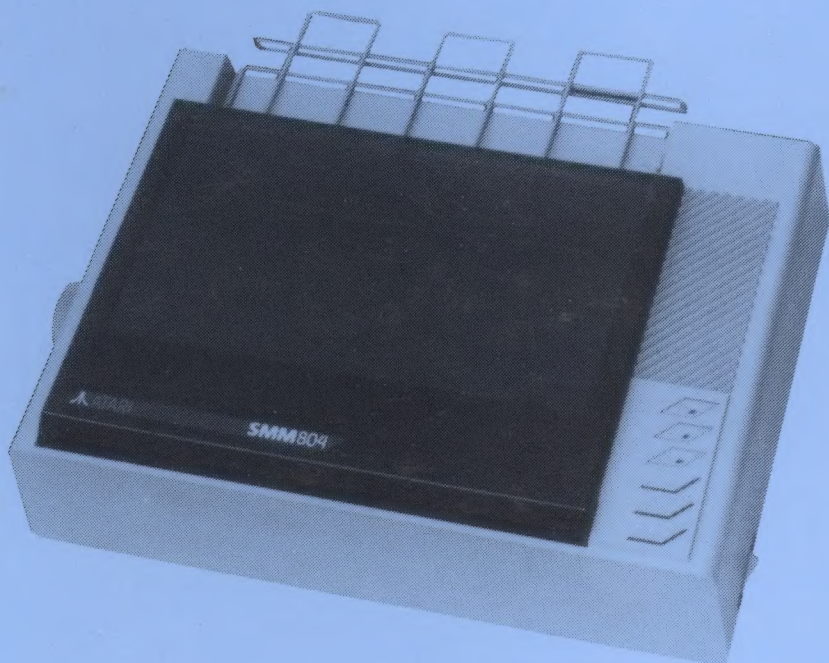


ATARI® SMM804™
Dot Matrix
Graphics Printer



Owner's Manual

Important Information

Like any electrical appliance, this ATARI Personal Computer equipment uses and produces radio-frequency energy. If not installed and used according to the instructions in this manual, the equipment may cause interference with your radio and television reception.

The SMM804 Printer 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 the FCC rules. These rules are designed to provide reasonable protection against such interference when the equipment is used in a residential setting. However, there is no guarantee that interference will not occur in a particular home or residence.

To ensure FCC compliance, the cable connected to the printer's I/O connector must be a shielded cable, like the one supplied with your printer. Use of a non-shielded cable will void FCC certification.

If you believe that this equipment is causing interference with your radio or television reception, try turning the equipment off and on. If the interference problem stops when the equipment is turned off, then the equipment is probably causing the interference. With the equipment turned on, you may be able to correct the problem by trying one or more of the following measures:

- Adjust the position of the radio or television antenna.
- Reposition the equipment in relation to the radio or television set.
- Move the equipment away from the radio or television set.
- Plug the equipment into a different wall outlet so that the equipment and the radio or television set are connected to different branch circuits.

If necessary, consult your ATARI Computer retailer or an experienced radio/television technician for additional suggestions.

A resource that you may find helpful is a booklet prepared by the Federal Communications Commission: *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.

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ATARI® SMM804™
Dot Matrix
Graphics Printer

Owner's Manual





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OFFICE OF THE
ATTORNEY GENERAL



TABLE OF CONTENTS

MEET THE ATARI SMM804 PRINTER	1
HOW TO USE THIS MANUAL	1
CHAPTER 1: GETTING STARTED	5
UNPACKING INSTRUCTIONS	5
CONNECTING THE PRINTER	6
INSTALLING AND REMOVING THE RIBBON CARTRIDGE	7
LOADING PAPER	9
Loading Pin-Feed Paper	9
Loading Single-Sheet Paper	14
THE CONTROL PANEL	16
Indicators	16
Controls	17
SELF-TEST PRINTING	17
CHAPTER 2: TWO WAYS TO PRINT	19
COMMERCIAL APPLICATIONS PROGRAMS	19
PRINTER COMMANDS IN BASIC	19
The LPRINT Command	20
The CHR\$(nn) Function	21
CHAPTER 3: PRINTER CONTROL	23
DEFAULT CONDITION	23
Power-Up Routine and Default Condition	23
CONTROL CHARACTERS AND ESCAPE SEQUENCES	23
USING THE CHR\$(nn) FUNCTION	24
PRINTER CONTROL CODES	25
Horizontal Action	26
Vertical Action	32
Character Pitch and Print Style	39
Character Set	49
Other Codes	52
CHAPTER 4: GRAPHICS	59
TRANSFERABLE GRAPHICS	59
BITMAP GRAPHICS	59

CHAPTER 5: TROUBLESHOOTING AND PREVENTIVE	
MAINTENANCE	73
TROUBLESHOOTING	73
PREVENTIVE MAINTENANCE	74
APPENDIX A: SMM804 PRINTER CONTROL CODE SUMMARY	77
APPENDIX B: CHARACTER CODE TABLES	83
APPENDIX C: CHARACTER PITCH AND PRINT STYLE	
COMBINATIONS	109
APPENDIX D: SMM804 PRINTER INTERFACE SPECIFICATIONS ...	111
APPENDIX E: SMM804 PRINTER SPECIFICATIONS	115
CUSTOMER SUPPORT	117

MEET THE ATARI SMM804 PRINTER

The ATARI SMM804 Printer is powerful and versatile, attractively designed, and easy to use. Its dot-matrix printing method allows you maximum flexibility in formatting your written work. Where a conventional typewriter requires a separate type character for each printed character, the SMM804 prints every character with a single print head. The print head is composed of nine vertically arranged pins that strike the ribbon (while the carriage moves horizontally) to produce characters and images. A microprocessor within the printer keeps track of which dots to print and where to print them.

The SMM804 offers an array of print styles, column widths, and page-length options. Its bidirectional, logic-seeking carriage movement eliminates wasteful mechanical movement, and so increases printing speed (80 characters per second). Among the printer's other features are an uncomplicated control panel and the capability to accept both pin-feed computer paper and standard single-sheet paper.

The SMM804 also prints high-resolution graphics. Using your ATARI ST™ Computer's print-screen utility, for example, you can transfer designs and pictures from the computer directly to the printer. Or, if you wish, you can write your own programs to generate graphics directly from the printer.

The printer's Centronics® -compatible 8-bit parallel interface enables you to drive the printer with software that runs on any ATARI ST Personal Computer.

HOW TO USE THIS MANUAL

Although operating your new printer is not difficult, you must learn how to use it properly. This manual has been prepared for users of all ability levels. Whether you are a novice computer user or a seasoned expert, you will easily find within the manual the information that suits your particular needs.

This is how the manual is organized:

Chapter 1, **Getting Started**, explains the parts and features of the printer and how they work. It shows, step by step, how to unpack the printer, connect it to your computer system, prepare it for printing, and how to run it through its self-test routine.

Chapter 2, **Two Ways to Print**, introduces two ways to use your SMM804: Printing from original programs that you've written in a programming language such as BASIC; and printing from prepackaged applications software, such as word processing and other business applications programs.

Chapter 3, **Printer Control**, discusses printer control codes — instructions that you send to the printer to activate its special features or to modify its operation for various printing formats. For each printer control code, an example of its use in BASIC is provided.

Chapter 4, **Graphics**, examines the SMM804's high-resolution graphics modes, explaining how to transfer graphics from computer to printer, and how to produce your own graphic patterns and pictures directly from the printer.

Chapter 5, **Troubleshooting and Preventive Maintenance**, anticipates some problems you might encounter while operating your printer and offers simple solutions to those problems. The chapter also provides some helpful hints about the care and maintenance of your printer.

Appendix A, **SMM804 Printer Control Code Summary**, lists all the SMM804 control codes, their functions, and their decimal and hexadecimal equivalents.

Appendix B, **Character Code Tables**, lists the decimal and hexadecimal character codes for the SMM804's extended ASCII character set. Here you will also find the character codes for the printer's foreign language character sets.



Appendix C, **Character Pitch and Print Style Combinations**, provides a table of permissible character pitch and print style combinations using the SMM804 Printer.

Appendix D, **SMM804 Printer Interface Specifications**, provides technical information about the printer's Centronics-compatible 8-bit parallel interface.

Appendix E, **SMM804 Printer Specifications**, summarizes the major features and requirements of the printer.

Customer Support provides you with information about how to get your questions and comments about the SMM804 Printer answered, should they arise.

Paragraphs marked **Warning** or **Note** appear throughout the manual. **Warnings** alert you to potential problems and suggest ways to avoid them. **Notes** contain useful hints and other information relevant to the topic at hand.



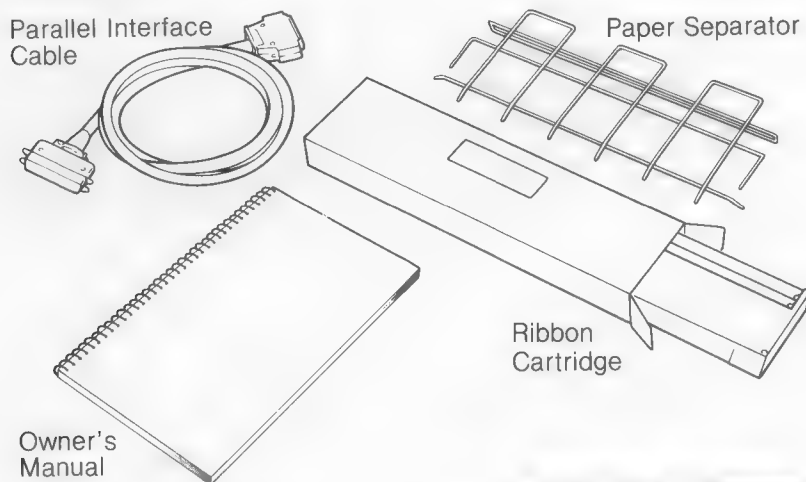
CHAPTER 1

GETTING STARTED

UNPACKING INSTRUCTIONS

1. Using both hands, lift the printer out of the box.
2. Place the printer on a firm, level surface and remove the foam packing and plastic bag from the printer. Locate and remove the ribbon cartridge packed within one of the foam panels.
3. Remove the printer's dustcover by slipping your hands under the cover's back edge and lifting it up and away from the printer. Remove the piece of tape and foam cushion that have held the carriage in place during shipment.
4. Lift the printer up and rest it gently on its back panel (avoid bending the interface connector clips). Unscrew and remove the two shipping screws. Right the printer and replace the dustcover.
5. Packed along with your SMM804 Printer you should find a ribbon cartridge, a wire paper separator, a parallel interface cable, this owner's manual, and a warranty card. Before going on, make sure you have received all these items.

Note: Save all packing materials for storing or transporting your printer.

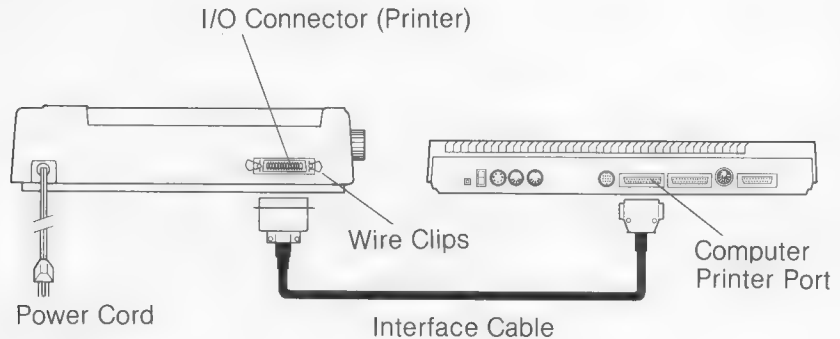


CONNECTING THE PRINTER

Choose the right working environment for your printer. Avoid places that would expose the components to dust, grease, extreme temperatures, or high humidity. Position your printer on a firm, level surface.

To connect the printer to your computer system, follow these steps:

1. Turn off all components of your computer system.
2. Plug the smaller end of the interface cable, packed with your printer, into the printer port of your computer.
3. Plug the other, larger end of the cable into the port marked I/O CONNECTOR on the back panel of the printer. Before connecting the cable, move the two wire retainer clips aside, one to the left and one to the right. After plugging in the cable, snap the clips into place on the plug housing.
4. Make sure the printer is switched off. (The on/off switch is on the right side of the machine.) Now plug the printer's power cord into a wall outlet or power strip.

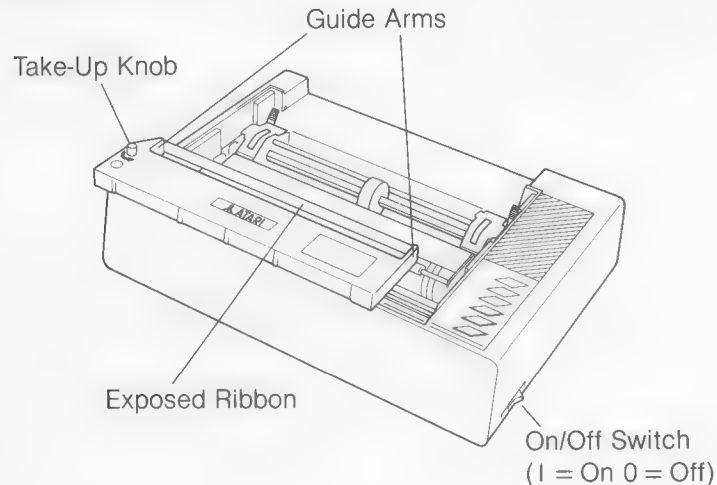


INSTALLING AND REMOVING THE RIBBON CARTRIDGE

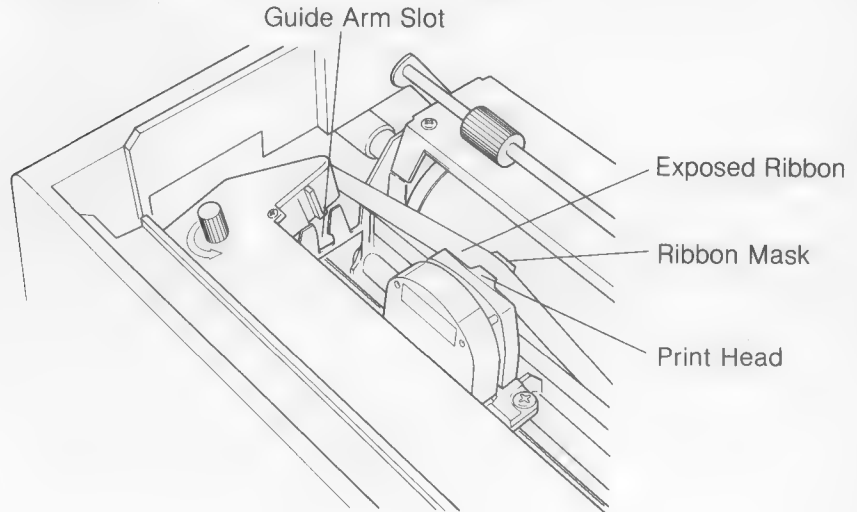
Your printer comes equipped with a multistrike carbon-film ribbon housed in a replaceable cartridge. The ribbon is designed to produce excellent print quality over long use. The cartridge itself has been specially fitted to the SMM804 Printer. Replacement ribbon cartridges like the one packed with your printer are available from your ATARI Computer retailer.

To install the ribbon, follow the illustrated steps below. (You will also find a quick-reference diagram molded on the cartridge housing.)

1. Make sure the printer is switched off and remove the dustcover. Unpack the ribbon cartridge.
2. Hold the cartridge so that the raised take-up knob is on the left, facing up, and the exposed length of ribbon is away from you. Turn the knob counterclockwise to take up any slack in the ribbon, taking care that the ribbon runs around the guide arms at either side of the cartridge.



3. Raise the paper bail up off the platen. Now, holding the cartridge from above, by the far edge opposite the ribbon, lower the near side into the carriage well first, sliding it under the shelf of the printer housing. As you do so, be sure the ribbon guide arms fall into their slots and gently push the cartridge down until it snaps into place. Be sure that the exposed length of ribbon slips *between* the print head and the metal ribbon mask. Use the take-up knob to remove any slack in the ribbon.



4. To remove the cartridge, lift the far edge (opposite the exposed ribbon) until the guide arms snap free of their slots. Now carefully lift the cartridge out of the printer.

Warning: The printer has no mechanism to alert you when the ribbon runs out or no cartridge is installed. *Always remember to install the ribbon cartridge before printing.* If printed characters appear light and the cartridge is no longer feeding unused ribbon, the ribbon is used up and should be replaced.

LOADING PAPER

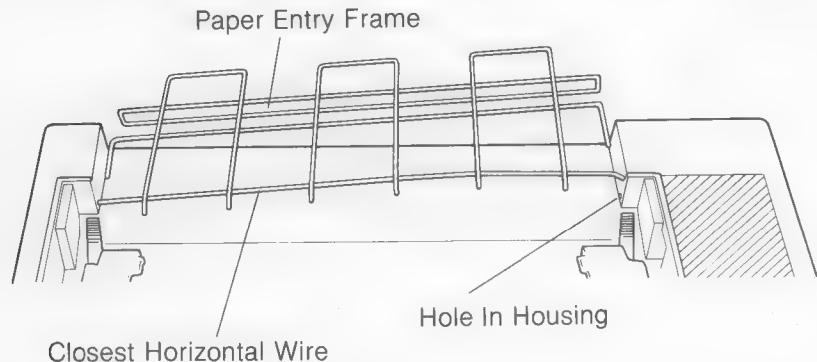
The SMM804 Printer accepts pin-feed computer paper as well as single sheets of regular paper. Two different mechanisms feed the two types of paper into the printer: pin-feed sprockets and friction rollers, respectively.

