TEXAS INSTRUMENTS PRINTER 80
USERS MANUAL

ed in Japan   1057278-1

Save the packing material for storing
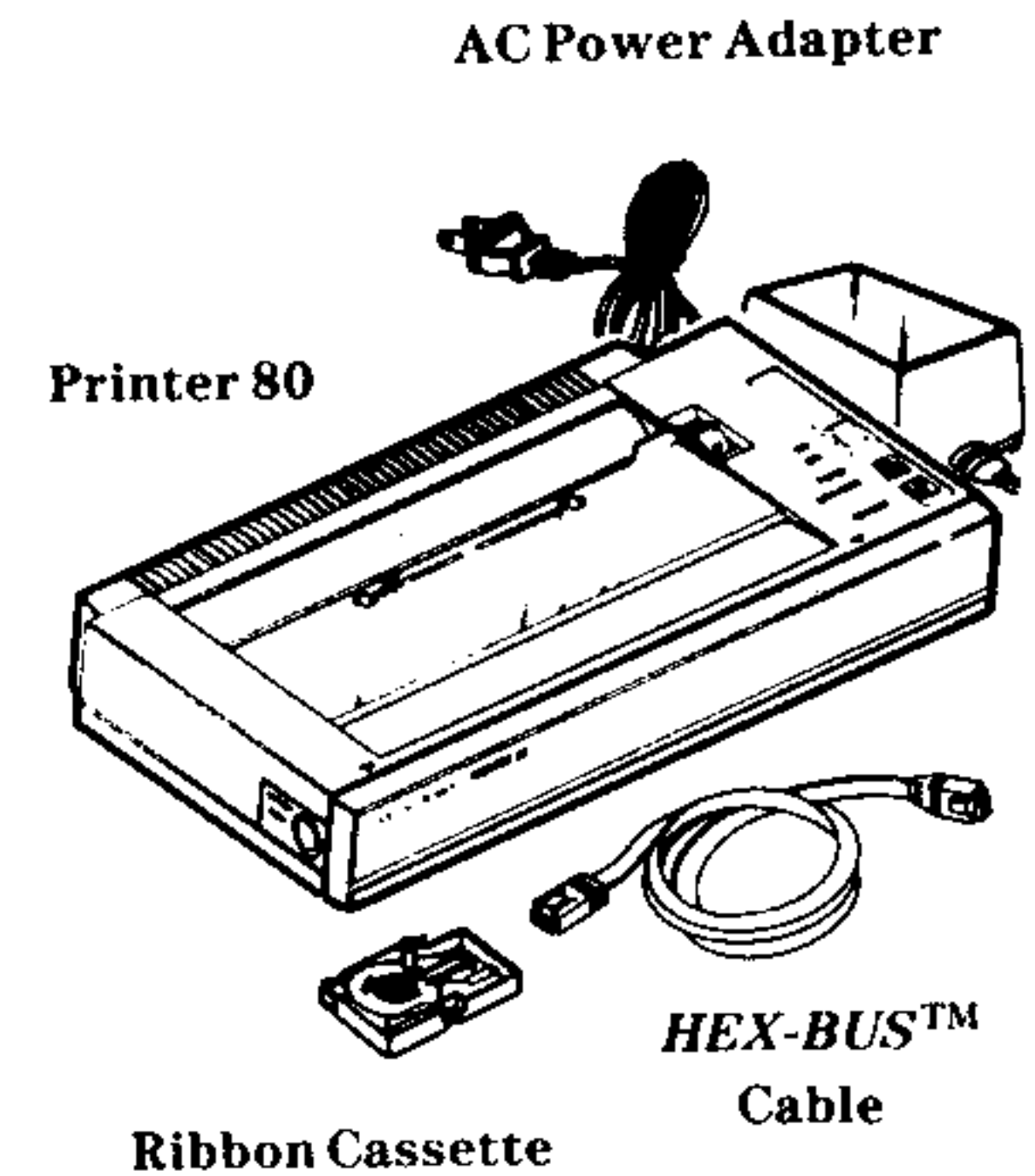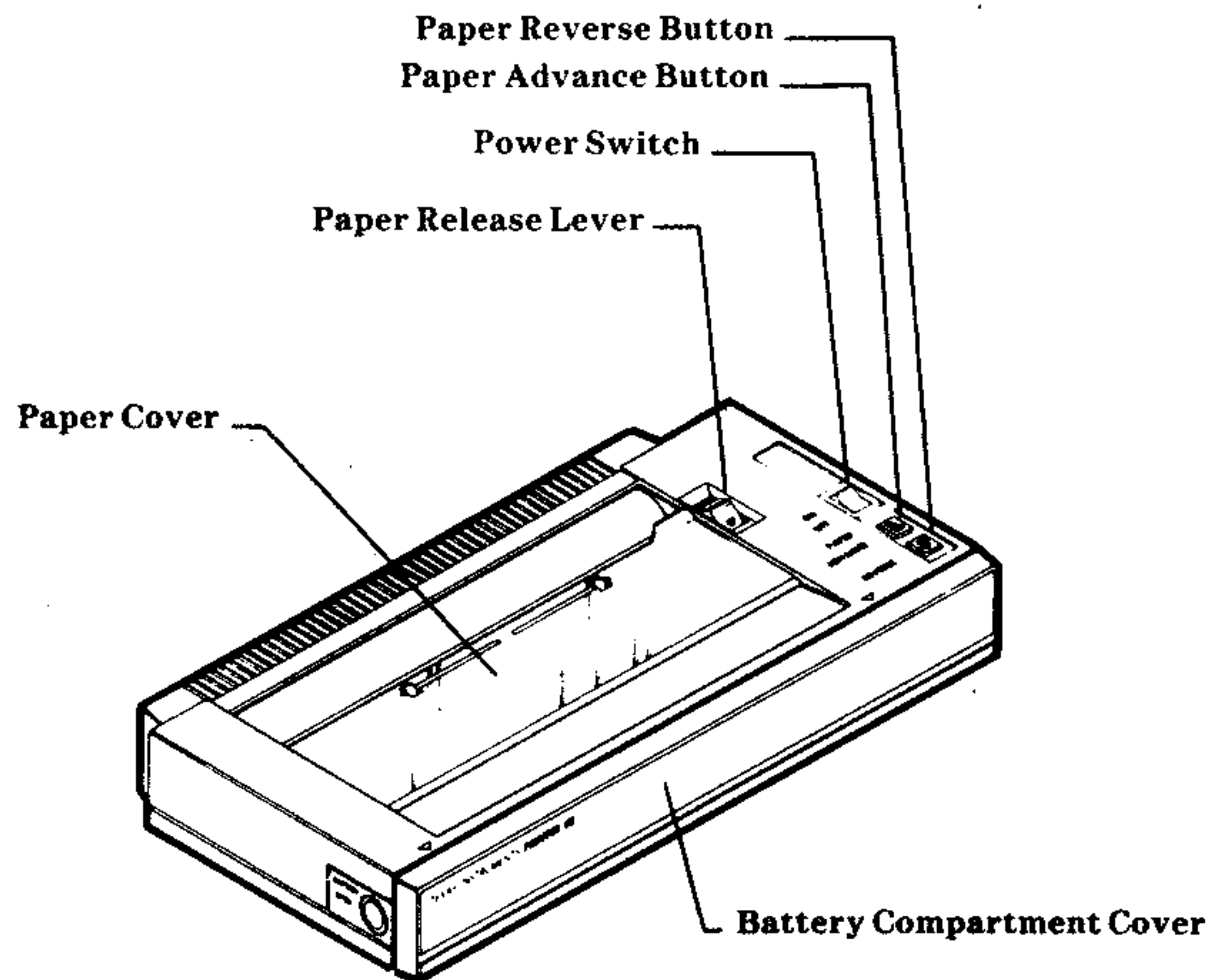or transporting the printer.

Package Contents

The following components are
contained in the printer box.
- The Printer 80
- Three ribbon cassettes (one installed
  in the printer)
- *HEX-BUS*™ data cable
- AC power adapter
- User's manual

Three shipping inserts are packed inside
the Printer. **These must be removed
before you operate the printer.**

- A sheet of white foam rests between
  the transparent paper cover and the
  top of the ribbon cassette. Remove
  this piece.

- A green plastic tab is inserted in the
  top of the ribbon cassette. The tab
  must be removed before use of the
  printer.

- A white plastic insert rests between
  the platen and the print head. Slide
  the print head away from the insert,
  and pull the insert upward and out of
  the printer.

