off or send new codes to cancel them.

When you set the top margin, you can substitute for “*n*” any value between 1 and 16 (the power-on default value is 1). When you enter the code for the bottom margin, you may enter any value between

1 and 127 — just be sure that this number is greater than the value you chose for the top margin.

Table 5-2. Setting the page length, number of lines per page, and the top and bottom margins.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Page Length in inches ($n = 1$ to 32)	<ESC> C 0 n	27 67 0 n	1B 43 00 n
Number of Lines Per Page ($n = 1$ to 127)	<ESC> C n	27 67 n	1B 43 n
Top Margin ($n = 1$ to 16)	<ESC> r n	27 114 n	1B 72 n
Bottom Margin ($n = 1$ to 127)	<ESC> N n	27 78 n	1B 4E n
Cancel Top and Bottom Margins	<ESC> O	27 79	1B 4F

■ ADJUSTING LINE SPACING

Just as your word processor will set the margins, it will also set the line spacing (or distance between lines of print) without requiring a special command. When you turn on the printer, it will automatically print with a line spacing of 1/6th inch, which is the American standard. This means that you will get six lines to an inch, and 66 lines on an 11-inch page.

If you wish to change the line spacing, you can do it either through DIP switch 1-3, or by sending a code. First let's see how the line spacing changes when you turn off DIP switch 1-3.

WHEN YOU PRINT WITH DIP SWITCH 1-3 IN THE OFF POSITION, YOUR LINE SPACING WILL BE 1/8TH INCH.

WHEN YOU PRINT WITH DIP SWITCH 1-3 IN THE ON POSITION, YOUR LINE SPACING WILL BE 1/6TH INCH.

Figure 5-1. Controlling line spacing with DIP switch 1-3.

As Figure 5-1 shows, when you print with DIP switch 1-3 in the off position, your line spacing will be 1/8th inch, the European standard. This setting will yield 8 lines per inch, or 88 lines on an 11-inch form. Of course, you are by no means limited to these two settings—by entering codes you can have complete control of the line spacing function. In fact, you can adjust line spacing to 1/60th or 1/120th of an inch by sending the proper codes included in Table 5-3. (For “*n*”, just select any value between 0 and 255.) Also shown are the codes for 1/6th-inch, 1/8th-inch, and 1/10th-inch (no space between lines) line spacing.

Table 5-3. Adjusting line spacing.

SPACING	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
1/6th inch	<ESC> 2	27 50	1B 32
1/8th inch	<ESC> 0	27 48	1B 30
1/10th inch	<ESC> 1	27 49	1B 31
<i>n</i> /60th inch	<ESC> A <i>n</i>	27 65 <i>n</i>	1B 41 <i>n</i>
<i>n</i> /120th inch	<ESC> 3 <i>n</i>	27 51 <i>n</i>	1B 33 <i>n</i>

■ SUPERSCRIPTS AND SUBSCRIPTS

The installation program of your word processing package will ask you to enter the value you wish (in increments of 1/120th of an inch) for printing superscripts and subscripts within text. You may also send codes to the printer to perform the same function (Table 5-4). When you choose the code to “select superscript” or “select subscript,” the printer will print all subsequent characters at the super- and subscript level until you send the proper code to cancel this feature.

Table 5-4. Printing superscripts and subscripts.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Select Superscript	<ESC> S 0	27 83 0	1B 53 00
Select Subscript	<ESC> S 1	27 83 1	1B 53 01
Cancel Superscript or Subscript	<ESC> T	27 84	1B 54

■ VERTICAL TABS

When you are tabulating reports or printing certain kinds of text, you may find it useful to leave a number of lines blank between sections of print. This printer's vertical tab feature allows you to do this with the codes shown in Table 5-5.

Table 5-5. Setting and using vertical tabs.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Set Vertical Tabs	<ESC> B <i>n1 n2...0</i>	27 66 <i>n1 n2...0</i>	1B 42 <i>n1 n2...00</i>
Advance to Next Tab	<VT>	11	0B

When you turn on the printer, your vertical tabs are automatically set at one inch apart (lines 6, 12, 18, etc.) to the bottom of your page. To advance the page to the next vertical tab position, just enter decimal code 11 or hexadecimal code 0B.

You can also set your own vertical tabs by first entering the escape, decimal or hexadecimal codes shown in Table 5-5. Then, enter the line number for each vertical tab you want to set, represented in the table by *n1*, *n2*, etc. (Your printer allows you a maximum of 12 vertical tab positions per page.) The number of each tab setting must be greater than the previous one (for example, typical tab settings might be on lines 10, 15, 19, etc.).

After you have set the last tab, be sure to terminate the vertical tab command, by entering 0 (00 for hexadecimal).

You can now move to each of your specified vertical tab positions using the "Advance to Next Tab Position" code shown in the table.

■ HORIZONTAL TABS

Horizontal tabs function similarly to those of a typewriter: they help you print charts and tables, and create columns of information across the page.

When you first turn the printer on, it will automatically set horizontal tab positions every 8 spaces (spaces 9, 17, 25, etc.) to the right edge of the page. You can advance to the next horizontal tab position with decimal code 9 or hexadecimal code 09, as shown in Table 5-6.

You can also set new horizontal tabs to your own specified positions, using the same procedures you learned for setting vertical tabs. Remember, when you set your own tabs, you cancel all previously set tab stops.

Table 5-6. Setting and using horizontal tabs.

FUNCTION	ESCAPE CODE	DECIMAL CODE	HEXADECIMAL CODE
Set Horizon- tal Tabs	<ESC> D n1 n2...0	27 68 n1 n2...0	1B 44 n1 n2...00
Advance to Next Horizon- tal Tab	<HT>	9	09

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

In this section, we've shown you some of the more common methods you will use to create a custom format. But there are many more, as a quick review of Appendix A will show. In the next section, we'll show you how to use some of these features when you program in BASIC.

MEMO

PROGRAMMING IN BASIC

WHAT THIS SECTION SHOWS YOU:

- *How to Use the Character String to Capture BASIC Commands*
 - *Some Examples of Short Programs Utilizing Features of the printer*
-

If you're like most personal computer owners, you'll probably use your printer primarily for printing your spreadsheet and word processing applications. But if you are interested in some of the more esoteric uses of your printer—such as high resolution graphics or printing while you're writing a software program—you may want to experiment by putting it through its paces with BASIC.

■ A WORD ABOUT MBASIC

The most common form of BASIC available today is Microsoft BASIC, or MBASIC. We've endeavored to provide you with a few programs that will run on most computers, and for this reason the programs listed here use the most elementary form of BASIC: MBASIC for 8-bit microcomputers. You will also be able to run these programs on 16-bit systems, such as the IBM PC and compatibles.

The character string (CHR\$): If you're familiar with BASIC, you'll know that the character string command, CHR\$, is used to "capture" escape and control codes such as those which control the printer. BASIC doesn't understand an escape code or control code all by itself; but you can enter escape or control codes within the character string format. To do this, enter the decimal form of the code between the parentheses in CHR\$(). Here are a few examples of the printer's features that can be programmed in BASIC:

Expanded type: The expanded type feature enlarges each of the pitch sizes to twice their normal widths. Try this program to see how it works:

NEW

```
10 LPRINT CHR$(27) CHR$(87) CHR$(1);  
20 LPRINT "THIS LINE IS EXPANDED"  
30 LPRINT CHR$(27) CHR$(87) CHR$(0);  
40 LPRINT "BUT THIS LINE IS NOT."
```

THIS LINE IS EXPANDED
BUT THIS LINE IS NOT.

Figure 6-1. A sample of expanded type.

As you can see, the command represented by the first statement, CHR\$(27) CHR\$(87) CHR\$(1), turns on the expanded print function; the command represented by the third statement, CHR\$(27) CHR\$(87) CHR\$(0), turns it off. All of your printer's features can be activated and canceled using CHR\$ statements and the LPRINT command.

By combining the expanded print feature with each of the three pitches (pica, elite and condensed), you will be able to get three different versions of expanded print in the draft-quality mode.

Table 6-1. Expanded print conversion chart.

PITCH	NORMAL	EXPANDED
Pica	10 cpi	5 cpi
Elite	12 cpi	6 cpi
Condensed	16.7 cpi	8.3 cpi

Emphasized and double-strike printing

Whenever you want something to really stand out on the page, these are two good ways to do it. As we showed you earlier in the book, your printer prints both emphasized and double-strike words twice, but uses somewhat different methods for each. With emphasized print, the platen is moved just slightly for the second printing, giving the character a "shadow" appearance. Double-strike, you will remember, is done simply by printing the same character over itself. Try this program to demonstrate the two styles in BASIC:

NEW

```
10 LPRINT CHR$(27) CHR$(71);  
'SELECT DOUBLE-STRIKE  
20 LPRINT "THIS IS DOUBLE-STRIKE PRINTING"  
30 LPRINT CHR$(27) CHR$(72);  
'CANCEL DOUBLE-STRIKE
```



```

40 LPRINT CHR$(27) CHR$(69);
   'SELECT EMPHASIZED
50 LPRINT "THIS IS EMPHASIZED PRINTING"
60 LPRINT CHR$(27) CHR$(71);
   'SELECT DOUBLE-STRIKE
70 LPRINT "AND THIS IS BOTH AT ONCE"
80 LPRINT CHR$(27) CHR$(72) CHR$(27) CHR$(70);
   'CANCEL DOUBLE-STRIKE AND EMPHASIZED
90 LPRINT "NOW YOU'RE BACK TO NORMAL PRINTING"

```

```

THIS IS DOUBLE-STRIKE PRINTING
THIS IS EMPHASIZED PRINTING
AND THIS IS BOTH AT ONCE
NOW YOU'RE BACK TO NORMAL PRINTING

```

Figure 6-2. Double-strike and emphasized print in BASIC.

Underlined printing

Underlining is another good way to emphasize a point, or to highlight sections of text. Try this short program to give you an illustration of underline feature.

```

NEW
10 LPRINT CHR$(27) CHR$(45) CHR$(1);
   'SELECT UNDERLINE
20 LPRINT "LADIES AND GENTLEMEN,";
30 LPRINT CHR$(27) CHR$(45) CHR$(0);
   'CANCEL UNDERLINE
40 LPRINT " START YOUR ENGINES!"

```

Your results should look like this:

```

LADIES AND GENTLEMEN, START YOUR ENGINES!

```

Figure 6-3. A print sample of underlined text.

In this sample, the underline feature is turned on with the command CHR\$(27) CHR\$(45) CHR\$(1), and turned off with CHR\$(27) CHR\$(45) CHR\$(0). You'll notice that we did it all on one line. You can do this simply by adding—as we did—semicolons at the end of the appropriate lines. This tells BASIC to continue those lines without sending a carriage return/line feed at the end of each line.

We did this just to illustrate that most of the printer's codes can be used in the middle of a line.

Superscripts and subscripts

When you need to reference footnotes or write math formulas, your printer's superscripts and subscripts will come in handy. Here's a short program to illustrate how easy it is to use them:

```
NEW
10 LPRINT "LOOK! ";
20 LPRINT CHR$(27) CHR$(83) CHR$(0);
'SELECT SUPERSCRIPT
30 LPRINT "SUPERSCRIPTS ";
40 LPRINT CHR$(27) CHR$(84);
'CANCEL SUPERSCRIPT
50 LPRINT "AND ";
60 LPRINT CHR$(27) CHR$(83) CHR$(1);
'SELECT SUBSCRIPT
70 LPRINT "SUBSCRIPTS ";
80 LPRINT CHR$(27) CHR$(84);
'CANCEL SUBSCRIPT
90 LPRINT "ON ONE LINE."
```

LOOK! SUPERSCRIP^TS AND SUBSCRIP_TS ON ONE LINE.

Figure 6-4. Superscript and subscript printing.

Line spacing and reverse line feed

You learned about line spacing and how to use escape codes to adjust it in Section 5. It's just as easy, you'll find, to perform all of these functions when programming in BASIC.

In the following program, we show you how to use each of these features; in addition, we'll show you how to program your printer to do a reverse line feed—a useful feature if you ever create charts and tables. When you run this program, watch the platen as the last statement comes up, to verify reverse line feed:

```
NEW
10 LPRINT CHR$(27) CHR$(48);
20 LPRINT "THIS COMMAND SETS THE LINE SPACING"
30 LPRINT "TO 1/8TH INCH,THE EUROPEAN STANDAR
D."
40 LPRINT CHR$(27) CHR$(49)
50 LPRINT "NOW THE LINE WILL BE TOUCHING.THIS"
60 LPRINT "LINE SPACING IS SET TO 1/10TH INCH.
"
70 LPRINT CHR$(27) CHR$(50)
```

```

80 LPRINT "NOW YOU ARE PRINTING WITH 1/6TH INC
H"
90 LPRINT "LINE SPACING,WHITH IS THE AMERICAN
STANDARD."
100 LPRINT CHR$(10);
110 LPRINT CHR$(27) CHR$(10);
120 LPRINT "THIS COMMAND CAUSES THE PRINTER"
130 LPRINT "TO REVERSE THE PAPER ONE ENTIRE LI
NE."

```

Here is an example of the line space settings for the program:

```

THIS COMMAND SETS THE LINE SPACING
TO 1/8TH INCH,THE EUROPEAN STANDARD.
NOW THE LINE WILL BE TOUCHING.THIS
LINE SPACING IS SET TO 1/10TH INCH.
NOW YOU ARE PRINTING WITH 1/6TH INCH
LINE SPACING,WHITH IS THE AMERICAN STANDARD.
THIS COMMAND CAUSES THE PRINTER
TO REVERSE THE PAPER ONE ENTIRE LINE.

```

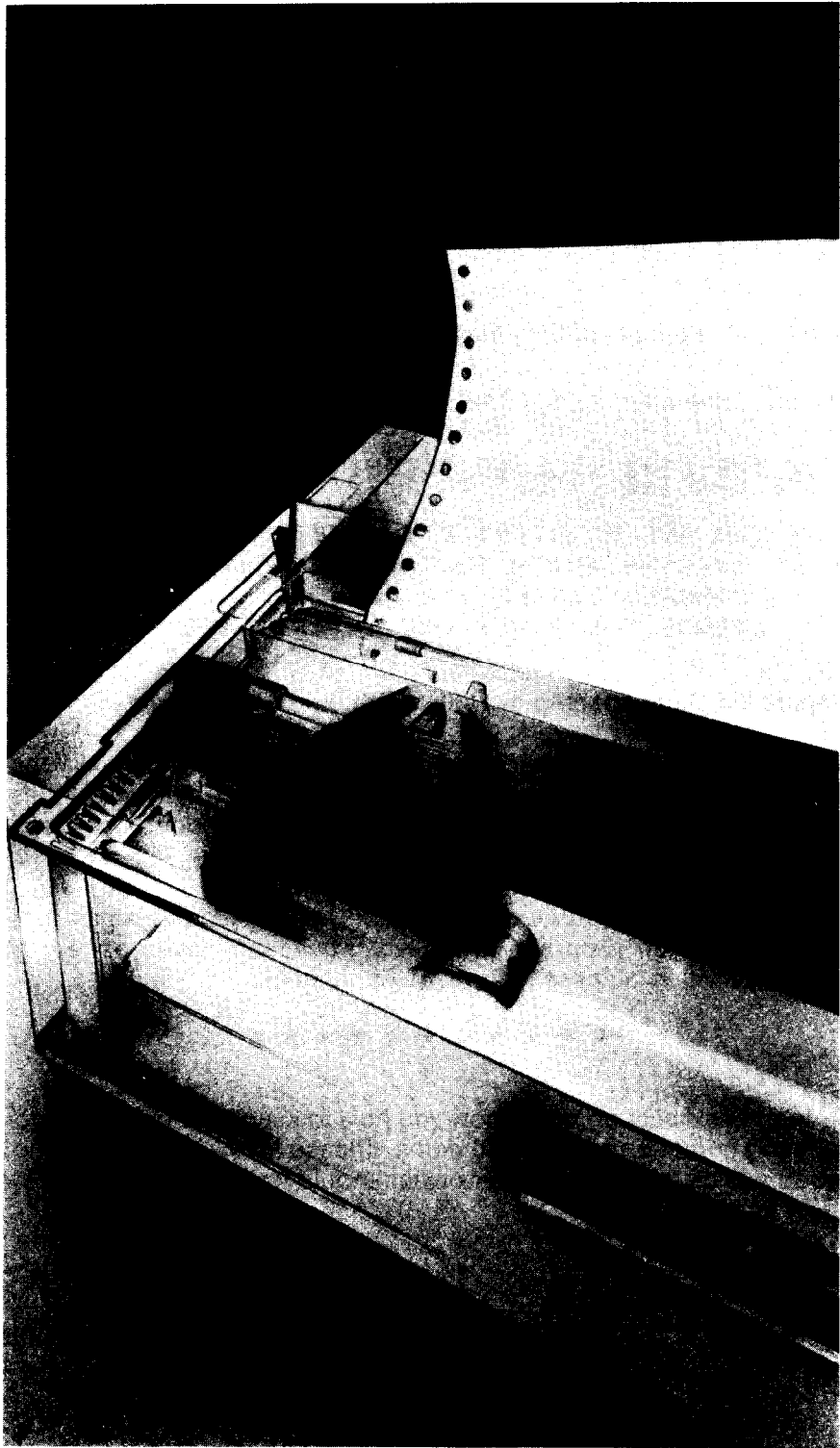
Figure 6-5. Line spacing at 1/6th, 1/8th, and 1/10th inch.