Loading Pin-Feed Paper

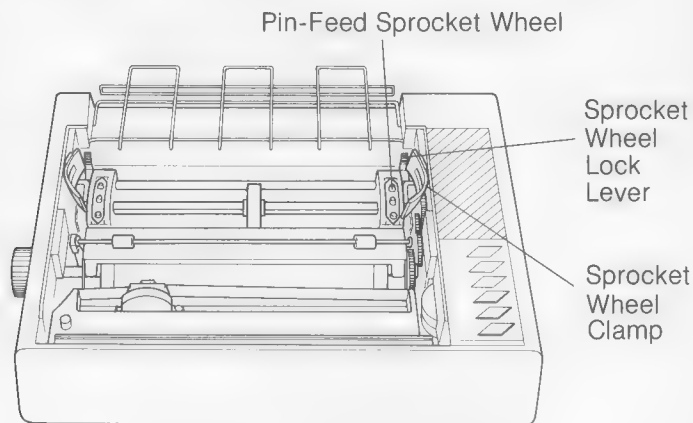
Pin-feed paper has punched holes down both sides. The holes fit over the printer's pin-feed sprocket wheels, which revolve to advance the paper through the printer. Pin-feed paper comes stacked in prefolded, perforated panels to permit continuous movement of paper into and through the machine as it prints, out the paper exit, and back into a stack.

To load pin-feed paper, follow these steps:

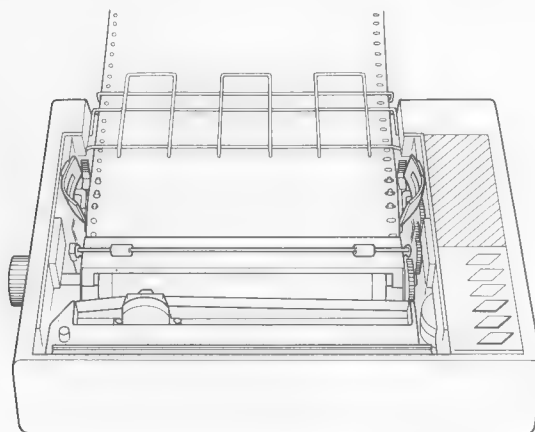
1. Remove the dustcover from the printer. Unpack the wire paper separator.
2. Hold the paper separator parallel to the top of the printer so that the paper entry frame angles downward, toward the rear of the printer. Tilting the paper separator, slip the wire ends closest to you, one at a time, into the holes in the printer's housing. The entry frame should extend beyond the back of the printer.



3. Release both sprocket wheel lock levers by pulling them toward you, till they snap forward. Notice that once you unlock the sprocket housings you can slide them freely along their square guide bar. Now lift the sprocket wheel clamps outward to either side, resting them in their up positions.

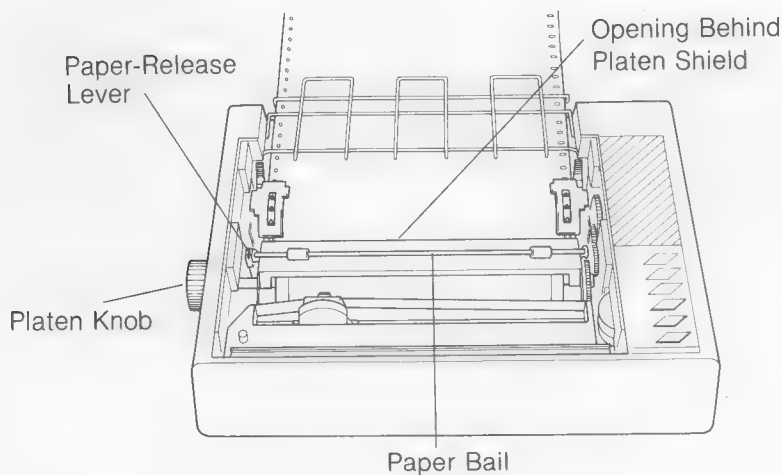


4. Insert the paper's leading edge through the paper separator's entry frame. Now slide the paper forward under the separator and up to the sprocket wheels. Move the sprocket housings along their guide bar until the paper holes and sprocket-pins are aligned.

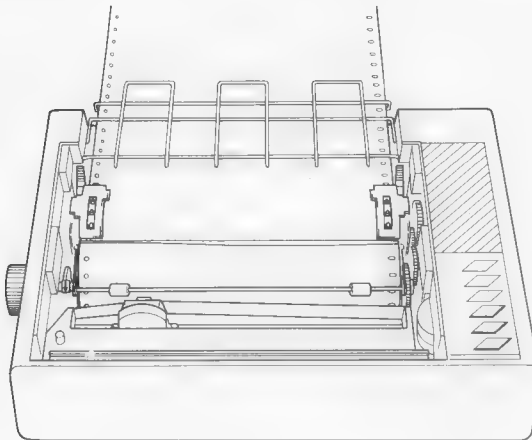


5. Close the sprocket wheel clamps to secure the paper holes on the sprocket pins. If necessary, adjust the sprocket wheel position a little on either side to flatten out the loaded paper. Snap the sprocket wheel lock levers back to their locked positions (away from you).

6. Lift the paper bail. Flip the paper-release lever up to its friction position — the opposite direction indicated by the arrow on the lever itself. (Friction feed is used to advance pin-feed paper only when loading and unloading.) Now turn the platen knob counter-clockwise to advance the paper into the opening at the back of the platen.



7. Continue to advance the paper under the platen, then up to, under, and beyond the paper bail. Once the paper is beyond the paper-bail rollers, return the paper bail to its down position. Return the paper release lever to its down (pin-feed) position — the direction indicated by the arrow on the lever.



Aligning Pin-Feed Paper

Notice the red rings on the paper bail. Together they mark the margins of a full eight-inch printed line: the left ring marks the far left margin; the right ring the far right margin. The printer cannot print outside these margins. When aligning paper for printing, use these two red markings as reference points in positioning your text or graphic on the page.

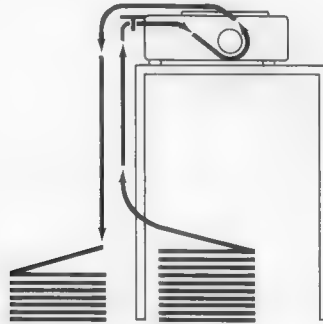
Setting the Top of the Page

The printer has no special operation or instruction to establish where each new printed page will begin on pin-feed paper. The top of the printed page is determined by the position of the print head when you switch the printer on. To avoid setting a mistaken top-of-page, be sure to line up the desired top-of-page position with the print head before you switch on the printer.

Paper Supply and Paper Exit

When using pin-feed paper, situate your printer so that its paper supply lies directly below and parallel with the printer. If you do not have a printer stand, place your printer near the edge of a desk or table, and place the box of pin-feed paper under the table and directly below the printer. Bring the paper up to the printer from behind, and guide it through the paper entry frame of the paper separator.

When printing, let the paper exit back over the paper separator and spill straight over the edge of the table into a self-folding stack on the floor.



Warning: Do not allow exiting paper to pile up on the unprinted paper entering the printer as the exiting paper may be pulled back into the printer, jam the paper-feed mechanism, and possibly damage the printer.

Unloading the Pin-Feed Paper Supply

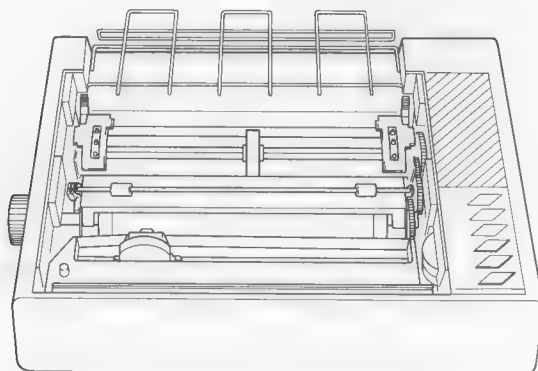
To unload the pin-feed paper supply, flip the paper-release lever to the friction position (up) and turn the platen knob clockwise (toward you) until the paper's leading edge clears the paper separator.

Loading Single-Sheet Paper

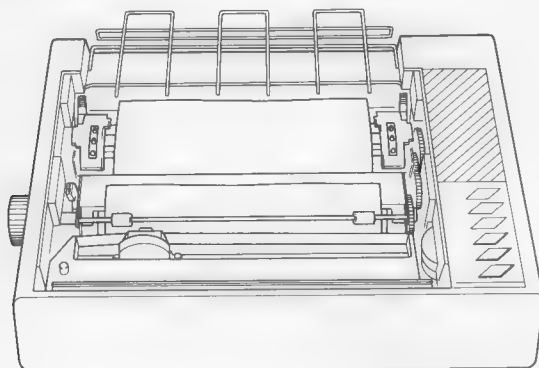
Because your printer also accepts single-sheet paper, you can use typing paper, personal or business stationery, or any other single sheet of paper up to 8½ inches wide.

Loading a single sheet of paper into your printer is much like loading paper into a typewriter. Follow these steps:

1. Pull the sprocket wheel lock levers toward you to release the sprocket housings. Slide the sprocket housings out of the way, one to the right and one to the left as far as they will go. Now lock the sprockets in place.
2. Flip the paper release lever to the up position (the opposite direction indicated by the arrow on the lever) so that friction will feed the paper into the printer. Lift the paper bail up to rest away from the platen.



3. Insert the paper through the opening behind the platen. Turn the platen knob counterclockwise to bring the paper under the platen, then up to, under, and beyond the paper bail. Return the paper bail to its down position.



Aligning Single-Sheet Paper

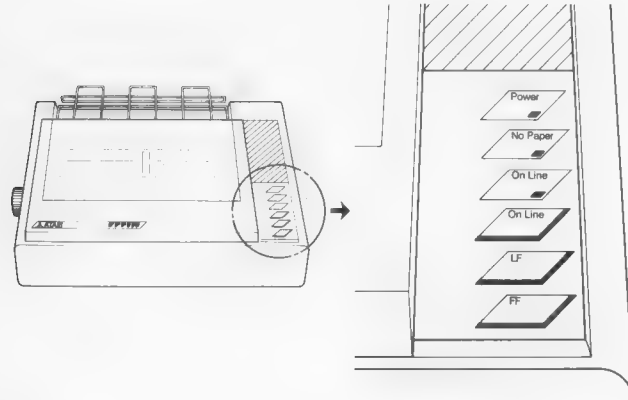
To align a single sheet of paper once it has been loaded, use the paper release lever just as you would on a typewriter. After repositioning the paper, return the lever to the up (friction) position. Use the red text-margin markings on the paper bail as reference points when you align the paper.

Unloading Single-Sheet Paper

To remove a single sheet of paper, turn the platen knob counterclockwise until the paper feeds out of the printer.

THE CONTROL PANEL

Typically, you'll be using your computer to tell your printer what to do. However, the printer itself is equipped with a few built-in indicators and functions which are represented on the control panel.



Indicators

Power

Whenever the power to the printer is switched on, the red Power light is illuminated. It stays on until you switch the printer off. The on/off switch is located on the forward right side of the machine.

No Paper

Your printer is equipped with a paper-out sensor. When the printer is about to run out of paper the No Paper light goes on, a high-pitched buzzer sounds, and the printer stops printing (the printer goes off-line). The paper-out sensor will also alert you if you fail to insert paper before you switch the printer on. When you replenish the paper supply the No Paper light will go off, but the printer remains off-line until you press the On Line button.

On Line

The On Line light is illuminated when the printer is ready to receive instructions from the computer. It blinks while the printer is receiving instructions and printing. The light goes off when the printer is off-line.

Controls

On Line

Pressing this button switches the printer from on-line to off-line and vice versa. When on-line, the printer is ready to receive printing instructions from the computer. When off-line, it cannot receive instructions from the computer, but can still perform the other control-panel functions.

Line Feed (LF)

Pressing this button advances the paper by one line. Holding down the Line Feed button advances the paper continuously, line by line, until you release the button. Using the LF button is a handy way to remove a single sheet of paper from the printer mechanically. The LF button works *only* when the printer is off-line.

Form Feed (FF)

Pressing this button advances the paper an entire page length. This function enables you to remove and tear off a completed page from the printer quickly and conveniently. The FF button works *only* when the printer is off-line.

SELF-TEST PRINTING

Your SMM804 Printer features a self-test function. When you switch the printer on in a certain way, the printer automatically prints out its complete set of characters. The test will continue for about three minutes or until you switch the printer off. To activate the self-test, follow these steps:

1. Make sure the ribbon cartridge is correctly installed and that paper is properly loaded.

Warning: Do not switch the printer on before you remove the shipping screws, carriage tape, and foam cushion (see page 5).

2. Switch the printer on *while simultaneously* pressing the Line Feed (LF) button on the control panel.

3. Watch it print!

4. When you've seen enough, switch the printer off.

Warning: Do not touch the top of the print head. The surface becomes hot while operating.



The purpose of this test is to ensure that the printer is in good working order. Examine the self-test printout carefully. The print quality and the spacing between characters and lines should be consistent. If you find inconsistencies, check to see that the ribbon is installed correctly and the paper is loaded properly. If a problem persists, please contact your ATARI Computer retailer or an authorized ATARI Service Center.

CHAPTER 2

TWO WAYS TO PRINT

Self-test printing is not the most productive use of your printer. There are two ways to use your printer in conjunction with your computer: Printing with original programs that you have written in a programming language (such as BASIC); and printing from within a commercial applications program, like a word processing or data base management program.

COMMERCIAL APPLICATIONS PROGRAMS

One valuable task that your SMM804 Printer can help you tackle is word processing or data base management—using your computer to write letters, term papers, business reports, and the like.

The SMM804 has been designed for compatibility with major word processing and data base management programs that run on ATARI ST Personal Computers, or any computer equipped with a parallel printer interface. When you print your work, you should use the program's ATARI SMM804 printer driver or the program's dot-matrix printer driver.

Word processing programs make writing faster and easier. You can arrange your written work using virtually any test format—then send your work directly to the SMM804 Printer. And you can store your work on diskette for later reference or revision.

Data base management programs allow you to organize, store, and retrieve large amounts of information with minimal effort. With the SMM804 Printer and compatible business applications programs, you can print reports, spreadsheets, graphs, and tables.

Sophisticated word processing and data base management programs that run on ATARI ST Personal Computers and that fully support the SMM804 Printer are available from ATARI. Look for these products at your ATARI Computer retailer.

PRINTER COMMANDS IN BASIC

In Chapter 3 of this manual, the BASIC programming language is used to help demonstrate the SMM804 Printer's printing and formatting features. The following section discusses the two BASIC commands most frequently used in these demonstrations.

BASIC was chosen for use in this manual because its printer commands are easy and straightforward, and because it is probably the most widely known programming language among microcomputer users. Of course, you may have programming language preferences which exclude BASIC. Nonetheless, you will be able to garner, from the BASIC examples included in Chapter 3, all the essential properties of printer functions and features.

If you are already familiar with BASIC programming, then you may skip this section. If you are not, then what follows will afford you the introductory knowledge necessary to follow the demonstrations of printer control in Chapter 3.

Note 1: While operating in BASIC, the computer will not act on any statement, nor will it enter any statement into its memory until you press **[Return]**. *Remember to press the **[Return]** key on your computer keyboard at the end of each BASIC statement.*

Note 2: The BASIC examples throughout this manual are rendered in BASIC's programming mode. At the beginning of each program statement, a line number appears. A program may consist of one line or many lines. *To execute a BASIC program, you must type **RUN** and press **[Return]**.*

The LPRINT Command

Probably the most common way to send BASIC instructions to a printer is through the LPRINT command (short for LINE PRINT). Using LPRINT, you can send text and other instructions to the printer. For now, the discussion will concentrate on text; the other instructions will be presented in Chapter 3.

Type:

NEW

10 LPRINT "MY COMPUTER COMMUNICATES WITH MY PRINTER. "

The LPRINT command requires that you type the text to be printed between quotation marks. (The BASIC command NEW is not a part of the program—it simply clears the computer's memory.) When you type RUN and press **[Return]**, the printer prints:

MY COMPUTER COMMUNICATES WITH MY PRINTER.

BASIC divides a printed line into print zones. Each print zone is a predefined number of character spaces in length. If you place a comma (,) at the end of an LPRINT statement, the printer spaces to the next print zone but will not move to a new line. If you end an LPRINT statement with a semicolon (;), the print head remains at the end of the last character printed. If you place neither a comma nor a semicolon at the end of an LPRINT statement (as in the example above), the printer returns the carriage and feeds a line.

The CHR\$(nn) Function

Every character that your SMM804 Printer can print has a decimal equivalent. In BASIC, as well as in other programming languages, every character can be expressed as a decimal number. When you send a decimal character code to the printer, the printer will type the corresponding character.

In the United States, the standard correspondence between decimal codes and characters is known as ASCII (American Standard Code for Information Interchange). The ASCII characters and decimal codes are given in Appendix B, as are the SMM804's international character sets.

In BASIC, decimal codes are sent to the printer via the CHR\$(nn) function, in which *nn* is the decimal number of any given character.

For example:

NEW

10 LPRINT CHR\$(65);CHR\$(66);CHR\$(67)

Decimal code 65 stands for the letter A, 66 corresponds to B, and 67 corresponds to C. Character strings—CHR\$(nn) functions and text between quotation marks—must be separated by either a comma (carriage moves to the next print zone) or a semicolon (carriage remains at the end of the last character). When you type RUN and press [Return], the printer prints:

ABC

The CHR\$(nn) function works within LPRINT command lines, but they must not fall inside quotation marks. If you type a CHR\$(nn) function inside LPRINT-statement quotation marks, the printer will print the CHR\$(nn) notation itself—like any other series of characters between quotation marks—instead of carrying out the CHR\$(nn) function.

Still, within the same LPRINT statement, you can mix CHR\$(nn) functions and text that is enclosed between quotation marks.

Type:

```
NEW  
10 LPRINT CHR$(65); " IS THE FIRST LETTER OF THE  
ALPHABET. "  
RUN
```

The printer prints:

```
A IS THE FIRST LETTER OF THE ALPHABET.
```

CHAPTER 3 PRINTER CONTROL

DEFAULT CONDITION

When you first switch on the SMM804 Printer, the machine performs a few opening routines and prepares itself to print according to a set of “default,” or preselected, instructions. For example, it will automatically print pica characters at 66 lines per page. The following section lists the printer’s “power-up” routine and its default condition.

Power-Up Routine and Default Condition

- The printer goes on-line, unless it is out of paper.
- The carriage returns to the far left margin.
- The character pitch is set at pica (10 characters per inch).
- Horizontal tab stops are set at every eight character spaces.
- Line spacing is set at 1/6 inch (six lines per vertical inch).
- The page length is set at 66 lines (11 inches).
- The top of the page (the place on the paper where the printer will start every new page) is set by the position of the print head.
- The printer buffer is cleared.
- All special print instructions are cleared if previously in use.
- The printing direction is bidirectional.
- The character set is United States (ASCII)/Multinational.
- The paper-out sensor is active.