AC Power Adapter

Printer 80

HEX-BUS™
Cable

Ribbon Cassette

Paper Reverse Button
Paper Advance Button
Power Switch
Paper Release Lever
Paper Cover
Battery Compartment Cover

Your Printer 80

Power Switch: This is a rocker-type switch used to turn the printer ON or OFF. When you turn the printer ON (and when you turn the computer ON with the printer connected), a linefeed and carriage return are performed. As good operating practice, the printer should be turned OFF when not in use.

Paper Release Lever: Moving this lever to the open position (toward the front of the printer) releases pressure on the paper feed roller and moves the print head away from the friction roller. The lever must be in the closed position during printing.

Paper Advance Button: If this button is pressed momentarily, the paper advances one line. Holding the button down causes the paper to advance continuously.

Paper Reverse Button: If this button is pressed momentarily, the paper feeds one line in reverse. Holding the button down causes the paper to feed continuously in reverse.

Battery Compartment Cover: Simultaneously press the latches on both sides of the printer to open the battery compartment cover.

Paper Cover: This transparent hinged cover protects the internal parts of the printer from damage by dust or foreign objects. It is normally closed during printing or while the printer is not in use.

Print Samples

The following is a sample printout of the full character set available on the Printer 80. Note that the lower portion of letters such as j, **g**, and **p** descend below the line for easy readability.

```
!"#$%&'()*+,-./0
123456789:;<=>?@
ABCDEFGHIJKLMNOP
QRSTUVWXYZ[\]^_`
abcdefghijklmnop
qrstuvwxyz{|}~
```

The Printer 80 can be operated with the AC power adapter provided, or with batteries. When batteries are used the printer is fully portable.

Battery Operation

Note: When the AC adapter is plugged into the printer, the batteries are disconnected and are not used by the printer.

1. Make sure the printer is turned OFF.

2. Open the battery compartment by pressing inward on the two latches located on both sides of the printer. The battery compartment door is hinged at the bottom.

3. Insert four "D" size batteries with their positive (pointed) ends toward the left side of the printer. **Use alkaline batteries only.**
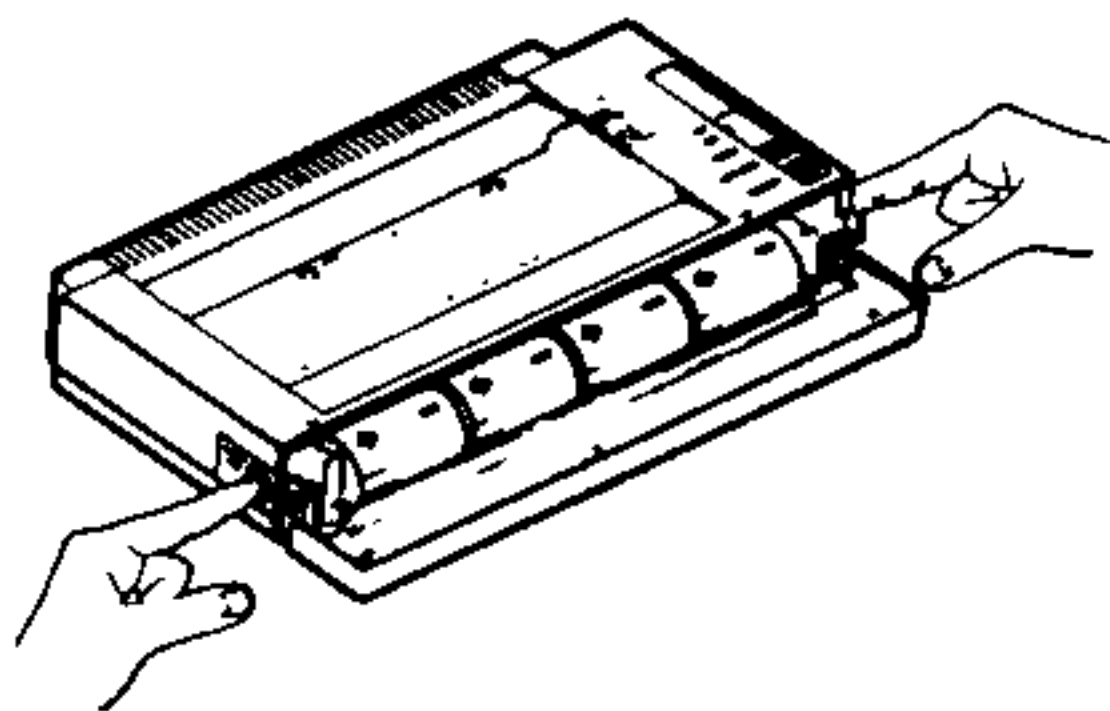

4. Close the battery compartment door so that it snaps into place.

Caution: If the printer is to be stored for more than a few weeks without use, remove the batteries. A leaking battery can damage the printer.

Operation with the AC Power Adapter

Note: Use only the AC power adapter (Model No. 9401) supplied with the Printer 80. Other adapters may look the same, but do not work properly with the Printer 80.

1. Make sure the printer is turned OFF.

2. Push the round plug on the adapter into the round jack on the rear of the printer, as shown. This disconnects the batteries from the power circuit if they are installed.

Back of Printer
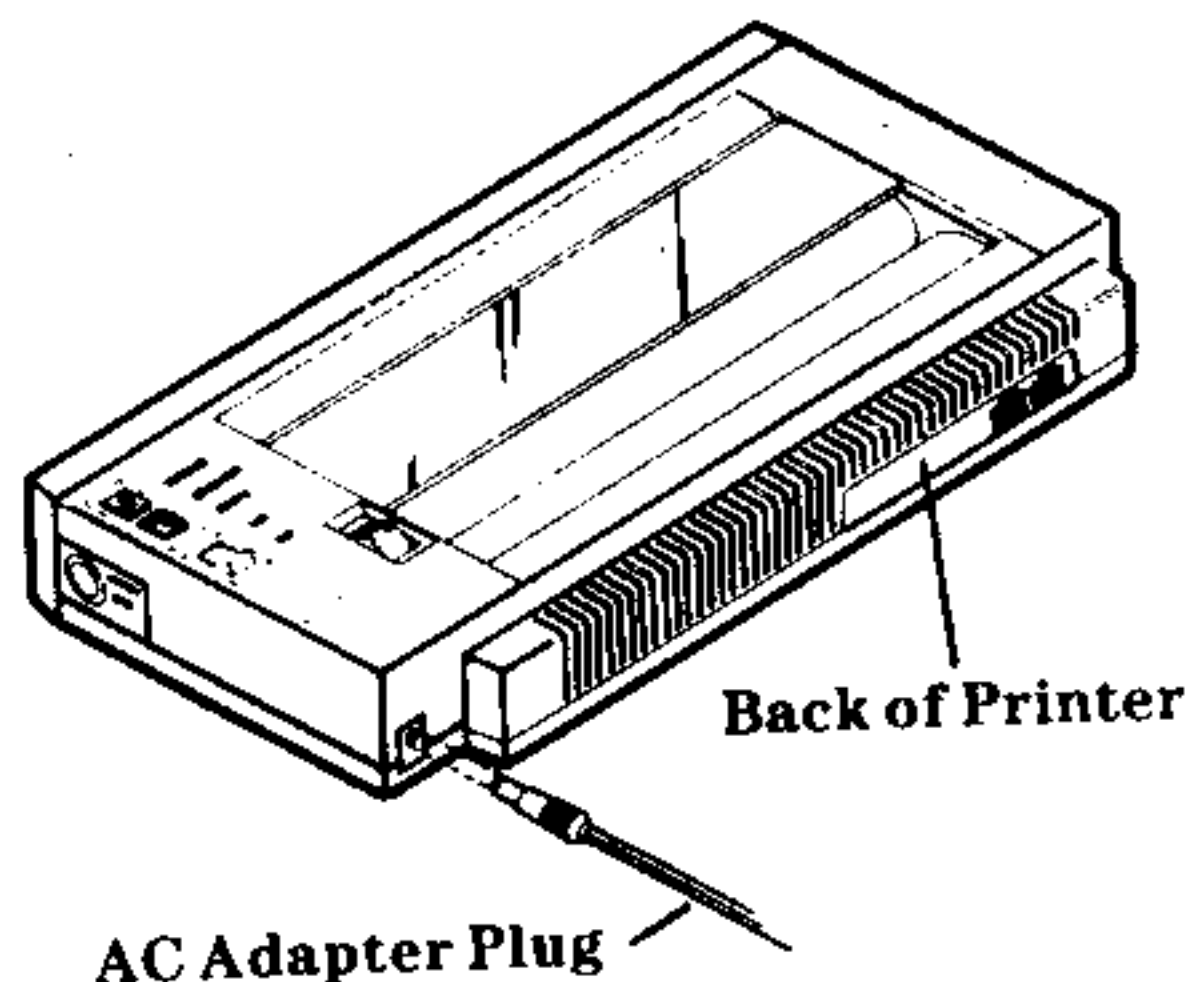
AC Adapter Plug

3. Plug the other end of the adapter into a standard 120 volt AC household outlet.

For maximum flexibility, either plain paper or specially treated thermal paper can be used. You need a ribbon cassette when printing on plain paper.