Just as you used an escape code in Section 5 to program your own user-specified line spacing (in increments of 1/60th or 1/120th inch), you can also do this in BASIC with the code: CHR\$(27) CHR\$(65) CHR\$(n) or CHR\$(27) CHR\$(51) CHR\$(n). For "n", you can enter any value between 0 and 255.

This section illustrates only a few of the many possibilities that await when you program in BASIC. Remember, you can get a complete listing of these features in Appendix A.

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In the next section, we'll show you how to keep your printer in top running condition for years to come. Please follow along for some good advice that every printer owner should know.



SECTION

7

BASIC MAINTENANCE PROCEDURES

WHAT THIS SECTION SHOWS YOU:

- *How to Clean the Printer*
 - *How to Replace the Fuse*
 - *How to Replace the Print Head*
 - *Checking the Printer for Correct Operation*
-

■ PREVENTIVE MAINTENANCE

Over the years you will come to appreciate your printer for its extremely accurate and reliable operation. It was designed to have a minimum of moving parts, and this will contribute to the printer's many years of trouble-free service.

Here are a few tips to keep your printer in top condition:

- Avoid touching the business end of the print head.
 - Keep hair, clothing and other foreign objects away from the moving parts of the printer.
 - Do not place foreign objects on any part of the printer. If an object accidentally falls into the printer during operation, always turn the power off before reaching into the printer.
 - Also turn off the printer before cleaning it. When cleaning the inside of the printer be very careful not to bend or otherwise change those tiny wires and attachments— or you will risk electrical shock.
-

■ HOW TO CLEAN THE PRINTER

In order to maintain optimum performance of your printer, you'll want to clean it inside and out on a periodic basis. First be sure to turn the power off and disconnect the printer from the power source.

Exterior

Use a soft cloth moistened in denatured alcohol to remove any dust and dirt from the case of the printer. However, be careful not to moisten either the printing mechanism or any electronic parts.

Interior

We recommend an interior cleaning of the printer after approximately six months of moderate use, to remove any paper dust or small-particle buildup.

You may wish to use a can of pressurized air to blow off loose particles and dust. Or, you may use either a soft (e.g., camel's hair) brush or cloth. Again, be careful to avoid exposed electronic parts and wiring.

■ REPLACING THE FUSE

A fuse has been incorporated into the circuitry of your printer as a safety device to protect it. This fuse may burn out as a result of fluctuations in AC line voltage (that is, the electricity from your power source).

Here are two easy ways to determine whether the fuse in your printer is burned out:

- The power lamp does not light when you turn the power switch on, or
- The printer has been in operation and the power lamp suddenly goes out.

The spare fuse provided with your printer is easy to replace. Here's how to do it:

- Turn the power off and unplug the printer.

BE CAREFUL: The electronic circuitry of your printer uses high-voltage power. Always disconnect the printer from the power source before inspecting the fuse.

- Using a screwdriver or coin, turn the fuse cover counterclockwise until it loosens. Gently pull it straight out toward you.
- Pull out the fuse and inspect it. You should see a thin metal strip inside the glass tube.

- If the metal strip is bent or broken, you'll want to replace it. (Be sure to get a 5MT 2-amp fuse, or its equivalent.)

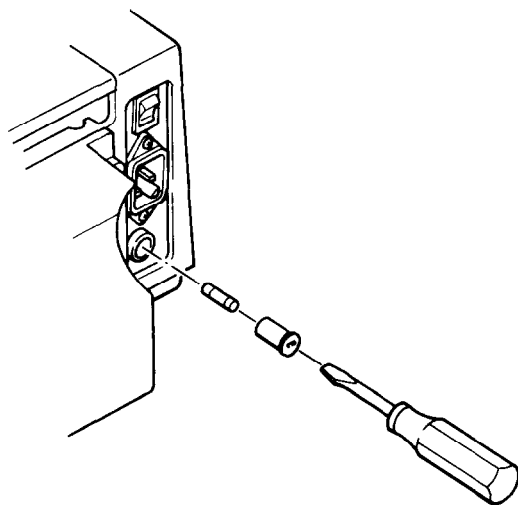


Figure 7-1. Replacing the fuse in the printer

■ **REPLACING THE PRINT HEAD**

The print head in your printer is very durable and has an extremely long design life. However, like most mechanical devices, it may eventually wear out. If you ever do need to change the print head, you'll find that it, too, is easy to replace. Here's how to do it:

- If the printer has been in operation, turn it off and allow about 10 minutes for the print head to cool.
- Lift the front cover and remove the ribbon cassette.
- Locate and remove the screws and washers that hold the print head in place. (You may want to keep them in a cup so that they don't become misplaced.)
- Remove the print head from the carriage.
- Hold the print head in one hand between the thumb and forefinger; with your free hand, gently disconnect the cable (attached to the head) from the socket on the printer's logic board (beneath the rubber cover).
- Connect the ribbon cable from the new print head to the socket on the logic board, and fasten the print head to the carriage with the screws and washers.

- To keep the screws from vibrating loose, apply "Screw Lock" adhesive (or a similar product), available at your dealer or a local hardware store.
- Check to see that the print head and its cable are secure before you resume printing.

■ **CHECKING THE PRINTER FOR CORRECT OPERATION**

On occasion, you may find that your printer isn't operating normally according to the parameters we've set out in this manual. If this should ever happen to you, please turn to the checklist given in the following pages—you'll probably find that it will take only moments to return the printer to correct working order.

We have found that the majority of printer problems are, in general, also the easiest to solve. Most can be corrected through a series of simple checks, and fall into three categories: electrical, mechanical, and those related to the DIP-switch configuration of the printer.

Electrical

The problems in this category are by far the most obvious, but you'd be surprised how often problems can be avoided by making these simple checks:

•Is the power plug firmly seated in a working electrical outlet?

You can verify the outlet is working properly by plugging in another appliance in the same outlet.

- Is the power cord firmly plugged into the back of the printer?**
- Is the printer cable securely fastened to the interface connectors on both the printer and computer?**

Be sure to use the proper clamps or screws to keep the connection tight.

- Is the power switch turned on?**
- Does the Power On lamp fail to light when you turn the printer on?**

Please check the fuse according to the instructions given earlier in this section.

•Did the Power On lamp go out during operation?

Again, please check the fuse.

•Power lamp is on, but printer will not operate.

Make sure the printer is on-line and the front cover is closed. The front-cover-open detector keeps the printer in the "Pause" mode until you close the cover firmly.

Mechanical

This group of checks is related to the mechanical operation of the printer, especially the flow of paper and ribbon through the machine.

•Single sheets don't advance properly through the machine.

Please ensure that the paper release lever is in the "closed" position (toward you).

•Form feed paper jams or doesn't advance smoothly.

Check to see that the paper release lever is in the "open" position (away from you). Also make sure that the covers are closed on the tractor feed units.

•The ribbon does not advance properly.

Confirm that the ribbon cartridge is resting firmly on the carriage. Also check the ribbon tension: you can take out any slack by turning the spool counterclockwise. (See "Loading the Ribbon Cartridge" in Section 1).

•The characters printed on the paper are faint or lighter than normal.

Check the printhead-to-platen gap, making sure that the adjusting lever is properly set for the paper you are using. If the printing is still faint, replace the ribbon.

Configuration of DIP switches

The DIP switches of your printer have been preset at the factory, and unless you or your Star dealer have reconfigured them. For a complete chart of DIP switch settings, please check Appendix D. However, we've listed a few common problems that can be easily solved by the proper setting of a switch. (Remember, whenever you change a DIP switch setting, first turn the printer off, then turn it on again. The printer "reads" the DIP switch settings only when it is first turned on.)

•Print is double-spaced.

Your computer is sending its own automatic line feed with every carriage return (duplicating a similar instruction by the printer). Make sure DIP switch 1-8 is in the "on" position.

•**The printer prints over itself without advancing the paper.**

Check to see that DIP switch 1-8 is turned off. This ensures that an automatic line feed will be added to each carriage return—a command that your computer does not perform by itself.

•**The printer isn't printing normal letters, characters or symbols—only block graphic characters. (This may happen if your computer has a 7-bit interface.)**

Make sure that DIP switch 1-7 is turned off. (Your computer is designed to send normal text in "words" of 7 data bits each—if this switch is off, your printer is in its "block graphics" setting.)

•**The printer won't print block graphics—only letters, numbers and symbols.**

Be sure that DIP switch 1-7 is turned on. (Your computer is designed to send normal text in "words" of 8 bits each—if this switch is off, you won't be able to print in the block graphics mode.)



At Star Micronics, we are dedicated to bringing you the highest-quality, most durable printer money can buy. As a result, you'll find that this printer will provide many years of trouble-free use. But remember, if you have any questions or problems that aren't answered in this manual, your Star dealer is always there to help.

MEMO

APPENDICES



APPENDIX

A

FUNCTION CODE REFERENCE

Appendix A contains an entire listing of the codes used for every function performed by your printer. Many of these codes appear throughout the manual, but there are a number of additional functions that are described only in this appendix. So if you'd like to learn about all the capabilities of your printer, you can find them here.

Each function is listed by name, followed by a short description. Since there are several different ways to access a function—through escape, control, decimal, and hexadecimal codes, and also through BASIC character strings—we have listed each of your possible choices. The codes are also cross-referenced to other related codes, and to the proper section of the manual. Here are a few tips on using the codes listed in Appendix A:

- <ESC> This symbol represents the escape function; for instructions on enabling this function, please consult your computer manual or software manual.
- n* or "*n*" The "*n*" appears in the codes for user-selectable functions, such as horizontal tab settings. When you see "*n*", you may substitute a number or value within the parameters given in the function's description.
- CHR\$ The character string command, CHR\$, is used to "capture" a code entered when you are programming in BASIC. For details, please see Section 6.

Always be sure to enter the code exactly as it appears in the listing. (If a letter is shown in uppercase, enter it in its uppercase form, and vice-versa.)

FONT STYLES AND PRINT CONTROLS

■ SELECT THE DRAFT-QUALITY (DQ) CHARACTER SET

This code switches the printer to the draft-quality character set. You can also access the DQ set by turning DIP switch 1-5 on.

CODE: <ESC> 5
HEX: 1B 35
DECIMAL: 27 53
BASIC: CHR\$(27) CHR\$(53)
REFERENCE: <ESC> 4, Section 4.

■ SELECT THE LETTER-QUALITY (LQ) CHARACTER SET

This command switches the printer to the LQ character set. (You may also set LQ as the power-on default by turning DIP switch 1-5 off. See Appendix D.)

CODE: <ESC> 4
HEX 1B 34
DECIMAL: 27 52
BASIC: CHR\$(27) CHR\$(52)
REFERENCE: <ESC> 5, Section 4.

■ **SELECT AN INTERNATIONAL CHARACTER SET**

This command selects one of eight international character sets determined by the value of "n", as shown below. (You can also select a particular International Character Set as a power-on default. To do this, please turn to Appendix D, "DIP Switches.")

CODE: <ESC> R "n"

HEX: 1B 52 "n"

DECIMAL: 27 82 "n"

BASIC: CHR\$(27) CHR\$(82) CHR\$(n)

USA=0 France=1 Germany=2 England=3 Denmark=4
Sweden=5 Italy=6 Spain=7

■ **SET THE PROPORTIONAL SPACING**

In the letter-quality mode, this command causes all subsequent printing to be done in proportional spacing.

CODE: <ESC> p 1

HEX: 1B 70 01

DECIMAL: 27 112 1

BASIC: CHR\$(27) CHR\$(112) CHR\$(1)

REFERENCE: <ESC> p 0, Section4

■ **CANCEL PROPORTIONAL SPACING**

This command cancels the proportional spacing and returns the print pitch to pica.

CODE: <ESC> p 0
HEX: 1B 70 00
DECIMAL: 27 112 0
BASIC: CHR\$(27) CHR\$(112) CHR\$(0)
REFERENCE: <ESC> p 1, Section 4

■ **SET THE PRINT PITCH TO PICA (10 CPI)**

In the draft mode, this command causes all subsequent printing to be done in pica type. This command also sets the maximum line length to 80 characters. You can select pica type as the power-on default by turning on DIP switch 1-6.

CODE: <ESC> P
HEX: 1B 50
DECIMAL: 27 80
BASIC: CHR\$(27) CHR\$(80)
REFERENCE: <ESC> M, Section 4.

■ SET THE PRINT PITCH TO ELITE (12 CPI)

In the draft mode, this command causes all subsequent printing to be done in elite type, and sets the maximum line length to 96 characters. You can select elite type as the power-on default by turning DIP switch 1-6 off.

CODE: <ESC> M
HEX: 1B 4D
DECIMAL: 27 77
BASIC: CHR\$(27) CHR\$(77)
REFERENCE: <ESC> P, Section 4.

■ SET THE PRINT PITCH TO CONDENSED (16.7 CPI)

In the draft mode, this command instructs the printer to print in the condensed pitch, and also sets the maximum line length to 132 characters.

CODE: <ESC> <SI>
 <SI>
HEX: 1B 0F or 0F
DECIMAL: 27 15 or 15
BASIC: CHR\$(27) CHR\$(15) or CHR\$(15)
REFERENCE: <ESC> P, <ESC> M, Section 4.

■ **SELECT EXPANDED PRINT**

This instruction causes all subsequent printing to be in expanded type. The size of the type is determined by the pitch in use at the time the command is sent:

<u>PITCH</u>	<u>NORMAL</u>	<u>EXPANDED</u>
Pica	10 cpi	5 cpi
Elite	12 cpi	6 cpi
Condensed	16.7 cpi	8.3 cpi

CODE: < ESC > W 1

HEX: 1B 57 01

DECIMAL: 27 87 1

BASIC: CHR\$(27) CHR\$(87) CHR\$(1)

REFERENCE: < ESC > W 0, Section 4.

■ **1 LINE EXPANDED PRINT**

Another code for expanded type activates this function for one line only. Here are the codes:

CODE: < ESC > < SO >
 < SO >

HEX: 1B 0E or 0E

DECIMAL: 27 14 or 14

BASIC: CHR\$(27) CHR\$(14) or CHR\$(14)

REFERENCE: < ESC > W 1, < ESC > W 0.

■ **CANCEL EXPANDED PRINT**

Resets the print size to the pitch in use before expanded print began.

CODE: <ESC> W 0

HEX: 1B 57 00

DECIMAL: 27 87 0

BASIC: CHR\$(27) CHR\$(87) CHR\$(0)

REFERENCE: <ESC> W 1, Section 4.