Note: See page 54 (Reset Printer) or Appendix D for information on how to return the printer to its default condition without switching it off and on.

CONTROL CHARACTERS AND ESCAPE SEQUENCES

You can override the printer’s default print configurations by sending certain control codes that your printer is programmed to accept from your computer. For instance, you can send a code that tells the printer to print boldface characters, or send a code that changes page length. Printer control codes allow you to vary the printing format for greater flexibility in styling your written work.

There are two basic types of printer control codes: *control characters* and *escape sequences*.

Control characters are those members of the SMM804's character set with decimal values below 32. In this manual, control characters are referred to in two ways: by their ASCII mnemonics (which are simply abbreviations for their names) and with their decimal codes. For example, the ASCII mnemonic for the control character that produces a line feed is LF; its decimal code is 10.

Most printer control codes are escape sequences. Escape sequences consist of the escape character followed by one or more characters. The escape character is itself the ASCII control character ESC, but is typically used in conjunction with another character(s) to produce a printer control code (hence the label "escape sequences"). Like control characters, escape sequences are referred to in this manual by their ASCII mnemonics and with their decimal codes. For example, the code that allows you to print boldface characters is ESC E; its decimal equivalent is 27, 69 (27 for the escape character and 69 for the letter E).

Note: Some escape sequences contain parameter variables. In the charts that accompany the explanations of the printer control codes later in this chapter, an italicized lowercase letter designates a parameter variable.

USING THE CHR\$(*nn*) FUNCTION

In Chapter 2, the CHR\$(*nn*) function was used to send the decimal equivalent of printable characters (like the letters A, B, C, etc.) to the printer in BASIC. But you can also send printer control codes via the CHR\$(*nn*) function.

For example, the escape sequence for boldface characters is ESC E. The decimal codes for ESC and E are 27 and 69, respectively. To send the code in BASIC using the CHR\$(*nn*) function, you would type:

```
10 LPRINT CHR$(27);CHR$(69)
```

Or you could type:

```
10 LPRINT CHR$(27);"E"
```

The second example seems to print the E. However, when the printer receives an escape character, it waits for at least one more character to follow. The printer “knows” that the E following CHR\$(27) determines a function and should be interpreted as such—not that it should actually print the letter E.

You may find that combining decimal codes and characters in this way helps you remember many escape sequences. After all, the ESC part of the sequence will always be 27, and you’ll more readily recall the following character in the sequence than its decimal equivalent.

The SMM804’s character set includes both the printable characters (like the letter A) and the control characters (like LF and ESC). Consult Appendix B for their decimal equivalents.

The decimal equivalents for all printer control codes (both control characters and escape sequences) are given in Appendix A.

The rest of this chapter covers all the SMM804 Printer’s control codes and explains how to use the CHR\$(nn) function to express them in BASIC programs. You should have at least an introductory knowledge of BASIC printer commands before proceeding further (see Chapter 2).

PRINTER CONTROL CODES

To help you understand the functions of the codes and locate the ones you need to use in your programs, the codes have been arranged in categories.

The **Horizontal Action** section includes codes that control the movement of the carriage and the print head across the paper, such as the tab functions and the printing direction. **Vertical Action** discusses codes that control the up-and-down movement of the paper and such vertical measurements as line spacing and page length. The codes in **Character Pitch and Print Style** allow you to control the size and style of the characters, including such flourishes as boldface print and underlining. And the **Character Set** section explains how to access the printer’s variety of international character sets. The last section, **Other Codes**, pertains to certain miscellaneous operations of the printer.

Note: The SMM804 Printer’s graphics control codes are exhaustively covered as a tutorial in Chapter 4.

The discussion of each code begins with a chart. At a glance, you can find the control character or the escape sequence for the code, its decimal equivalent, and the function that the code performs. After a brief description of the code, a sample BASIC program shows you how to send the code to the printer.

Note: If you mistakenly enter an undefined printer control code, the printer simply ignores it.

Horizontal Action Space

CODE	DECIMAL	FUNCTION
SP	32	Spaces forward one character space

This code moves the carriage forward one character space.

BASIC example:

```
5 REM: SPACE
10 LPRINT "SP";CHR$(32);"ACE"
20 END
```

The printer prints:

SP ACE

Backspace

CODE	DECIMAL	FUNCTION
BS	8	Backspaces one character

Everyone is familiar with the [Backspace] key on a typewriter or a computer keyboard. When you press [Backspace], the carriage (in the case of a typewriter) or the cursor (in the case of a computer) moves backward one character space. The Backspace code for your printer functions in much the same way. When you send the Backspace code to the printer, the carriage moves back one character space, then prints the next character. This function is useful for printing two characters on top of one another. The BASIC example uses the Backspace code to print ≠.

BASIC example:

```
5 REM: BACKSPACE
```

```
10 LPRINT "X=";CHR$(8);"/ Y MEANS X IS NOT EQUAL TO Y."
```

```
20 END
```

The printer prints:

X ≠ Y MEANS X IS NOT EQUAL TO Y.

Carriage Return

CODE	DECIMAL	FUNCTION
CR	13	Carriage return to the left margin

As the computer transmits data to the printer, the printer buffer holds approximately the next line of incoming text to be printed. When you send the Carriage Return code, the printer prints all the data in the printer buffer and returns the carriage to the left margin. The Carriage Return code does *not* advance the paper to the next printing line.

BASIC example:

```
5 REM: CARRIAGE RETURN
```

```
10 LPRINT "RETURN THE CARRIAGE, OK?";CHR$(13);"OK."
```

```
20 END
```

The printer prints:

RETURN THE CARRIAGE, OK?

Because the Carriage Return code does not include a line-feed instruction, the carriage moves to the left margin of the same line and prints the second OK on top of the first sentence.

Note: The printer has a logic-seeking capability. This feature allows the printer to anticipate and conserve mechanical movement. For instance, if the BASIC example above did not contain the second OK, the printer would print the first sentence, check its buffer for more data, and stop the carriage (there being no more data to print). Although the carriage would not *physically* move to the left margin, the carriage would *logically* be in place at the left margin: the printer would know to return the carriage once it receives more data to print.

Horizontal Tab Set

CODE	DECIMAL	FUNCTION
ESC D $n1 \dots n32$ NUL	27, 68, $n1 \dots n 32, 0$	Sets horizontal tab stops (32 maximum)

With this code, you can set as many as 32 horizontal tab stops. The n variables take column numbers as values, starting at column 0. The column numbers must be sent to the printer in ascending numerical order. You must include the NUL code (decimal 0) at the end of the escape sequence. The horizontal tab stops are reset each time you send this code. Sending ESC D NUL *only* clears all horizontal tabs. Remember: You are setting tabs relative to the current print mode. A horizontal tab stop set beyond the legal horizontal column width will be ignored (e.g., 80 in Pica and 132 in Compressed).

BASIC example:

5 REM: HORIZONTAL TAB SET

```
10 LPRINT CHR$(27);"D";CHR$(10);CHR$(20);  
CHR$(30);CHR$(0);  
20 END
```

Three horizontal tab stops are set at columns 10, 20, and 30. Use the Horizontal Tab code to move the carriage to the tab stops set.

Horizontal Tab

CODE	DECIMAL	FUNCTION
HT	9	Tabs to the next horizontal tab stop

When you first switch on the printer, horizontal tab stops are automatically set at every eight spaces. This code moves the carriage to the next horizontal tab stop, as determined either by the default tab settings or by the Horizontal Tab Set code.

BASIC example:

```
5 REM: HORIZONTAL TAB
10 LPRINT "0123456789012345678901234567890"
20 FOR X=1 TO 3
30 LPRINT CHR$(9);"TAB";
40 NEXT X
50 END
```

The printer prints:

```
0123456789012345678901234567890
          TAB          TAB          TAB
```

Note: The above assumes that tabs have been set at columns 10, 20, and 30, as in the Horizontal Tab Set code BASIC example.

Right Margin Set

CODE	DECIMAL	FUNCTION
ESC Q <i>n</i>	27, 81, <i>n</i>	Sets the right margin

This code sets the right margin relative to the current print mode. When you decide on a right print boundary, replace the *n* variable with the desired number of character spaces. The maximum number of horizontal character "columns" (one-character spaces starting at 1) for each print mode are listed in the following table:

Pica	80
Elite	96
Compressed	132
Double Width	40
Double-Width Elite	48
Double-Width Compressed	66

Note: The *n* value must be greater than one but no more than the maximum number of columns given in the table. The printer ignores incorrect values.

BASIC example:

```
5 REM: RIGHT MARGIN SET
10 REM: SETS COLUMNS ACROSS TO 10
20 LPRINT CHR$(27);"0";CHR$(10);
30 LPRINT "012345678901234567890123456789"
40 END
```

The printer prints:

```
0123456789
0123456789
0123456789
```

Left Margin Set

CODE	DECIMAL	FUNCTION
ESC 1 <i>n</i>	27, 108, <i>n</i>	Sets the left margin

This code sets the left margin relative to the current print mode. Substitute a horizontal column number for the *n* variable (use the table in Right Margin Set). When you send the Left Margin Set code, all horizontal tab stops are cleared.

BASIC example:

```
5 REM: LEFT MARGIN SET
10 LPRINT CHR$(27);"1";CHR$(10);
20 END
```

The left margin is set at horizontal column 10.

Unidirectional Printing

CODE	DECIMAL	FUNCTION
ESC U SOH	27, 85, 1	Selects unidirectional
ESC <	27, 60	(left to right) printing

When you send this code, the printer prints from left to right only. This function ensures a more accurate starting position for better print quality (especially when printing charts and graphs). Normally

the print head prints continuously from left to right and from right to left (bidirectionally) for greater speed. The ESC < code is valid for one line *only*.

BASIC example:

```
5 REM: UNIDIRECTIONAL PRINTING  
10 LPRINT CHR$(27);"U";CHR$(1);  
20 FOR X=1 TO 3  
30 LPRINT "PRINT FROM LEFT TO RIGHT ONLY. "  
40 NEXT X  
50 END
```

The printer prints the sentence unidirectionally 3 times.

Bidirectional Printing

CODE	DECIMAL	FUNCTION
ESC U NUL	27, 85, 0	Selects bidirectional printing

If you send the Unidirectional Printing code, use this code to return to bidirectional printing. Bidirectional printing is the default condition.

BASIC example:

```
5 REM: BIDIRECTIONAL PRINTING  
10 LPRINT CHR$(27);"U";CHR$(1);  
20 FOR X=1 TO 3  
30 LPRINT "PRINT FROM LEFT TO RIGHT ONLY. "  
40 NEXT X  
50 LPRINT CHR$(27);"U";CHR$(0);  
60 FOR Y=1 TO 3  
70 LPRINT "NOW PRINT FROM LEFT TO RIGHT AND RIGHT TO LEFT. "  
80 NEXT Y  
90 END
```

The printer prints the first sentence unidirectionally three times, then prints the second sentence bidirectionally three times.

Vertical Action

Line Feed

CODE	DECIMAL	FUNCTION
LF	10	Feeds the paper one line

The Line Feed code empties the printer buffer and advances the paper one line. This code has the same effect as the Line Feed button, except that the instruction is sent from the computer. When the printer is first switched on, the line spacing is preset at 1/6 inch. If you change the printer's default line spacing, the printer executes the Line Feed code according to the new line spacing. The Line Feed code does *not* include a carriage return.

BASIC example:

```
5 REM: LINE FEED
10 LPRINT "ADVANCE THE PAPER ONE LINE,
OK?";CHR$(10);"OK."
20 END
```

The printer prints:

ADVANCE THE PAPER ONE LINE, OK?

OK.

Form Feed

CODE	DECIMAL	FUNCTION
FF	12	Feeds the paper to the next top-of-page

The Form Feed code advances the paper to the top of the next page. The position of the paper when the printer is first switched on determines where the top of every page begins. The Form Feed code has the same effect as the Form Feed button, except that the instruction to advance the paper is sent from the computer. When the printer is first switched on, the page length is preset at 11 inches. If you change the page length, the Form Feed code functions according to the new measurement.

BASIC example:

```
5 REM: FORM FEED
10 LPRINT "ADVANCE THE PAPER TO THE NEXT TOP OF PAGE,
OK?"
20 LPRINT CHR$(12);"OK."
30 END
```

The printer prints:

ADVANCE THE PAPER TO THE NEXT TOP OF PAGE, OK?

Here the printer advances the paper to the top of the next page and prints:

OK.

Vertical Tab Set

CODE	DECIMAL	FUNCTION
ESC B <i>n1</i> . . . <i>n16</i>	27, 66,	Sets vertical tab stops
NUL	<i>n1</i> . . . <i>n16</i> , 0	(16 maximum)

With this code, you can set as many as 16 vertical tab stops. The *n* variables take line numbers as values. The line numbers must be sent to the printer in ascending numerical order. You must include the NUL code (decimal 0) at the end of the escape sequence. The vertical tab stops are reset each time you send this code. Sending ESC B NUL *only* clears all vertical tabs. The form length (ESC C) must be set *before* vertical tab stops are set. A vertical tab stop set beyond the length of the form will be ignored.

BASIC example:

```
5 REM: VERTICAL TAB SET
10 LPRINT CHR$(27);"B";CHR$(10);CHR$(20);CHR$(30);
CHR$(0);
20 END
```

Three vertical tab stops are set at lines 10, 20, and 30. Use the Vertical Tab code to move the carriage to the vertical tab stops set.

Vertical Tab

CODE	DECIMAL	FUNCTION
VT	11	Tabs to the next vertical tab stop

When you send this code, the paper advances to the next vertical tab stop as set by the Vertical Tab Set code. If no vertical tabs have been set, the Vertical Tab code feeds the paper one line.

BASIC example:

```
5 REM: VERTICAL TAB
10 FOR X=1 TO 3
20 LPRINT CHR$(11);"VERTICAL TAB"
30 NEXT X
40 END
```

The printer prints the phrase at each of the three vertical tab stops as set in the previous Vertical Tab Set BASIC example.

Skip Perforation On

CODE	DECIMAL	FUNCTION
ESC N <i>n</i>	27, 78, <i>n</i>	Skips perforation

When not using software that automatically instructs the printer when to perform a page break, you can use this code to make the printer skip the end-of-page perforation in pin-feed paper. The Skip Perforation On code is thus useful for printing long program listings. The number you insert for the *n* variable tells the printer how many lines to skip, as measured from the bottom of the page. The value of *n* must be a number from 1 to 127, and you must reset the value each time you change the page length.

BASIC example:

```
5 REM: SKIP PERFORATION ON
10 REM: SKIP 5 LINES FROM BOTTOM OF PAGE
20 LPRINT CHR$(27);"N";CHR$(5);
30 FOR X=1 TO 70
```

```

40 LPRINT "SKIPS 5 LINES AT LINE 61"
50 NEXT N
60 END

```

The printer prints the sentence 61 times, skips to the top of the next page, and prints the sentence nine more times. The program assumes that the page length is set at 66 lines (the default page length) and that printing starts at the top of the page.

Skip Perforation Off

CODE	DECIMAL	FUNCTION
ESC O	27, 79	Cancels skip perforation

This code cancels the skip perforation instruction.

BASIC example:

```

5 REM: SKIP PERFORATION OFF
10 LPRINT CHR$(27);"O";
20 END

```

The skip perforation instruction is canceled.

1/6-Inch Line Spacing

CODE	DECIMAL	FUNCTION
ESC 2	27, 50	Selects six lines per vertical inch spacing

This code sets the line feed at 1/6 inch (six lines per vertical inch). This line spacing is the default condition and is considered single spacing.

BASIC example:

```

5 REM: 1/6-INCH LINE SPACING
10 LPRINT CHR$(27);"2";
20 FOR X=1 TO 3
40 LPRINT "THIS LINE SPACING IS 1\6 INCH."
50 NEXT X
60 END

```

The printer prints:

THIS LINE SPACING IS 1/6 INCH.
THIS LINE SPACING IS 1/6 INCH.
THIS LINE SPACING IS 1/6 INCH.

1/8-Inch Line Spacing

CODE	DECIMAL	FUNCTION
ESC 0	27, 48	Selects eight lines per vertical inch spacing

This code sets the line spacing at 1/8 inch (eight lines per vertical inch).

BASIC example:

```
5 REM: 1/8-INCH LINE SPACING
10 LPRINT CHR$(27);"0";
20 FOR X=1 TO 3
30 LPRINT "THIS LINE SPACING IS 1/8 INCH."
40 NEXT X
50 END
```

The printer prints:

THIS LINE SPACING IS 1/8 INCH.
THIS LINE SPACING IS 1/8 INCH.
THIS LINE SPACING IS 1/8 INCH.

7/72 Inch Line Spacing

CODE	DECIMAL	FUNCTION
ESC 1	27, 49	Selects 7/72-inch line spacing

This code sets the line spacing at 7/72 inch.

BASIC example:

```
5 REM: 7/72-INCH LINE SPACING
10 LPRINT CHR$(27);"1";
20 FOR X=1 TO 3
30 LPRINT "THIS LINE SPACING IS 7/72 INCH."
40 NEXT X
50 END
```

The printer prints:

THIS LINE SPACING IS 2/72 INCH.
THIS LINE SPACING IS 2/72 INCH.

n/72-Inch Line Spacing

CODE	DECIMAL	FUNCTION
ESC A <i>n</i>	27, 65, <i>n</i>	Selects line spacing in increments of 1/72 inch

This line spacing code sets the line feed in variable increments of 1/72 inch. Because the distance between any two dot wires in the print head is 1/72 inch (or one point), any line spacing proportional to that distance is programmable. The value of *n* must be a number from 1 to 85. This code is useful in conjunction with the printer's graphics modes (see Chapter 4).