## Connecting the *HEX-BUS*™ Data Cable

The *HEX-BUS* data cable provides a path for transmitting data between the computer and printer. Before connecting the cable, make sure that both the printer and the computer are turned OFF.

There are two rectangular openings on the rear of the printer for connection of the *HEX-BUS* cable; the cable can be connected to either of these. (The second connector on the printer can be used to connect another *HEX-BUS* device, such as the Texas Instruments RS232 Interface or Modem.)

The plugs at each end of the data cable have a raised tab on one edge to ensure proper installation to the connector. Position the raised tab toward the top of the printer, as shown in the drawing, and carefully insert the plug. Do not bend any of the pins on the connector.

Connect the other end of the cable to the computer, or to the last *HEX-BUS* peripheral already attached, in the same manner.

Caution: Before transporting the printer, disconnect the data cable to prevent damage to the connector pins.

HEX-BUS™ **Cable**

Back of Printer
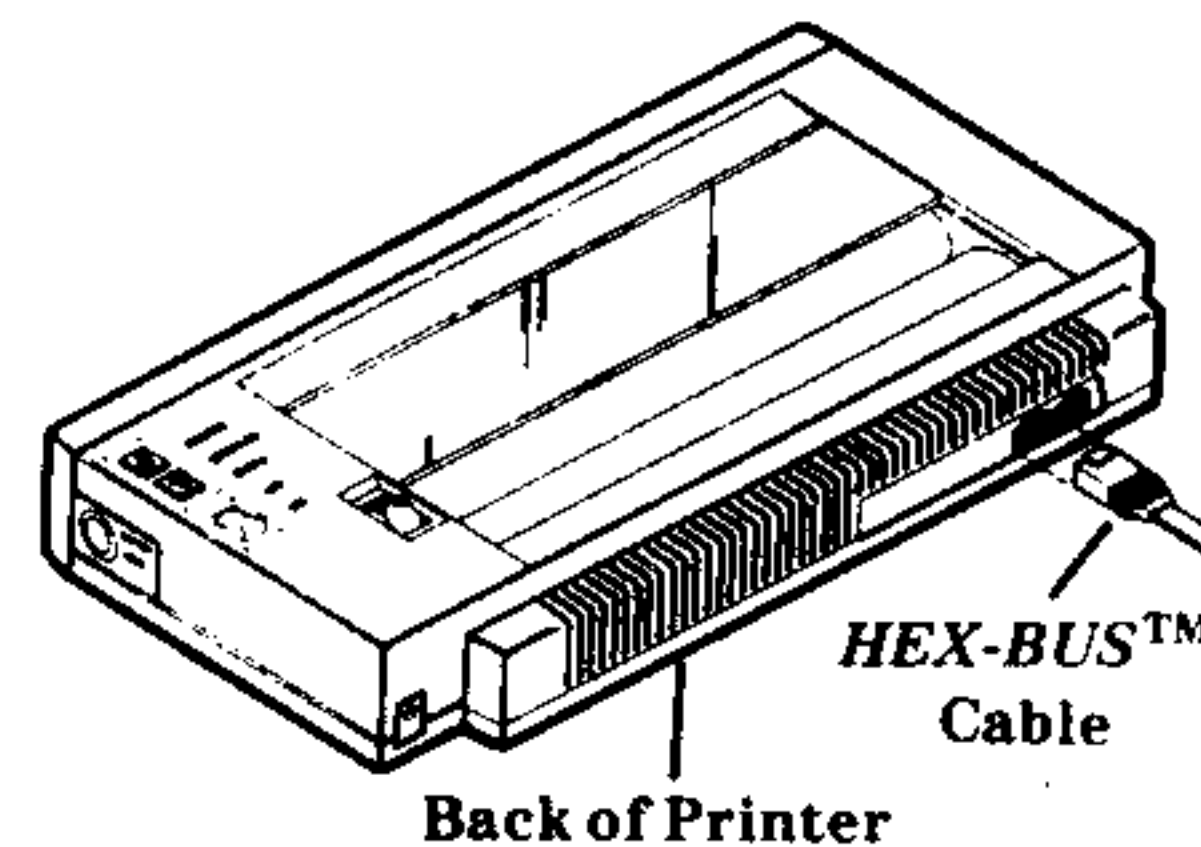
## Loading Paper

Note: The Printer 80 is designed for friction feeding of single sheet or roll paper. You can use fanfold paper, provided the width of the paper (including side perforations) does not exceed 8.5 inches.

1. Make sure the printer is ON.

2. Open the paper cover. If you are using thermal paper, the ribbon cassette should be removed (see "Changing the Ribbon Cassette" on page 9).

3. Insert the paper behind the friction roller. Thermal paper should be inserted with the shiny side toward the rear of the printer. (The shiny side of the paper will be facing the front of the printer as it exits at the front of the roller.)
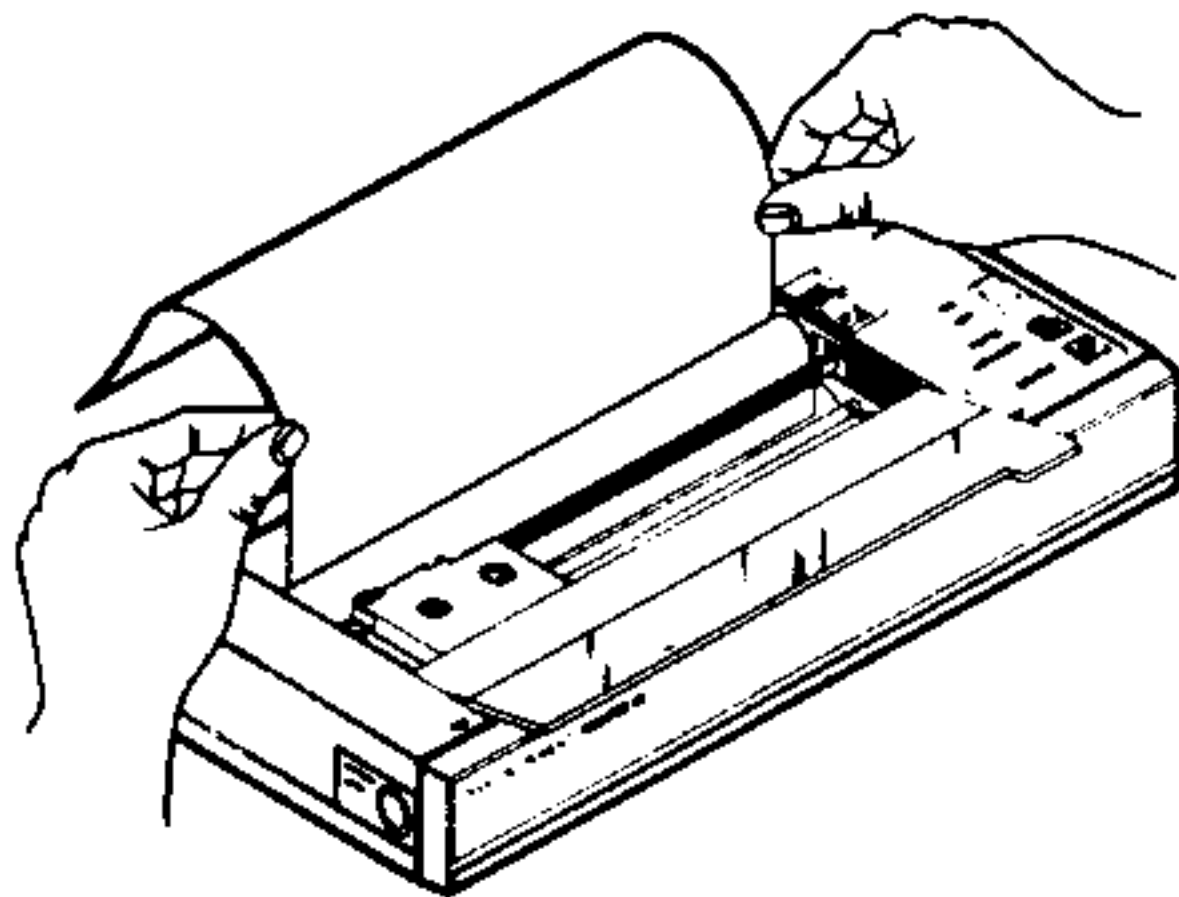
4. Roll the paper into the printer by pressing the paper advance button. To prevent damage to the roller drive mechanism, avoid contact with the roller while using the paper advance or paper reverse buttons.