■ **SELECT DOUBLE-STRIKE PRINTING**

After this command is sent, all characters will be printed in the double-strike mode.

CODE: <ESC> G

HEX: 1B 47

DECIMAL: 27 71

BASIC: CHR\$(27) CHR\$(71)

REFERENCE: <ESC> H, Section 4.

■ **CANCEL DOUBLE-STRIKE PRINTING**

This command returns printer to normal printing, canceling the double-strike mode.

CODE: <ESC> H

HEX: 1B 48

DECIMAL: 27 72

BASIC: CHR\$(27) CHR\$(72)

REFERENCE: <ESC> G, Section 4.

■ ***SELECT EMPHASIZED PRINTING***

This command causes all subsequent characters to be printed in the emphasized mode.

CODE: < ESC > E
HEX: 1B 45
DECIMAL: 27 69
BASIC: CHR\$(27) CHR\$(69)
REFERENCE: < ESC > F, Section 4.

■ ***CANCEL EMPHASIZED PRINTING***

Returns normal printing, canceling the emphasized print mode.

CODE: < ESC > F
HEX: 1B 46
DECIMAL: 27 70
BASIC: CHR\$(27) CHR\$(70)
REFERENCE: < ESC > E, Section 4.

■ ***SELECT UNDERLINING***

After this command is given, all characters will be underlined until this function is canceled.

CODE: < ESC > - 1
HEX: 1B 2D 01
DECIMAL: 27 45 1
BASIC: CHR\$(27) CHR\$(45) CHR\$(1)
REFERENCE: < ESC > - 0, Section 4.

■ **CANCEL UNDERLINING**

After this code is sent, underlining will be canceled.

CODE: <ESC> - 0
HEX: 1B 2D 00
DECIMAL: 27 45 0
BASIC: CHR\$(27) CHR\$(45) CHR\$(0)
REFERENCE: <ESC> - 1, Section 4.

■ **SELECT SUPERSCRIPTS**

With this command, all subsequent characters are printed as superscripts until this function is canceled.

CODE: <ESC> S 0
HEX: 1B 53 00
DECIMAL: 27 83 0
BASIC: CHR\$(27) CHR\$(83) CHR\$(0)
REFERENCE: <ESC> S 1, <ESC> T, Section 5.

■ **SELECT SUBSCRIPTS**

This code causes all subsequent characters to be printed at the subscript level, until this function is canceled.

CODE: <ESC> S 1
HEX: 1B 53 01
DECIMAL: 27 83 1
BASIC: CHR\$(27) CHR\$(83) CHR\$(1)
REFERENCE: <ESC> S 0, <ESC> T, Section 5.

■ **CANCEL SUPERSCRIPTS AND SUBSCRIPTS**

This command is used to cancel either super- or subscript printing.

CODE: <ESC> T

HEX: 1B 54

DECIMAL: 27 84

BASIC: CHR\$(27) CHR\$(84)

REFERENCE: <ESC> S 0, <ESC> S 1, Section 5.

FORMATTING CONTROLS

■ **SELECT UNIDIRECTIONAL PRINTING**

This command causes all subsequent lines to be printed in the unidirectional mode, until canceled. Unidirectional printing is useful in printing tables or charts, since it ensures that vertical columns of characters will be in alignment in the draft mode.

CODE: <ESC> U 1

HEX: 1B 55 01

DECIMAL: 27 85 1

BASIC: CHR\$(27) CHR\$(85) CHR\$(1)

REFERENCE: <ESC> U 0, <ESC> <.

A similar command can be used to activate unidirectional printing for one line only. Here are the codes:

CODE: <ESC> <

HEX: 1B 3C

DECIMAL: 27 60

BASIC: CHR\$(27) "<"

REFERENCE: <ESC> U 0, <ESC> U 1.

■ **CANCEL UNIDIRECTIONAL PRINTING**

This command cancels unidirectional printing, returning the printer to its standard bidirectional printing.

CODE: <ESC> U 0

HEX: 1B 55 00

DECIMAL: 27 85 0

BASIC: CHR\$(27) CHR\$(85) CHR\$(0)

REFERENCE: <ESC> U 1.

■ **ADVANCE THE PAPER ONE LINE (LINE FEED)**

The actual distance advanced by the line feed is set either through DIP Switch 1-3 or through other line spacing methods outlined in Section 5.

CODE: <LF>

HEX: 0A

DECIMAL: 10

BASIC: CHR\$(10)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> J "n",
<ESC> j "n", Section 5.

■ REVERSE THE PAPER ONE LINE (REVERSE LINE FEED)

This command causes the printer to reverse the paper one line. The distance reversed by this instruction is set either through DIP switch 1-3 or through other line spacing methods outlined in Section 5.

CODE: <ESC> <LF>

HEX: 1B 0A

DECIMAL: 27 10

BASIC: CHR\$(27) CHR\$(10)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> J "n",
<ESC> j "n", Section 5.

■ CHANGE THE LINE SPACING TO 1/8 INCH

This instructs your printer to print 8 lines per inch. (You can also select 1/8th inch line spacing by turning off DIP switch 1-3.)

CODE: <ESC> 0

HEX: 1B 30

DECIMAL: 27 48

BASIC: CHR\$(27) CHR\$(48)

REFERENCE: <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> J "n",
<ESC> j "n", Section 5.

■ CHANGE THE LINE SPACING TO 1/10 INCH

After this instruction is given, all subsequent line feeds will be set to 1/10th inch, or 10 lines per inch, as described in Section 5.

CODE: <ESC> 1

HEX: 1B 31

DECIMAL: 27 49

BASIC: CHR\$(27) CHR\$(49)

REFERENCE: <ESC> 0, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> J "n",
<ESC> j "n", Section 5.

■ CHANGE THE LINE SPACING TO 1/6 INCH

This command returns the line spacing on the printer to 1/6th inch, which is the American standard. You can also select 1/6th inch line spacing as the power-on default by turning DIP switch 1-3 on.

CODE: <ESC> 2

HEX: 1B 32

DECIMAL: 27 50

BASIC: CHR\$(27) CHR\$(50)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> A "n",
<ESC> 3 "n", <ESC> J "n",
<ESC> j "n", Section 5.

■ CHANGE THE LINE SPACING TO $n/60$ THS OF AN INCH

This command allows you to select the line spacing you want, to $n/60$ ths of an inch. You may choose a value for "n" between 0 and 255.

CODE: <ESC> A "n"

HEX: 1B 41 "n"

DECIMAL: 27 65 "n"

BASIC: CHR\$(27) CHR\$(65) CHR\$(n)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> 3 "n", <ESC> J "n", <ESC> j "n",
Section 5.

■ CHANGE THE LINE SPACING TO $n/120$ THS OF AN INCH

This command allows you to select the line spacing you want, to $n/120$ ths of an inch. You may choose a value for "n" between 0 and 255.

CODE: <ESC> 3 "n"

HEX: 1B 33 "n"

DECIMAL: 27 51 "n"

BASIC: CHR\$(27) CHR\$(51) CHR\$(n)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> J "n", <ESC> j "n",
Section 5.

■ SEND A ONE-TIME-ONLY LINE FEED OF $n/120$ THS OF AN INCH

This command causes the printer to advance the paper $n/120$ ths of an inch, for the remainder of the line. It does not change the current value of the line spacing, and it does not cause a carriage return. You may substitute for "n" any number between 0 and 255.

CODE: <ESC> J "n"

HEX: 1B 4A "n"

DECIMAL: 27 74 "n"

BASIC: CHR\$(27) CHR\$(74) CHR\$(n)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> j "n".

■ SEND A ONE-TIME-ONLY REVERSE LINE FEED OF $n/120$ THS OF AN INCH

You can use this command to reverse the paper $n/120$ ths of an inch. It does not change the current value of the line spacing, and it does not cause a carriage return. You may choose a value between 0 and 255.

CODE: <ESC> j "n"

HEX: 1B 6A "n"

DECIMAL: 27 106 "n"

BASIC: CHR\$(27) CHR\$(106) CHR\$(n)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "n",
<ESC> A "n", <ESC> 3 "n", <ESC> J "n".

■ **ADVANCE PAPER TO TOP OF NEXT PAGE (FORM FEED)**

The length of a page selected by the form feed is set either through DIP switch 1-2 or through various codes listed below.

CODE: < FF >

HEX: 0C

DECIMAL: 12

BASIC: CHR\$(12)

REFERENCE: < ESC > C "n", < ESC > C 0 "n"

■ **REVERSE PAPER TO TOP OF CURRENT PRINTING PAGE (REVERSE FORM FEED)**

This command causes the printer to reverse the paper to the top line of the page.

CODE: < ESC > < FF >

HEX: 1B 0C

DECIMAL: 27 12

BASIC: CHR\$(27) CHR\$(12)

REFERENCE: < ESC > C "n", < ESC > C 0 "n".

■ **SET PAGE LENGTH TO "n" LINES**

This command sets the length of all subsequent pages to "n" lines. You may choose for "n" any whole number between 1 and 127.

CODE: < ESC > C "n"

HEX: 1B 43 "n"

DECIMAL: 27 67 "n"

BASIC: CHR\$(27) CHR\$(67) CHR\$(n)

REFERENCE: < ESC > C 0 "n", Section 5.

■ SET PAGE LENGTH TO "n" INCHES

When you send this command, you set the length of all subsequent pages to "n" inches. You may choose for "n" any whole number value between 1 and 32. (You may also select a power-on default form length of 11 inches or 12 inches by setting DIP switch 1-2.)

CODE: <ESC> C 0 "n"

HEX: 1B 43 00 "n"

DECIMAL: 27 67 0 "n"

BASIC: CHR\$(27) CHR\$(67) CHR\$(0) CHR\$(n)

REFERENCE: <ESC> C "n", Section 5.

■ SET TOP MARGIN

This command allows you to redefine the top margin of the page. For "n", you may enter any number between 1 and 16.

CODE: <ESC> r "n"

HEX: 1B 72 "n"

DECIMAL: 27 114 "n"

BASIC: CHR\$(27) CHR\$(114) CHR\$(n)

REFERENCE: <ESC> N "n", Section 5.

■ SET THE BOTTOM MARGIN

With this command, you set the bottom margin of the page to "n" lines. The printer automatically executes a form feed when the number of lines left on a page is equal to the "n" value you choose. You may enter for "n" any value between 1 and 127.

CODE: <ESC> N "n"

HEX: 1B 4E "n"

DECIMAL: 27 78 "n"

BASIC: CHR\$(27) CHR\$(78) CHR\$(n)

REFERENCE: <ESC> O, Section 5.

■ CANCEL TOP AND BOTTOM MARGINS

This command cancels both the top margin set by <ESC> r "n" and the bottom margin set by <ESC> N "n".

CODE: <ESC> O

HEX: 1B 4F

DECIMAL: 27 79

BASIC: CHR\$(27) CHR\$(79)

REFERENCE: <ESC> r "n", <ESC> N "n", Section 5.

■ SET VERTICAL TAB POSITIONS

This command cancels all previous vertical tab positions and sets those defined at lines "n1", "n2", etc. The maximum number of vertical tab positions you can set is 12. This instruction must be terminated with the "NUL" code, CHR\$(0). Each vertical tab must be specified in ascending order.

CODE: <ESC> B "n1" "n2" ...0

HEX: 1B 42 "n1" "n2" ... 0

DECIMAL: 27 66 "n1" "n2" ... 0

BASIC: CHR\$(27) CHR\$(66) CHR\$(n1) CHR\$(n2) ... CHR\$(0)

REFERENCE: <VT>, Section 5.

■ ADVANCE TO NEXT VERTICAL TAB POSITION

This command causes to the paper to advance to the next vertical tab position or the top of the page, whichever comes first. The vertical tab positions are set automatically at power-on to lines 6, 12, 18, 24, 30, 36, 42, 48, 54, and 60.

CODE: <VT>

HEX: 0B

DECIMAL: 11

BASIC: CHR\$(11)

REFERENCE: <ESC> B "n1" "n2" ... 0, <ESC> a "n",
Section 5.

■ ADVANCE THE PAPER "n" LINES

This command causes the paper to advance "n" lines, but does not change any values of the vertical tab positions. You may choose any number between 1 and 255 for "n".

CODE: <ESC> a "n"

HEX: 1B 61 "n"

DECIMAL: 27 97 "n"

BASIC: CHR\$(27) CHR\$(97) CHR\$(n)

REFERENCE: <ESC> B "n1" "n2" ... 0.

■ SET VERTICAL FORM UNIT (VFU)

The vertical form unit command can be used to help you print multipage forms. If each page of the form has different vertical tab positions, the tabs can be set in "channels". There are 7 channels which are numbered from 0 to 6, you can program the tab positions for up to 7 different pages of a form. In the example below the variable "n" is used to select which channel will be used. The variables "m1", "m2", "m3"... are used to define the vertical tab positions for a given channel. The command must be terminated with a nul code <0> to signify the end of data for that command. The maximum number of tab positions for a channel is 12.

CODE: <US> "n" "m1" "m2" ... 0

HEX: 1F "n" "m1" "m2" ... 00

DECIMAL: 31 "n" "m1" "m2" ... 0

BASIC: CHR\$(31) CHR\$(n) CHR\$(m1) CHR\$(m2)
CHR\$(0)

REFERENCE: <ESC> B "n1" "n2" ...0, <ESC> / n

■ **SELECT VERTICAL FORM UNIT (VFU) CHANNEL**

This command causes the printer to execute all subsequent vertical tabs in accordance with the format you specified for VFU channel "n".

CODE: <ESC> / "n"
HEX: 1B 2F "n"
DECIMAL: 27 47 "n"
BASIC: CHR\$(27) CHR\$(47) CHR\$(n)
REFERENCE: <US> "n" "m1" "m2" ... 0
 <ESC> B "n1" "n2" ...0

■ **CARRIAGE RETURN**

This command returns the print head to its "home" position at the left margin.

CODE: <CR>
HEX: 0D
DECIMAL: 13
BASIC: CHR\$(13)
REFERENCE: Appendix D.

■ SET THE LEFT MARGIN

You can use this instruction to set the left printing margin of your page. This margin will be the "home" position of all subsequent carriage returns until it is canceled or changed. The power-on default for this position is 1. The value for "n" must be between 1 and 155. The maximum print position for pica type is 80 for elite, 96 and for condensed type, 132.

CODE: <ESC> I "n"

HEX: 1B 6C "n"

DECIMAL: 27 108 "n"

BASIC: CHR\$(27) CHR\$(108) CHR\$(n)

REFERENCE: <ESC> Q "n", Section 5.

■ SET THE RIGHT MARGIN

Use this command to set the right printing margin on the page. Any attempt to print beyond your chosen right-hand margin will cause an automatic carriage return and line feed. Choose any value between 1 and 155.

CODE: <ESC> Q "n"

HEX: 1B 51 "n"

DECIMAL: 27 81 "n"

BASIC: CHR\$(27) CHR\$(81) CHR\$(n)

REFERENCE: <ESC> I "n", Section 5.

■ SET HORIZONTAL TAB POSITIONS

With this command, you cancel all previously set horizontal tabs, and set new positions at lines "n1", "n2", etc. There are 255 available tab positions. Use 0 to terminate this command. Each horizontal tab must be between 1 and 255, and must be specified in ascending order.

CODE: <ESC> D "n1" "n2" ... 0

HEX: 1B 44 "n1" "n2" ... 00

DECIMAL: 27 68 "n1" "n2" ... 0

BASIC: CHR\$(27) CHR\$(68) CHR\$(n1) CHR\$(n2)
... CHR\$(0)

REFERENCE: <ESC> b "n", <HT>, Section 5.

■ ADVANCE TO NEXT HORIZONTAL TAB

This command moves the print head to the next available horizontal tab position. Horizontal tabs are set at power-on to positions 9, 17, 25, 33, etc., to the maximum print position.