BASIC example:

```
5 REM: N/72-INCH LINE SPACING
10 LPRINT CHR$(27);"A";CHR$(8);
20 FOR X=1 TO 3
30 LPRINT "THIS LINE SPACING IS 8/72 INCH."
40 NEXT X
50 END
```

The printer prints:

THIS LINE SPACING IS 8/72 INCH.
THIS LINE SPACING IS 8/72 INCH.
THIS LINE SPACING IS 8/72 INCH.

n/144-Inch Line Spacing

CODE	DECIMAL	FUNCTION
ESC 3 <i>n</i>	27, 51, <i>n</i>	Sets line spacing in increments of 1/144 inch
ESC J <i>n</i>	27, 74, <i>n</i>	

This code sets the line spacing in variable increments of 1/144 inch, which is 1/2 the distance between dot wires in the print head. The value of n must be a number from 1 to 127. The code is useful for printing dense graphics. The ESC J code is valid for one line *only* and generates a line feed.

BASIC example:

```
5 REM: N/144-INCH LINE SPACING
10 LPRINT CHR$(27);"3";CHR$(16);
20 FOR X=1 TO 3
30 LPRINT "THIS LINE SPACING IS 16/144 INCH."
40 NEXT X
50 END
```

The printer prints:

```
THIS LINE SPACING IS 16/144 INCH.
THIS LINE SPACING IS 16/144 INCH.
THIS LINE SPACING IS 16/144 INCH.
```

Lines Per Page

CODE	DECIMAL	FUNCTION
ESC C n	27, 67, n	Selects lines per page (127 lines maximum)

This code selects the page length by specifying the number of lines per page. The number that you insert for the n variable determines the number of lines per page. The maximum page length for the printer is 127 lines. The number of lines per page is stored as an absolute value that will not change even if line spacing changes. Dependent functions (such as Form Feed) automatically adjust to the lines-per-page limit. The default page length is 66 lines per page.

BASIC example:

```
5 REM: LINES PER PAGE
10 LPRINT CHR$(27);"C";CHR$(55);
20 END
```

The printer is set to print 55 lines per page.

Inches Per Page

CODE	DECIMAL	FUNCTION
ESC C NUL <i>n</i>	27, 67, 0, <i>n</i>	Sets page length in inches

This code sets page length by the number of inches. The command requires that *n* be a number from 1 to 22 (representing the number of inches desired). Because the page length is stored as an absolute value, the printer adjusts dependent functions (such as Form Feed) to accommodate the page length limit. The default page length is 11 inches.

BASIC example:

```
5 REM: INCHES PER PAGE  
10 LPRINT CHR$(27);"C";CHR$(0);CHR$(17);  
20 END
```

The page length is now set to 17 inches.

Character Pitch and Print Style

Note: Whenever you cancel a print mode, the printer reverts to the print mode previously selected.

Pica

CODE	DECIMAL	FUNCTION
ESC P	27, 80	Selects pica characters (10 characters per inch)

If you send the code for elite characters (see example), you may reset the printer to pica-sized printing by sending the Pica code. Pica is the default character pitch.

BASIC example:

```
5 REM: PICA  
10 LPRINT CHR$(27);"M";"THIS LINE IS ELITE."  
20 LPRINT CHR$(27);"P";"THIS LINE IS PICA."  
30 END
```

The printer prints:

**THIS LINE IS ELITE.
THIS LINE IS PICA.**

Elite

CODE	DECIMAL	FUNCTION
ESC M	27, 77	Selects elite characters (12 characters per inch)

This code instructs the printer to print elite-sized characters. If combined, elite has precedence over compressed and boldface characters.

BASIC example:

```
5 REM: ELITE  
10 LPRINT CHR$(27);"M";"THIS LINE IS ELITE."  
20 END
```

The printer prints:

THIS LINE IS ELITE.

Compressed On

CODE	DECIMAL	FUNCTION
SI	15	Selects compressed characters (17.1 characters per inch)

When you send this code, the printer prints compressed characters until canceled. The Compressed On code cannot be combined with elite or boldface characters.

BASIC example:

```
5 REM: COMPRESSED ON  
10 LPRINT CHR$(15);"THIS LINE IS COMPRESSED."  
20 END
```

The printer prints:

THIS LINE IS COMPRESSED.

Compressed Off

CODE	DECIMAL	FUNCTION
DC2	18	Cancels compressed print

This code cancels the compressed character-pitch instruction.

BASIC example:

```
5 REM: COMPRESSED OFF
10 LPRINT CHR$(15);"THIS LINE IS COMPRESSED."
20 LPRINT CHR$(18);"THIS LINE IS NOT."
30 END
```

The printer prints:

THIS LINE IS COMPRESSED.
THIS LINE IS NOT.

Double Width On

CODE	DECIMAL	FUNCTION
ESC W SOH SO	27, 87, 1, 14	Selects double-width characters (5 characters per inch in Pica)

This code prints double-width characters until canceled. Double-width characters are excellent for headings and for highlighted portions of your text. The Double Width code has precedence over super- and subscript printing. The SO code is valid for one line *only*.

BASIC example:

```
5 REM: DOUBLE WIDTH ON
10 LPRINT CHR$(27);"W";CHR$(1);
20 LPRINT "DOUBLE WIDTH"
30 END
```

The printer prints:

DOUBLE WIDTH

Double Width Off

CODE	DECIMAL	FUNCTION
ESC W NUL DC4	27, 87, 0, 20	Cancels double-width characters

This code cancels the instruction for double-width characters. The DC4 code cancels the SO code *only*.

BASIC example:

```
5 REM: DOUBLE WIDTH OFF
10 LPRINT CHR$(27);"W";CHR$(1);
20 LPRINT "DOUBLE WIDTH ON"
30 LPRINT CHR$(27);"W";CHR$(0);
40 LPRINT "DOUBLE WIDTH OFF"
50 END
```

The printer prints:

DOUBLE WIDTH ON
DOUBLE WIDTH OFF

Bold Print On

CODE	DECIMAL	FUNCTION
ESC E	27, 69	Prints boldface (emphasized) characters

This code prints boldface characters until canceled. The printer operates more slowly when printing boldface characters. The Bold Print code cannot be used with elite and has precedence over compressed, super- and subscript printing.

BASIC example:

```
5 REM: BOLD PRINT ON
10 LPRINT CHR$(27);"E";
20 LPRINT "THESE CHARACTERS ARE BOLDFACE ."
30 END
```

The printer prints:

THESE CHARACTERS ARE BOLDFACE.

Bold Print Off

CODE	DECIMAL	FUNCTION
ESC F	27, 70	Cancels boldface (emphasized) characters

This code cancels the instruction for boldface characters.

BASIC example:

```
5 REM: BOLD PRINT OFF
10 LPRINT CHR$(27);"E";
20 LPRINT "THESE CHARACTERS ARE BOLDFACE ."
30 LPRINT CHR$(27);"F";
40 LPRINT "THESE CHARACTERS ARE NOT ."
50 END
```

The printer prints:

THESE CHARACTERS ARE BOLDFACE.
THESE CHARACTERS ARE NOT.

Double Strike On

CODE	DECIMAL	FUNCTION
ESC G	27, 71	Selects double-strike print

This code instructs the printer to print double-strike characters until canceled. The result looks much like boldface print, but the printing method is different. The printer prints a line, then advances the paper 1/216 inch. The print head makes a second pass over the line and prints the characters again. The Double Strike code cannot be used with super- and subscript printing.

BASIC example:

```
5 REM: DOUBLE STRIKE ON
10 LPRINT CHR$(27);"G";
20 LPRINT "THESE ARE DOUBLE-STRIKE CHARACTERS."
30 END
```

The printer prints:

THESE ARE DOUBLE-STRIKE CHARACTERS.

Double-Strike Off

CODE	DECIMAL	FUNCTION
ESC H	27, 72	Cancels double-strike print

This code cancels the instruction for double-strike characters.

BASIC example:

```
5 REM: DOUBLE STRIKE OFF
10 LPRINT CHR$(27);"G";
20 LPRINT "THESE ARE DOUBLE-STRIKE CHARACTERS."
30 LPRINT CHR$(27);"H";
40 LPRINT "THESE CHARACTERS ARE NOT."
50 END
```

The printer prints:

THESE ARE DOUBLE-STRIKE CHARACTERS.
THESE CHARACTERS ARE NOT.

Auto Underlining On

CODE	DECIMAL	FUNCTION
ESC - SOH	27, 45, 1	Underlines text

When you send the Auto Underlining On code, the printer underlines text until canceled.

BASIC example:

```
5 REM: AUTO UNDERLINING ON
10 LPRINT CHR$(27);"-";CHR$(1);
20 LPRINT "UNDERLINE"
30 END
```

The printer prints:

UNDERLINE

Auto Underlining Off

CODE	DECIMAL	FUNCTION
ESC - NUL	27, 45, 0	Cancels underlining

This code cancels the Auto Underlining On code.

BASIC example:

```
5 REM: AUTO UNDERLINING OFF
10 LPRINT CHR$(27);"-";CHR$(1);
20 LPRINT "START UNDERLINING."
30 LPRINT CHR$(27);"-";CHR$(0);
40 LPRINT "NOW STOP IT."
50 END
```

The printer prints:

START UNDERLINING.
NOW STOP IT.

Italic Print On

CODE	DECIMAL	FUNCTION
ESC 4	27, 52	Prints italicized characters

This code prints italicized characters until canceled. You can italicize any valid print mode.

BASIC example:

```
5 REM: ITALIC PRINT ON
10 LPRINT CHR$(27);"4";
20 LPRINT "THESE ARE ITALICIZED CHARACTERS."
30 END
```

The printer prints:

THESE ARE ITALICIZED CHARACTERS.

Italic Print Off

CODE	DECIMAL	FUNCTION
ESC 5	27, 53	Cancels italicized print

This code cancels the instruction for italicized characters.

BASIC example:

```
5 REM: ITALIC PRINT OFF
10 LPRINT CHR$(27);"4";
20 LPRINT "THESE ARE ITALICIZED CHARACTERS."
30 LPRINT CHR$(27);"5";
40 LPRINT "THESE ARE NOT."
50 END
```

The printer prints:

THESE ARE ITALICIZED CHARACTERS.
THESE ARE NOT.

Superscript Print On

CODE	DECIMAL	FUNCTION
ESC S NUL	27, 83, 0	Prints superscripts

When you send this code, the text following the code is superscribed, printed in a miniature font just above the center line. The superscript function is handy for footnotes and mathematical notation. The Superscript Print On code has precedence over double-strike characters and cannot be combined with bold or double-width characters.

BASIC example:

```
5 REM: SUPERSCRIPT PRINT ON
10 LPRINT "10";CHR$(27);"5";CHR$(0);"10"
20 END
```

The printer prints:

10¹⁰

Subscript Print On

CODE	DECIMAL	FUNCTION
ESC S SOH	27, 83, 1	Prints subscripts

When you send this code, the text following the code is subscripted, printed in a miniature font just below the center line. This function is convenient for mathematical and chemical notation. The Subscript Print On code has precedence over double-strike characters and cannot be combined with bold or double-width characters.

BASIC example:

```
5 REM: SUBSCRIPT PRINT ON
10 LPRINT "H";CHR$(27);"5";CHR$(1);"2"
20 END
```

The printer prints:

H₂

Superscript/Subscript Print Off

CODE	DECIMAL	FUNCTION
ESC T	27, 84	Cancels superscripts and subscripts

This code cancels the Superscript Print On and Subscript Print On codes.

BASIC example:

```

5 REM: SUPERScript/SUBScript PRINT OFF
10 LPRINT "H";CHR$(27);"5";CHR$(1);"2";CHR$(27);
  "T";"O"
20 END

```

The printer prints:

H₂O

Master Print Mode

CODE	DECIMAL	FUNCTION
ESC ! <i>n</i>	27, 33, <i>n</i>	Selects any print mode

With this code, you can select any character pitch and print style combination. Illegal combinations are ignored. See Appendix C for all valid print mode combinations. The Master Print Mode code takes precedence over any previously selected print mode.

The Master Print Mode code assigns bits within the variable *n*'s byte to various print modes. Which bits are "on" (values of 1) and which bits are "off" (values of 0) determines the print mode selection. Below is a table of the assignments.

	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1
ON (1)	Undl	Ital	Dbl Wdth	Dbl Strk	Bold	Comp	ASUD	Elit
OFF (0)							OFF	Pica
	7 2	6 2	5 2	4 2	3 2	2 2	1 2	0 2
	128	64	32	16	8	4	2	1

For example, if only bit 8 were "on," the binary number to replace *n* would be 10000000, resulting in underlined characters. And if all bits were "off," resulting in pica characters, the binary number would be 00000000.

However, such binary numbers are long and cumbersome to use; decimal numbers are much easier to work with. To send the n variable byte to the printer, use a decimal number and let the computer convert the decimal to a binary number. Along the bottom of the diagram of bit-assignments the decimal value of each bit for the n variable's byte is shown. To calculate the decimal number, add up the decimal values of only those bits to be switched "on" (those with values of 1).

So, for example, 10000000 (binary) equals 128 (decimal); 01000001 (binary) equals 65 (decimal); and 00000000 (binary) equals 0 (decimal).

BASIC example:

```
5 REM: MASTER PRINT MODE
10 REM: SELECT ITALIC PRINT
20 LPRINT CHR$(27);"!";CHR$(65);
30 LPRINT "THIS IS ITALIC ELITE PRINT."
40 REM: SELECT PICA
50 LPRINT CHR$(27);"!";CHR$(0);
60 LPRINT "NOW ITS NORMAL PICAL."
70 END
```

The printer prints:

THIS IS ITALIC ELITE PRINT.
NOW IT'S NORMAL PICA.

Character Set

Country Select

CODE	DECIMAL	FUNCTION
ESC R n	27, 82, n	Selects an international character set

The ATARI SMM804 Printer is sold the world over. Because different languages employ different characters, the printer is designed to accommodate the written alphabet and punctuation of the country in which you purchased the printer.

When the printer is first switched on, the character set is United States (ASCII)/Multinational. If you wish to access another language, you must send the Country Select code to tell the printer which character set you want to use. Specify the value of *n* according to the table below.

<i>n</i>	<i>Left Set</i>	<i>Right Set</i>
0	United Kingdom	United States
1	United States (ASCII)	Multinational
2	Finland	United States
3	Norway/Denmark	United States
4	Sweden	United States
5	Japan Roman	Japan Katakana
6	Japan Katakana	United States
7	Germany	United States
8	French Canada	United States
9	France	United States
10	Italy	United States
11	Spain	United States

Note: Refer to the Locking Shift Out code for an explanation of *left* and *right* sets, and see Appendix B for the characters available using any given language.

Locking Shift Out

CODE	DECIMAL	FUNCTION
ESC 6	27, 54	Accesses the right set only
ESC >	27, 62	

The SMM804's character set, for any given country, is divided into its *left* set (0 through 127 decimal) and its *right* set (128 through 255 decimal). When you first switch on the printer, both the left and right sets in United States (ASCII)/Multinational are available to you (or the left and right sets for any given country, once it's been selected). The Locking Shift Out code results in making *only* the right set available. It does this by setting the eighth bit to 1, and is useful for computer systems that are limited to 7-bit ASCII codes. The ESC 6 and ESC > codes are functionally equivalent.

BASIC example:

```
5 REM: LOCKING SHIFT OUT
10 LPRINT CHR$(27);"6";
20 FOR X=0 TO 255
30 LPRINT CHR$(X);
40 NEXT X
50 LPRINT
60 END
```

The printer prints the right set twice, including control characters such as Form Feed (if applicable).

Note: Since the Multinational set does not contain control characters (such as ESC), in order to send command sequences after Locking Shift Out, the printer must be reset by switching the power off and on (this applies to the United States (ASCII)/Multinational set *only*).

Locking Shift In

CODE	DECIMAL	FUNCTION
ESC 7	27, 55	Accesses the left and right sets
ESC #	27, 35	

When you send this code, both the left and right sets are made available by accepting the eighth bit "as is." Locking Shift In is a default condition. The ESC 7 and ESC # codes are functionally equivalent.

BASIC example:

```
5 REM: LOCKING SHIFT IN
10 LPRINT CHR$(27);"7";
20 FOR X=0 TO 255
30 LPRINT CHR$(X);
40 NEXT X
50 LPRINT
60 END
```

The printer prints both the left and right sets, including control characters such as Form Feed.

Clear Eighth Bit

CODE	DECIMAL	FUNCTION
ESC =	27, 61	Clears eighth bit to zero

This code clears the eighth bit, unconditionally, to zero. Sending this code results in making only the left set available.

BASIC example:

```
5 REM: CLEAR EIGHTH BIT  
10 LPRINT CHR$(27);"=";  
20 FOR X=0 TO 255  
30 LPRINT CHR$(X);  
40 NEXT X  
50 LPRINT  
60 END
```

The printer prints the left set twice, including control characters such as Form Feed.

Other Codes

Null

CODE	DECIMAL	FUNCTION
NUL	0	Used in other printer control codes

The Null code alone has no command function. It is used within other printer control codes.

Start of Heading

CODE	DECIMAL	FUNCTION
SOH	1	Used in other printer control codes

The Start of Heading code alone has no command function. It is used within other printer control codes.

Escape

CODE	DECIMAL	FUNCTION
ESC	27	Used in other printer control codes

The Escape code alone has no command function. It is used to introduce a printer control code sequence.

Sound Buzzer

CODE	DECIMAL	FUNCTION
BEL	7	Sounds the printer's buzzer

When you send the Sound Buzzer code, the printer sounds its high-pitched buzzer for about one second.

BASIC example:

```
5 REM: SOUND BUZZER
10 LPRINT CHR$(7);
20 END
```

The printer beeps.

Clear Buffer

CODE	DECIMAL	FUNCTION
CAN	24	Clears the printer buffer

As the computer transmits data to the printer, the printer buffer holds approximately the next line of incoming text to be printed. The Clear Buffer code erases all characters in the printer buffer.

BASIC example:

```
5 REM: CLEAR BUFFER
10 LPRINT CHR$(24);
20 END
```

The printer buffer is cleared of all pending characters.

Delete Character

CODE	DECIMAL	FUNCTION
DEL	127	Deletes last character in printer buffer

This code deletes the last character in the printer buffer. Do not confuse the Delete Character code with the Backspace code: the Backspace code moves the carriage backward one character space, whereas the Delete Character code erases the most recently received character in the printer buffer.

BASIC example:

```
5 REM: DELETE CHARACTER  
10 LPRINT "DELETEZ";CHR$(127);  
20 END
```

The printer prints

DELETE

Reset Printer

CODE	DECIMAL	FUNCTION
ESC @	27, 64	Resets printer to its default condition

This code "resets" the printer (returns it to its initial, or default, state). Whenever you switch on the printer or send the Reset Printer code, the sequence of events listed on page 23 takes place in the printer.