5. Move the paper release lever to the open position to release tension on the friction feed roller.

6. Manually center the paper so that you can see an equal portion of the roller on both sides of the paper.

7. Return the paper release lever to the
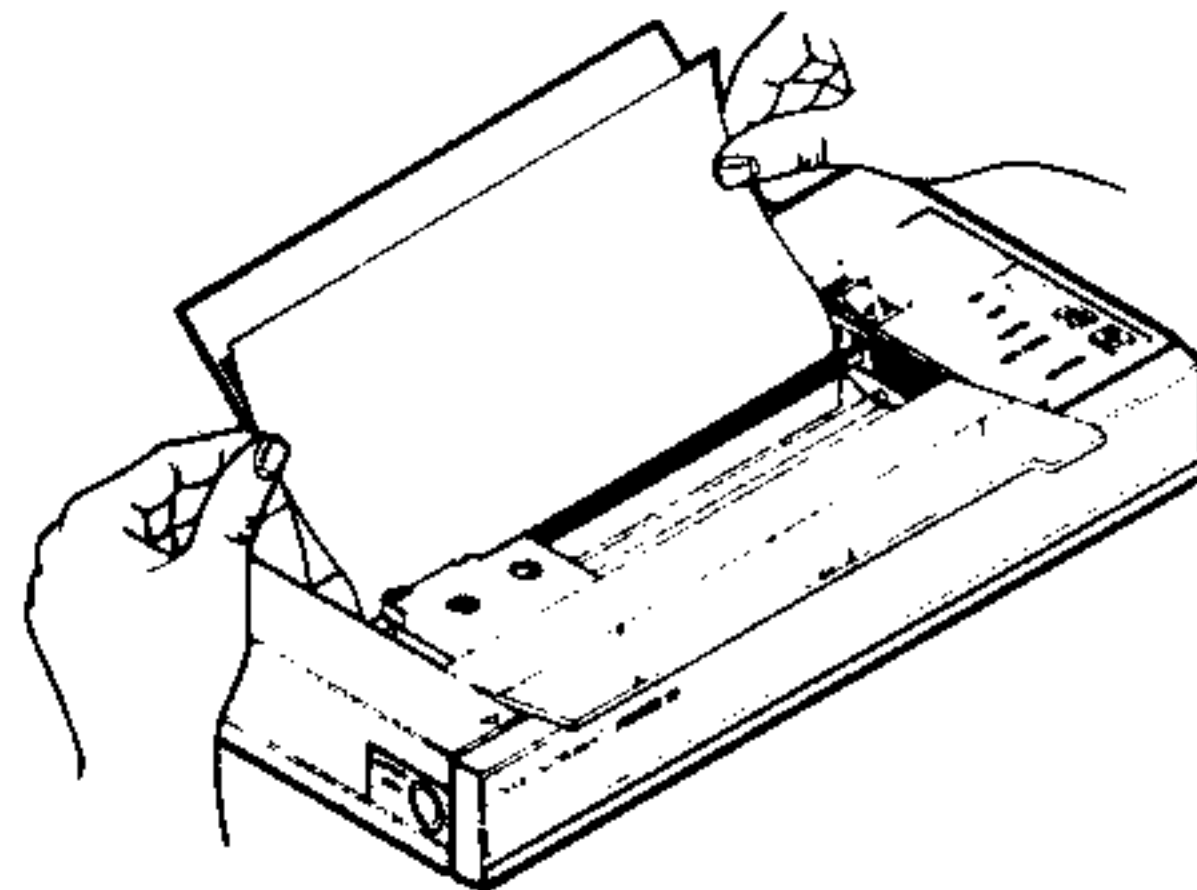
8. Use the paper reverse button to roll the paper backward until it is in the desired position. Do this by repeatedly pressing the button or by holding the button down for continuous roller movement.

9. Close the paper cover. (If you have positioned the paper for printing at the very top of the sheet or if you are using fanfold paper, the paper cover must be left open to allow the paper to advance without jamming.)

For information on obtaining replacement thermal paper, see "If You Have Questions or Need Assistance" on page 31.

Removing Paper

To remove paper, hold down the paper advance or paper reverse button until the paper is ejected. **Do not pull the paper out by hand, as this can**
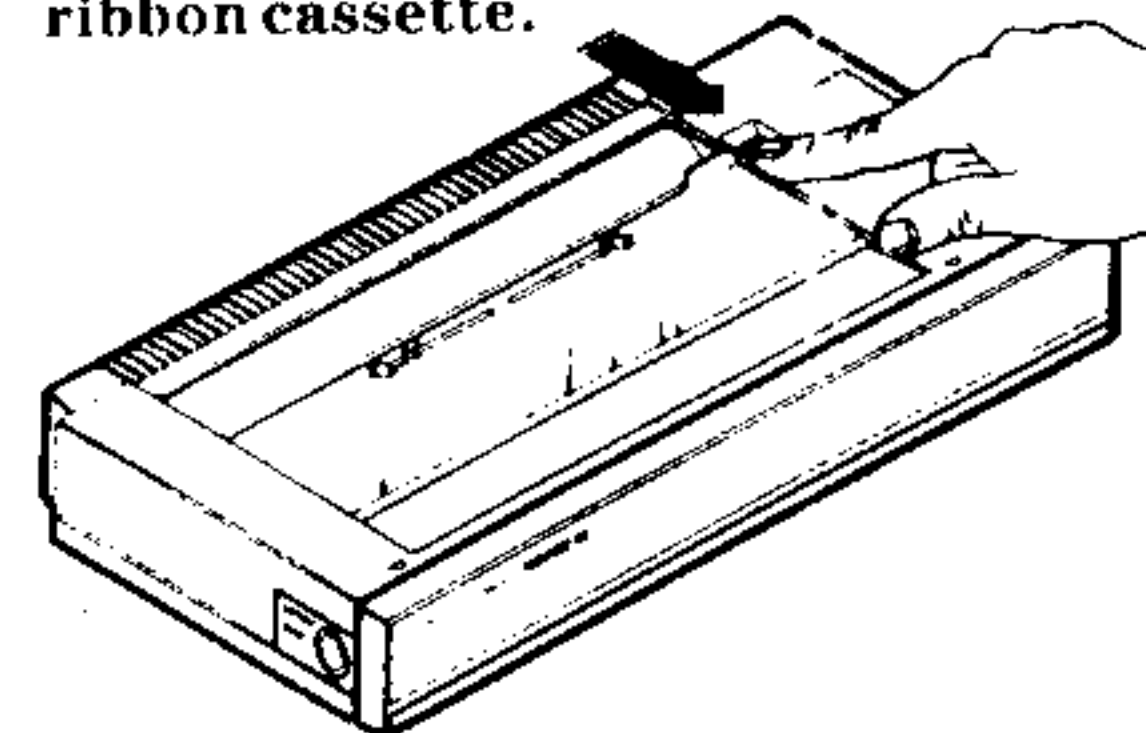
Changing the Ribbon Cassette

Note: It is not necessary to use a ribbon cassette when you are printing on thermal paper. This paper is specially treated for thermal printing, and does not require ribbon. As noted in the specifications, the life of the ribbon is 20,000 characters. This corresponds to 10 pages of text, with each page double spaced and having 60 lines per page.

You can effectively "extend" the life of your ribbon by using thermal paper whenever possible, and plain paper (with the ribbon cassette installed) only when necessary.

1. Open the paper cover.

2. Move the paper release lever toward the front of the printer until it clicks into the open position.

Caution: To avoid damage to the ribbon, you must move the paper release lever to the open position before removing or inserting a ribbon cassette.