CODE: <HT>

HEX: 09

DECIMAL: 9

BASIC: CHR\$(9)

REFERENCE: <ESC> D "n1" "n2" ... 0, Section 5.

■ SKIP HORIZONTAL TAB POSITIONS

Causes the print head to advance "n" print positions to the right. It does not, however, change the current values of the horizontal tabs. You may choose any number for "n" between 1 and 255.

CODE: <ESC> b "n"

HEX: 1B 62 "n"

DECIMAL: 27 98 "n"

BASIC: CHR\$(27) CHR\$(98) CHR\$(n)

REFERENCE: <ESC> D "n1" "n2" ...0.

■ MOVE THE PRINT HEAD BACK ONE POSITION (BACKSPACE)

Shifts the print head one column to the left. This command can be used to overstrike characters.

CODE: <BS>

HEX: 08

DECIMAL: 8

BASIC: CHR\$(8)

REFERENCE: Section 2.

■ **PRINT 8-BIT GRAPHICS**

This command selects the 8-bit graphics mode. Please see Appendix F for a detailed explanation of this mode.

CODE: <ESC> Y "n1" "n2" "m1" "m2"

HEX: 1B 59 "n1" "n2" "m1" "m2"

DECIMAL: 27 89 "n1" "n2" "m1" "m2"

BASIC: CHR\$(27) CHR\$(89) CHR\$(n1) CHR\$(n2) CHR\$(m1)
 CHR\$(m2)... .

REFERENCE: Appendix F.

■ **PRINT 16-BIT GRAPHICS**

This command switches the printer into its 16-bit graphics mode. Please see Appendix F for more on the printer's graphics modes.

CODE: <ESC> I "n1" "n2" "m1" "m2"

HEX: 1B 49 "n1" "n2" "m1" "m2"

DECIMAL: 27 73 "n1" "n2" "m1" "m2"

BASIC: CHR\$(27) CHR\$(73) CHR\$(n1) CHR\$(n2) CHR\$(m1)
 CHR\$(m2)

REFERENCE: Appendix F.

■ **PRINT 24-BIT GRAPHICS**

With this command, you can print high-resolution 24-bit graphics. Please see Appendix F for details.

CODE: <ESC> V "n1" "n2" "m1" "m2"

HEX: 1B 56 "n1" "n2" "m1" "m2"

DECIMAL: 27 86 "n1" "n2" "m1" "m2"

BASIC: CHR\$(27) CHR\$(86) CHR\$(n1) CHR\$(n2) CHR\$(m1)
 CHR\$(m2)...

REFERENCE: APPENDIX F.

■ **PRINT 8X3-BIT GRAPHICS**

This command enables the 8x3-bit graphics mode, which prints about three times as dense and three times as wide as simple 8-bit graphics. Please see Appendix F for details.

CODE: <ESC> K "n1" "n2" "m1" "m2"

HEX: 1B 4B "n1" "n2" "m1" "m2"

DECIMAL: 27 75 "n1" "n2" "m1" "m2"

BASIC: CHR\$(27) CHR\$(75) CHR\$(n1) CHR\$(n2) CHR\$(m1)
 CHR\$(m2)...

REFERENCE: Appendix F.

■ SELECT MASTER PRINT MODE

With this command, you can select one of 16 unique print mode combinations shown in Table A-1, for the value of "n". (You may choose for "n" any number between 0 and 255.) This command precedes other commands (such as <ESC> G, etc.) which set the print mode.

CODE: <ESC>! "n"

HEX: 1B 21 "n"

DECIMAL: 27 33 "n"

BASIC: CHR\$(27) CHR\$(33) CHR\$(n)

REFERENCE: <ESC> <SO>, <ESC> <SI>, <ESC> E,
<ESC> F, <ESC> G, <ESC> H, <ESC> M,
<ESC> P, <ESC> W 0, <ESC> W 1.

Table A-1. Options for the master print mode.

PITCH	NORMAL	EMPHASIZED	DOUBLE-STRIKE	DOUBLE-STRIKE & EMPHASIZED
Pica	0, 2, 64, 66, 128, 130, 192, 194	8, 10, 12, 14, 72, 74, 76, 78, 136, 138, 140, 142, 200, 202, 204, 206	16, 18, 80, 82,144, 146, 208, 210	24, 26, 28, 30, 88, 90, 92, 94, 152, 154, 156, 158, 216, 218, 220, 222
Elite	1, 3, 5, 7, 9, 11, 13, 15, 65, 67, 69, 71, 73, 75, 77, 79, 129, 131, 133, 135, 137, 139, 141, 143, 193, 195, 197, 199, 201, 203, 205, 207	Elite takes precedence over Emphasized.	17, 19, 21, 23, 25, 27, 29, 31, 81, 83, 85, 87, 89, 91, 93, 95,145, 147, 149,151, 153, 155,157, 159, 209,211, 213, 215,217, 219, 221,223	Elite takes precedence over Emphasized.
Condensed	4, 6, 68, 70, 132, 134, 196, 198	Emphasized takes precedence over condensed.	20, 22, 84, 86,148, 150, 212,214	Emphasized takes precedence over condensed.
Expanded Pica	32, 34, 96, 98, 160, 162, 224, 226	40, 42, 44, 46, 104, 106, 108, 110, 168, 170, 172, 174, 232, 234, 236, 238	48, 50, 112, 114,176, 178, 240, 242	56, 58, 60, 62, 120, 122, 124, 126, 184, 186, 188, 190, 248, 250, 252, 254
Expanded Elite	33, 35, 37, 39, 41, 43, 45, 47, 97, 99, 101, 103, 105, 107, 109, 111, 161, 163, 165, 167, 169, 171, 173, 175, 225, 227, 229, 231, 233, 235, 237, 239	Elite takes precedence over Emphasized.	49, 51, 53, 55, 57, 59, 61, 63, 113, 115,117, 119, 121,123, 125, 127,177, 179, 181,183, 185, 187,189, 191, 241,243, 245, 247,249, 251, 253,255	Elite takes precedence over Emphasized.
Expanded Condensed	36, 38, 100, 102, 164, 166, 228, 230	Emphasized takes precedence over condensed.	52, 54, 116, 118,180, 182, 244,246	Emphasized takes precedence over condensed.

■ DEFINE MACRO INSTRUCTION

This command cancels any existing macro instruction and replaces it with a new macro defined by you. Your maximum number of codes in this instruction is 16. The last character in each of the codes below is used to terminate the command.

CODE: <ESC> + ... <RS>
HEX: 1B 2B ... 1E
DECIMAL: 27 43 ... 30
BASIC: CHR\$(27) CHR\$(43) ... CHR\$(30)
REFERENCE: <ESC> ?, Section 4.

■ EXECUTE MACRO INSTRUCTION

This command is used to execute your previously defined macro instruction.

CODE: <ESC> ?
HEX: 1B 3F
DECIMAL: 27 63
BASIC: CHR\$(27) CHR\$(63)
REFERENCE: <ESC> + ... <RS> , Section 4.

■ SET THE VALUE OF THE 8TH DATA BIT TO LOGICAL 1

This command allows users with a 7-bit interface to access those characters whose ASCII code is greater than 127.

CODE: <ESC> >
HEX: 1B 3E
DECIMAL: 27 62
BASIC: CHR\$(27) CHR\$(62)
REFERENCE: <ESC> #, <ESC> =.

■ SET THE VALUE OF THE 8TH DATA BIT TO LOGICAL 0

This command causes the printer to ignore the eighth data bit.

CODE: <ESC> =
HEX: 1B 3D
DECIMAL: 27 61
BASIC: CHR\$(27) CHR\$(61)
REFERENCE: <ESC> >, <ESC> #.

■ ACCEPT THE VALUE OF THE 8TH DATA BIT AS IS

This command cancels either setting of the 8th data bit, causing the printer to use the value of the eighth data bit that is sent from the computer.

CODE: <ESC> #
HEX: 1B 23
DECIMAL: 27 35
BASIC: CHR\$(27) CHR\$(35)
REFERENCE: <ESC> >, <ESC> =.

■ DELETE THE LAST CHARACTER SENT

This command deletes the last character received by the printer; it is ignored if the last character received has already been printed, or if the last character received was all or part of a function code.

CODE:
HEX: 7F
DECIMAL: 127
BASIC: CHR\$(127)

■ SET PRINTER OFF-LINE

This command causes the printer to set itself off-line, disregarding all subsequent characters and function codes (with the exception of <DC1>, which returns the printer to its on-line state). When the ON LINE lamp on the printer is off, the printer will not respond to <DC1>.

CODE: <DC3>

HEX: 13

DECIMAL: 19

BASIC: CHR\$(19)

REFERENCE: <DC1>

■ SET THE PRINTER ON-LINE

This code resets the printer to an on-line state, allowing it to again receive and process characters and function codes. The ON LINE lamp must be lit for the printer to respond to this code.

CODE: <DC1>

HEX: 11

DECIMAL: 17

BASIC: CHR\$(17)

REFERENCE: <DC3>.

■ SOUND THE PRINTER BELL

This command causes the printer tone to sound for approximately 1/4th second.

CODE: <BEL>

HEX: 07

DECIMAL: 7

BASIC: CHR\$(7)

REFERENCE: <ESC> y 1, <ESC> y 0.

■ **DISABLE THE PRINTER BELL**

This command causes the printer to ignore the <BEL> code.

CODE: <ESC> y 0
HEX: 1B 79 00
DECIMAL: 27 121 0
BASIC: CHR\$(27) CHR\$(121) CHR\$(0)
REFERENCE: <ESC> y 1, <BEL>

■ **ENABLE PRINTER BELL**

This command causes the printer to respond to the <BEL> code by sounding the printer tone.

CODE: <ESC> y 1
HEX: 1B 79 01
DECIMAL: 27 121 1
BASIC: CHR\$(27) CHR\$(121) CHR\$(1)
REFERENCE: <ESC> y 0, <BEL> .

■ **DISABLE PAPER-OUT DETECTOR**

This command causes the printer to disregard the signal sent by the paper-out detector. The paper-out signal normally sounds the printer bell and stops printing until paper is inserted and the printer is reset.

CODE: <ESC> 8
HEX: 1B 38
DECIMAL: 27 56
BASIC: CHR\$(27) CHR\$(56)
REFERENCE: <ESC> 9.

■ **ENABLE PAPER-OUT DETECTOR**

This command restores the function of the paper-out detector.

CODE: <ESC> 9
HEX: 1B 39
DECIMAL: 27 57
BASIC: CHR\$(27) CHR\$(57)
REFERENCE: <ESC> 8.

■ **CANCEL TEXT IN PRINT BUFFER**

This command cancels all the data previously stored in the print buffer of your printer.

CODE: <CAN>
HEX: 18
DECIMAL: 24
BASIC: CHR\$(24)
REFERENCE: .

■ **INITIALIZE PRINTER**

This command is used to reinitialize the printer. The print buffer is cleared and the form length, character pitch, character set, line feed pitch, and international character set are all reset to the values defined by their respective DIP switches. The main difference between this code and simply turning the printer off is that download character RAM is preserved with this command.

CODE: <ESC> @
HEX: 1B 40
DECIMAL: 27 64
BASIC: CHR\$(27) CHR\$(64)

■ **SELECT INCREMENTAL MODE**

This command causes the printer to print each character as it is typed in. If the data is input at intervals of less than approximately 0.1 second, printout will be performed continuously. This is useful for completing forms, or whenever you need to print a character on command.

CODE: <ESC> i 1
HEX: 1B 69 01
DECIMAL: 27 105 1
BASIC: CHR\$(27) CHR\$(105) CHR\$(1)
REFERENCE: <ESC> i 0.

■ **CANCEL INCREMENTAL MODE**

This command cancels incremental mode.

CODE: <ESC> i 0
HEX: 1B 69 00
DECIMAL: 27 105 0
BASIC: CHR\$(27) CHR\$(105) CHR\$(0)
REFERENCE: <ESC> i 1.

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B

INSTALLING THE PRINTER INTO YOUR WORD PROCESSING PACKAGE

In Section 1, we listed the basic information you will need to know when you install the printer into your word processing package. Now let's look at a typical installation for WordStar, one of the first—and still the most popular—word processors made for the personal computer. If you aren't planning to use WordStar as your word processor, you can still benefit by reading the following step-by-step description—it will take you through a typical "custom installation", giving you valuable information you can use with any word processor.

To get to the WordStar installation program, insert the disk into your computer as you normally do; at the A>, type the word WINSTALL. The installation program will appear, prompting you with a few preliminary questions (such as "Do you want to continue with this installation?"; answer these questions, and when you get to the query "Name of file to install", enter WS.COM and press the return key three times.

■ **THE INSTALLATION MENU**

The next menu to appear on your screen will be the WordStar Installation Menu, with several choices, including "Menu of Printers" and "Custom Installation of Printers." As we said, you may want to look at the menu of printers and experiment with any of the dot matrix printers listed.

However, you'll get your best results by using WordStar's "Custom Installation of Printers." This choice requires some detailed information about your printer, which you'll find in the following pages. When you choose "Custom Installation of Printers," you are immediately given a submenu called the Printer Installation Menu. The

Printer Installation Menu contains a separate entry for each category of information you will provide concerning the printer.

From this menu your choice is "Automatic Installation for Specialty Printers," which will lead you through each individual category under the heading "All printers"; in addition, it will lead you through the categories for "Specialty printers only".

Printer Name

Your first category is an easy one—the optional "Printer Name." If this is your first installation of WordStar, there will be a blank space next to the words "Current name is:". Press C to change this status, and type in your printer's name.

Printer Initialization

This important category tells WordStar the exact code sequence needed to communicate with your printer. The sequence is "currently empty," so press C to change this status; then enter the following hexadecimal numbers in the exact order shown here (press the return key when you see the word <return>):

```
0D <return>
1B <return>
40 <return>
1B <return>
34 <return>
1B <return>
1E <return>
09 <return>
1B <return>
1F <return>
0D <return>
00 <return>
00 <return>
00 <return>
00 <return>
00 <return> <return>
```

When you're finished entering the initialization code, press Y or <return> to confirm your choices.

Printer De-initialization

You will automatically advance to this category when you have finished entering the information concerning printer initialization. No de-initialization code is needed for your printer, so just press <return> to advance to the next category.

Overprinting

The "Overprinting" category will want to know how your printer backspaces. Press C and, from a list of three choices, choose "backspacing standard printer"; then press Y or <return> to confirm your choice.

Next you will be prompted to enter the "backspacing code sequence." Press C, then type in "8h", and finish by pressing the return key.

Boldfacing

Your next category, "Boldfacing", informs you directly of the correct number of strikes for boldface printing: 2. So, press C, 2, and <return>.

Communications protocol

If you are using the parallel interface, no protocol is necessary for this printer. (For the code sequences used in the various serial interface protocols, please see Appendix H.)

Printer driver

If you have chosen "Primary list device" as your printer driver, then the correct codes for that device will already be entered in this category, and no further input is necessary on your part. Press <return> to exit this category.

Ribbon selection

This category also does not apply to your printer, so please press <return> to exit.

Vertical motion and Horizontal motion

When you chose "Automatic Installation for Specialty Printers," the installation program automatically entered the necessary codes for these two categories. No further input is necessary, so just press <return> to pass through them unchanged.

Print modes

This category asks for the code sequences of the backward and forward print modes. You should also pass through these sequences unchanged.

Print phantom characters

This category does not apply to your printer, so press <return> to pass through it. You will be returned to the Printer Installation Menu, and may now enter the special features of the printer that you'll want to use on a regular basis: emphasized, expanded, and underlined printing, or any of the other features you've learned about in this book.

■ USER FUNCTIONS

Once you have entered them, you'll be able to call up each of these features from the WordStar Print Menu, under the heading "User Patches."

You can enter these features into WordStar by choosing the option "User-defined functions" from the Printer Installation Menu; "User function #1" will appear on your screen.