BASIC example:

```
5 REM: RESET PRINTER  
10 LPRINT "CHR$(27);" @ ";  
20 END
```

The printer is reset to its default condition.

Paper-Out Sensor Off

CODE	DECIMAL	FUNCTION
ESC 8	27, 56	Disables paper-out sensor

This code disables the paper-out sensor, enabling you to print to the very bottom of a single sheet. Normally the paper-out sensor switches the printer off-line when it comes within approximately one inch of the bottom of the sheet. For the program example below, use a single sheet of paper and be sure to begin printing at the top of the page. The program assumes that the page length is set at 66 lines (default).

BASIC example:

```
5 REM: PAPER-OUT SENSOR OFF  
10 LPRINT CHR$(27);"8";  
20 FOR X=1 TO 66  
30 LPRINT "IGNORE PAPER END."  
40 NEXT X  
50 END
```

The printer prints to the bottom of the sheet.

Warning: Be sure that the lines you want to print will fit on a single sheet and will not run over the length of the page. When the paper-out sensor is disabled, the print head will continue to print right onto the platen.

Paper-Out Sensor On

CODE	DECIMAL	FUNCTION
ESC 9	27, 57	Enables paper-out sensor

If you have disabled the paper-out sensor, you can use this code to enable it. For the program example below, use a single sheet of paper.

BASIC example:

```
5 REM: PAPER-OUT SENSOR ON  
10 LPRINT CHR$(27);"8";  
20 LPRINT CHR$(27);"9";  
30 FOR X=1 TO 66  
40 LPRINT "ACTIVATE PAPER-OUT SENSOR"  
50 NEXT X  
60 END
```

The machine prints the sentence until the end of the paper nears.

Printer Off-Line

CODE	DECIMAL	FUNCTION
DC3	19	Deselects the printer

When you send this code, the printer is deselected (placed off-line). This code has the same effect as the On Line button except that the instruction is sent from the computer.

BASIC example:

```
5 REM: PRINTER OFF-LINE  
10 LPRINT CHR$(19);  
20 END
```

The printer is placed off-line.

Note: The printer is factory-set to ignore this command.

Printer On-Line

CODE	DECIMAL	FUNCTION
DC1	17	Selects the printer

When you send this code, the printer is selected (placed on-line). This code has the same effect as the On Line button except that the instruction is sent from the computer.

BASIC example:

```
5 REM: PRINTER ON-LINE  
10 LPRINT CHR$(17);  
20 END
```

The printer is placed on-line.

Note: The printer is factory-set to ignore this command.



CHAPTER 4 GRAPHICS

TRANSFERABLE GRAPHICS

Your SMM804 Printer is capable of printing high-quality, high-resolution graphics in two ways. The easier way is to use the print-screen utility that came with your ATARI ST Computer, which transfers a graphic design or a picture directly from your computer to the printer.

Note: Two of the SMM804 Printer's graphics modes (120 DPI and 60 DPI) are specially designed to accommodate graphics programs that run on other popular personal computers.

In addition to transferring graphics from your computer to the printer, you can write BASIC programs (or programs in another programming language) to generate your own graphics directly onto the printer. The following section explains this process in detail.

BITMAP GRAPHICS

Your SMM804 Printer forms characters out of individual dots. Examine a sample of something you've already printed to see these dots, or *pixels*, and how they form discrete characters. The word "pixel" is short for *picture element*, which means an individual printed dot when speaking about a printer's output.

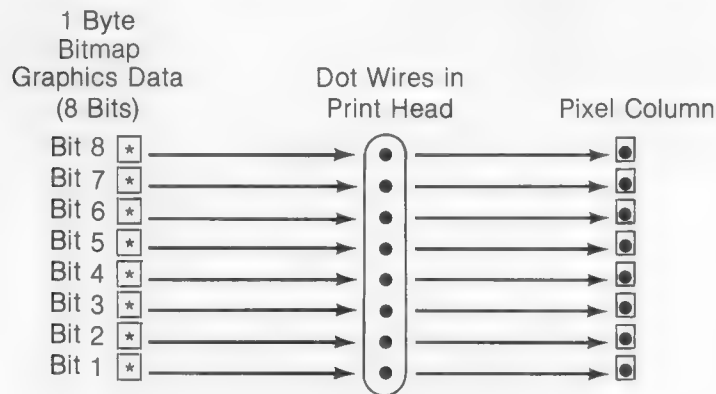
The printer prints one "pixel column" at a time. Each column is eight pixels (dots) high by one pixel (dot) wide. When you use the SMM804 in its bitmap graphics modes, you have direct control over these pixels. In a graphics program, that is, you can indicate which of the eight pixels are to be printed and which ones are not in each pixel column. By determining the print pattern of all available pixel columns, you can design countless graphics.

The computer sends bitmap graphics data to the printer, like any other data, in "bytes," which are units of information. Each byte encodes the printing instruction for one pixel column. Just as a pixel column is made up vertically of eight pixels, so a byte is made up of eight "bits," numbered 1 through 8. Each bit corresponds to a pixel (hence the term "bitmap" or bit-mapped graphics), and every pixel in a pixel column is printed by a specific dot wire in the print head.

The topmost wire is controlled by the high bit (number 8) and prints the topmost pixel in a pixel column; the bottommost wire is controlled by the low bit (number 1), and prints the bottommost pixel in a pixel column. (Actually, the print head contains nine vertical dot wires; eight are used for three of the printer's graphics modes; all nine are used for another.)

Every byte, accordingly, may be represented by an eight-place binary number sequence—eight binary numbers for eight bits. When a pixel in a pixel column is to be printed, the value of the corresponding bit is 1; when a pixel is not to be printed, the value of the corresponding bit is 0.

The following table shows the relationship between a byte of bitmap graphics data, the printer's dot wires, and a printed pixel column.



In the table, all the pixels in the column are to be printed. The binary sequence for the byte in the table will be 11111111.

However, such binary sequences are long and cumbersome to use; decimal numbers are much easier to work with. To send a byte of bitmap graphics data to the printer, use a decimal number and let the computer convert the decimal number to a binary number.

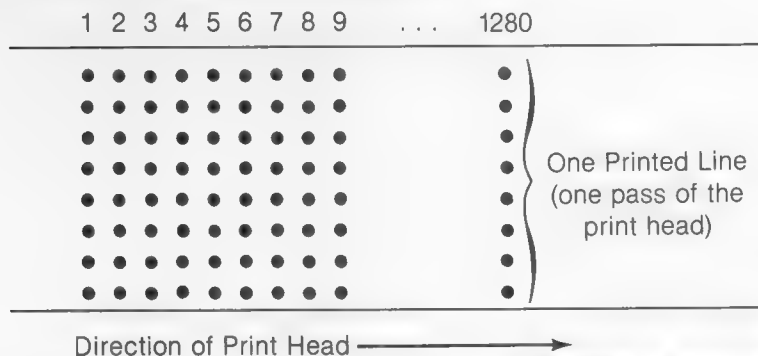
The following table shows the decimal value of each bit in the binary sequence and demonstrates how to convert a binary sequence to a decimal number. The decimal value of each bit appears along the bottom of the table. To calculate the decimal number of a given byte, add up the decimal values of *only* those bits whose pixels are to be printed. (Remember that 1 represents a printed pixel, and 0 indicates an unprinted one.)

BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1
7 2	6 2	5 2	4 2	3 2	2 2	1 2	0 2
128 +	64 +	32 +	16 +	8 +	4 +	2 +	1

So, for example, the binary sequence for the byte of graphics data that will print all pixels in a pixel column is 11111111; it equals 255 decimal. And the binary sequence that will print every other dot is 10101010; it equals 170; and so forth.

In one of the SMM804's bitmap graphics modes (160 DPI), one printed line (one pass of the print head across the paper) consists of 1,280 pixel columns. Because eight pixels times 1,280 columns equals 10,240, a single printed line in 160 DPI Graphics comprises 10,240 printable pixels. While 10,240 may seem to be quite a few pixels, remember that the pixels are quite small and very close together, so as to shape solid-looking, high-resolution characters and graphics.

Number of Pixel Columns Across



Divide the graph paper into horizontal bands eight squares (pixels) high. Now number the vertical column of squares at the far left margin of each horizontal band as shown:

[illegible]

Now plot out a small butterfly on your grid. Simply fill in selected squares to design the graphic.

	1	2	3	4	5	6	7	8	9	10	11	12	13						
128			X	X	X				X	X	X								
64		X				X		X				X							
32	X						X						X						
16		X					X					X							
8			X				X				X								
4				X			X			X									
2			X			X		X			X								
1				X	X				X	X									

One way to instruct the printer which pixels to print in a pixel column is to use DATA statements in a BASIC program. DATA statements contain the decimal numbers that indicate the pixels to be printed in a particular pixel column. Each decimal number in a DATA statement represents one byte of graphics data to be sent to the printer.

The first number in a DATA statement indicates which pixels are to be printed in the first pixel column. The second number indicates which pixels are to be printed in the second pixel column; and so on. To calculate the DATA statement numbers, simply add the values of the pixels that you want printed in each pixel column.

In the graphic plotted out above, only the third pixel from the top in the first pixel column is to be printed. Because its decimal value is 32, the first number in the DATA statement will be 32.

In the second pixel column, the pixels to be printed have values of 64 and 16, whose sum is 80. 80 will be the second number in the DATA statement.

In the third pixel column, three pixels having values of 128, 8, and 2 are to be printed. The third number in the DATA statement will be the sum of 128, 8, and 2 — 138.

In the fourth pixel column, the sum of the printed pixel's values — 128, 4, and 1 — is 133, the fourth entry in the DATA statement. The values of the two printed pixels in the fifth pixel column are 128 and 1, so the next DATA number will be 129. The values of the printed pixels in the sixth and seventh pixel columns add up to 66 and 60, respectively; these are the sixth and seventh numbers in the DATA statement.

Column 7 is the midline of the butterfly graphic. Because the right side (columns 8 through 13) of the graphic is a mirror image of the left side (columns 1 through 6), you can now simply list the pixel column values calculated above for the left side, in reverse order, for the right side: the eighth column will be 66; the ninth, 129; the tenth, 133; the eleventh, 138; the twelfth, 80; and the thirteenth, 32.

The BASIC DATA statement for the entire graphic takes the following form:

```
DATA 32,80,138,133,129,66,60,66,129,133,138,80,32,0
```

The really tedious part is now done. The next step is to tell the printer how to process the DATA statement so that it will print the graphic. A BASIC program, one line of which will be the DATA statement, provides the printer with the necessary instructions.

As with other printing options, you must send a printer control code to instruct the printer to perform bitmap graphics functions. The graphics control codes are all escape sequences.

160 DPI Graphics

CODE	DECIMAL	FUNCTION
ESC Y <i>lsb msb</i>	27, 89, <i>lsb, msb</i>	Selects 160 dots per inch (160 DPI) graphics mode

120 DPI Graphics

CODE	DECIMAL	FUNCTION
ESC L <i>lsb msb</i>	27, 76, <i>lsb, msb</i>	Selects 120 dots per inch (120 DPI) graphics mode

60 DPI Graphics

CODE	DECIMAL	FUNCTION
ESC K <i>lsb msb</i>	27, 75, <i>lsb, msb</i>	Selects 60 dots per inch (60 DPI) graphics mode

These three bitmap graphics modes work in very much the same way. The crucial difference between them is relative density, or DPI (dots per inch). Obviously, 160 DPI affords a greater density than 120 DPI; and 120 DPI provides denser output than 60 DPI. *DPI* is a horizontal value that measures the number of *printable* dots (pixels) per inch on a given line.

The acronyms *lsb* and *msb* stand for "least significant byte" and "most significant byte," which are values that you must supply. These two numbers tell the printer how much data to expect (how many bytes of graphics data are on the way).

If you are programming a graphic that uses 255 or fewer pixel columns across a line, you will be sending 255 or fewer bytes of data for that line (because each pixel column constitutes a byte of data). In this case, the *lsb* will be the actual number of bytes you are sending, and the *msb* will always be 0.

If you are using 256 or more pixel columns in a line and are, therefore, sending 256 or more bytes of data, then the *msb* will range from 1 to 4, depending on which graphics mode you're using. The *msb* holds the result (quotient) of the following: total number of bytes/256. The *lsb* would then hold the remainder.

For instance, suppose you want to send 340 bytes (you are using 340 pixel columns across on a single printed line, and your DATA statements accordingly contain 340 entries for a single line). Your *lsb* will be 84 (340 minus 256), and your *msb* will be 1.

It may help you to think of the *lsb* as holding the 1's place and the *msb* as holding the 256's place. Putting a 0 in the 256's place (the *msb*) means that fewer than 256 bytes will be sent, and that the total number of bytes is given in the 1's place (the *lsb*). Putting a 1 in the 256's place (the *msb*) means that the number of bytes to be sent is 256 *plus* the amount in the 1's place (the *lsb*). Substituting 84 for the *lsb* and 1 for the *msb* instructs the printer that 84 plus 256 bytes (340 bytes) are to be sent in all.

In 160 DPI Graphics, a printed line has a maximum of 1,280 pixel columns (1,280 bytes). The *msb* may range from 0 to 4. When the *msb* is 4 (which stands for 1,024 bytes), the *lsb* cannot exceed 156 because 156 plus 1,024 equals 1,280—the maximum number of bytes (printable pixels) that can be sent for a single eight-inch printed line.

Likewise, in 120 DPI Graphics, the *msb* can range from 0 to 3: $(3 \times 256) + 192 = 960$ —the maximum number of bytes (printable pixels) for a single line; and in 60 DPI Graphics, the *msb* can range from 0 to 1: $(1 \times 256) + 224 = 480$ —the maximum number of bytes (printable pixels) for a single line.

One program line holds many fewer than, for instance, 1,280 DATA statement entries; but as long as you designate the *lsb* and *msb* correctly, the computer will continue to read data sequentially on successive DATA program lines.

For each printed line in graphics, you must enter the graphics escape sequence, the line spacing, and you must redefine the *lsb* and *msb* according to the number of bytes you are sending for that printed line.

In the case of the small butterfly graphic, you are using only 14 pixel columns. You will therefore be sending only 14 bytes of data. The *lsb* will be 14, and the *msb* will be 0.

To send the *lsb* and the *msb* values to the printer, you must use the CHR\$(*nn*) function. The beginning of the butterfly program will look like this:

```
5 REM: SMALL BUTTERFLY (160 DPI)  
10 LPRINT CHR$(27);"Y";CHR$(14);CHR$(0);
```

CHR\$(13) and CHR\$(0) designate the *lsb* and *msb*, respectively. Now use a FOR/NEXT loop to tell the computer to read the DATA statement so that it can send the data to the printer:

```
20 FOR X=1 TO 14  
30 READ A  
40 LPRINT CHR$(A);  
50 NEXT X  
60 DATA  
32,80,138,133,129,66,60,66,129,133,138,80,32
```

The entire program looks like this:

```
5 REM: SMALL BUTTERFLY (160 DPI)  
10 LPRINT CHR$(27);"Y";CHR$(14);CHR$(0);  
20 FOR X=1 TO 14  
30 READ A  
40 LPRINT CHR$(A);  
50 NEXT X  
60 DATA  
32,80,138,133,129,66,60,66,129,133,138,80,32,0  
70 END
```

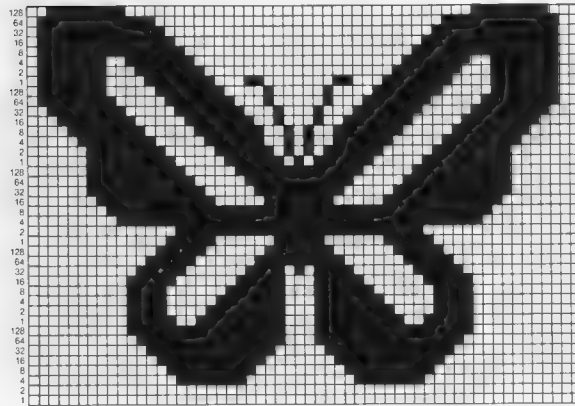
When you type RUN and press [Return], the printer prints:

Y

The butterfly graphic is only eight pixels (one printed line) high. But suppose you want to plot out a graphic that is both higher than eight pixels and wider than 14 pixel columns. How do you calculate the data for it?

Note: The following section is intended for computer users who are fairly good BASIC programmers.

As before, begin with graph paper. This time plot out a larger butterfly. (Butterflies work well because they're symmetrical.)



Here's the program that will print out the large butterfly:

```
5 REM: LARGE BUTTERFLY (160 DPI)
10 RESTORE 10000:GOSUB 1000
15 RESTORE 10000:GOSUB 2000
20 RESTORE 10100:GOSUB 1000
25 RESTORE 10100:GOSUB 2000
30 RESTORE 10200:GOSUB 1000
35 RESTORE 10200:GOSUB 2000
40 RESTORE 10300:GOSUB 1000
45 RESTORE 10300:GOSUB 2000
50 RESTORE 10400:GOSUB 1000
55 RESTORE 10400:GOSUB 2000
99 END

1000 LSB=0:MSB=0
1010 READ A:IF A=-1 THEN 1030
1020 LSB=LSB+1:GOTO 1010
1030 IF LSB=255 THEN MSB=1:LSB=LSB-256
1040 LPRINT
CHR$(27);"A";CHR$(8);CHR$(27);"Y";CHR$(LSB);
CHR$(MSB);
1050 RETURN
2000 FOR X=1 TO LSB+(MSB*256)
2010 READ A
2020 LPRINT CHR$(A);
2030 NEXT X
2040 LPRINT
2050 RETURN
10000 DATA 0,127,255,255,255,255,255,255,248,248,
124,126,127,63,31,15,7,3,1,0,0,0,1,1,0,0,0,0,
0,0,0,1,1,0,0,0,1,3
10010 DATA 7,15,31,63,127,126,124,248,248,255,255,
255,255,255,255,127,0,-1
10100 DATA 192,224,240,248,252,255,255,127,63,31,
15,7,131,193,224,240,248,252,253,127,63,31,15,
195,49,14,1,14,49
10110 DATA 195,15,31,63,127,253,252,248,240,224,
193,131,7,15,31,63,127,255,255,252,248,240,
224,192,-1
10200 DATA 0,0,0,0,0,0,224,240,248,252,252,
252,252,252,253,255,127,63,31,14,14,142,206,
238,254,255,255,255,255,255
10210 DATA 254,238,206,142,14,14,31,63,127,
```

```

255,253,252,252,252,252,252,248,240,224,
0,0,0,0,0,-1
10300 DATA 0,0,0,0,0,0,0,0,0,0,31,63,127,255,
241,224,192,129,3,7,15,31,63,127,255,255,192,
124,192,255,127,63,31,15
10310 DATA 7,3,129,192,224,241,255,127,63,31,0,
0,0,0,0,0,0,0,0,-1
10400 DATA 0,0,0,0,0,0,0,0,0,0,128,192,224,240,
248,252,252,252,252,252,252,248,240,224,192,
0,0,0,192,224,240
10410 DATA 248,252,252,252,252,252,252,252,248,
240,224,192,128,0,0,0,0,0,0,0,0,-1

```

When you RUN this program, the printer prints:



Lines 10 through 55 each send the computer to the subroutines beginning on line 1000 and line 2000.