3. Remove the old ribbon cassette by pulling it gently upward.

4. Insert the new cassette as shown in the drawing. Make sure the exposed portion of the ribbon passes between the print head and the friction roller.

5. Press the cassette down until it clicks into position.

Ribbon   **Print Head**

Shipping Retainer (remove)
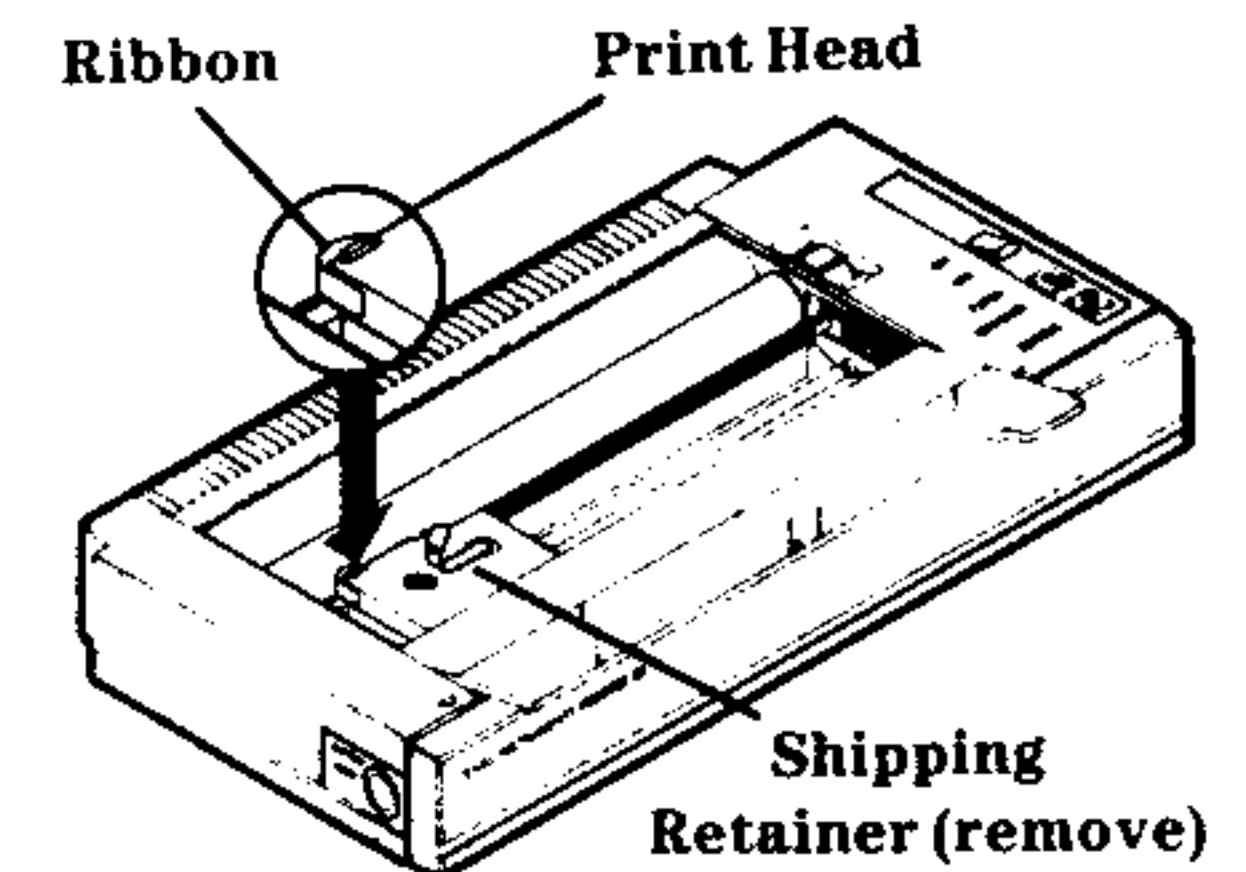
6. Remove the green plastic shipping retainer so the ribbon can advance.

7. Turn the small wheel on top of the cassette counterclockwise until the ribbon fits snugly against the print head. This is important, as it prevents damage to the ribbon when printing begins.

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8. Return the paper release lever to the closed position.

9. Close the paper cover. (If you have paper already positioned for printing at the very top of the sheet, the cover must remain open until the paper has advanced far enough to clear the paper cover.)

For information on obtaining replacement ribbon cassettes, refer to "If You Have Questions or Need Assistance" on page 31.

Self-Test Feature

The Printer 80 has a built-in self-test capability so you can check that all characters are printing properly. To use this feature, press the paper advance button while turning the printer ON. A pattern of all 96 available characters is printed. The pattern repeats until you turn the printer OFF.

The OPEN statement establishes a link with the Printer 80, and readies it for printing. The PRINT statement follows OPEN, and is most often used to send printable characters to the printer. CLOSE is used when your program is finished sending characters to the printer.

Using the OPEN Statement

The Printer 80 is treated by your TI computer as a peripheral, or external, "device."

In order to access a device from BASIC, you must identify the device with an OPEN statement. This statement establishes a link between BASIC and your Printer 80. The OPEN statement has the following general form.

OPEN #*file-number*, "*device-number*[.*software-options*]" [,*file-attributes*]

File-number is a numeric expression that evaluates to an integer within the range 1 to 255. The *file-number* must be one that is not currently in use for another file.

Device-number is the numeric designation of the peripheral to be operated. Each peripheral has a unique number. *Device-number* 16 is used to designate the Printer 80.

Note: A jumper wire on the printed circuit board can be cut to change the Printer 80's *device-number* to 17. This allows the use of two printers on the same system. If your applications require this modification, write to Texas Instruments Incorporated, Printer 80 Device Codes, P.O. Box 53, Lubbock, Texas 79408.

Software-options are a set of parameters that you may use to set the printing characteristics of the Printer 80 while the file is open. If you choose not to alter them, these characteristics assume certain settings called **default values**. If more than one *software-option* is specified in your OPEN statement, the options must be separated by a period or a comma. The following *software-options* can be selected on the Printer 80.

• L=S sets the printer to single line-spacing. This is the default value for line-spacing, and is used if you do not specify L=D.

- L=D sets the printer to double line-spacing. If this option is specified in the OPEN statement, any linefeed character will cause the paper to be advanced two lines.

- R=L causes the printer to perform a linefeed and carriage return after each record is printed. This is the default value for linefeeds, and is used if you do not specify R=N.

- R=N causes the printer **not** to perform a linefeed and carriage return after each record is printed. Regardless of this setting, the printer will always perform a linefeed and carriage return when the print head reaches the right edge of the paper. Linefeed and carriage return control codes embedded in your data are always performed.

File-attributes are keywords that define certain features of the data to be sent to the printer. If an attribute is not specified in the OPEN statement, a default value is assumed. The features defined by *file-attributes* are described below.

- File organization—The only file organization that may be used with the Printer 80 is SEQUENTIAL. This is the default value, and need not be specified in the OPEN statement. RELATIVE (random access) file organization cannot be specified.

- File type—This attribute specifies whether data is to be transmitted in ASCII characters as DISPLAY or in the internal machine format as INTERNAL. A Printer 80 file should be opened with the DISPLAY file type. DISPLAY is the default value and need not be specified.

- Open mode—This attribute determines whether the file may be read from (INPUT), written to (OUTPUT), or both (UPDATE). Because the Printer 80 is an output device, the OUTPUT open mode **must be** specified in the OPEN statement. INPUT and UPDATE (the default value) open modes are invalid, and will result in an error condition.

- Record type—Records are the blocks of data sent to the printer. The Printer 80 defaults to VARIABLE records with a maximum record length of 80 characters. If you prefer, you may specify VARIABLE records with a different record length.

Here is an example of the OPEN statement for use with the Printer 80.

```
OPEN #1,"16.L=D",OUTPUT
```

Caution: Once you have opened a file for the printer, do not turn the printer OFF to change paper or ribbon. This causes an error when your program attempts to send additional data to the printer. If the printer must be turned OFF while a printer file is open, you may have to restart the program.

Additional examples of the OPEN statement are shown later in this section.

Using the PRINT Statement

After establishing a link to the Printer 80 with the OPEN statement, you can print your data. The data can be sent to the printer in the form of numeric values, strings of characters, or control codes that instruct the printer to perform some action. The PRINT statement is used for this.

For example, the following statement prints the phrase THIS IS THE PRINTER 80.

```
PRINT #1,"THIS IS THE PRINTER 80"
```

Note: If you do not first use the OPEN statement, a "File Error" message is displayed, and nothing is printed. The *file-number* in the PRINT statement (following the "#" sign) must be the same as that used in the OPEN statement.