WordStar allows you four separate "user functions," each of which represents a feature of the printer (and requires a specific code). Now, remember that most printer features need both a code to turn them on and a code to turn them off. So, you will need two user functions for, say, expanded print. Using expanded print as a typical feature you might want to install, let's proceed with user function #1. (Before we do, however, please note that function #1 is given the designation " \wedge PQ"; when you are word processing in WordStar, you can call up this function simply by typing in \wedge PQ.)

Begin by pressing C to change the status of user function #1. WINSTALL will present you with an explanation of how to enter three different kinds of codes: "ASCII", decimal and hexadecimal. In this particular installation program, the method described for entering "ASCII" codes can be used to enter both escape codes and control codes: for each character in the code sequence,

- press ":"
- enter the character itself, and
- press <return>.

The code sequence to activate expanded print is <ESC> W 1; to enter this code in WordStar, type in:

```
:<ESC> <return>  
:W <return>  
:1 <return> <return>
```

WordStar will next read back to you the hexadecimal form of this code: 1B 57h 1h 0h (the lowercase "h" denotes hexadecimal numerals, and the "0h" means that the fourth space remains empty). You can check the hexadecimal code displayed on your screen with the hexadecimal code for expanded print in Appendix A of this manual. If they match, you'll know that you have entered the code correctly. Press Y or <return> to confirm your choice.

You will next be presented with WordStar user function #2. Here you'll want to enter the code to cancel expanded print. You can enter the code to cancel expanded print, <ESC> W 0, using the same method you employed for user function #1. At a later time, when you are word processing with WordStar, you can access this function by entering \wedge PW.

You can program user functions #3 and #4 the same way you did for #1 and #2, employing any other feature that you wish to use.

By following these procedures, you'll have successfully completed the WordStar installation program, and will have up to four special features of the printer at your command.

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MEMO

APPENDIX



ASCII CODE CONVERSION CHART

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CONTROL CHARACTER	CHARACTER
0	00	0000 0000	CTRL-@	< NUL >
1	01	0000 0001	CTRL-A	
2	02	0000 0010	CTRL-B	
3	03	0000 0011	CTRL-C	
4	04	0000 0100	CTRL-D	
5	05	0000 0101	CTRL-E	
6	06	0000 0110	CTRL-F	
7	07	0000 0111	CTRL-G	< BEL >
8	08	0000 1000	CTRL-H	< BS >
9	09	0000 1001	CTRL-I	< HT >
10	0A	0000 1010	CTRL-J	< LF >
11	0B	0000 1011	CTRL-K	< VT >
12	0C	0000 1100	CTRL-L	< FF >
13	0D	0000 1101	CTRL-M	< CR >
14	0E	0000 1110	CTRL-N	< SO >
15	0F	0000 1111	CTRL-O	< SI >
16	10	0001 0000	CTRL-P	
17	11	0001 0001	CTRL-Q	< DC1 >
18	12	0001 0010	CTRL-R	< DC2 >
19	13	0001 0011	CTRL-S	< DC3 >
20	14	0001 0100	CTRL-T	< DC4 >
21	15	0001 0101	CTRL-U	
22	16	0001 0110	CTRL-V	
23	17	0001 0111	CTRL-W	
24	18	0001 1000	CTRL-X	< CAN >
25	19	0001 1001	CTRL-Y	
26	1A	0001 1010	CTRL-Z	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
27	1B	0001 1011	<ESC>
28	1C	0001 1100	
29	1D	0001 1101	
30	1E	0001 1110	<RS>
31	1F	0001 1111	<US>
32	20	0010 0000	SP
33	21	0010 0001	!
34	22	0010 0010	"
35	23	0010 0011	#
36	24	0010 0100	\$
37	25	0010 0101	%
38	26	0010 0110	&
39	27	0010 0111	'
40	28	0010 1000	(
41	29	0010 1001)
42	2A	0010 1010	*
43	2B	0010 1011	+
44	2C	0010 1100	,
45	2D	0010 1101	-
46	2E	0010 1110	.
47	2F	0010 1111	/
48	30	0011 0000	0
49	31	0011 0001	1
50	32	0011 0010	2
51	33	0011 0011	3
52	34	0011 0100	4
53	35	0011 0101	5
54	36	0011 0110	6
55	37	0011 0111	7
56	38	0011 1000	8
57	39	0011 1001	9
58	3A	0011 1010	:
59	3B	0011 1011	;
60	3C	0011 1100	<
61	3D	0011 1101	=
62	3E	0011 1110	>
63	3F	0011 1111	?
64	40	0100 0000	@
65	41	0100 0001	A
66	42	0100 0010	B
67	43	0100 0011	C
68	44	0100 0100	D
69	45	0100 0101	E
70	46	0100 0110	F

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
71	47	0100 0111	G
72	48	0100 1000	H
73	49	0100 1001	I
74	4A	0100 1010	J
75	4B	0100 1011	K
76	4C	0100 1100	L
77	4D	0100 1101	M
78	4E	0100 1110	N
79	4F	0100 1111	O
80	50	0101 0000	P
81	51	0101 0001	Q
82	52	0101 0010	R
83	53	0101 0011	S
84	54	0101 0100	T
85	55	0101 0101	U
86	56	0101 0110	V
87	57	0101 0111	W
88	58	0101 1000	X
89	59	0101 1001	Y
90	5A	0101 1010	Z
91	5B	0101 1011	[
92	5C	0101 1100	\
93	5D	0101 1101]
94	5E	0101 1110	^
95	5F	0101 1111	_
96	60	0110 0000	
97	61	0110 0001	a
98	62	0110 0010	b
99	63	0110 0011	c
100	64	0110 0100	d
101	65	0110 0101	e
102	66	0110 0110	f
103	67	0110 0111	g
104	68	0110 1000	h
105	69	0110 1001	i
106	6A	0110 1010	j
107	6B	0110 1011	k
108	6C	0110 1100	l
109	6D	0110 1101	m
110	6E	0110 1110	n
111	6F	0110 1111	o
112	70	0111 0000	p
113	71	0111 0001	q
114	72	0111 0010	r

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
115	73	0111 0011	s
116	74	0111 0100	t
117	75	0111 0101	u
118	76	0111 0110	v
119	77	0111 0111	w
120	78	0111 1000	x
121	79	0111 1001	y
122	7A	0111 1010	z
123	7B	0111 1011	{
124	7C	0111 1100	
125	7D	0111 1101	}
126	7E	0111 1110	~
127	7F	0111 1111	< DEL >
128	80	1000 0000	
129	81	1000 0001	
130	82	1000 0010	
131	83	1000 0011	
132	84	1000 0100	
133	85	1000 0101	
134	86	1000 0110	
135	87	1000 0111	< BEL >
136	88	1000 1000	< BS >
137	89	1000 1001	< HT >
138	8A	1000 1010	< LF >
139	8B	1000 1011	< VT >
140	8C	1000 1100	< FF >
141	8D	1000 1101	< CR >
142	8E	1000 1110	< SO >
143	8F	1000 1111	< SI >
144	90	1001 0000	
145	91	1001 0001	< DC1 >
146	92	1001 0010	< DC2 >
147	93	1001 0011	< DC3 >
148	94	1001 0100	< DC4 >
149	95	1001 0101	
150	96	1001 0110	
151	97	1001 0111	
152	98	1001 1000	< CAN >
153	99	1001 1001	
154	9A	1001 1010	
155	9B	1001 1011	< ESC >
156	9C	1001 1100	
157	9D	1001 1101	
158	9E	1001 1110	< RS >

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
159	9F	1001 1111	<US>
160	A0	1010 0000	
161	A1	1010 0001	
162	A2	1010 0010	
163	A3	1010 0011	
164	A4	1010 0100	
165	A5	1010 0101	
166	A6	1010 0110	
167	A7	1010 0111	
168	A8	1010 1000	
169	A9	1010 1001	
170	AA	1010 1010	
171	AB	1010 1011	
172	AC	1010 1100	
173	AD	1010 1101	
174	AE	1010 1110	
175	AF	1010 1111	
176	B0	1011 0000	
177	B1	1011 0001	
178	B2	1011 0010	
179	B3	1011 0011	
180	B4	1011 0100	
181	B5	1011 0101	
182	B6	1011 0110	
183	B7	1011 0111	
184	B8	1011 1000	
185	B9	1011 1001	
186	BA	1011 1010	
187	BB	1011 1011	
188	BC	1011 1100	
189	BD	1011 1101	
190	BE	1011 1110	
191	BF	1011 1111	
192	C0	1100 0000	
193	C1	1100 0001	
194	C2	1100 0010	
195	C3	1100 0011	
196	C4	1100 0100	
197	C5	1100 0101	
198	C6	1100 0110	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
199	C7	1100 0111	
200	C8	1100 1000	
201	C9	1100 1001	
202	CA	1100 1010	
203	CB	1100 1011	
204	CC	1100 1100	
205	CD	1100 1101	
206	CE	1100 1110	
207	CF	1100 1111	
208	D0	1101 0000	
209	D1	1101 0001	
210	D2	1101 0010	
211	D3	1101 0011	
212	D4	1101 0100	
213	D5	1101 0101	
214	D6	1101 0110	
215	D7	1101 0111	
216	D8	1101 1000	
217	D9	1101 1001	
218	DA	1101 1010	
219	DB	1101 1011	
220	DC	1101 1100	
221	DD	1101 1101	
222	DE	1101 1110	
223	DF	1101 1111	
224	E0	1110 0000	
225	E1	1110 0001	
226	E2	1110 0010	
227	E3	1110 0011	
228	E4	1110 0100	
229	E5	1110 0101	
230	E6	1110 0110	
231	E7	1110 0111	
232	E8	1110 1000	
233	E9	1110 1001	
234	EA	1110 1010	
235	EB	1110 1011	
236	EC	1110 1100	
237	ED	1110 1101	
238	EE	1110 1110	
239	EF	1110 1111	
240	F0	1111 0000	
241	F1	1111 0001	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
242	F2	1111 0010	
243	F3	1111 0011	
244	F4	1111 0100	
245	F5	1111 0101	
246	F6	1111 0110	
247	F7	1111 0111	
248	F8	1111 1000	
249	F9	1111 1001	
250	FA	1111 1010	
251	FB	1111 1011	
252	FC	1111 1100	
253	FD	1111 1101	
254	FE	1111 1110	
255	FF	1111 1111	

MEMO

APPENDIX



DUAL IN-LINE PACKAGE (DIP) SWITCHES

Some of your printer's most important functions are user-selectable through its DIP switches. The following table gives both the preset positions of the switches and their characteristics in the on and off modes.

Table D-1. DIP switch settings and their functions.

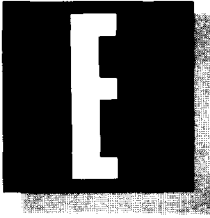
SWITCH NO.	FUNCTION	ON	OFF	PRESET
1-1	Paper-out detector	Disables printer when paper is out	Allows printer to print without paper	ON
1-2	Form length	11 inches	12 inches	ON
1-3	Line spacing	1/6th inch	1/8th inch	ON
1-4	On-line/off-line	On-line at power-on	Off-line at power-on	ON
1-5	Character set	Draft-quality	Letter-quality	ON
1-6	Print pitch	Pica (10 cpi)	Elite (12 cpi)	ON
1-7	7- or 8-bit interface	Set to 8 bits	Set to 7 bits	ON
1-8	Auto line feed	Line feed not performed by input of CR code	Automatic line feed performed by input of CR code	ON

2-1	Selection of international character set	See Table D-2 below	ON
2-2			ON
2-3			ON
2-4	Unused		
2-5	Print quality alignment adjustment, preset at factory for each printer.		
2-6	Record original factory set position for future reference.		
2-7	Do not change factory adjustment.		
2-8	These switches should be adjusted only by authorized service technicians.		
2-9	unused		
2-10	Allocated for future use		ON

Table D-2. Selection of the International Character Set.

SWITCH NO.			COUNTRY
2-1	2-2	2-3	
ON	ON	ON	USA
OFF	ON	ON	France
ON	OFF	ON	Germany
OFF	OFF	ON	England
ON	ON	OFF	Denmark
OFF	ON	OFF	Sweden
ON	OFF	OFF	Italy
OFF	OFF	OFF	Spain

APPENDIX



CHARACTER SETS OF THE PRINTER

■ LETTER-QUALITY (LQ) CHARACTER SET AND DRAFT-QUALITY (DQ) CHARACTER SET

The code lists of the letter-quality character set and the draft-character set are shown below.

Decimal	Character	Function	Decimal	Character	
0	<NUL>	End tab settings	34	" "	
7	<BEL>	Bell	35	# #	*
8	<BS>	Backspace	36	\$ \$	
9	<HT>	Horizontal tab	37	% %	
10	<LF>	Line feed	38	& &	
11	<VT>	Vertical tab	39	' '	Apostrophe
12	<FF>	Form feed	40	((
13	<CR>	Carriage return	41))	
14	<SO>	Expanded print on	42	* *	
15	<SI>	Condensed print on	43	+ +	
17	<DC1>	On line	44	, ,	Comma
18	<DC2>	Pica pitch	45	- -	Hyphen
19	<DC3>	Off line	46	. .	Period
20	<DC4>	Expanded print off	47	/ /	
24	<CAN>	Cancel text	48	0 0	
27	<ESC>	Escape	49	1 1	
30	<RS>	End macro	50	2 2	
31	<US>	VFU setting	51	3 3	
32		Space	52	4 4	
33	! !		53	5 5	

*This character may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 113.

Decimal Character

54	6	6
55	7	7
56	8	8
57	9	9
58	:	:
59	;	;
60	<	<
61	=	=
62	>	>
63	?	?
64	@	@
65	A	A
66	B	B
67	C	C
68	D	D
69	E	E
70	F	F
71	G	G
72	H	H
73	I	I
74	J	J
75	K	K
76	L	L
77	M	M
78	N	N
79	O	O
80	P	P
81	Q	Q
82	R	R
83	S	S
84	T	T
85	U	U
86	V	V
87	W	W
88	X	X
89	Y	Y
90	Z	Z

Decimal character

91	[[*
92	\	\	*
93]]	*
94	^	^	*
95			
96	`	`	*
97	a	a	
98	b	b	
99	c	c	
100	d	d	
101	e	e	
102	f	f	
103	g	g	
104	h	h	
105	i	i	
106	j	j	
107	k	k	
108	l	l	
109	m	m	
110	n	n	
111	o	o	
112	p	p	
113	q	q	
114	r	r	
115	s	s	
116	t	t	
117	u	u	
118	v	v	
119	w	w	
120	x	x	
121	y	y	
122	z	z	
123	{	{	*
124	 		*
125	}	}	*
126	~	~	*
127		Delete	

*These characters may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 113.

International Character Sets

If you want to access the international character sets, you can get to them in either of two ways: (1) position the DIP switches according to Table D-2 in Appendix D, or (2) use the appropriate escape code shown below in Figure E-3. Then enter the decimal or hexadecimal codes for the character you want, as illustrated in the chart.

Decimal	USA	England	Germany	Denmark	France	Sweden	Italy	Spain
35	#	#	#	£	#	#	#	R
64	@	£	€	@	@	£	@	@
91	[°	€	[Æ	Å	°	I
92	/	©	Ö	/	Ø	Ö	/	N
93]	€	Ü]	À	À	€	Ç
94	(©	~	(^	Ü	©	^
96)	©	~)	^	€	©	^
123	}	€	€	}	®	€	€	€
124		©	Ö		®	Ö	Ö	€
125	~	€	Ü	~	®	Ü	€	~
126	^	€	~	^	®	Ü	€	~

■ BLOCK GRAPHICS CHARACTER SET

The codes for block graphics characters are shown below. The printer always uses unidirectional printing when it prints block graphics.