Line 99 prevents the computer from running through the subroutine after executing line 55.

Lines 1000 through 1020 count the number of DATA statement entries. Line 1030 calculates the *lsb* and *msb* values for each printed line.

Line 1040 sets the line spacing at 8/72 inch and sends the code that instructs the printer to perform 160 DPI Graphics. Then it plugs in the *lsb* and *msb* values calculated on line 1030. The 8/72 inch line spacing is selected because each horizontal pass of the print head prints a line that is eight pixels high, and each pixel occupies 1/72 inch. Any line spacing less than 8/72 inch would cause the printed lines to overlap; any line spacing greater than 8/72 inch would produce a horizontal gap between printed lines.

For each printed line in graphics, you must enter the graphics escape sequence, the line spacing, and the values of the *lsb* and *msb* according to the number of bytes you are sending. The subroutine in this program performs these functions automatically for each line.

Lines 2000 through 2040 read the data and instruct the printer to print them.

Line 1050 or 2050 returns the computer from the subroutine to the line with the next GOSUB ("go to subroutine") command.

Lines 10000 through 10410 are the DATA statements. Notice that -1 appears at the end of lines 10010, 10110, 10210, 10310, and 10410. This -1 is used by line 1010 as it counts the number of DATA statement entries: when the computer reads a -1 within the subroutine, it stops counting and proceeds to calculate the *lsb* and *msb* for that printed line.

There is no -1 at the end of the other DATA statement program lines because they don't contain data for the end of a printed line. If you use this subroutine in your own programs (and it really is a time-saver), remember to put a -1 at the end of each DATA statement that finishes a printed line.

Nine-Dot Graphics

CODE	DECIMAL	FUNCTION
ESC ^ <i>n lsb msb</i>	27, 94, <i>n, lsb, msb</i>	Selects nine-dot graphics mode

Nine-Dot Graphics work nearly the same way as the previously described graphics modes, but use *all* nine dot wires in the print head instead of the first eight. This produces vertically higher printed pixel columns, which reduces the number of passes the print head must make to produce a complex bitmap graphic.

In programming nine-dot graphics, the *lsb* and *msb* are calculated in the same way as in eight-dot graphics. However, you must now send *two* bytes of data for every printed pixel column, counting each pair of data-bytes as one byte when calculating the *lsb* and *msb*. The second byte determines whether the ninth and bottom-most wire in the print head will fire or not. The first byte determines which of the first eight wires in the print head will fire.

Treat the first byte just as you did in the eight-dot graphics modes. The second byte, controlling the ninth and bottommost wire, will either be "on" (128 decimal) or "off" (0 decimal).

The n variable takes the following numbers as values, determining which graphics mode you want printed with all nine dot wires:

n	<i>Graphics Mode</i>
0	60 DPI
1	120 DPI
3	160 DPI

As you can see, you may use any of the SMM804's three graphics modes to produce nine-dot graphics, hence more pixel rows per line.



CHAPTER 5 TROUBLESHOOTING AND PREVENTIVE MAINTENANCE

TROUBLESHOOTING

If you run into problems when you're hooking up or operating your printer, chances are the difficulty is a minor hitch that you can take care of yourself. This section discusses some possible problems and suggests simple solutions.

It Just Won't Work

Probably the most common problem is that sometimes the machine just won't work—it just doesn't respond. Usually the remedy is very simple.

If your printer just won't budge, take the following steps:

- Make sure all the connections are correct and secure. Check that the power cord is plugged in, that the Power light is on, and that the interface cable is connected securely to both the printer and the computer.
- Make sure the On Line light is illuminated. If it isn't, press the On Line button.
- Check whether you've forgotten to load the paper or whether the paper supply has run out. The paper-out sensor automatically takes the printer off-line when the machine doesn't have paper.

Print Quality

Should you detect inconsistencies in print quality or, generally poor print quality, a few things may be going wrong. Again, problems and solutions are simple and straightforward.

- Be sure the ribbon cartridge is installed correctly.
- If printed characters appear light, smudged, or spotty, even though the ribbon is installed correctly, then the ribbon may be feeding improperly because it is damaged. Replace the old cartridge with a new one.

- If you are getting extremely light characters or nothing at all, most likely the ribbon is used up. The printer does not have a sensor to alert you when the ribbon runs out or when the ribbon is simply not installed. Replace the old cartridge with a new one.

Paper Jams

Sometimes the paper may fail to advance properly, and you will have a paper jam on your hands. The most common reason for paper jams is improper paper loading. Here's how to solve the problem:

- Switch off the printer and unload the paper. Be sure to remove any torn pieces of paper stuck along the paper path.
- If you were using pin-feed paper, reload it and be sure the sprocket pins and paper holes are aligned properly. Once they are aligned, don't forget to lock the sprockets in position. Manually feed the paper forward and backward to check the paper path for hidden bits of paper. After loading the paper, don't forget to move the paper release lever to the down position; you don't want friction to feed the paper. Using friction feed together with pin-feed paper will inevitably cause a paper jam.
- If you were using a single sheet of paper, reload it and be sure the paper release lever is in the up (friction) position.

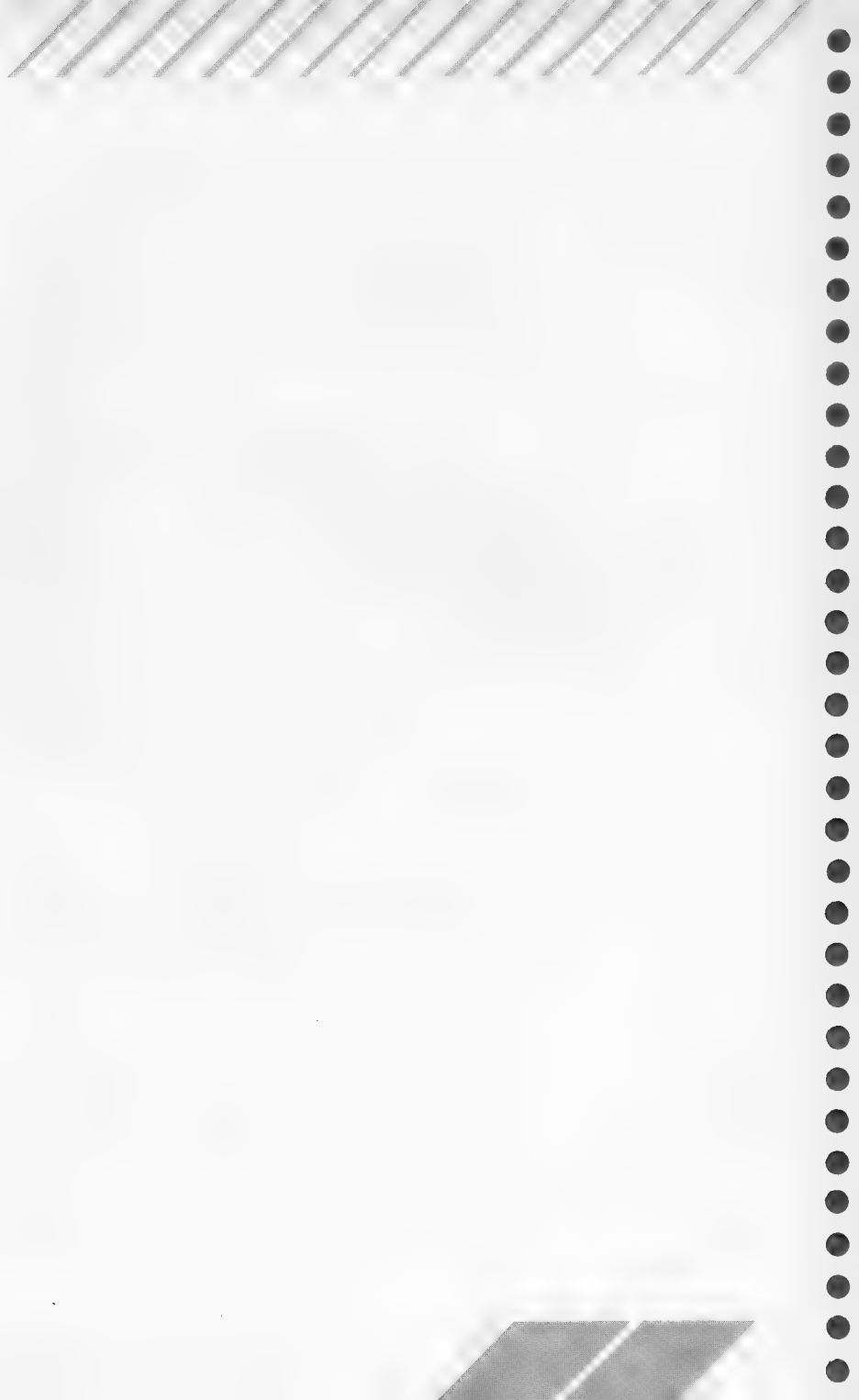
Note: Your ATARI SMM804 Printer is designed for low maintenance and high reliability. However, like anything mechanical, a printer can break down. If you experience problems that you think are serious, the best course is to take your printer to an authorized ATARI Service Center.

PREVENTIVE MAINTENANCE

To insure top performance from your printer, follow these simple guidelines:

- Keep the printer dust-free, especially within the print head and carriage area. Keep the dustcover closed, both when the printer is operating and when it is idle or in storage.
- Keep the platen and paper-bail rollers dust-free by cleaning them occasionally. Use a cotton ball and a little rubbing alcohol to wipe them off. Rotate the platen knob as you clean the carriage and rollers.

- Do not touch the carriage rod. Finger oils attract dust, which may adversely affect the smooth movement of the carriage along the rod.
- Never drop foreign objects into the print-head and carriage-rod area. If such an accident does occur, immediately switch the printer off and carefully remove the object.
- Clean the outside of the printer with a soft, damp cloth only. Do not use household cleansers or abrasives, because they may damage the printer's plastic housing.
- When you switch off the printer, wait at least two seconds before you switch it on again. Otherwise, the printer's system may not initialize properly.
- Never switch the printer off while it is printing.
- Never move the print head manually.
- Never print without paper and ribbon.
- Always have your printer placed on a firm, level surface.
- Avoid operating the machine in a room with high humidity.
- Keep your printer out of direct sunlight.
- Avoid exposing your printer to extreme temperature changes. Operate your printer only at temperatures from 41°F to 95°F (5°C to 35°C). Store your printer only at temperatures from – 4°F to 140°F (– 20°C to 60°C).
- For shipping or storing the printer, repack it in the original factory packing materials. Refer to the unpacking illustration and instructions on page 5.



APPENDIX A

SMM804 PRINTER CONTROL CODE SUMMARY

HORIZONTAL ACTION

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Space	SP	32	20	Spaces forward one character space
Backspace	BS	8	08	Backspaces one character
Carriage Return	CR	13	0D	Carriage return to the left margin
Horizontal Tab Set	ESC D <i>n</i> 1 . . . <i>n</i> 32, NUL	27, 68, <i>n</i> 1 . . . <i>n</i> 32, 0	1B, 44, <i>n</i> 1 . . . <i>n</i> 32 00	Sets horizontal tab stops (32 maximum)
Horizontal Tab	HT	9	09	Tabs to the next horizontal tab stop
Right Margin Set	ESC Q <i>n</i>	27, 81, <i>n</i>	1B, 51, <i>n</i>	Sets the right margin
Left Margin Set	ESC 1 <i>n</i>	27, 108, <i>n</i>	1B, 6C, <i>n</i>	Sets the left margin
Unidirectional Printing	ESC U SOH ESC <	27, 85, 1 27, 60	1B, 55, 01 1B, 3C	Selects unidirectional printing
Bidirectional	ESC U NUL	27, 85, 0	1B, 55, 00	Selects bidirectional printing

VERTICAL ACTION

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Line Feed	LF	10	0A	Feeds the paper one line
Form Feed	FF	12	0C	Feeds the paper to the next top-of-page
Vertical Tab Set	ESC B <i>n</i> 1 . . . <i>n</i> 16 NUL	27, 66, <i>n</i> 1 . . . <i>n</i> 16, 0	1B, 42, <i>n</i> 1 . . . <i>n</i> 16, 00	Sets vertical tab stops (16 maximum)

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Vertical Tab	VT	11	0B	Tabs to the next vertical tab stop
Skip Perforation On	ESC N <i>n</i>	27, 78 <i>n</i>	1B, 4E, <i>n</i>	Skips perforation
Skip Perforation Off	ESC O	27, 79	1B, 4F	Cancels skip perforation
1/6-Inch Line Spacing	ESC 2	27, 50	1B, 32	Selects six lines per vertical inch spacing
1/8-Inch Line Spacing	ESC 0	27, 48	1B, 30	Selects eight lines per vertical inch spacing
7/72-Inch Line Spacing	ESC 1	27, 49	1B, 31	Selects 7/72-inch line spacing
<i>n</i> /72-Inch Line Spacing	ESC A <i>n</i>	27, 65, <i>n</i>	1B, 41, <i>n</i>	Selects line spacing in increments of 1/72 inch
<i>n</i> /144-Inch Line Spacing	ESC 3 <i>n</i> ESC J <i>n</i>	27, 51, <i>n</i> 27, 74, <i>n</i>	1B, 33, <i>n</i> 1B, 4A, <i>n</i>	Sets line spacing in increments of 1/144 inch
Lines per Page	ESC C <i>n</i>	27, 67 <i>n</i>	1B, 43, <i>n</i>	Selects lines per page (127 lines maximum)
Inches per Page	ESC C NUL <i>n</i>	27, 67, 0, <i>n</i>	1B, 43, 00, <i>n</i>	Sets page length in inches

CHARACTER PITCH AND PRINT STYLE

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Pica	ESC P	27, 80	1B, 50	Selects pica characters (10 characters per inch)
Elite	ESC M	27, 77	1B, 4D	Selects elite characters (12 characters per inch)

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Compressed On	SI	15	0F	Selects compressed characters (17.1 characters per inch)
Compressed Off	DC2	18	12	Cancels compressed print
Double Width On	ESC W SOH SO	27, 87, 1 14	1B, 57, 01 0E	Selects double-width characters (5 characters per inch in pica)
Double Width Off	ESC W NUL DC4	27, 87, 0 20	1B, 57, 00 14	Cancels double-width characters
Bold Print On	ESC E	27, 69	1B, 45	Prints boldface (emphasized) characters
Bold Print Off	ESC F	27, 70	1B, 46	Cancels boldface (emphasized) characters
Double Strike On	ESC G	27, 71	1B, 47	Selects double-strike print
Double Strike Off	ESC H	27, 72	1B, 48	Cancels double-strike print
Auto Under- lining On	ESC - SOH	27, 45, 1	1B, 2D, 01	Underlines text
Auto Under- lining Off	ESC - NUL	27, 45, 0	1B, 2D, 00	Cancels underlining
Italic Print On	ESC 4	27, 52	1B, 34	Prints italicized characters
Italic Print Off	ESC 5	27, 53	1B, 35	Cancels italicized print
Superscript Print On	ESC S NUL	27, 83, 0	1B, 53, 00	Prints superscripts
Subscript Print On	ESC S SOH	27, 83, 1	1B, 53, 01	Prints subscripts
Superscript/ Subscript Print Off	ESC T	27, 84	1B, 54	Cancels superscripts and subscripts

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Master Print Mode	ESC ! <i>n</i>	27, 33, <i>n</i>	1B, 21, <i>n</i>	Selects any print mode
<i>n</i>	Print Mode			
0	Pica			
1	Elite			
2	Reserved			
4	Compressed			
8	Bold			
16	Double Strike			
32	Double Width			
64	Italics			
128	Underline			

CHARACTER SET

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Country Select	ESC R <i>n</i>	27, 82, <i>n</i>	1B, 52, <i>n</i>	Selects an international character set
<i>n</i>	Country			
0	United Kingdom			
1	United States			
2	Finland			
3	Norway/Denmark			
4	Sweden			
5	Japan Roman			
6	Japan Katakana			
7	Germany			
8	French Canada			
9	France			
10	Italy			
11	Spain			
Locking Shift Out	ESC 6 ESC >	27, 54 27, 62	1B, 36 1B, 3E	Accesses right set only
Locking Shift In	ESC 7 ESC #	27, 55 27, 35	1B, 37 1B, 23	Accesses left and right sets
Eighth Bit Cleared	ESC =	27, 61	1B, 3D	Clears eighth bit to zero

OTHER CODES

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
Null	NUL	0	00	Used in other printer control codes
Start of Heading	SOH	1	01	Used in other printer control codes
Escape	ESC	27	1B	Used in other printer control codes
Sound Buzzer	BEL	7	07	Sounds the printer's buzzer
Clear Buffer	CAN	24	18	Clears the printer buffer
Delete Character	DEL	127	7F	Deletes last character in printer buffer
Reset Printer	ESC @	27, 64	1B, 40	Resets printer to its default condition
Paper-Out Sensor Off	ESC 8	27, 56	1B, 38	Disables paper-out sensor
Paper-Out Sensor On	ESC 9	27, 57	1B, 39	Enables paper-out sensor
Printer Off-Line	DC3	19	13	Deselects the printer
Printer On-Line	DC1	17	11	Selects the printer