Additional examples of the PRINT statement are shown later in this section.

Using the CLOSE Statement

The CLOSE statement is used to dissolve the link established by an OPEN statement. If a print-pending condition is active, CLOSE sends to the printer any data remaining in the print buffer. Once the CLOSE statement is executed, you can assign the *file-number* to another device.

If you specified *file-number* 1 in your OPEN statement to the Printer 80, the following statement prints any characters still in the file buffer, and then dissolves the link between BASIC and the printer.

```
CLOSE #1
```

The CLOSE statement must be used before you can OPEN the same file again. If the *file-number* used in the CLOSE statement does not refer to an open file, a "File Error" message is displayed.

Characters and numbers can be sent to the printer. Here are some examples of different methods for printing characters. There is a difference between printing a number and sending a character's ASCII value to the printer. (ASCII stands for American Standard Code for Information Interchange.)

Printing Text

The following program illustrates the combined use of the OPEN, PRINT, and CLOSE statements for a TI Compact Computer. Enter each line as it is shown. To run the program, press the CLR, RUN, and ENTER keys.

```
100 OPEN #3,"16",OUTPUT
110 PRINT #3,"HELLO THERE"
120 CLOSE #3
130 END
```

The program prints HELLO THERE. In this example, an arbitrary choice was made to use *file-number* 3.

The following program produces the same printed message, but uses a different method.

```
100 OPEN #1,"16",OUTPUT
110 M$="HELLO THERE"
120 PRINT #1,M$
130 CLOSE #1
140 END
```

In this case, the message "HELLO THERE" is assigned to the string variable M$, and the variable is then printed.

In addition to assigning a string of characters to a variable by enclosing the characters in quotes, you can assign them in the following way.

```
100 A$=CHR$(72)&CHR$(105)
110 OPEN #255,"16",OUTPUT
120 PRINT #255,A$
130 CLOSE #255
140 END
```

The program prints the message Hi. Line 100 "builds" A$ by assigning the ASCII values 72 ("H") and 105 ("i"). For a complete list of ASCII character values, refer to Appendix B.

Numbers and numeric variables can also be printed. The following program demonstrates this.

```
100 OPEN #1,"16",OUTPUT
110 K=9000
120 PRINT #1,K,788
130 CLOSE #1
140 END
```

Output from the above program:

```
9000      788
```

Notice that the value assigned to the variable K (9000) and the numeric "constant" 788 are both printed on the same line. The separation between the two numbers is caused by the comma between K and 788 in line 120. If you change this comma to a semicolon, the numbers still print on the same line, but have less space between them.

PRINT USING is a variation of the PRINT statement that allows very specific formatting of printed data. The following program illustrates the use of the PRINT USING statement to print a formatted table with the Printer 80. It prints several numeric values and their corresponding ASCII characters, similar to Appendix B.

```
100 OPEN #1,"16",OUTPUT
110 FOR REF=32 TO 50
120 FOR CH=REF TO REF+76 STEP
    19
130 PRINT #1,USING"### #
    ".CH,CHR$(CH);
140 NEXT CH:PRINT #1
150 NEXT REF
160 CLOSE #1
170 END
```

Line 130 shows the form of the PRINT USING statement. The PRINT #1 statement in line 140 causes the printer to perform a linefeed and carriage return after each five items have been printed across the page.

Refer to the manual supplied with your computer for more information regarding the printed format of numbers.

In addition to printable characters and numbers, you can send control codes. These are special codes that make the printer perform some action. Through control codes, your program can manipulate the Printer 80's paper-feed mechanism.

Printing Control Codes

The Printer 80 responds to seven "control codes." When the printer receives one of these codes, it performs a certain action, such as a reverse linefeed. All control codes have ASCII values in the range 0 to 31.

You can send control codes to the Printer 80 by using the CHR$($n$) statement, where n is the ASCII value of the desired control code. The control codes and their functions are described below.

ASCII Code	Function
5	Double Line-Spacing—Sets the printer to double line-spacing. After this code is received, any linefeed causes the paper to feed two lines instead of one.
7	Single Line-Spacing—Sets the printer to normal, single line-spacing. This condition is active when the printer is first turned on.
10	Linefeed—Causes the paper to advance one line (two lines if line-spacing is set to double). This control code does not move the print head to the right or left.
11	Reverse Linefeed—Causes the paper to feed one line in reverse (two lines if line-spacing is set to double). This control code does not move the print head to the right or left.
13	Carriage Return—Positions the print head to left edge of the paper on the current line.
14	1/2 Linefeed—Advances the paper 1/2 line, regardless of the current line-spacing condition. This code does not move the print head to the right or left.
15	1/2 Reverse Linefeed—Feeds the paper 1/2 line in reverse, regardless of the current line-spacing condition. This code does not move the print head to the right or left.

Note: Control codes 5 and 7 are not acted upon until a subsequent linefeed is performed by the printer.

As an example of sending control codes, the following program sets the Printer 80 to double line-spacing, prints two lines, then restores single line-spacing.

```
100  OPEN #1,"16.L=D",OUTPUT
110  PRINT #1,"1ST LINE"
120  PRINT #1,"2ND LINE":CHR$(7)
130  PRINT #1,"3RD LINE"
140  CLOSE #1
150  END
```

Output from the above program:

```
1ST LINE

2ND LINE
3RD LINE
```

The CHR$(7) in line 120 sends a control code that sets the Printer 80 to single line-spacing after the first two lines are printed. In this example, the L=D option is specified in the OPEN statement. Another method for setting double line-spacing is to print CHR$(5). This has the same effect as the L=D option, but can be used after the file has been opened with single line-spacing and several single-spaced lines have been printed.

The following program uses the 1/2 reverse and 1/2 forward linefeed control codes to illustrate the printing of superscripts.

```
100  OPEN #1,"16",OUTPUT
110  PRINT #1,"THIS IS";
120  PRINT #1,CHR$(15);"SUPER";CHR$(14);
130  PRINT #1," SCRIPT PRINT."
140  CLOSE #1
150  END
```

Output from the above program:

```
THIS IS SUPER SCRIPT PRINT.
```

The CHR$(15) in line 120 causes an immediate 1/2 reverse linefeed prior to the printing of any further text.

After the word SUPER is printed, CHR$(14) causes a 1/2 forward linefeed, returning the paper to the original print line.

The semicolons at the ends of lines 110 and 120 create a print-pending condition to prevent a linefeed and carriage return after the first two PRINT statements.

Exchanging the 15 and 14 in line 120 will cause the word SUPER to be subscripted (printed slightly below the original print line).

Super- and subscript printing are especially useful in math and chemistry printing applications.

The following program demonstrates a method for producing underlined text. The underline characters in line 130 are generated with CTL 5 on the Compact Computer.

Listing your programs on the printer provides you with an 80-column record useful in program analysis. Permanent file copies of your program listings can be stored for reference.

Applications programs such as word processors can send their results to the Printer 80.

```
100 OPEN #1,"16",OUTPUT
110 PRINT #1,"THIS IS UNDERLI
NED,":
120 PRINT #1,CHR$(13);
130 PRINT #1,"         _____
"
140 CLOSE #1
150 END
```

Output from the above program:

THIS IS UNDERLINED.

The CHR$(13) in line 120 sends a carriage return control code to the printer so that the underline characters will be printed on the same print line. The semicolons at the end of lines 110 and 120 create a print-pending condition to prevent the printer from performing a linefeed and carriage return after those PRINT statements.

Using the LIST Command

The LIST command produces a printed copy of your program, or a specified segment of the program. It is not necessary to precede the LIST command with an OPEN statement. The command may optionally specify a line number or a range of line numbers you want to print.

The following are some examples of the LIST command.

LIST "16"

Prints all lines in the current program.

LIST "16",120-

Prints program lines, starting with line 120.

LIST "16",120-140

Prints program lines 120 through 140.

LIST "16",-130

Prints from first program line through line 130.

Memo Processor with Data Communications

The Printer 80 can be used with the Compact Computers to print your Memo Processor documents, including text received through data communications. This is done by setting Memo Processor's printer options as shown here.

Option	Default	Change To
Print device number:	10	16
Mode (print/plot):	Compressed	Normal

For printing on single sheets, set the "Pause between pages:" option to YES. The remaining printer options, which are preset for use with the TI Printer/Plotter, can remain unchanged.