Decimal Character	Decimal Character
176	192
177	193
178	194
179	195
180	196
181	197
182	198
183	199
184	200
185	201
186	202
187	203
188	204
189	205
190	206
191	207

Decimal Character

208 .
209 /
210 T
211 U
212 C
213 F
214 f
215 +
216 +

Decimal Character

217 J
218 F
219 [bracket]
220 [bracket]
221 [bracket]
222 [bracket]
223 [bracket]
224]
225]

★ ★ ★ ★ ★ ★ ★ ★ ★ ★



DESIGNING BIT-IMAGE GRAPHICS

In Appendix E, we showed you the many block graphic characters provided by the printer. You can use these characters to create bar graphs, pie charts, or just about any kind of graphic image you can think of. In addition to block graphics, we'd like to introduce you to bit-image graphics—for the truly imaginative user who will settle for nothing less than total control of the printer. You'll see that its bit-image graphics give you new capabilities in business applications, computer art, and even allows you to create your own "alphabet"!

When you program the printer to perform bit-image graphics, you literally control every pin on its 24-pin print head. As a result, you can print as many as 1,440 dots horizontally, and up to 1,320 dots vertically on an 8 1/2-x-11-inch page.

■ FOUR MODES FOR BIT-IMAGE GRAPHICS

The printer has four distinct bit-image modes, allowing you to print:

- 8-bit graphics, with 1 data byte controlling each column,
- 16-bit graphics, with 2 data bytes controlling each column,
- 24-bit graphics, with 3 data bytes controlling each column, and
- 8x3-bit graphics, in which each byte controls 3 columns of graphics data and each bit controls 3 pins of the print head.

The relationships between your graphics data and the pins on the print head are shown in Figures F-1, F-2, F-3 and F-4 for the four bit-image modes.

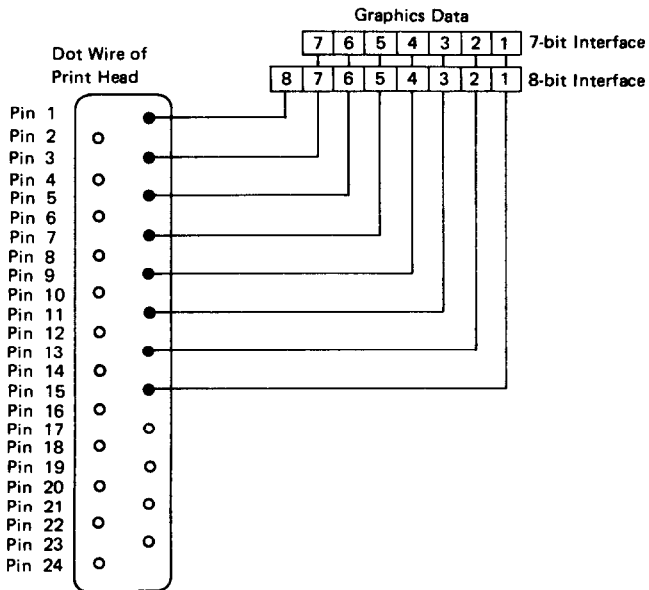


Figure F-1. Pin relationship of the 8-bit graphics mode.

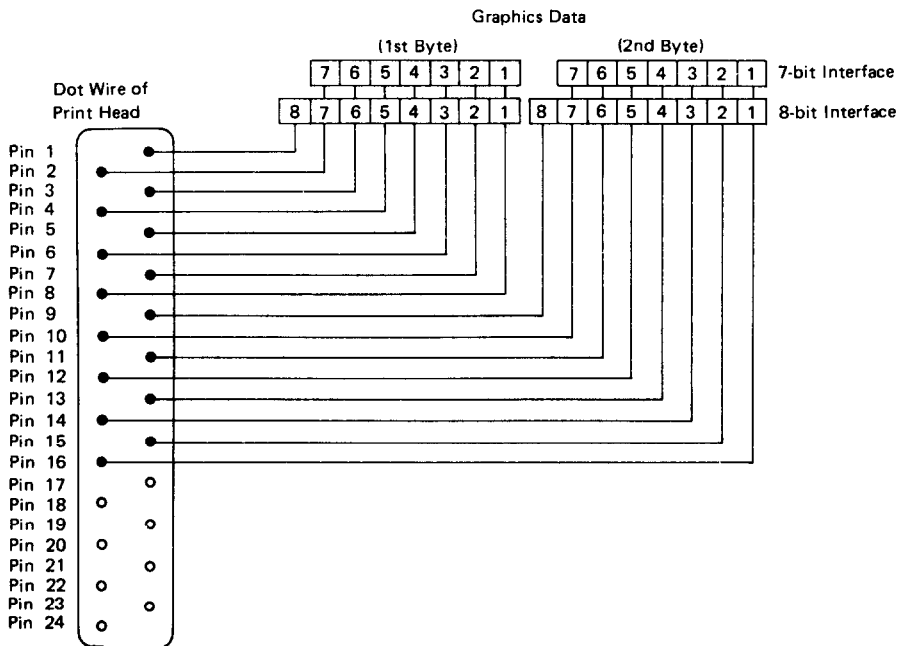


Figure F-2. Pin relationship of the 16-bit graphics mode.

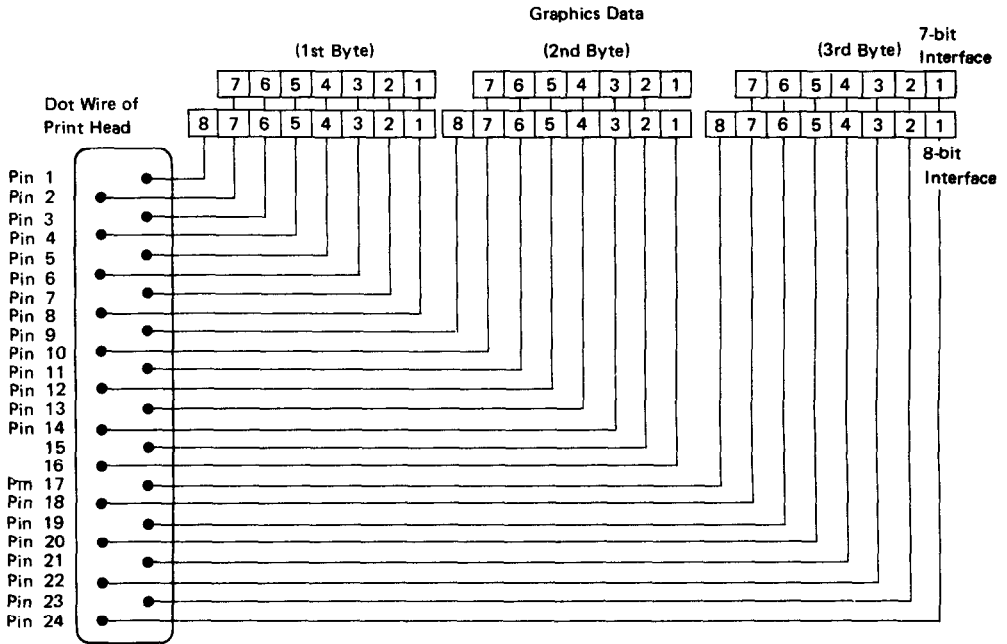


Figure F-3. Pin relationship of the 24-bit graphics mode.

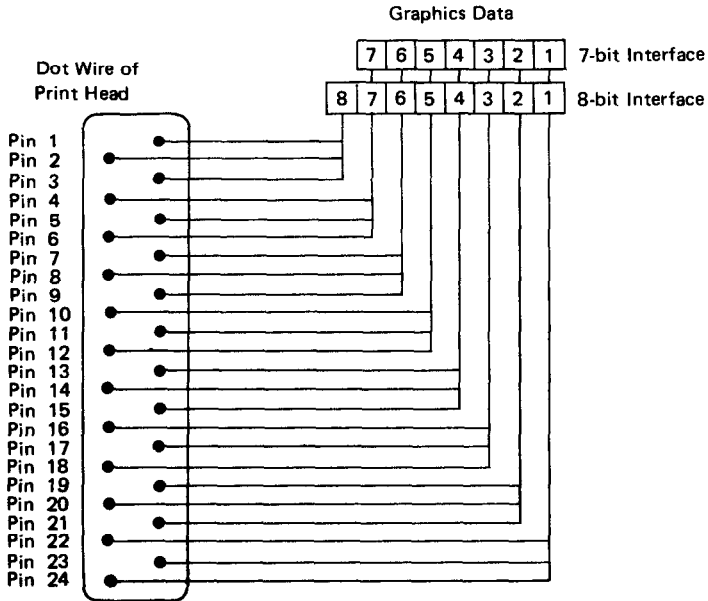


Figure F-4. Pin relationship of the 8x3-bit graphics mode.

■ PRINTING 8-BIT GRAPHICS

In 8-bit, normal-density graphics, the graphic image is divided into "dot columns", each directly corresponding to the pin configuration in the print head. Each "dot column" can be controlled by 1 byte of data. As a result, every bit in the byte corresponds to a particular pin in the print head (Figure F-1). This mode, which yields 180 dots per inch horizontally and up to 120 dots per inch vertically, uses the following setup format:

Table F-1. Setup codes for the printer's four graphics modes.

GRAPHICS MODE	ESCAPE CODE SEQUENCE
8-bit	<ESC> Y "n1" "n2" "m1" "m2" .. .
16-bit	<ESC> I "n1" "n2" "m1" "m2" .. .
24-bit	<ESC> V "n1" "n2" "m1" "m2" .. .
8x3-bit	<ESC> K "n1" "n2" "m1" "m2" .. .

Using this code sequence, the "n1" and "n2" tell the printer how many bytes of graphics data (measured in dot columns) you are going to send per line. (The "m1", "m2", etc., tell the printer exactly which pins to fire on each column. We'll demonstrate this shortly.)

■ SPECIFYING THE NUMBER OF DOT COLUMNS.

To determine the values of *n1* and *n2*, you will need to calculate the width (in dot columns) of your graphics image and send this information to the printer. To do this, you'll have to convert the number of dot columns into two separate values, using the formula given in Table F-2. This conversion is necessary because the maximum number you can send in one byte is 255, while normal-density graphics mode can print as many as 1,440 columns across the page. The formula shown in Table F-2 allows you to tell the printer exactly what your printing parameters will be, specifying the exact number of bytes to represent dot columns. (In the formula, *x* = the number of dot columns in your graphic image; thus, if you have a total of 500 columns, divide 500 by 256. Since 256 "goes into" 500 only once, *n2* = 1. *n1* is the remainder of this division, so *n1* = 244.

Specifying the graphics data

When you have entered <ESC> Y *n1* and *n2*, you've set up the 8-bit graphics mode, telling the printer how much data to expect per line. Now you are free to specify the exact picture itself (the "m1", "m2", etc." of the sequence). Figure F-5 shows that each pin on the print head is labeled with a value; the topmost pin has the highest value, and each pin corresponds to a particular value in descending order.

Table F-2. Calculating the width of your graphic image.

IF THE NUMBER OF COLUMNS RANGES FROM:	THEN $n1$ IS:	AND $n2$ IS:
1 to 255	x	0
256 to 511	$x - 256$	1
512 to 767	$x - 512$	2
768 to 1023	$x - 768$	3
1024 to 1279	$x - 1024$	4
1280 to 1440	$x - 1280$	5

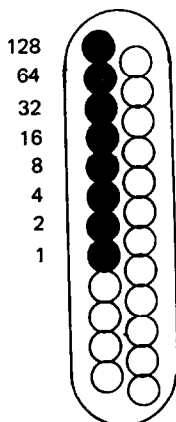


Figure F-5. Pin values for 8-bit graphics.

To fire, say, the second pin from the top, you'll send the BASIC code `CHR$(64)`. You can fire several pins at once by adding their values and sending the sum total in a single BASIC `CHR$` code. Thus:

To fire the 1st, 3rd and 4th pins, add their values ($128 + 32 + 16$) —> then send the BASIC `CHR$` code: —> `CHR$(176)`

Here's a short program to show you how you can implement 8-bit graphics to make a simple zigzag image (Figure F-6).

```

NEW
10 'PRINT GRAPHIC PATTERN
20 WIDTH "LPT1:",255
30 LPRINT CHR$(27) CHR$(89) CHR$(94) CHR$(1);
40 FOR I=1 TO 25
50 FOR J=0 TO 6
60 LPRINT CHR$(2^J);

```

```

70 NEXT J
80 FOR J=6 TO 0 STEP -1
90 LPRINT CHR$(2^J);
100 NEXT J
110 NEXT I
120 WIDTH "LPT1:", 80
130 LPRINT

```



Figure F-6. A zigzag pattern created with 8-bit graphics.

In line 30 of this program, we selected normal-density graphics and indicated that 350 characters of graphics data would follow {94 + (1 * 256) = 350}. The loop between lines 40 and 110 is repeated 25 times; this is what gives us the zigzag effect. The loop from lines 50 to 70 creates the lines that slope up; the loop between lines 80 and 100 prints downward-sloping lines. This is an example of plotting a very simple mathematical function to create a design.

Combining text and graphics

It's also possible to mix text and graphics in one line. This can be useful for labeling charts and graphs, or even for inserting graphics into text. Try adding these lines to the program:

```

25 LPRINT "WOW!";
115 LPRINT " THIS IS GREAT!";

```

If you run the program with these lines added, you should get a printout that looks like this:

```

WOW! ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^ THIS IS GREAT!

```

Figure F-7. Graphics pattern inserted within text.

There is one thing you must remember when you print this kind of program: all graphics data must print on the same line. The graphics command is turned off at the end of each line, even if you have specified that more graphics codes will follow.

■ PRINTING A DESIGN OR GRAPHIC PICTURE

Since you control the firing of every pin, you can print nearly anything that you can draw. In our next example, we'll demonstrate the printer's ability to plot computer art of your own design.

The best way to start is to lay out your image on graph paper. You can print eight rows (seven with a 7-bit interface) of dot columns with each pass of the print head, so begin by drawing a heavy hor-

horizontal line every eight rows on your graph paper. The dot columns are represented by the column of eight blocks between the horizontal lines. Each of the blocks on the graph represents a pin on the print head. It may be helpful to write the pin values (128, 64, 32, etc.) down the left side of each row. Now you can use a pencil or felt tip marker to draw the picture you want on the graph paper (Figure F-8). After you have filled in the "dots" that you want to print, add up the values of each column of dots: the sum total represents one byte.

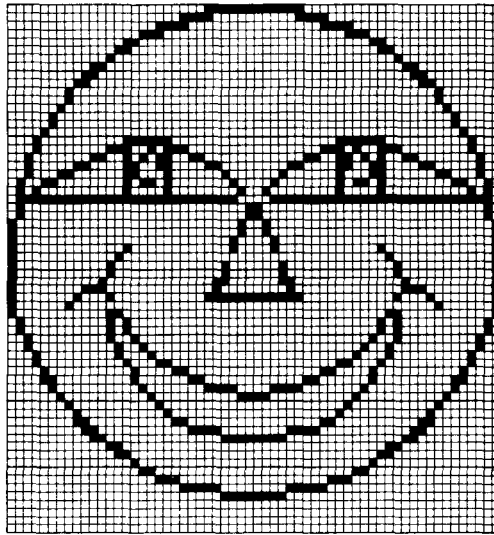


Figure F-8. Planning your graphic design on graph paper.