GRAPHICS

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
160 DPI Graphics	ESC Y <i>lsb msb</i>	27, 89, <i>lsb, msb</i>	1B, 59, <i>lsb, msb</i>	Selects 160 dots per inch (160 DPI) graphics mode

NAME	CODE	DECIMAL	HEXA- DECIMAL	FUNCTION
120 DPI Graphics	ESC L <i>lsb msb</i>	27, 76, <i>lsb, msb</i>	1B, 4C, <i>lsb, msb</i>	Selects 120 dots per inch (120 DPI) graphics mode
60 DPI Graphics	ESC K <i>lsb msb</i>	27, 75, <i>lsb, msb</i>	1B, 4B, <i>lsb, msb</i>	Selects 60 dots per inch (60 DPI) graphics mode
Nine-Dot Graphics	ESC ^ <i>n</i> <i>lsb msb</i>	27, 94, <i>n</i> , <i>lsb, msb</i>	1B, 5E, <i>n</i> , <i>lsb, msb</i>	Selects nine- dot graphics mode
<i>n</i>	Graphics Mode			
0	60 DPI			
1	120 DPI			
3	160 DPI			

APPENDIX B CHARACTER CODE TABLES

UNITED STATES (ASCII) DEFAULT LEFT SET

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
0	00	NUL	26	1A		52	34	4
1	01	SOH	27	1B	ESC	53	35	5
2	02		28	1C		54	36	6
3	03		29	1D		55	37	7
4	04		30	1E		56	38	8
5	05		31	1F		57	39	9
6	06		32	20	SP	58	3A	:
7	07	BEL	33	21	!	59	3B	;
8	08	BS	34	22	"	60	3C	<
9	09	HT	35	23	#	61	3D	=
10	0A	LF	36	24	\$	62	3E	>
11	0B	VT	37	25	%	63	3F	?
12	0C	FF	38	26	&	64	40	@
13	0D	CR	39	27	'	65	41	A
14	0E	SO	40	28	(	66	42	B
15	0F	SI	41	29	)	67	43	C
16	10		42	2A	*	68	44	D
17	11	DC1	43	2B	+	69	45	E
18	12	DC2	44	2C	,	70	46	F
19	13	DC3	45	2D	-	71	47	G
20	14	DC4	46	2E	.	72	48	H
21	15		47	2F	/	73	49	I
22	16		48	30	0	74	4A	J
23	17		49	31	1	75	4B	K
24	18	CAN	50	32	2	76	4C	L
25	19		51	33	3	77	4D	M

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
78	4E	N	95	5F	_	112	70	p
79	4F	O	96	60	`	113	71	q
80	50	P	97	61	a	114	72	r
81	51	Q	98	62	b	115	73	s
82	52	R	99	63	c	116	74	t
83	53	S	100	64	d	117	75	u
84	54	T	101	65	e	118	76	v
85	55	U	102	66	f	119	77	w
86	56	V	103	67	g	120	78	x
87	57	W	104	68	h	121	79	y
88	58	X	105	69	i	122	7A	z
89	59	Y	106	6A	j	123	7B	{
90	5A	Z	107	6B	k	124	7C	
91	5B	[	108	6C	l	125	7D	}
92	5C	\	109	6D	m	126	7E	~
93	5D	]	110	6E	n	127	7F	DEL
94	5E	^	111	6F	o			

MULTINATIONAL DEFAULT RIGHT SET

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
128	80	Ç	140	8C	î	152	98	ÿ
129	81	ü	141	8D	ï	153	99	ö
130	82	é	142	8E	Ä	154	9A	Ü
131	83	â	143	8F	Å	155	9B	å
132	84	ä	144	90	É	156	9C	£
133	85	à	145	91	æ	157	9D	¥
134	86	ä	146	92	Æ	158	9E	ß
135	87	ç	147	93	ö	159	9F	ƒ
136	88	ê	148	94	ö	160	A0	á
137	89	ë	149	95	ò	161	A1	í
138	8A	è	150	96	û	162	A2	ó
139	8B	ì	151	97	ù	163	A3	ú

Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII
164	A4	ř	195	C3	ב	226	E2	Γ
165	A5	ř	196	C4	ג	227	E3	Π
166	A6	ž	197	C5	ד	228	E4	Σ
167	A7	ž	198	C6	ה	229	E5	σ
168	A8	ž	199	C7	ו	230	E6	μ
169	A9	ř	200	C8	ז	231	E7	τ
170	AA	ř	201	C9	ח	232	E8	ξ
171	AB	ž	202	CA	ט	233	E9	θ
172	AC	ž	203	CB	י	234	EA	Ω
173	AD	ı	204	CC	כ	235	EB	δ
174	AE	«	205	CD	ל	236	EC	φ
175	AF	»	206	CE	מ	237	ED	Φ
176	B0	ž	207	CF	נ	238	EE	€
177	B1	ž	208	D0	ו	239	EF	Π
178	B2	ø	209	D1	ז	240	F0	≡
179	B3	ø	210	D2	ח	241	F1	±
180	B4	ø	211	D3	ט	242	F2	≥
181	B5	Œ	212	D4	ה	243	F3	≤
182	B6	A	213	D5	ו	244	F4	ρ
183	B7	ž	214	D6	ש	245	F5	J
184	B8	ž	215	D7	ת	246	F6	÷
185	B9	..	216	D8	י	247	F7	≈
186	BA	/	217	D9	י	248	F8	°
187	BB	†	218	DA	י	249	F9	°
188	BC	‡	219	DB	י	250	FA	-
189	BD	ø	220	DC	י	251	FB	J
190	BE	ø	221	DD	ø	252	FC	Π
191	BF	ž	222	DE	^	253	FD	2
192	C0	ij	223	DF	ω	254	FE	3
193	C1	ij	224	E0	α	255	FF	-
194	C2	κ	225	E1	β			

UNITED KINGDOM (ESC R 0)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	@ 48	Q 64	P 80	` 96	p 112
1	SOH 1	DC1 17	!	1 33	A 49	Q 65	a 81	q 97
2		DC2 18	"	2 34	B 50	R 66	b 82	r 98
3		DC3 19	£	3 35	C 51	S 67	c 83	s 99
4		DC4 20	\$	4 36	D 52	T 68	d 84	t 100
5			%	5 37	E 53	U 69	e 85	u 101
6			&	6 38	F 54	V 70	f 86	v 102
7	BEL 7		'	7 39	G 55	W 71	g 87	w 103
8	BS 8	CAN 24	€	8 40	H 56	X 72	h 88	x 104
9	HT 9		)	9 41	I 57	Y 73	i 89	y 105
A	LF 10		*	10 42	J 58	Z 74	j 90	z 106
B	VT 11	ESC 27	+	11 43	K 59	[75	k 91	[107
C	FF 12		,	12 44	L 60	\ 76	l 92	l 108
D	CR 13		-	13 45	= 61	M 77	m 93	m 109
E	SO 14		.	14 46	> 62	N 78	n 94	n 110
F	SI 15		/	15 47	? 63	O 79	o 95	DEL 127

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	' 224	p 240
SOH 129	DC1 145	!	1 177	A 193	Q 209	a 225	q 241
	DC2 146	"	2 178	B 194	R 210	b 226	r 242
	DC3 147	#	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$	4 180	D 196	T 212	d 228	t 244
		%	5 181	E 197	U 213	e 229	u 245
		&	6 182	F 198	V 214	f 230	v 246
BEL 135		'	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(	8 184	H 200	X 216	h 232	x 248
HT 137		)	9 185	I 201	Y 217	i 233	y 249
LF 138		*	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+	;	K 203	[219	k 235	{ 251
FF 140		,	<	L 204	\	l 236	 252
CR 141		-	=	M 205	]	m 237	} 253
SO 142		.	>	N 206	^	n 238	~ 254
SI 143		/	? 191	O 207	_	o 239	DEL 255

Right Set (United States)

FINLAND (ESC R 2)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	0 48	@ 64	P 80	4 96	p 112
1	SOH 1	DC1 17	!	1 33	A 65	Q 81	a 97	q 113
2		DC2 18	"	2 34	B 50	R 66	b 82	r 98
3		DC3 19	#	3 35	C 51	S 67	c 83	s 99
4		DC4 20	\$	4 36	D 52	T 68	d 84	t 100
5			%	5 37	E 53	U 69	e 85	u 101
6			&	6 38	F 54	V 70	f 86	v 102
7	BEL 7		'	7 39	G 55	W 71	g 87	w 103
8	BS 8	CAN 24	(	8 40	H 56	X 72	h 88	x 104
9	HT 9		)	9 41	I 57	Y 73	i 89	y 105
A	LF 10		*	*	J 58	Z 74	j 90	z 106
B	VT 11	ESC 27	+	;	K 59	ä 75	k 91	ä 107
C	FF 12		,	<	L 60	ö 76	l 92	ö 108
D	CR 13		-	=	M 61	ä 77	m 93	ä 109
E	SO 14		.	>	N 62	ü 78	n 94	ü 110
F	SI 15		/	?	O 63	ö 79	o 95	DEL 127

Left Set (Finland)

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	' 224	p 240
SOH 129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$ 164	4 180	D 196	T 212	d 228	t 244
		% 165	5 181	E 197	U 213	e 229	u 245
		& 166	6 182	F 198	V 214	f 230	v 246
BEL 135		' 167	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
HT 137		) 169	9 185	I 201	Y 217	i 233	y 249
LF 138		* 170	: 186	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	£ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	l 252
CR 141		- 173	= 189	M 205	] 221	m 237	3 253
SO 142		. 174	> 190	N 206	^ 222	n 238	5 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

NORWAY/DENMARK (ESC R 3)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	Ø 48	ä 64	P 80	ä 96	p 112
1	SOH 1	DC1 17	! 33	1 49	Å 65	Q 81	å 97	q 113
2		DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
3		DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
4		DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5			% 37	5 53	E 69	U 85	e 101	u 117
6			& 38	6 54	F 70	V 86	f 102	v 118
7	BEL 7		' 39	7 55	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 9		) 41	9 57	I 73	Y 89	1 105	y 121
A	LF 10		* 42	: 58	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+ 43	; 59	K 75	Æ 91	k 107	æ 123
C	FF 12		, 44	< 60	L 76	Ø 92	l 108	ø 124
D	CR 13		- 45	= 61	M 77	å 93	m 109	å 125
E	SO 14		. 46	> 62	N 78	ü 94	n 110	ü 126
F	SI 15		/ 47	? 63	O 79	ö 95	o 111	DEL 127

Left Set (Norway/Denmark)

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	' 224	p 240
SOH 129	DC 1 145	!	1 161	A 193	Q 209	a 225	q 241
	DC2 146	"	2 162	B 194	R 210	b 226	r 242
	DC3 147	#	3 163	C 195	S 211	c 227	s 243
	DC4 148	\$	4 164	D 196	T 212	d 228	t 244
		%	5 165	E 197	U 213	e 229	u 245
		&	6 166	F 198	V 214	f 230	v 246
BEL 135		'	7 167	G 199	W 215	g 231	w 247
BS 136	CAN 152	(	8 168	H 200	X 216	h 232	x 248
HT 137		)	9 169	I 201	Y 217	i 233	y 249
LF 138		*	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+	;	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

SWEDEN (ESC R 4)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	Ø 48	É 64	P 80	Å 96	Þ 112
1	SOH 1	DC1 17	!	1 33	À 65	Q 81	ä 97	q 113
2		DC2 18	"	2 34	B 66	R 82	å 98	r 114
3		DC3 19	#	3 35	C 67	S 83	ç 99	s 115
4		DC4 20	\$	4 36	D 68	T 84	d 100	t 116
5			%	5 37	E 69	U 85	e 101	u 117
6			&	6 38	F 70	V 86	f 102	v 118
7	BEL 7		'	7 39	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(	8 40	H 72	X 88	h 104	x 120
9	HT 9		)	9 41	I 73	Y 89	ı 105	y 121
A	LF 10		x	10 42	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+	11 43	;	K 75	ä 91	k 107
C	FF 12		,	12 44	<	L 76	ö 92	l 108
D	CR 13		-	13 45	=	M 77	å 93	m 109
E	SO 14		.	14 46	>	N 78	ü 94	n 110
F	SI 15		/	15 47	?	O 79	o 95	DEL 127

Left Set (Sweden)

8	9	A	B	C	D	E	F
NUL 128		SP 160	@ 176	@ 192	P 208	' 224	p 240
SOH 129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$ 164	4 180	D 196	T 212	d 228	t 244
		% 165	5 181	E 197	U 213	e 229	u 245
		& 166	6 182	F 198	V 214	f 230	v 246
BEL 135		' 167	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
HT 137		) 169	9 185	I 201	Y 217	i 233	y 249
LF 138		* 170	: 186	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

JAPAN ROMAN (ESC R 5)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	@ 48	@ 64	P 80	' 96	p 112
1	SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113
2		DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
3		DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
4		DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5			% 37	5 53	E 69	U 85	e 101	u 117
6			& 38	6 54	F 70	V 86	f 102	v 118
7	BEL 7		' 39	7 55	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 9		) 41	9 57	I 73	Y 89	i 105	y 121
A	LF 10		* 42	: 58	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	FF 12		, 44	< 60	L 76	\ 92	l 108	 124
D	CR 13		- 45	= 61	M 77	] 93	m 109	} 125
E	SO 14		. 46	> 62	N 78	^ 94	n 110	~ 126
F	SI 15		/ 47	? 63	O 79	_ 95	o 111	DEL 127

Left Set (Japan Roman)

8	9	A	B	C	D	E	F
NUL 128		SP 160	- 176	ア 192	エ 208		
SOH 129	DC1 145	+	ア 177	チ 193	セ 209		
	DC2 146	Γ	イ 178	ウ 194	ノ 210		
	DC3 147	J	ウ 179	テ 195	モ 211		
	DC4 148	J	イ 180	ト 196	ヤ 212		
		+	オ 181	ナ 197	ユ 213		
		ア	カ 182	ニ 198	ヨ 214		
BEL 135		ア	キ 183	マ 199	テ 215		
BS 136	CAN 152	イ	ク 184	*	リ 216		
HT 137		+	ケ 185	/	ル 217		
LF 138		エ	コ 186	ハ 202	レ 218		
VT 139	ESC 155	*	サ 187	ヒ 203	ロ 219		
FF 140		×	マ 188	フ 204	フ 220		
CR 141		1	フ 189	ヘ 205	フ 221		
SO 142		3	セ 190	ホ 206	セ 222		
SI 143		+	ソ 191	マ 207	+		DEL 255

Right Set (Japan Katakana)

JAPAN KATAKANA (ESC R 6)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	- 48	? 64	≡ 80		
1	SOH 1	DC1 17	+ 33	Ɔ 49	Ɔ 65	6 81		
2		DC2 18	Г 34	イ 50	ゞ 66	メ 82		
3		DC3 19	J 35	ウ 51	ㇿ 67	モ 83		
4		DC4 20	J 36	I 52	ト 68	ヤ 84		
5			+ 37	π 53	† 69	1 85		
6			? 38	カ 54	ニ 70	ヨ 86		
7	BEL 7		Ɔ 39	* 55	ㇿ 71	ㇿ 87		
8	BS 8	CAN 24	イ 40	7 56	* 72	リ 88		
9	HT 9		† 41	ㇿ 57	/ 73	ル 89		
A	LF 10		I 42	コ 58	ハ 74	レ 90		
B	VT 11	ESC 27	* 43	サ 59	ヒ 75	ロ 91		
C	FF 12		x 44	ㇿ 60	7 76	7 92		
D	CR 13		1 45	ㇿ 61	ハ 77	ㇿ 93		
E	SO 14		ヨ 46	ㇿ 62	ㇿ 78	ㇿ 94		
F	SI 15		ㇿ 47	ㇿ 63	ㇿ 79	ㇿ 95		DEL 127

Left Set (Japan Katakana)

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	' 224	p 240
SOH 129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$ 164	4 180	D 196	T 212	d 228	t 244
		% 165	5 181	E 197	U 213	e 229	u 245
		& 166	6 182	F 198	V 214	f 230	v 246
BEL 135		' 167	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
HT 137		) 169	9 185	I 201	Y 217	i 233	y 249
LF 138		* 170	: 186	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

GERMANY (ESC R 7)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	Ø 48	ø 64	Ɔ 80	ˆ 96	Ɔ 112
1	SOH 1	DC1 17	!	1 33	A 65	Q 81	ä 97	q 113
2		DC2 18	"	2 34	B 66	R 82	b 98	r 114
3		DC3 19	#	3 35	C 67	S 83	c 99	s 115
4		DC4 20	\$	4 36	D 68	T 84	d 100	t 116
5			%	5 37	E 69	U 85	e 101	u 117
6			&	6 38	F 70	V 86	f 102	v 118
7	BEL 7		'	7 39	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(	8 40	H 72	X 88	h 104	x 120
9	HT 9		)	9 41	I 73	Y 89	i 105	y 121
A	LF 10		*	: 42	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+	; 43	K 75	Ä 91	k 107	ä 123
C	FF 12		,	< 44	L 76	Ö 92	l 108	ö 124
D	CR 13		-	= 45	M 77	Ü 93	m 109	ü 125
E	SO 14		.	> 46	N 78	^ 94	n 110	ß 126
F	SI 15		/	? 47	O 79	° 95	o 111	DEL 127

8	9	A	B	C	D	E	F
NUL 128		SP 160	@ 176	@ 192	P 208	' 224	p 240
SOH 129	DC 1 145	! 161	1 177	A 193	Q 209	a 225	q 241
	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$ 164	4 180	D 196	T 212	d 228	t 244
		% 165	5 181	E 197	U 213	e 229	u 245
		& 166	6 182	F 198	V 214	f 230	v 246
BEL 135		' 167	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	€ 168	8 184	H 200	X 216	h 232	x 248
HT 137		) 169	9 185	I 201	Y 217	i 233	y 249
LF 138		* 170	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+ 171	;	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