Refer to "Printing a Document" in the *Memo Processor User's Guide* for more specific information concerning these options.

Editor/Assembler

The Compact Computer Editor/Assembler contains options for printer output. For output to the Printer 80, specify device number 16 in the LIST command or when prompted to enter the filename during assembly. For example, the command LIST "16",100-120 lists source code lines 100 through 120 to the Printer 80.

Here are some DOs and DON'Ts to help you get the most from your Printer 80.

- Position the printer so that the *HEX-BUS*™ data cable is not likely to become entangled. Tension on the cable can damage the cable or the connector.
- Ensure that both the computer and printer are turned OFF before connecting or disconnecting the *HEX-BUS* data cable.
- Use the AC power adapter whenever possible. When the AC adapter is connected to the printer, your batteries are not used and will last longer.
- DO NOT leave batteries in the printer during extended periods without use. They can leak and cause damage to the printer.
- Keep the paper cover closed except when inserting paper or changing a ribbon cassette. The cover must remain open when you are using continuous fanfold paper to ensure smooth feeding of the sheets.
- Make sure the paper release lever is in the open position before inserting or removing a ribbon cassette.
- DO NOT turn the friction-feed roller by hand. Use the paper advance or paper reverse buttons.
- DO NOT place objects on top of the printer.
- DO NOT interfere with the print mechanism or the roller while the printer is in operation.
- Use your word processor's Stop at End of Page printing option (if it has one) while printing on single sheets. The

Printer 80 does not have a "paper empty" sensor to interrupt printing at the end of a page.
- The exterior surface of the printer can be cleaned with a mild detergent and water solution. **Caution: DO NOT USE SOLVENTS**
- DO NOT expose the printer or ribbon cassettes to extreme temperature conditions.
- Use the original shipping carton for storage and transport of the printer.

The following ASCII codes do not print characters on the Printer 80. Instead, they cause the printer to perform a specific action.

ASCII Code	Function
5	Sets Double Line-Spacing Mode
7	Sets Single Line-Spacing Mode
10	Performs a Linefeed
11	Performs a Reverse Linefeed
13	Performs a Carriage Return
14	Performs 1/2 Linefeed
15	Performs 1/2 Reverse Linefeed

Control code values (0–31) not listed here are ignored by the printer.

Note: Control codes 5 and 7 do not have any effect on printing until a subsequent linefeed is performed. For information on the use of these codes, see "Printing Control Codes" on page 16.

With ASCII codes, you can print a character by specifying its ASCII value in a PRINT CHR$(n) statement, where n is a decimal value corresponding to the character.

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

This appendix is provided for programmers with a working knowledge of Compact Computer assembly language.

As a HEX-BUS™ device, the Printer 80 is accessed by the sending of a command message. The printer replies with a response message. The command message is set up in a 12-byte HEX-BUS PAB (Peripheral Access Block), and consists of the device number, command code, and other information as shown below. The response message is returned in the PAB, and includes a status byte that specifies which I/O error, if any, has occurred.

In addition to a PAB, certain operations (such as OPEN or WRITE) require a data buffer for data to be transmitted to or received from the printer. For an OPEN command, the data buffer must contain the device attributes and software options. For a WRITE command, the data buffer must contain the actual data to be printed.

The structure of a PAB for the Printer 80 is as follows.

Device Number	(1 byte)
Command Code	(1 byte)
Logical Unit Number (LUNO)	(1 byte)
Record Number	(2 bytes, LSB first)
Buffer Length	(2 bytes, LSB first)
Data Length	(2 bytes, LSB first)
Returned Status	(1 byte)
Buffer Pointer	(2 bytes, LSB first)

- The Device Number (first byte) for the Printer 80 is normally >10. A jumper wire on the printed circuit board can be cut to change the Device Number to >11. This allows the use of two printers on the same system. If your applications require this modification, write to Texas Instruments Incorporated, Printer 80 Device Codes, P.O. Box 53, Lubbock, Texas 79408. The printer also responds to device code 00, which references all HEX-BUS™ devices. The Reset Bus command can make use of this device code.
- The Command Code (second byte) specifies which I/O operation is to take place. A list of command codes applicable to the Printer 80 is shown below.
- The Logical Unit Number (third byte) is ignored by the Printer 80.
- The Record Number (fourth and fifth bytes) is ignored by the Printer 80.
- The Buffer Length (sixth and seventh bytes) specifies the size of the data buffer for receiving data from the printer during the current bus operation. It should be set to at least >0004 for an OPEN command.

- The Data Length (eighth and ninth bytes) specifies the length of the data, if any, to be sent to the printer in the current operation. If no data is to be sent, this field should be set to >0000 in the command message.
- The Returned Status (tenth byte) is reserved for the error code returned in the printer's response message.
- The Buffer Pointer (eleventh and twelfth bytes) must contain the address of the data buffer, if any data is to be sent or received in the current operation. Any data to be sent to the printer in the current operation must be stored in the buffer. Any data returned as part of the printer's response message will be stored in the data buffer by the printer.

Note: Certain operations require that a data buffer contain data to be sent to the printer. Since RAM access is done in reverse order on the Compact Computer, the data in this buffer must be stored "backwards." That is, the last byte contained in the data buffer is the first byte sent to the printer, the second-to-last byte in the data buffer is sent next, and so on up to the data length specified.

Applicable command codes (second byte of the PAB) that may be used with the Printer 80 are as follows.

Command Code	Operation
>00	OPEN
>01	CLOSE
>04	WRITE
>07	RETURN STATUS
>0A	SERVICE REQUEST POLL
>FE	NULL OPERATION
>FF	RESET BUS

OPEN—Command code >00 is used to prepare the printer for receiving print data. For an OPEN command, the Buffer Length field of the PAB must contain a value of at least >0004 (this is to accomodate the data returned by the printer in its response message). The data buffer used in the OPEN command must contain the following data, stored in reverse order.

Requested I/O Buffer Size	(2 bytes, LSB first)
File Attributes	(1 byte)
File Characteristics, if any	(length varies)

- The Requested I/O Buffer Size specifies the size of the buffer that will be used during subsequent WRITE operations. It is equivalent to the maximum record length. If this value is zero in the OPEN command, the Printer 80 will return the default of >50 as the accepted I/O Buffer Size in its response message.
- The File Attributes byte must be >80 for the Printer 80. This value specifies the attributes SEQUENTIAL, DISPLAY, VARIABLE, and OUTPUT.
- The File Characteristics field may contain the *software-options* normally specified in an OPEN statement, such as L=D, R=L, etc., stored in their ASCII form. For a description of these options, refer to "Using the OPEN Statement" in the BASIC section of this manual.

Note: The Data Length field of the PAB must specify the length of the data to be sent (at least three bytes).

In response to an OPEN command, the Printer 80 will:
- perform a carriage return.
- return the length of its response data in the Data Length field of its response message. For an OPEN operation, this will always be >0004.
- return the following 4 bytes of data. Accepted I/O Buffer Size (2 bytes) Record Number (always zero) (2 bytes)

- return one of the following status codes.
  >00—sucessful open
  >01—incorrect file characteristics
  >02—invalid file attributes
  >05—device already open
  >06—device error (print head unable to initialize)
  >0C—buffer length error (length must be at least >0004)

WRITE—Command code >04 is used to send print data to the printer. For this command, the Buffer Length field of the PAB will be ignored, because no data is returned in the Printer 80's response to a WRITE command. The Data Length field of the PAB must contain the length of the data to be sent to the printer.

In its response to a WRITE command, the Printer 80 sets the Status byte of the PAB to one of the following error codes.

>00—WRITE sucessfully completed
>04—device not open

CLOSE—Command code >01 is used to terminate I/O with the printer. For a CLOSE command, the Buffer Length field of the PAB is ignored by the printer, because the printer's response to this command does not include any data. The Data Length field of the PAB must be set to >0000, since no data is included as part of a CLOSE command.

n the printer's response to a CLOSE command, the Data Length field of the PAB will be set to >0000, and the Status byte is set to one of the following error codes.

>00—CLOSE sucessfully completed
>04—device never opened
>08—data too long (CLOSE command attempted to transmit data)

RETURN STATUS—Command code >07 is used to determine the current status of the printer. The Buffer Length field of the PAB must contain at least >0001 to accomodate the 1-byte data returned by the printer. No data is sent in this command, so the Data Length field of the PAB should be set to >0000.

The Printer responds to the RETURN STATUS command by setting the Status byte of the PAB to one of the following error codes.