In the program below, we have taken the graphics information from the design in Figure F-8 and put it into BASIC data statements:

```

NEW
10 WIDTH "LPT1:",255
20 LPRINT CHR$(27) CHR$(51) CHR$(10)
30 FOR ROW=1 TO 8
40 LPRINT CHR$(27) "Y" CHR$(60) CHR$(0);
50 FOR COLUMN=1 TO 60
60 READ X
70 LPRINT CHR$(X);
80 NEXT COLUMN
90 LPRINT CHR$(10);
100 NEXT ROW
110 LPRINT
120 LPRINT "SMILE"
130 DATA 0,0,0,0,0,0,0,0,0,0,0
  
```

140 DATA 1, 1, 2, 4, 12, 8, 16, 16, 48, 32
150 DATA 32, 96, 64, 64, 192, 128, 128, 128, 128, 128
160 DATA 128, 128, 128, 128, 128, 192, 64, 64, 96, 32
170 DATA 32, 48, 16, 16, 8, 12, 4, 2, 1, 1
180 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
190 DATA 0, 0, 0, 0, 1, 6, 8, 48, 64, 192
200 DATA 128, 0, 0, 0, 0, 0, 0, 0, 0, 0
210 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
220 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
230 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 128
240 DATA 192, 64, 48, 8, 6, 1, 0, 0, 0, 0
250 DATA 0, 7, 57, 195, 5, 5, 9, 9, 17, 17
260 DATA 33, 33, 65, 65, 255, 153, 165, 197, 177, 255
270 DATA 65, 65, 33, 33, 17, 17, 9, 5, 2, 0
280 DATA 0, 2, 5, 9, 17, 17, 33, 33, 65, 65
290 DATA 255, 177, 197, 165, 153, 255, 65, 65, 33, 33
300 DATA 17, 17, 9, 9, 5, 5, 195, 57, 7, 0
310 DATA 63, 192, 0, 0, 0, 0, 0, 0, 0, 0
320 DATA 0, 0, 1, 2, 4, 0, 0, 0, 0, 0
330 DATA 0, 0, 0, 0, 0, 0, 1, 12, 48, 192
340 DATA 192, 48, 12, 1, 0, 0, 0, 0, 0, 0
350 DATA 0, 0, 0, 0, 0, 4, 2, 1, 0, 0
360 DATA 0, 0, 0, 0, 0, 0, 0, 0, 192, 63
370 DATA 252, 3, 0, 0, 0, 0, 0, 8, 16, 32
380 DATA 32, 96, 151, 4, 3, 0, 0, 0, 0, 0
390 DATA 0, 0, 0, 0, 16, 112, 208, 16, 16, 16
400 DATA 16, 16, 16, 208, 112, 16, 0, 0, 0, 0
410 DATA 0, 0, 0, 0, 0, 3, 4, 151, 96, 32
420 DATA 32, 16, 0, 0, 0, 0, 0, 0, 3, 252
430 DATA 0, 0, 192, 48, 12, 6, 1, 0, 0, 0
440 DATA 0, 0, 128, 96, 16, 140, 66, 33, 16, 16
450 DATA 8, 8, 4, 4, 2, 2, 2, 2, 1, 1
460 DATA 1, 1, 2, 2, 2, 2, 4, 4, 8, 8
470 DATA 16, 16, 33, 66, 140, 16, 96, 128, 0, 0
480 DATA 0, 0, 0, 1, 6, 12, 48, 192, 0, 0
490 DATA 0, 0, 0, 0, 0, 0, 0, 128, 96, 48
500 DATA 24, 8, 4, 6, 2, 1, 0, 0, 128, 64
510 DATA 32, 32, 16, 16, 16, 16, 8, 8, 8, 8
520 DATA 8, 8, 8, 8, 16, 16, 16, 16, 32, 32
530 DATA 64, 128, 0, 0, 1, 2, 6, 4, 8, 24
540 DATA 48, 96, 128, 0, 0, 0, 0, 0, 0, 0
550 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
560 DATA 0, 0, 0, 0, 0, 0, 128, 128, 64, 64
570 DATA 64, 32, 32, 32, 32, 32, 16, 16, 16, 16
580 DATA 16, 16, 16, 16, 32, 32, 32, 32, 32, 64

```
590 DATA 64,64,128,128,0,0,0,0,0,0
600 DATA 0,0,0,0,0,0,0,0,0,0
```



SMILE

Figure F-9. Picture of a smile.

The data lines of our program (lines 130 – 600) correspond to the eight horizontal sections of the graph. In each line, we have entered the pin firing values calculated from the information drawn on the graph. The program used to create a picture from this data is actually quite simple. Please follow along for a brief explanation of how it works:

LINE 20 In this statement, we enter the codes to change line spacing to 10/120ths of an inch. This causes the lines to just slightly touch each other, but not to overlap.

You can experiment with line spacing in your graphics, but in general, overlapping lines will cause your picture to be distorted. On the other hand, if the line spacing is too wide, your image will have unwanted "gaps" in it. To adjust the line spacing in your graphic image, just enter a different value in $n/120$ ths of an inch: a higher value for wider spacing, or a lower value for narrower spacing.

LINE 30 In this statement, we set up the number of rows to print—in our example, eight—by using the BASIC "for/next" loop.

LINE 40 Now we're ready to enter the code to set up the graphics mode we want to use. The <ESC> "Y" sets up 8-bit graphics, and the "60" and "0" are the values of $n1$ and $n2$, respectively.

LINE 50 This statement sets up the number of dot columns that will be contained in the image, by using a BASIC "nested" for/next loop.

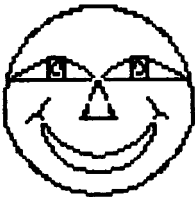
LINE 60 Reads the data for a single column.

- LINE 70 Prints the data read in line 60.
- LINE 80 Continues the nested for/next loop, which causes all 60 columns in a row to be read and printed.
- LINE 90 Causes a line feed.
- LINE 100 Instructs the nested for/next loop to continue to read and print subsequent rows until all eight rows have been printed.
- LINE 120 Tells the printer to print the word "smile" underneath the graphic image.

When you've run this program, your result should be similar to the picture illustrated in Figure F-9. Now try running the same program again, with the following minor changes to lines 90 and 110:

- In line 20, change "10" to "15".
- In line 40, change "Y" to "K".

When your printer prints the new program, it will look like this:



SMILE

Figure F-10. "Smiling" in the 8x3-bit mode.

That's how easy it is to print a picture using 8x3-bit mode! 8x3-bit graphics mode is similar to the 8-bit mode, except that each bit in the data byte controls three pins, not just one. Thus, the 8x3-bit mode will print the same image three times as wide and three times as dense as the one shown in Figure F-9.

To print in the 8x3-bit mode, remember: just use <ESC> K to set up the mode, and change the line spacing to 15/120ths of an inch. We hope you enjoy experimenting with 16-bit and 24-bit modes, too—you just may unleash a creative streak you never knew you had!



APPENDIX



TECHNICAL SPECIFICATIONS

The following specifications are subject to change without notice.

■ **PRINTING**

Method	Serial impact dot matrix
Speed	Draft quality: 144 cps in elite 120 cps in pica 78 cps in condensed Letter quality: 47 cps in pica 54 cps in proportional printing
Direction	Bidirectional logic-seeking Unidirectional in LQ and graphics modes
Paper feed	Sprocket or friction feed, 10 lines per second at 1/6th inch line spacing
Line spacing	6 or 8 lines per inch (switch- and software selectable) Software selectable in increments of $n/120$ ths of an inch
Character set	96 Letter-Quality characters 99 International LQ characters 96 Draft-Quality characters 99 International DQ characters 50 Block graphic characters

Character matrix	24 dot x 13 dot standard with true descenders 30 dot x 18 dot block graphics 24 dot x 34 dot LQ characters 24 dot x 14 - 36 dot proportional LQ characters 8 dot x 1440 dot 8-bit graphics 16 dot x 1440 dot 16-bit graphics 24 dot x 1440 dot 24-bit graphics 24 dot x 1440 dot 8x3-bit graphics
Character fonts	Pica (10 cpi) Elite (12 cpi) Condensed (16.7 cpi) Proportional Expanded (5, 6, and 8.35 cpi and proportional) Emphasized Double-strike
Special features	Self-test Continuous underline Backspace Vertical and horizontal programmable tabs Left and right margin set 7- or 8-bit selectable interface Bit-image column scan Perforation skip Reversible paper feed Macro instruction
Column width	Draft quality: 80 characters per line (pica) 96 characters per line (elite) 132 characters per line (condensed) 40 characters per line (pica expanded) 48 characters per line (elite expanded) 66 characters per line (condensed expanded) Letter quality: Proportional spacing 80 characters per line (pica) 40 characters per line (pica expanded)
Form length	11 or 12 inches

■ PAPER AND RIBBON

Single-sheet paper	5.5 - 8.5 inches wide 0.07 - 0.10 mm thick (1 part)
Sprocket-feed paper	4 - 10 inches wide 0.07 - 0.10 mm thick (1 part) 0.28 mm thick (3-part copies)
Ribbon	Black nylon ribbon cassette, multistrike, endless

■ PRINTER

Width	420 mm (16.5 in.)
Depth	368 mm (14.5 in.)
Height	148 mm (5.8 in.)
Weight	11 kg (approx.)
Power	120VAC +/-10%, 60 Hz, approx. 100 watts
Operating environment	10 - 40 deg. C (50 - 104 deg. F) 20 - 80% relative humidity, noncondensing
Paper feed system	Sprocket and friction feed
Buffer	1-line, expandable to 128K

■ PARALLEL INTERFACE (STANDARD)

Interface	Centronics-compatible
Transfer rate	1,000 - 6,000 cps
Synchronization	By externally-supplied $\overline{\text{STROBE}}$ pulses
Handshaking	By $\overline{\text{ACK}}$ and BUSY signals
Logic level	TTL-compatible

■ **SERIAL INTERFACE(OPTIONAL)**

Interface RS-232C levels/20mA current loop (selectable)

Transfer rate RS-232C: 150 - 19,200 bits per second (selectable)
Current loop: 150 - 9,600 bits per second

Word length 1 start bit, 7 or 8 data bits, 1 or 2 stop bits; odd, even or no parity

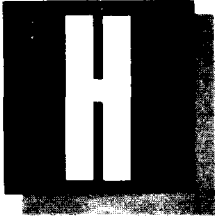
Handshaking By $\overline{\text{ACK}}$, BUSY and XON/XOFF signals (selectable)

Signal polarity Mark: logic "1" (-3V to -15V or current on)
Space: logic "0" (+3V to +15V or current off)

■ **IEEE-488 INTERFACE(OPTIONAL)**

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see Appendix H



INTERFACES

This appendix contains the technical information necessary to connect the printer to your computer using each of the three possible interfaces: parallel, serial, and IEEE-488.

■ **THE PARALLEL INTERFACE**

Your printer uses a Centronics-compatible parallel interface capable of transferring from 1,000 to 6,000 characters per second. Externally supplied $\overline{\text{STROBE}}$ pulses accomplish synchronization of data transmission. $\overline{\text{ACK}}$ and BUSY signals govern the "handshaking" between your computer and the printer. Parallel interface uses a TTL-compatible logic level.

Functions of the connector signals

Pin 1 carries the $\overline{\text{STROBE}}$ pulse signal from the computer to the printer (see Figure H-1). When the computer has data ready for the printer it sets this signal to low value for at least 0.5 microseconds. When the printer sees this pulse on the $\overline{\text{STROBE}}$ pin, it reads the data supplied by the computer on pins 2-9. Each of these lines carries one bit of information. A logical "1" is represented by a high signal level, and a logical "0" is represented by a low signal level. The computer must maintain these signals for at least 0.5 microseconds before—and 0.5 microseconds after—the $\overline{\text{STROBE}}$ pulse.

When the printer has successfully received the byte of data from the computer, it sets the $\overline{\text{ACK}}$ signal (pin 10) low for approximately 9 microseconds. A high BUSY signal (pin 11) reports when the printer is unable to receive data. This signal will be high during data transfer when the printer is off-line, or when an error condition exists. See the circuit example of these signals in Figure H-2.

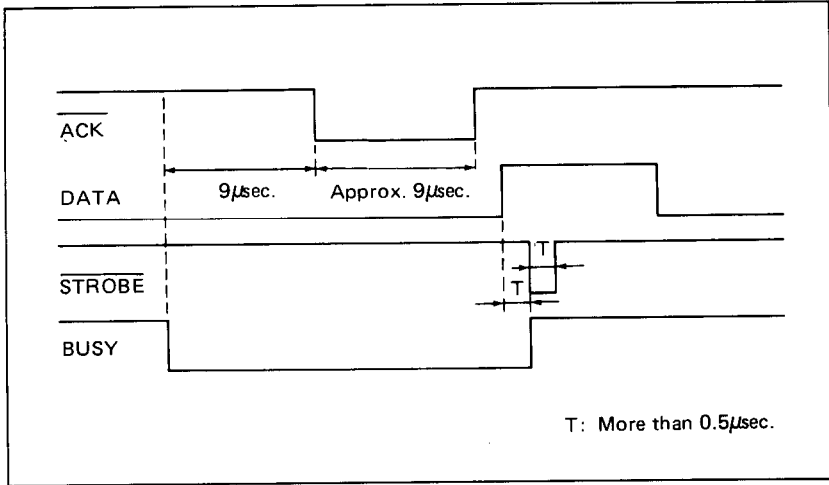


Figure H-1. Data transfer timing chart for the parallel interface.

Signal Name	Circuit Example
DATA 1 - DATA 8 (To Printer)	74LS Compatible
$\overline{\text{STROBE}}$ (To Printer)	74LS Compatible
BUSY, $\overline{\text{ACK}}$ (From Printer)	74LS Compatible

Figure H-2. Circuit example of the parallel interface.

Connector signals

The following chart describes the connector signals for the 36 pins of the parallel interface.

Table H-1. Parallel interface connector signals.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1	STROBE	IN	The STROBE pulse is used to read data. When this signal goes low, data is read in.
2	DATA 1	IN	The signals on pins 2-9 represent parallel data bits 1-8. Each signal is at a high level for logical 1 and at a low level for a logical 0.
3	DATA 2	IN	
4	DATA 3	IN	
5	DATA 4	IN	
6	DATA 5	IN	
7	DATA 6	IN	
8	DATA 7	IN	
9	DATA 8	IN	
10	ACK	OUT	This 9-microsecond pulse acknowledges the receipt of data.
11	BUSY	OUT	The BUSY signal indicates the operating condition of the printer. When this signal goes low, the printer is ready to accept data.
12	PAPER END	OUT	This signal is used to indicate "paper-out" status to the computer. This signal is normally low; when DIP switch 1-1 is off, this signal is held low.
13	SELECTED	OUT	The SELECTED signal is high when the printer is on-line.
14-15	N/C	—	Unused.
16	SIGNAL GND	—	Signal ground.
17	CHASSIS GND	—	Chassis ground.
18	+5VDC	OUT	External supply of +5VDC power (max. 50 mA).
19-30	TWISTED PAIR RETURN GND	—	Return line of various signals.
31	INPUT PRIME	IN	Resets all control circuits. A low signal level initializes the printer and clears buffer memory.
32	ERROR	OUT	This signal goes low when the printer detects an error.
33	EXT GND	—	External ground.
34-35	N/C		Unused.
36	N/C		TTL high level.

■ THE SERIAL INTERFACE(OPTIONAL)

Your printer uses either an RS-232C level or 20mA current loop to provide serial communication with your computer. (See the circuit diagrams contained in Figure H-3.) Using either interface, it can transfer from 150 to 9,600 bits per second. However, the printer can communicate at 19,200 bits per second using only an RS-232C level interface. Its word length is:

- 1 start bit
- 7 or 8 data bits (selectable)
- 1 or 2 stop bits (selectable)
- Odd, even or no parity (selectable)

You can select from the following four "handshake" modes:

- Serial BUSY, 1-byte mode
- Serial BUSY, 1-block mode
- ACK mode
- XON/XOFF mode

A mark or ON (logical 1) generates a signal of -3V to -15V. A space or OFF (logical 0) generates a signal of +3V to +15V.