FRENCH CANADA (ESC R 8)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	0 48	Δ 64	P 80	ô 96	p 112
1	SOH 1	DC1 17	! 33	1 49	A 65	Q 81	a 97	q 113
2		DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
3		DC3 19	# 35	3 51	C 67	S 83	c 99	s 115
4		DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5			% 37	5 53	E 69	U 85	e 101	u 117
6			& 38	6 54	F 70	V 86	f 102	v 118
7	BEL 7		' 39	7 55	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 9		) 41	9 57	I 73	Y 89	i 105	y 121
A	LF 10		* 42	: 58	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+ 43	; 59	K 75	Δ 91	k 107	Δ 123
C	FF 12		, 44	< 60	L 76	Ç 92	l 108	ù 124
D	CR 13		- 45	= 61	M 77	Δ 93	m 109	Δ 125
E	SO 14		. 46	> 62	N 78	î 94	n 110	û 126
F	SI 15		/ 47	? 63	O 79	ÿ 95	o 111	DEL 127

Left Set (French Canada)

8	9	A	B	C	D	E	F
NUL 128		SP 160	@ 176	Q 192	P 208	' 224	p 240
SOH 129	DC1 145	! 161	1 177	A 193	Q 209	a 225	q 241
	DC2 146	" 162	2 178	B 194	R 210	b 226	r 242
	DC3 147	# 163	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$ 164	4 180	D 196	T 212	d 228	t 244
		% 165	5 181	E 197	U 213	e 229	u 245
		& 166	6 182	F 198	V 214	f 230	v 246
BEL 135		' 167	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(168	8 184	H 200	X 216	h 232	x 248
HT 137		) 169	9 185	I 201	Y 217	i 233	y 249
LF 138		* 170	: 186	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+ 171	; 187	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

FRANCE (ESC R 9)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	0 48	1 64	P 80	' 96	p 112
1	SOH 1	DC1 17	!	1 33	A 49	Q 65	a 81	q 97
2		DC2 18	"	2 34	B 50	R 66	b 82	r 98
3		DC3 19	£	3 35	C 51	S 67	c 83	s 99
4		DC4 20	\$	4 36	D 52	T 68	d 84	t 100
5			%	5 37	E 53	U 69	e 85	u 101
6			&	6 38	F 54	V 70	f 86	v 102
7	BEL 7		'	7 39	G 55	W 71	g 87	w 103
8	BS 8	CAN 24	€	8 40	H 56	X 72	h 88	x 104
9	HT 9		)	9 41	I 57	Y 73	i 89	y 105
A	LF 10		*	*	J 58	Z 74	j 90	z 106
B	VT 11	ESC 27	+	;	K 59	° 75	k 91	° 107
C	FF 12		,	<	L 60	£ 76	l 92	£ 108
D	CR 13		-	=	M 61	¢ 77	m 93	¢ 109
E	SO 14		.	>	N 62	^ 78	n 94	^ 110
F	SI 15		/	?	O 63	_ 79	o 95	DEL 127

Left Set (France)

8	9	A	B	C	D	E	F
NUL 128		SP 160	@ 176	Q 192	P 208	' 224	p 240
SOH 129	DC1 145	!	1 177	A 193	Q 209	“ 225	q 241
	DC2 146	”	2 178	B 194	R 210	b 226	r 242
	DC3 147	#	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$	4 180	D 196	T 212	d 228	t 244
		%	5 181	E 197	U 213	e 229	u 245
		&	6 182	F 198	V 214	f 230	v 246
BEL 135		'	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(	8 184	H 200	X 216	h 232	x 248
HT 137		)	9 185	I 201	Y 217	i 233	y 249
LF 138		*	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+	;	K 203	[219	k 235	{ 251
FF 140		/	<	L 204	\	l 236	 252
CR 141		-	=	M 205	]	m 237	} 253
SO 142		.	>	N 206	^	n 238	~ 254
SI 143		/	? 191	O 207	_	o 239	DEL 255

Right Set (United States)

ITALY (ESC R 10)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	0 48	8 64	P 80	ù 96	p 112
1	SOH 1	DC1 17	¡ 33	1 49	A 65	Q 81	a 97	q 113
2		DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
3		DC3 19	£ 35	3 51	C 67	S 83	c 99	s 115
4		DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5			% 37	5 53	E 69	U 85	e 101	u 117
6			& 38	6 54	F 70	V 86	f 102	v 118
7	BEL 7		' 39	7 55	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 9		) 41	9 57	I 73	Y 89	i 105	y 121
A	LF 10		* 42	: 58	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+ 43	; 59	K 75	° 91	k 107	¿ 123
C	FF 12		, 44	< 60	L 76	Ç 92	l 108	¿ 124
D	CR 13		- 45	= 61	M 77	€ 93	m 109	€ 125
E	SO 14		. 46	> 62	N 78	^ 94	n 110	¿ 126
F	SI 15		/ 47	? 63	O 79	_ 95	o 111	DEL 127

Left Set (Italy)

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	` 224	p 240
SOH 129	DC1 145	!	1 177	A 193	Q 209	a 225	q 241
	DC2 146	"	2 178	B 194	R 210	b 226	r 242
	DC3 147	#	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$	4 180	D 196	T 212	d 228	t 244
		%	5 181	E 197	U 213	e 229	u 245
		&	6 182	F 198	V 214	f 230	v 246
BEL 135		'	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(	8 184	H 200	X 216	h 232	x 248
HT 137		)	9 185	I 201	Y 217	i 233	y 249
LF 138		*	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+	;	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)

SPAIN (ESC R 11)

	0	1	2	3	4	5	6	7
0	NUL 0		SP 32	0 48	8 64	P 80	ˆ 96	p 112
1	SOH 1	DC1 17	¡ 33	1 49	A 65	Q 81	ª 97	q 113
2		DC2 18	" 34	2 50	B 66	R 82	b 98	r 114
3		DC3 19	£ 35	3 51	C 67	S 83	c 99	s 115
4		DC4 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5			% 37	5 53	E 69	U 85	e 101	u 117
6			& 38	6 54	F 70	V 86	f 102	v 118
7	BEL 7		' 39	7 55	G 71	W 87	g 103	w 119
8	BS 8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 9		) 41	9 57	I 73	Y 89	ı 105	y 121
A	LF 10		* 42	: 58	J 74	Z 90	j 106	z 122
B	VT 11	ESC 27	+ 43	; 59	K 75	ı 91	k 107	º 123
C	FF 12		, 44	< 60	L 76	ˆ 92	l 108	ˆ 124
D	CR 13		- 45	= 61	M 77	ı 93	m 109	ç 125
E	SO 14		. 46	> 62	N 78	^ 94	n 110	ˆ 126
F	SI 15		/ 47	? 63	O 79	ˆ 95	o 111	DEL 127

Left Set (Spain)

8	9	A	B	C	D	E	F
NUL 128		SP 160	0 176	@ 192	P 208	` 224	p 240
SOH 129	DC1 145	!	1 177	A 193	Q 209	a 225	q 241
	DC2 146	"	2 178	B 194	R 210	b 226	r 242
	DC3 147	#	3 179	C 195	S 211	c 227	s 243
	DC4 148	\$	4 180	D 196	T 212	d 228	t 244
		%	5 181	E 197	U 213	e 229	u 245
		&	6 182	F 198	V 214	f 230	v 246
BEL 135		'	7 183	G 199	W 215	g 231	w 247
BS 136	CAN 152	(	8 184	H 200	X 216	h 232	x 248
HT 137		)	9 185	I 201	Y 217	i 233	y 249
LF 138		*	:	J 202	Z 218	j 234	z 250
VT 139	ESC 155	+	;	K 203	[219	k 235	{ 251
FF 140		, 172	< 188	L 204	\ 220	l 236	 252
CR 141		- 173	= 189	M 205	] 221	m 237	} 253
SO 142		. 174	> 190	N 206	^ 222	n 238	~ 254
SI 143		/ 175	? 191	O 207	_ 223	o 239	DEL 255

Right Set (United States)



APPENDIX C

CHARACTER PITCH AND PRINT STYLE COMBINATIONS

	Pica	Elite	Com-pressed	Bold	Double Strike	Double Width	Italics	Under-line	Super/Subscript
Pica		(1)	•	•	•	•	•	•	•
Elite	(1)		(2)	(3)	•	•	•	•	•
Com-pressed	•	(2)		(4)	•	•	•	•	•
Bold	•	(3)	(4)		•	•	•	•	(5)
Double Strike	•	•	•	•		•	•	•	(6)
Double Width	•	•	•	•	•		•	•	(7)
Italics	•	•	•	•	•	•		•	•
Under-line	•	•	•	•	•	•	•		•
Super/Subscript	•	•	•	(5)	(6)	(7)	•	•	

Notes

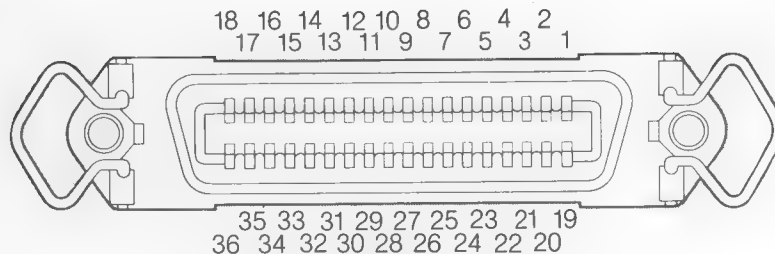
1. Pica cancels Elite and vice versa.
2. Elite has precedence over Compressed.
3. Elite has precedence over Bold.
4. Bold has precedence over Compressed.
5. Bold has precedence over Super/Subscript.
6. Super/Subscript has precedence over Double Strike.
7. Double Width has precedence over Super/Subscript.



APPENDIX D

SMM804 PRINTER INTERFACE SPECIFICATIONS

Data Transmission Method	8-bit data parallel
Data Transfer Rate	1000 cps (maximum)
Synchronization	By externally supplied $\overline{\text{STROBE}}$ pulses
Handshaking	By $\overline{\text{ACKNLG}}$ or BUSY signal
Logic Level	TTL compatible
Plug	57-30360 (Amphenol) or its equivalent. It is recommended that interface cables be kept as short as possible.
Receptacle (on printer side)	Amphenol 57-40360 or its equivalent.



CONNECTOR PIN ASSIGNMENTS AND SIGNAL DESCRIPTIONS

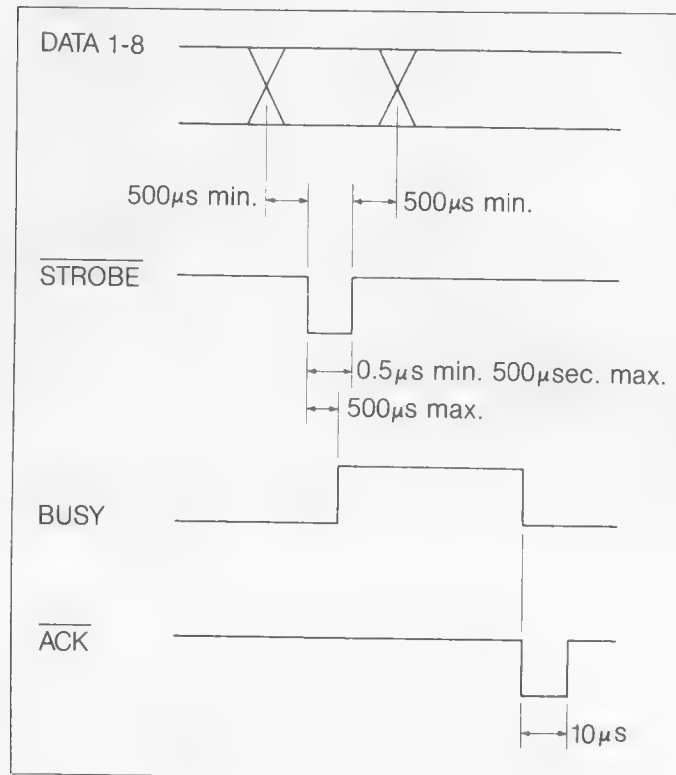
PIN #	SIGNAL	IN/OUT	SIGNAL DESCRIPTION
1	STROBE	IN	STROBE pulse to read data in. Pulse width must be more than 10 μ s at receiving terminal. The signal level is normally "high"; read-in of data is performed at the "low" level of this signal.
2	DATA 1	IN	These signals represent information of the 1st to 8th bits of parallel data respectively. Each signal is at "high" level when data is logical "1" and "low" when 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	ACKNLG	OUT	Approximately 10 μ s pulse; "low" indicates that data has been received and the printer is ready to accept other data.
11	BUSY	OUT	A "high" signal indicates that the printer cannot receive data. The signal becomes "high" in the following cases: 1. During data entry. 2. During printing operation. 3. In "offline" state. 4. During printer error status.
12	PE	OUT	A "high" signal indicates that the printer is out of paper.
13	SLCT	OUT	This signal indicates that the printer is in the selected state.
14	AUTO FEED XT	IN	With this signal being at "low" level, the paper is automatically fed one line after printing.
15	NC	—	Not used.
16	GND	OUT	Logic GND level.
17	CHASSIS-GND	OUT	Printer chassis GND. In the printer, the chassis GND and the logic GND are isolated from each other.
18	NC	—	Not used.

19-30	GND	OUT	"Twisted-Pair Return" signal; GND level.
31	$\overline{\text{INIT}}$	IN	When the level of this signal becomes "low", the printer controller is reset to its initial state and the print buffer is cleared. This signal is normally at "high" level, and its pulse width must be more than 50 μ s at the receiving terminal.
32	$\overline{\text{ERROR}}$	OUT	The level of this signal becomes "low" when the printer is in "Paper End" state, "Offline" state and "Error" state.
33	GND	OUT	Same as with pin numbers 19 to 30.
34	NC	—	Not used.
35		OUT	Pulled up to +5 Vdc through resistance.
36	$\overline{\text{SLCT IN}}$	IN	Data entry to the printer is possible only when the level of this signal is "low".

Notes

1. "Direction" refers to the direction of signal flow as viewed from the printer.
2. "Return" denotes "Twisted-Pair Return" and is to be connected at signal-ground level. When wiring the interface, be sure to use a twisted-pair cable for each signal and never fail to complete connection on the return side. To prevent noise effectively, these cables should be shielded and connected to the chassis of the system unit and printer, respectively.
3. All interface conditions are based on TTL level. Both the rise and fall times of each signal must be less than 0.2 μ s.
4. Data transfer must not be carried out by ignoring the ACKNLG or BUSY signal. (Data transfer to this printer can be carried out only after confirming the ACKNLG signal or when the level of the BUSY signal is "low.")

TIMING DIAGRAM



APPENDIX E

SMM804 PRINTER SPECIFICATIONS

Printing Method	Impact dot matrix																									
Printing Speed	80 characters per second (at 10 characters per inch)																									
Printing Direction	Bidirectional with logic seeking																									
Number of Pins in Print Head	9																									
Character Matrix	8 dots high by 9 dots wide (Pica) in a 9 by 9 character matrix																									
Bitmap Graphics Modes	8 dots high by 480 (60 dpi), 960 (120 dpi), or 1280 (160 dpi) dots per line; and 9 dots high by 480 (60 dpi), 960 (120 dpi), or 1280 (160 dpi) dots per line																									
Character Sets	United Kingdom, United States, Finland, Norway/Denmark, Sweden, Japan Roman, Japan Katakana, Germany, French Canada, France, Italy, Spain, ATARI ST Extended ASCII.																									
Horizontal Pitches	<table> <tr> <th></th><th>Characters Per Inch</th><th>Maximum Characters Per Line</th></tr> <tr> <td>Pica</td><td>10</td><td>80</td></tr> <tr> <td>Elite</td><td>12</td><td>96</td></tr> <tr> <td>Compressed</td><td>17.1</td><td>132</td></tr> <tr> <td>Double-Width</td><td>5</td><td>40</td></tr> <tr> <td>Double-Width Elite</td><td>6</td><td>48</td></tr> <tr> <td>Double-Width Compressed</td><td>8.55</td><td>66</td></tr> <tr> <td>Super/Subscript</td><td>10</td><td>80</td></tr> </table>			Characters Per Inch	Maximum Characters Per Line	Pica	10	80	Elite	12	96	Compressed	17.1	132	Double-Width	5	40	Double-Width Elite	6	48	Double-Width Compressed	8.55	66	Super/Subscript	10	80
	Characters Per Inch	Maximum Characters Per Line																								
Pica	10	80																								
Elite	12	96																								
Compressed	17.1	132																								
Double-Width	5	40																								
Double-Width Elite	6	48																								
Double-Width Compressed	8.55	66																								
Super/Subscript	10	80																								
Line Spacing	1/6 inch (4.23 mm) or programmable																									
Line Feed Speed	200 milliseconds at 6 lines per inch (6 lines per 25.38 mm)																									

Paper-Feed Method	Sprocket or friction feed
Paper-Feed Direction	Forward (reverse by platen knob)
Line Length	8 inches (203.04 mm)
Overall Paper-Width Range	4 to 10 inches (101.6 to 254 mm)
Paper Thickness	0.002 to 0.006 inch (0.05 to 0.15 mm); one original plus two carbon copies maximum
Paper Types	Fanfold pin-feed and single sheets
Ribbon	Cartridge containing multistrike carbon-film ribbon; life expectancy of 2 million characters
Interface	8-bit parallel; Centronics® -compatible (see Appendix D)
Power Requirements:	
Voltage	117 AC (or 220 AC)
Frequency	60 Hz (or 50/60 Hz)
Power Consumption	40 VA (average)
Weight	10.12 pounds (4.6 kg)
Dimensions (H x W x D)	4.5 x 13.75 x 11.5 inches (113 x 394 x 287 mm)
Ambient Temperature:	
Operating	41°F to 95°F (5°C to 35°C)
Storage	– 4°F to 140°F (– 20°C to 60°C)
Maximum Humidity:	
Operating	20 to 80 percent relative humidity, no condensation
Storage	10 to 80 percent relative humidity, no condensation

CUSTOMER SUPPORT

Atari Corp. welcomes any questions you might have about your SMM804 Printer or about any other ATARI Computer product.

You may write to:

ATARI Customer Relations
P.O. Box 61657
Sunnyvale, CA 94088

Please write the subject of your letter on the outside of the envelope.

Or contact your local Atari User Group. They are an outstanding source of information on how to get the most from your ATARI Computer. To obtain a list of User Groups in your area, send a self-addressed stamped envelope to:

ATARI User Group List
P.O. Box 61657
Sunnyvale, CA 94088











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