>00   status returned sucessfully
>08   data too long (Data Length was not zero)
>0C   Buffer Length = zero

Additionally, the printer's open or closed status is returned in the 1-byte data buffer. The bit fields in this byte are as follows.

bit 7	always 0
bit 6	always 0
bit 5	always 0
bit 4	1 if printer open, 0 if printer closed
bit 3	always 0
bit 2	always 0
bit 1	always 1
bit 0	always 0

SERVICE REQUEST POLL—Command code >0A is used to query a peripheral as to whether it requested service. Although the Printer 80 does not issue service requests, it must nevertheless be able to respond to a service request poll. No data buffer is required for the printer's response.

The response from the printer will always be a returned Status byte of >0A in the PAB. This value means "it wasn't me," that is, the service request did not originate from the Printer 80.

NULL OPERATION—Command code >FE is sent by the computer, and is not normally used in programming.

The printer does not issue a response to this command.

RESET BUS—Command code >FF is used to tell the printer (or all devices) to close all open files. When this command is received by the printer, it will initialize the print head and revert to a closed status. If a Device Code of >00 is used in this command, all *HEX-BUS*™ devices connected to the system honor the command. No data buffer is required for this command.

The printer does not issue a response to this command.

The following sample program is written in Compact Computer BASIC, and simulates assembly-language access to the Printer 80 using that computer. The program opens the printer, prints This is the Texas Instruments Printer 80., and closes the printer. An explanation of each program segment follows the program listing.

```
100 ! Build data and PAB for
OPEN
110 D$=CHR$(80)&CHR$(0)&CHR$(
128)&"L=D"
120 GOSUB 450:B1ADDR=ADDR
130 FOR CMDBYTE=1 TO 7
140 READ BYTE
150 PAB1$=PAB1$&CHR$(BYTE)
160 NEXT CMDBYTE
170 PAB1$=PAB1$&CHR$(LSBLEN)&
CHR$(MSBLEN)&CHR$(0)
180 PAB1$=PAB1$&CHR$(LSBBUF)&
CHR$(MSBBUF)
190 ! Build data and PAB for
WRITE
200 D$="This is the Texas Ins
truments Printer 80."
210 GOSUB 450:B2ADDR=ADDR
220 FOR CMDBYTE=1 TO 7
230 READ BYTE
240 PAB2$=PAB2$&CHR$(BYTE)
250 NEXT CMDBYTE
260 PAB2$=PAB2$&CHR$(LSBLEN)&
CHR$(MSBLEN)&CHR$(0)
270 PAB2$=PAB2$&CHR$(LSBBUF)&
CHR$(MSBBUF)
280 ! Build data and PAB for
CLOSE
290 D$=""
300 GOSUB 450:B3ADDR=ADDR
310 FOR CMDBYTE=1 TO 7
320 READ BYTE
330 PAB3$=PAB3$&CHR$(BYTE)
340 NEXT CMDBYTE
350 PAB3$=PAB3$&CHR$(LSBLEN)&
CHR$(MSBLEN)&CHR$(0)
360 PAB3$=PAB3$&CHR$(LSBBUF)&
CHR$(MSBBUF)
370 ! Now OPEN, WRITE, and CL
OSE
380 CALL IO(PAB1$,STATUS):CAL
L RELMEM(B1ADDR)
390 IF STATUS THEN PRINT "OPE
N error";STATUS:PAUSE:STOP
```

For clarity, the sample program uses three separate string variables to hold the three PAB's and three separate areas of memory for the data buffers. You can, however, use a single PAB and a single data buffer for all I/O with the printer.

```
400 CALL IO(PAB2$,STATUS):CAL
L RELMEM(B2ADDR)
410 IF STATUS THEN PRINT "WRI
TE error";STATUS:PAUSE:STOP
420 CALL IO(PAB3$,STATUS):CAL
L RELMEM(B3ADDR)
430 IF STATUS THEN PRINT "CLO
SE error";STATUS:PAUSE
440 END
450 ! Subroutine to store dat
a and get buffer address
460 DLEN=LEN(D$)
470 MSBLEN=INT(DLEN/256):LSBL
EN=DLEN-MSBLEN*256
480 CALL GETMEM(DLEN,ADDR)
490 VALUE=ADDR+DLEN-1
500 MSBBUF=INT(VALUE/256):LSB
BUF=VALUE-MSBBUF*256
510 FOR X=0 TO DLEN-1
520 CALL POKE(VALUE-X,ASC(SEG
$(D$,X+1,1)))
530 NEXT X
540 RETURN
550 ! Data for OPEN PAB
560 DATA 16,0,0,0,0,4,0
570 ! Data for WRITE PAB
580 DATA 16,4,0,0,0,0,0
590 ! Data for CLOSE PAB
600 DATA 16,1,0,0,0,0,0
```

Program line 110 assigns the Requested I/O Buffer Size, File Attributes, and File Characteristics to D$ (in the example, L=D is specified as a File Characteristic to cause double line-spacing). The subroutine at line 450 is then called to store the data length as LSBLEN and

MSBLEN (line 470), reserve space for the data buffer (line 480), store the buffer's address as LSBBUF and MSBBUF (line 500), and store the data from D$ in the buffer in reverse order (lines 510 to 530).

Lines 130 to 160 build the first seven bytes of a PAB for an OPEN operation into PAB1$ by reading the data from line 560. Line 170 adds the data length and a dummy status byte to the PAB, and line 180 adds the buffer pointer. The data buffer and PAB are now prepared for the OPEN command.

Lines 190 to 270 prepare a data buffer and a PAB (PAB2$) for a WRITE operation. The data from line 580 is used for the first seven bytes of the PAB.

Lines 280 to 360 prepare a PAB (PAB3$ and an empty data buffer for a CLOSE operation (no data is required for a CLOSE). The data from line 600 is used for the first seven bytes of this PAB.

Line 380 uses the CALL IO statement to send the OPEN command message to the printer and get the status byte of the printer's response message. Line 390 displays an error message if the OPEN was unsuccessful, that is, if the status byte was not zero.

Line 400 WRITEs the message This is the Texas Instruments Printer 80

Print Method	Thermal or Thermal Ink Transfer
Printing Speed	20 Characters per Second
Printable Characters	96 ASCII
Characters per Line	80
Printing Area	190.4 mm (7.5 in.
Ribbon Life (approximate)	20,000 characters
Paper Feed	Friction
Paper	Plain or Thermal
Paper Width	216 mm (8.5 in.
Supply Voltage	Four "D" Cell Alkaline Batteries or AC Adapter 120 Volt AC Input

Physical Dimensions:

Width	318 mm (12.5 in.
Length	163 mm (6.4 in.
Height	48 mm (1.9 in.

Data Interface	Texas Instruments HEX-BUS™

Service Information

This list does not include all possible error situations, but it may help you identify some of the more common errors. For a complete list of error codes, see Appendix C.

In Case of Difficulty

Compact Computer Symptom	Possible Problem
I/O error 2	OPEN statement did not specify OUTPUT mode.
I/O error 4	Printer was turned OFF after the file was opened and before the file was closed.
I/O error 6	Printer was unable to initialize properly (check for interference with print head movement).
I/O error 255	HEX-BUS data cable not connected. Printer not turned ON. AC power adapter plugged into printer, but not into a "live" wall outlet. Batteries dead. Wrong device-code was specified in the OPEN statement.

If the print head moves across the page, but no characters are printed, check for the following.

- Thermal paper must be inserted correctly, if thermal paper is used (see "Loading Paper" on page 7).
- Ribbon cassette must be inserted correctly, if used (see "Changing the Ribbon Cassette" on page 9).
- Paper release lever must be in the closed position (toward the rear of the printer).

If You Have Questions or Need Assistance

For General Information

If you have questions concerning repair of your Printer 80, please call our Consumer Relations Department at (800) 858-4565 (toll-free within the contiguous United States). If you wish to make peripheral or software purchases and are unable to find these items locally, call our Software Sales Department toll-free at (800) 858-4075. You can also call this number to order replacement ribbon cassettes (Part No. 1057277-1) or paper not available at your retail store. The operators at these numbers cannot provide technical assistance.

For Technical Assistance

For technical questions about programming, specific applications, etc., you can call (806) 741-2663. Please note that this is not a toll-free number, and collect calls cannot be accepted.

As an alternative, you can write to:

Consumer Relations Department
Texas Instruments Incorporated
P.O. Box 53
Lubbock, Texas 79408