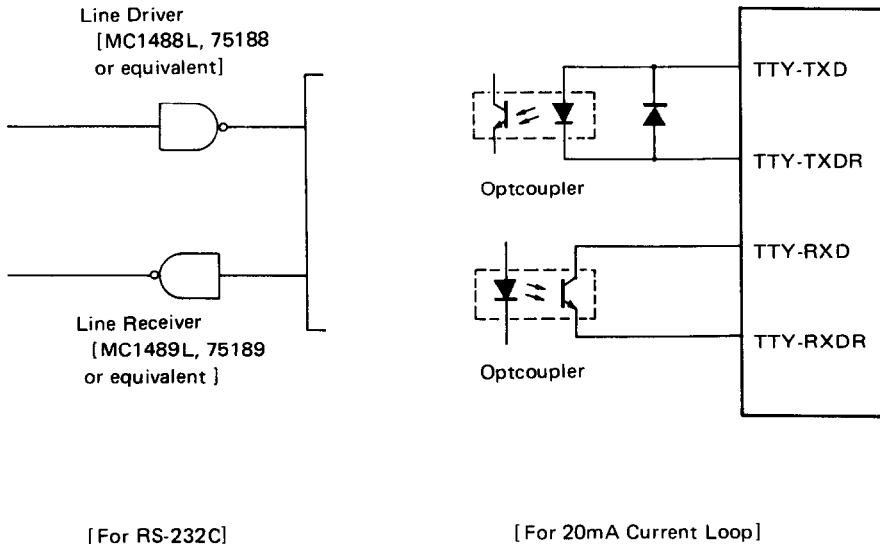


Figure H-3. Circuit diagrams of the serial interface.

Table H-2. Connector signals for the serial interface.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1	F-GND		Frame ground.
2	TXD	OUT	The TXD (transmit data) signal carries data from the printer
3	RXD	IN	The RXD (receive data) signal carries data to the printer
4	RTS	OUT	The RTS (request to send) signal is on when the printer is ready to receive data.
5	CTS	IN	The CTS (clear to send) signal is on when the computer is ready to send data.
6	DSR	IN	This signal line is used to check if the printer is ready for operation.
7	S-GND		Signal ground.
8	DCD	IN	When the DCD (data carrier detect) signal is on, the receive signal is within a specified range.
9	TTY TXDR		This pin indicates the signal line return of 20mA current loop for data transmission.
10	TTY TXD	OUT	Indicates the signal line of 20mA current loop for data transmission.
11	REV-CH	OUT	The REV-CH (reverse channel) pin is the signal line for busy protocols. This pin goes off when the buffer fills, and on when the printer is ready to receive data.
12	N/C		Unused.
13	S-GND		Signal ground.
14-16	N/C		Unused.
17	TTY TXDR		Indicates the signal line return of the 20mA current loop for data transmission.
18	TTY RXDR		Indicates the signal line return of the 20mA current loop for data reception.
19	TTY RXD	IN	Indicates the signal line of the 20mA current loop for data reception.
20	DTR	OUT	The DTR (data terminal ready) pin is on when the printer is ready to receive data.
21-22	N/C		Unused.
23	TTY RXDR		Indicates the signal line return of the 20mA current loop for data reception.
24	TTY TXD	OUT	Indicates the signal line of 20mA current loop for data transmission.
25	TTY RXD	IN	Indicates the signal line of the 20 mA current loop for data reception.

Serial busy protocols

In these protocols, the printer uses DTR (pin 20) and REV-CH (pin 11) to signal to the computer when it is able to accept data. These pins go on when the printer is ready to accept data. In the 1-byte mode, they go off after each character is received. In the 1-block mode, they go off only as the printer buffer approaches capacity. In both cases, they stay off if the buffer is too full to accept more data.

XON/XOFF protocol

This protocol uses the ASCII characters DC1 and DC3 (sometimes called XON and XOFF, respectively) to communicate with the computer. When the printer buffer approaches capacity, the printer sends a DC3 on TXD (pin 2) to tell the computer that it must stop sending data. When the printer is able to receive more data, it sends a DC1 on the TXD pin. The computer can then send more data until the printer sends another DC3.

ACK protocol

In the ACK protocol, the printer sends an $\overline{\text{ACK}}$ (ASCII 6) signal on the TXD pin each time it is prepared to receive a byte of data.

■ THE IEEE-488 INTERFACE

You may also use the IEEE-488 interface to connect printer to your computer. This 8-bit parallel interface uses a TTL-compatible logic level, and is capable of transferring characters at rates of up to 1 megabyte per second. Its transfer system is governed by a three-wire handshaking protocol, illustrated in Figure H-4.

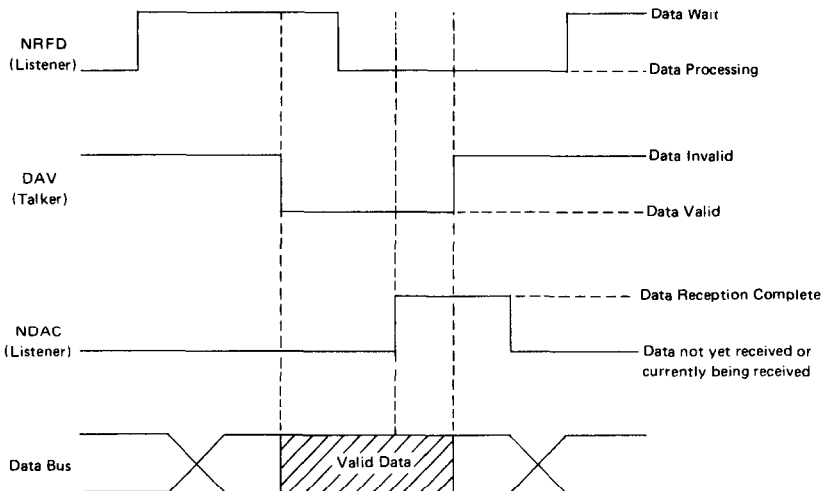


Figure H-4. Data transfer timing chart for the IEEE-488 interface.

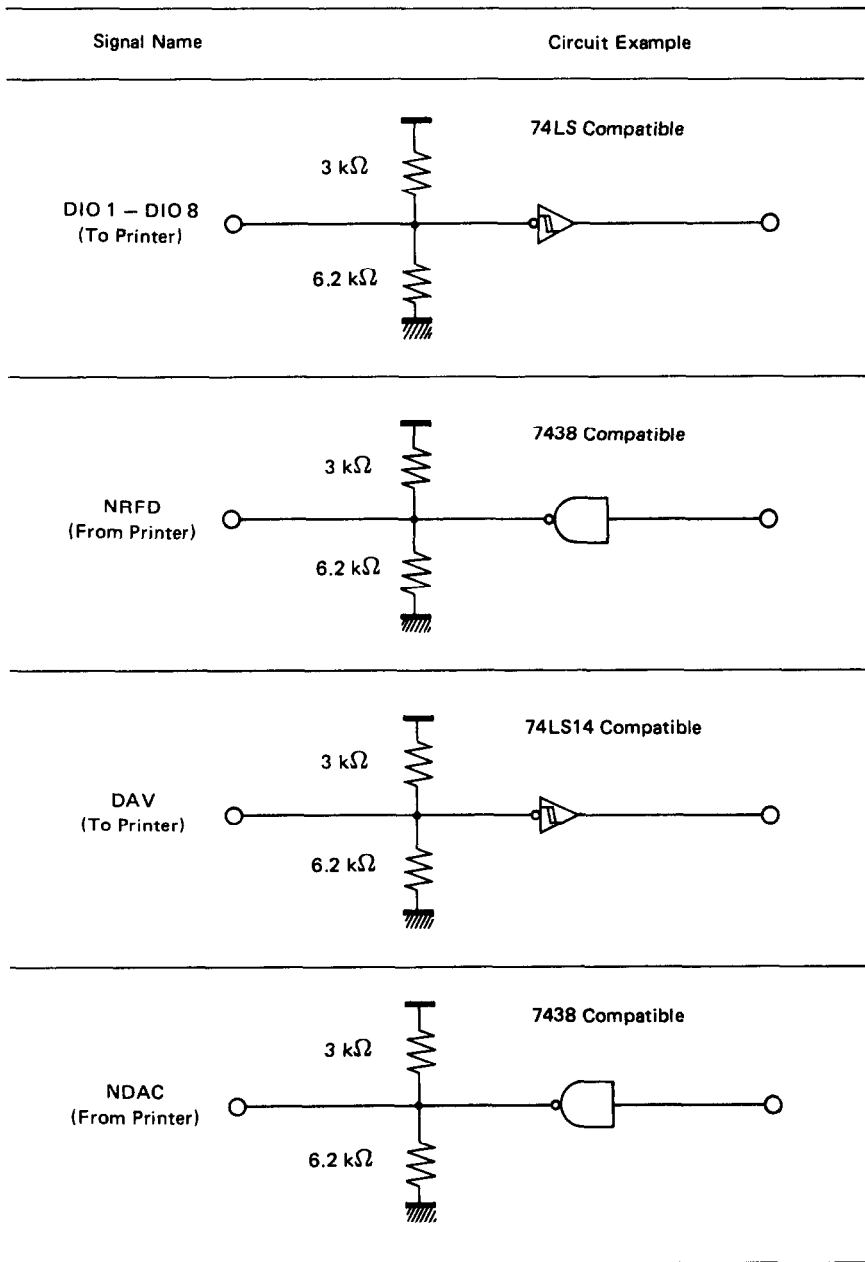


Figure H-5. Circuit example of the IEEE-488 parallel interface.

Table H-3. Connector signals for the IEEE-488 interface.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1	DIO 1	IN	These signals represent parallel data bits 1-4. Each signal is at a low level for a logical 1, and at a high level for logical 0.
2	DIO 2	IN	
3	DIO 3	IN	
4	DIO 4	IN	
5	N/C		Unused.
6	Data Valid (DAV)	IN	Indicates valid data.
7	Not Ready For Data (NRFD)	OUT	Indicates the completion of preparation for data reception.
8	Not Data Accepted (NDAC)	OUT	Indicates the completion of data reception.
9	Interface Clear (IFC)	IN	Initializes the interface.
10	N/C		Unused.
11	Attention (ATN)	IN	Indicates that data on the data bus is either an address or a command.
12	SHIELD		Shield.
13	DIO 5	IN	These signals represent parallel data bits 5-8. Each signal is at a low level for a logical 1, and a high level for a logical 0.
14	DIO 6	IN	
15	DIO 7	IN	
16	DIO 8	IN	
17	Remote Enable (REN)	IN	Specifies remote/local.
18-23	GND		Ground.
24	LOGIC GND		Logic ground.

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**Federal Communications Commission Radio Frequency
Interference Statement**

This equipment generates and uses radio frequency energy and, if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. It has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. If this equipment does cause interference to radio or television reception—which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

For compliance with Federal Noise Interference Standard, this equipment requires a shielded cable.

This statement will apply only for printers marketed in the U.S.A.



WARRANTY

STAR MICRONICS, INC., warrants this product to be free from defects in material and/or workmanship for a period of one year (if purchased after July 1, 1984) from the original date of purchase by the buyer other than for the purpose of resale. This warranty shall apply only if such original purchase by the buyer was made in the United States of America, of Canada.

This warranty shall apply only if the product fails to function properly under normal use. Should this product fail to be in good working order anytime during the one year warranty period, Star Micronics, Inc., will, at its sole option, repair or replace this product at no additional charge except as set forth below. The forgoing is STAR MICRONICS, INC., sole responsibility under this warranty, and any liability for incidental or consequential damages, is expressly disclaimed. Repair parts and replacement products shall be furnished on an exchange basis and shall be either new or reconditioned. All replaced parts and products shall become the property of STAR MICRONICS, INC.

Warranty coverage will not be granted if, in the sole opinion of STAR MICRONICS, INC., the defect or malfunction was caused by accident, abuse or misuse, neglect, improper packing or improper modifications, service by other than an authorized STAR service center, or where the serial number or rating label has been removed, defaced or altered.

Requests for warranty service shall include the buyer's purchase receipt or other valid proof of date of original consumer purchase, including the serial number of the product when a request for warranty service is made. The buyer is responsible for returning the STAR product, properly packaged in its original container, or an equivalent, to the nearest authorized STAR service center or to the dealer from whom the product was purchased. Any postage, insurance or

shipping costs incurred in presenting or sending the product for service is the sole responsibility of the buyer.

ALL EXPRESS AND IMPLIED WARRANTIES FOR THIS PRODUCT, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE AND NO WARRANTIES EITHER EXPRESS OR IMPLIED WILL APPLY AFTER THIS PERIOD. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

TRADEMARK

ACKNOWLEDGEMENTS

SB-10: Star Micronics, Inc.

WORDSTAR: MicroPro International Corporation

MBASIC: Microsoft Corporation

VISICALC: VisiCorp

SUPERCALC: Sorcim Corporation

LOTUS 1-2-3: Lotus Development Corporation

IBM PC: International Business Machine Corporation

CP/M: Digital Research

PFS WRITER: Perfect Software Inc.

EASYWRITER II: Information Unlimited Software Inc.



COMMAND QUICK REFERENCE

Print Style Commands

<ESC> 4 letter-quality mode
<ESC> 5 draft-quality mode
<ESC> R "n" International Character Set

Font Pitch Controls

<ESC> p 1 proportional print
<ESC> p 0 cancel proportional print
<ESC> P pica pitch
<ESC> M elite pitch
<SI> condensed pitch
<ESC> <SI> condensed pitch
<SO> expanded pitch
<ESC> <SO> one line expanded print
<DC2> cancel condensed print
<DC4> cancel expanded print
<ESC> W 1 expanded print
<ESC> W 0 cancel expanded print

Special Print Modes

<ESC> G double-strike print
<ESC> H cancel double-strike print
<ESC> E emphasized print
<ESC> F cancel emphasized print
<ESC> - 1 underlined print
<ESC> - 0 cancel underlined print
<ESC> S 0 superscript printing
<ESC> S 1 subscript printing
<ESC> T cancel superscript and subscript printing

<ESC> i 1.....	incremental mode
<ESC> i 0.....	cancel incremental mode
<ESC> U 1.....	select unidirectional print
<ESC> U 0.....	cancel unidirectional print
<ESC> <.....	one line of unidirectional print

Format Controls

<LF>	advance paper to the next line
<FF>	advance paper to the top of the next form
<VT>	advance paper to the next vertical tab
<ESC> 0.....	1/8th-inch line spacing
<ESC> 1.....	1/10th-inch line spacing
<ESC> 2.....	1/6th-inch line spacing
<ESC> A "n".....	n/60ths-inch line spacing
<ESC> 3 "n".....	n/120ths-inch line spacing
<ESC> J "n".....	one time line feed of n/120th inch
<ESC> j "n".....	one time reverse line feed of n/120th inch
<ESC> C "n".....	set page length to "n" lines
<ESC> C 0 "n".....	set page length to "n" inches.
<ESC> r "n".....	set top margin
<ESC> N "n".....	set bottom margin
<ESC> O.....	cancel top and bottom margins
<ESC> l "n".....	set left margin
<ESC> Q "n".....	set right margin
<ESC> B "n1" "n2" ...0.....	set vertical tabs
<ESC> D "n1" "n2" ...0.....	set horizontal tabs
<ESC> a "n".....	advance page "n" lines
<ESC> <LF>	reverse the paper one line
<ESC> <FF>	reverse the paper to top of the page
<US>	set the vertical form unit (VFU)
<ESC> / "n".....	select VFU channel
<ESC> b "n".....	skip "n" print positions
<CR>	carriage return
<HT>	advance the paper to the next horizontal tab
<BS>	back space

Graphics Controls

<ESC> Y "n1" "n2" "m1" "m2" 8-bit graphics mode
<ESC> K "n1" "n2" "m1" "m2" 8x3-bit graphics mode
<ESC> I "n1" "n2" "m1" "m2" 16-bit graphics mode
<ESC> V "n1" "n2" "m1" "m2" 24-bit graphics mode

Macro Instruction Commands

<ESC> + ... <RS> define macro
<ESC> ? execute macro

Other Commands

<DC3> set printer off-line
<DC1> set printer on-line
<BEL> sound printer bell
<CAN> delete the last printable
 character sent
<ESC> > sets 8th bit to a logical 1
<ESC> = sets 8th bit to a logical 0
<ESC> # accepts bit to a logical 0
<ESC> y 0 disable the printers bell
<ESC> y 1 enable the printers bell
<ESC> 8 disable the paper-out detector
<ESC> 9 enable the paper-out detector
<ESC> @ reinitialize the printer